On the Speed of Transition in Central Europe

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Abstract

Transition in Central Europe involves the closing and restructuring of state firms, as well as the emergence of a new private sector. The speed of closing and restructuring and the rate of private job creation determine the dynamics of unemployment. And unemployment in turn affects both the decisions to restructure as well as to create new private jobs. Our paper presents a model which captures these interactions. It characterizes the positive and normative properties of the equilibrium speed of transition and unemployment rate, and the role of policy.
In all Central European countries, the legacy of the previous economic system is a large and ailing state sector. Labor productivity is low. Many firms, or parts of firms, must close. The others need drastic restructuring and labor shedding before they can be made to prosper. But, so far, the pace of restructuring has been extremely slow.

The evolution of the state sector accounts however only for one side of the transition process. The other is the growth of a new private sector. The growth has been impressive so far, but it has not taken place across the board. And it is facing many obstacles, from poor financial markets to insufficient human capital and expertise.

This transition process raises many important issues. What is determining the speed of transition? How and why can it derail? What are the risks of going too fast and what are those of going too slow? Should the government try to affect the speed, and through which instruments?

These are the issues we take up in this paper. We think of the economy as having two sectors, the state and the private sector. Workers are either employed in one of the two sectors, or unemployed. We think of the pre-transition economy as one in which all workers work in the state sector. We then formalize transition as the result of two interacting processes, the restructuring of state firms on the one hand, and the growth of new private firms on the other. The rate of restructuring determines the flow into unemployment; the rate of private job creation determines the flow out of unemployment. Together they determine the evolution of unemployment and the speed of transition.\footnote{1}

We think that our contribution lies as much in offering a simple and flexible conceptual structure as in the results we obtain. But those can be stated simply. Most—but not all—of our results point to too slow a speed of transition, and thus for a role for the government to accelerate the process. They also point out however to a clear risk that too fast a speed can lead to derailment and an ultimately
unsuccessful transition.

Our paper is organized as follows.

Section 1 offers a benchmark model. In it, state firms are low productivity firms and are closed at some constant rate, leading to a flow into unemployment. The flow out of unemployment comes from private sector job creation, which is a function of both wage and non-wage costs. Wages in turn are a decreasing function of unemployment, while non-wage costs are an increasing function of unemployment. By assuming that state firms simply close at a constant rate, the model does justice neither to the possibility of restructuring, nor to the decisions of state firms as to restructure or not. But it sheds light on the joint dynamics of unemployment and private sector job creation. Those dynamics are characterized in Sections 2 and 3. The main lesson is that too high a rate of closing can, through its effect on unemployment, kill private sector growth and derail the transition.

Sections 4 and 5 refine the treatment of the state sector. Section 4 allows for restructuring rather than closing. Restructuring is formalized as a process where firms become private, productivity is increased, and a proportion of the workers are laid off. Section 5 focuses on the decision to restructure. It argues that in effect, workers can block restructuring, so that restructuring only happens if workers approve it. It derives the implications of such an assumption. Clearly, as restructuring implies that some workers will lose their job and that wages will be set as in private firms, restructuring is less appealing, the higher state firm wages compared to those in private firms, and the higher unemployment. Thus, the rate of restructuring and the flow into unemployment are decreasing in the level of unemployment.

Sections 6 to 8 put the pieces together. Section 6 characterizes the equilibrium rate of unemployment and speed of transition. Section 7 looks at their normative properties, and the case for government intervention. Section 8 presents rough calibrations.
Section 9 concludes, and indicates what we see as some of the limitations of our analysis. Let us mention one from the start. We carry our analysis under the assumption of a hard budget constraint, that firms cannot act in such a way as to obtain larger subsidies from the government. We see this as having been mostly true so far in the major Central European countries (but not in Russia; hence the title of our paper). But the constraint is likely to be tested again and again, and may well not hold in the future. Our only excuse for not modelling it is that this would have taken us too far.

1 A benchmark model

The economy is composed of two sectors, the state sector with employment \( E \), the private sector with employment \( N \). The labor force is normalized to one, so that \( E + N + U = 1 \), where \( U \) is unemployment, equivalently the unemployment rate. We assume that before the transition, all workers work in the state sector, so that \( E = 1 \) and \( N = U = 0 \). We describe the behavior of employment and wages, first in the state and then in the private sector.

1.1 The state sector

(1) Both price liberalization and the demise of the CMEA had the effect of making many jobs unproductive from the start of the transition process. We capture this by assuming that, as transition starts, employment in the state sector drops to \( E_0 \leq 1 \).

We assume that the remaining workers, \( E_0 \), have constant marginal product, \( x \). The low productivity of state firms is captured by assuming that \( x \) is less than \( y \), the marginal product of workers in the private sector, described below.

(2) Three years into the transition, most state firms have remained nominally state owned. But, in the absence of state supervision and control, firms have acted
largely in the interest of their workers, with a fairly short horizon. Thus, in many firms, workers have increased wages so as to appropriate quasi rents.

We capture this by assuming that the wage in state firms is equal to:

\[ w_E = \alpha z - z \]  

(1.1)

where \( \alpha \) is greater than one, reflecting the appropriation of quasi rents by workers, and \( z \) are taxes per worker. Once the workers have appropriated all rents, the incidence of taxes levied on the firm must fall entirely on wages.

(3) Finally, we assume that the speed of closing in the state sector is given by \( s \):

\[ dE/dt = -s \]  

(1.2)

We shall start by thinking of \( s \) as an exogenous parameter, say under the control of the government. Starting with the assumption of an exogenous \( s \) is useful in showing the basic dynamics of the model most starkly. But, later, we shall relax this assumption in two ways. First we shall allow for the fact that some firms, or parts of firms, can be saved and restructured, albeit at the cost of reductions in employment. Second, and more importantly, we shall endogenize \( s \), by looking at the choice of state firms/workers between restructuring or not restructuring.

1.2 The private sector

(1) The private sector has grown fast, but clearly cannot replace the state sector overnight. We assume private job creation to be given by:

\[ dN/dt = a(y - z - w) \]  

(1.3)

where \( y \) is the constant marginal product of labor in the private sector, \( w \) is the wage in the private sector, and \( z \) are again taxes per worker, which are assumed
to be the same for private and state firms.

Private job creation is thus characterized by a relation between the change in employment and the profit per worker. This relation can be seen as coming from the constraint that investment in new capacity not exceed retained earnings\(^3\). The evidence is indeed that that new private firms do not use outside finance. Or we can think of it as coming from costs of adjustment, some physical and conventional, and some coming from such aspects as learning by doing, accumulation of information, development of reputation in goods and financial markets and so on\(^4\). If the relation comes from costs of adjustment, it is likely however to be forward looking: before creating jobs, firms will worry about both current and future expected profits. We ignore this aspect for the time being, but take it up in Section 3 below.

(2) The evidence on private sector wage determination is still sketchy, but the idea that the private sector wage depends on labor market conditions appears reasonable. We take private sector wages to be determined by:

\[
w = b + c(r + H/U) \tag{1.4}
\]

where \(b\) is unemployment benefits, \(r\) is the interest rate, and \(H/U\) the ratio of hires to unemployment is the exit rate from unemployment, and \(c\) is a constant. This equation is easily derived from efficiency wage considerations. It is useful for later to derive it explicitly:

Let \(V_U\) and \(V_N\) be the values of being unemployed and employed in the private sector respectively. Assume further that there is no turnover in the private sector, so that hires, \(H\) are equal to \(dN/dt\), and that all hires are from unemployment\(^5\). Under those assumptions, the probability of being hired when unemployed is equal to \(H/U\).
The two values thus follow "arbitrage" equations:

\begin{align*}
    rV_U &= b + (H/U)(V_N - V_U) + dV_U/dt \quad (1.5) \\
    rV_N &= w + dV_N/dt \quad (1.6)
\end{align*}

When unemployed, a worker receives unemployment benefits \(b\), and has probability \(H/U\) of being employed. When employed, a worker faces, by assumption, no risk of becoming unemployed again, and thus receives the private sector wage forever after.

Many efficiency wage considerations can be summarized by the condition that firms choose a wage such that the value of being employed exceeds the value of being unemployed by some amount, thus such that \(V_N - V_U = c\), \(c \geq 0\). Under that assumption, which obviously implies that \(dV_N/dt - dV_U/dt = 0\) as well, taking the difference between the two equations above gives the wage equation \((1.4)\) above. Note that, in that equation, higher unemployment benefits increase the wage one for one. Note also that the wage is an increasing function not of the unemployment rate itself, but of the exit rate out of unemployment. It is clearly the probability of getting a job, not the unemployment rate per se, which is of concern to workers, and thus, which affects the wage.

1.3 Taxes and unemployment benefits

The remaining assumption relates taxes, unemployment and unemployment benefits. We assume that taxes are levied equally on employment, state and private, to finance unemployment benefits. This implies:

\[ Ub = (1 - U)z \quad (1.7) \]

This relation has a straightforward implication. Higher unemployment, given unemployment benefits, leads to higher taxes per worker; thus, ceteris paribus,
higher unemployment decreases private job creation.

There is obviously more to the relation between the process of transition and fiscal balance than this simple relation. We see this formalization as a metaphor for the different channels through which a depressed economy affects adversely the profitability and thus the growth of the new private sector. These may be other, but related, fiscal channels: for example, there has been in Poland an unusually large flow of retirements, clearly as an alternative to unemployment for older workers; those higher retirement benefits also need to be financed. These may be through aggregate demand: higher unemployment may mean lower aggregate demand, and lower demand for the output of private firms. One can think of yet others: higher unemployment decreases support for reform and thus the likelihood that the reform process will go on; this in turn leads to lower expected profitability, higher uncertainty, and in turn lower private job creation.

There is a strong assumption implicit in (1.7). It is that the tax burden on private firms depends just on unemployment, and does not depend on the composition of employment between the private and the state sector. One may easily think of channels through which the burden may depend on that composition, for example if state firms receive subsidies and private firms do not, or if state firms and private firms are taxed differently. Allowing for such distribution effects would, complicate the analytics below; we do not think that it would change very much the substance of our results.\(^6\)

### 1.4 Taking care of corners

In specifying our assumptions, it might have been more natural to specify the equations for state and private employment in terms of rates of change rather than changes, i.e. in terms of \((dE/dt)/E\) and \((dN/dt)/N\) than in terms of \(dE/dt\) and \(dN/dt\). We have chosen our specification because it substantially simplifies the analysis later, leaving only one state variable, unemployment, rather than two, employment in one sector and unemployment. But, as a result of these assump-
tions, the economy can hit corners, and we have to state what happens when those are reached. Those conditions only play a role at the end of the transition or when things in the economy go very wrong, but they must be specified nevertheless:

First, state employment can only decline if it is positive in the first place, so that the condition (1.2) only holds for $E > 0$: for $E = 0$, $dE/dt = 0$. Second, a similar condition must hold for private employment. Here, it is convenient and innocuous to make a slightly different assumption, that for $(y - z - w) < 0$, $N = 0$. Namely, private firms can close if they are losing money. We shall ignore these conditions in the text, (but not in the derivations and graphs which underlie the text), only mentioning them when directly relevant.

2 Unemployment and the speed of transition

In our benchmark model, the speed of closing determines the inflow into unemployment. Unemployment in turn determines private job creation, the out-flow from unemployment. Together, these two relations thus determine unemployment dynamics.

Working backwards, we first derive the relation between unemployment and private job creation. Solving for the wage, using equations (1.4), (1.3) and (1.7) gives:

$$(w - b) = [ca/(U + ca)][y + (r/a)U - ((1/(1 - U))b]$$  \hspace{1cm} (2.1)

Replacing $w$ by its value from (2.1), and $z$ by its value from (1.7) gives private job creation as a function of unemployment:

$$dN/dt = a[U/(U + ca)][y - rc - (1/(1 - U))b] \equiv f(U)$$  \hspace{1cm} (2.2)

Unemployment affects private job creation through two channels. The direct channel is captured in the first term: the higher is unemployment, the lower is
the wage, and thus the higher is private sector job creation. The second term captures the effect of unemployment through contributions, taking into account implicitly the incidence on the private sector wage, which partly offsets the effect. The higher is unemployment, the higher are unemployment contributions, thus the lower is private sector job creation.

How these two relations determine unemployment is shown in figures 1 and 2, which, each, plot private job creation and state job closing as functions of $U$.

In both, private job creation is given by $dN/dt = f(U)$. The locus starts from the origin. When unemployment is equal to zero, the wage is so high as to prevent private employment creation; any positive rate of hiring would lead to an infinite exit rate and thus infinite wages. As unemployment increases, the effect which dominates initially is the direct effect of unemployment on wages, so that private employment growth increases. As unemployment gets sufficiently large however, the effect of unemployment on contributions dominates the effect of unemployment on wages, and private employment growth declines. As unemployment gets large enough, wages and contributions exceed the marginal product of labor, leading to the disappearance of the private sector. Thus, at low unemployment, higher unemployment leads to more job creation; at high unemployment, higher unemployment leads to less job creation.

In both, the decline in state employment on the other hand is given by $s$, which is, by assumption, constant and thus independent of unemployment, a horizontal line at $s$.

Figures 1 and 2 consider the two configurations which these equations can yield: In figure 1, the maximum rate of private sector job creation is such that it exceeds $s$, so that unemployment at that point is decreasing. In that case, if the economy starts anywhere between 0 and $U_1$, unemployment goes to $U_1$ and then stays there during the transition. If the economy starts between $U_1$ and $U_2$, then unemployment decreases to $U_1$. Beyond $U_2$, the weight of contributions is too large; the
private sector does not take off fast enough and unemployment grows until the private sector actually closes. To the right of point A, the private sector never takes off.

In figure 2, the maximum rate of private sector change is instead such that unemployment is still increasing at that point. In that case, starting from low unemployment, things look good initially, and the rate of change of private sector employment is increasing. But, before private employment growth can offset state employment decline, the fiscal effects become dominant, and private employment starts slowing down. Unemployment relentlessly increases until everybody is unemployed.

There is one simple lesson from this model: there is a maximum speed at which the state sector can be closed. It is that value of s such that the two loci are exactly tangent. If the speed is higher, the rise in unemployment never allows the private sector to grow fast enough to replace the jobs lost in the state sector.

3 A forward looking private sector

As we pointed out earlier, private sector job creation is likely to be, at least in part, forward looking. Many private firms, and especially foreign direct investors, will not invest if they expect conditions to deteriorate, and profits to shrink in the future. But in turn, profits in the future may be low if private job creation is insufficient to avoid rising unemployment.

To explore this interaction, we modify our description of private employment creation, equation (1.3), to read:

\[ \frac{dN}{dt} = arV \]  \hspace{1cm} (3.1)

\[ rV = (y - z - w) + \frac{dV}{dt} \] \hspace{1cm} (3.2)

where \( V \) is the value of a new private job. Job creation now depends on the value
of a new job. The value of a new job follows an arbitrage equation, which implies that it is the present value of the difference between \( y \) and direct and indirect costs, \( z + w \). Such a relation is easily derived from quadratic costs of adjustment.

Under these assumptions, the economy reduces to two equations, in \( U \) and \( V \):

\[
\frac{dU}{dt} = s - arV \tag{3.3}
\]

\[
rV = f(U) + \frac{U}{(U + ca)} dV/dt \tag{3.4}
\]

where, as before, \( f(U) \equiv \frac{U}{(U + ca)}[y - (1/(1 - U))b] \).

The locus \( (dU/dt = 0) \) is an horizontal line in the \( V - U \) space, at \( (V = s/ar) \), such that private employment creation is equal to state employment destruction. The locus \( (dV/dt = 0) \) is given by \( V = f(U)/r \) and thus has the same properties as the \( f(U) \) locus characterized earlier. It goes through the origin as, if \( U \) is zero, wages extract all the rents and thus \( V \) is zero. It is upward sloping initially as unemployment decreases wages more than it increases unemployment contributions. Eventually, it is downward sloping, and \( V \) becomes equal to zero at \( U = 1 - b/y \).

There are again two cases, depending on whether the two loci intersect or not. We concentrate on the case where they intersect; the conditions for this are the same as before.

The dynamics are characterized in figure 3. There are always two equilibrium paths. The first path is given by \( A'B' \) (under myopic expectations, it would be given by \( OB' \) instead). The private sector is optimistic, and quickly creates enough jobs to maintain unemployment constant. The transition is a smooth one. The second path goes to the wrong place. Firms are less optimistic, create less jobs, employment creation is never enough, and their fears are proven founded. The economy goes from \( A \) to \( B \) and asymptotes to \( C \) as above. 

Thus, even if the speed is below the maximum speed derived in the previous sec-
tion, expectations matter very much. If $s$ is constant, there are always two self-fulfilling paths, one where transition succeeds, and one where it is anticipated to fail and indeed does fail.

What are the policy lessons from this exercise? Suppose that the government can control $s$. There is no obvious sense—at least that we can see—in which a lower speed makes the good outcome more likely. But the government can however announce a policy which eliminates the bad outcome. Any policy which announces that the speed of closing will be equal to zero for an unemployment rate higher than, say $U_1$, achieves this result. Under such an announcement, the only perfect foresight path will be the good path. One can think of other announcements which achieve the same result. For example, the announcement that unemployment benefits will be eliminated if unemployment exceeds $U_1$ formally serves the same purpose. But one senses that there is a substantive difference between the two announcements. Even without an explicit treatment of the government’s objectives, it is clear that the announcement of lower benefits when unemployment benefits is more likely to suffer from problems of credibility and time consistency.

Thus, within our model, the lesson is that, in order to avoid self-fulfilling forecasts of the failure of transition, for example, by foreign investors, the government may want to announce a flexible policy, namely announce that, conditional on high unemployment, it will slow down the process of closing state firms. In doing so, the government will avoid the emergence of high unemployment, and therefore will not have to actually decrease $s$.

How robust is this result? It goes against the often expressed view that it is as risky to go slow as it is to go fast. One possible rationale for that view is that, with time, state firms may increasingly ask for and obtain subsidies, more so than private firms. Our model very much relies on the assumption that state firms operate under a hard budget constraint. While this assumption is clearly incorrect in Russia, it has been largely satisfied in the major Central European countries so far.
4 Restructuring instead of closing

The approach so far has been to assume that all activity must eventually come from the new private sector. The evidence however suggests that this view is wrong, that a number of state firms are likely to be profitable, although not without closing of some activities, and not without considerable labor shedding.

This possibility of transformation can be introduced easily—perhaps too easily—in the following way. Reinterpret the initial assumptions about state firms as follows. Initially, there are $E_0$ state “firms”, each producing $x$ units of output, and employing each 1 worker (a convenient normalization). Over time, those firms are transformed. Transformation is such that:

1. each firm now employs only $\lambda$ workers, $\lambda < 1$, and each worker produces $y, y > x$ units of output, so that each firm now produces $\lambda y$ units of output, which can be greater or less than $x$. Closing, the case we have considered so far, is clearly just a special case of this more general formulation, with $\lambda = 0$.

2. the new firm operates from then on like a private firm, so that wages are now set as in the rest of the private sector, at level $w$.

Thus, we think in effect of transformation as restructuring cum privatization. The private sector will now include both transformed state firms and new private firms; we shall when convenient, refer to the second source, as “new” private job creation.

We shall maintain for the moment the assumption of an exogenous speed $s$, where $s$ is now the speed of restructuring rather than of closing. We shall endogenize it in the next section.

When restructuring takes place at rate $s$, $(1 - \lambda)s$ workers become unemployed. The equation for the behavior of unemployment becomes:

$$\frac{dU}{dt} = s(1 - \lambda) - f(U) \quad (4.1)$$
The dynamics of unemployment and transition are thus the same as in figures 1 and 2, with the flow into unemployment being given by the horizontal line at \((1 - \lambda)s\) rather than \(s\). The conclusions we derived earlier above still hold, in slightly modified form:

There is a maximum speed of restructuring —which is simply equal to the maximum speed of closing we derived earlier, multiplied by \(1/(1 - \lambda)\)— consistent with a successful transformation. For speeds beyond this maximum, even if restructuring directly increases output, that is even if \(\lambda y > x\), unemployment increases too much. This eventually kills private sector job creation. Eventually, both the new and the transformed private sector become unprofitable and close.

For speeds lower than the maximum, and as long as \(U_0 < U_2\), the economy eventually converges to \(U_1\), the lower of the two unemployment rates at which \(dU/dt = 0\), and stays there during the transition. When unemployment is equal to \(U_1\), restructuring is contributing both directly (\(\lambda s\)) and indirectly \((f(U))\) to the increase in the private sector. The indirect effect is through the increased unemployment, which, given that \(f'(U_1) > 0\), leads to faster job creation in the new private sector as well.

When forward looking behavior is introduced in the new private sector, as we did in the previous section, then constant announced speeds of restructuring are associated with two paths, one successful and one unsuccessful. And, again, announcing that restructuring will be halted if unemployment is too high can help sustain the virtuous circle equilibrium.

5 Restructuring as a choice

We have so far viewed the speed of restructuring as a given parameter, under the control of the government. We now view it instead as a choice by state firms. Many of them indeed have the choice, at least for some time, between continuing to operate at low levels of productivity, or restructuring, getting rid of redundant
operations, eliminating labor hoarding, and increasing productivity. When will they take the decision to restructure? If firms' decisions mostly represent, as we have argued, the interests of their workers, the answer must be that firms will be restructured only when the workers agree to it.

What it means for "workers to agree" is ambiguous, and this raises an issue of much relevance. To see that, let $V_E$ represent the value for a worker of employment in the untransformed state sector. Let, as before, $V_U$ be the value of being unemployed. And let $V_N$ be the value of being employed in the transformed firm, which, under our assumptions, is the same as that of working in the new private sector so that we can use the same symbol. Recall that restructuring implies that a proportion $\lambda$ of the workers will remain employed after restructuring, and a proportion $1 - \lambda$ will become unemployed.

If all workers perceive an equal probability of keeping their job after restructuring, then—under the assumption of risk neutrality, an assumption that we have made implicitly until now in defining the various value functions as linear in wages and benefits—, the condition for restructuring is:

$$\lambda V_N + (1 - \lambda)V_U \geq V_E$$  \hspace{1cm} (5.1)

For restructuring to take place, the expected value after restructuring must be greater than or equal to the value absent restructuring.

But, in most firms, the assumption that workers choose under a veil of ignorance is clearly wrong. In most cases, it is easy to identify parts of the firm which will surely have to close. What happens then depends on the decision process within the firm. Even if decisions to restructure require, as they do de facto in Poland, quasi unanimity of the workers, the condition above may still hold if those workers who know they will lose their job can be fully compensated, through severance pay for example, by those who are likely to keep theirs. But the evidence is that, in many cases, workers who were likely to lose their job as a result of restructuring
have blocked attempts at such restructuring. Under the extreme assumption of unanimity and no-transfers, the condition for restructuring must be:

\[ V_U \geq V_E \quad (5.2) \]

This condition, that restructuring will take place only if those who lose their jobs as a result are as well off as if they remained employed in the untransformed firm, is probably too strong, and reality is somewhere between the two conditions, (5.1) and (5.2). We shall work in what follows with condition (5.1), and indicate how things are modified when working with (5.2) instead.

6 Endogenous restructuring, unemployment and the speed of transition

We now put both parts of the model together, and start by giving a general description of the transition, with details and qualifications to follow:

Starting from an unemployment rate \( U_0 \), the economy converges to an equilibrium unemployment rate, \( U^* \), such that the condition (5.1) holds with equality. From then on, the economy stays at this unemployment rate, until the end of the transition.

At \( U = U^* \), job creation in the new private sector is equal to \( f(U^*) \). The speed of restructuring is thus given implicitly by the condition that inflows into unemployment equal outflows, or \((1 - \lambda)s^* = f(U^*)\). Thus, at \( U = U^* \), total private sector job creation, from transformation of state firms and from new private sector creation is equal to:

\[ s\lambda + f(U^*) = f(U^*)/(1 - \lambda). \]

Along the transition path, the value of being employed in the private sector is given by \( V_N = w/r \). As the wage is a decreasing function of unemployment, \( V_N \)
is a decreasing function of unemployment. And from the conditions $V_N = V_U + c$ and $V_E = \lambda V_N + (1 - \lambda) V_U$, the three values are all decreasing functions of unemployment. And from the same conditions, those employed in the private sector are better off than those employed in the state sector, who are in turn better off than the unemployed:

$$V_N > V_E = V_N - (1 - \lambda)c > V_U = V_N - c$$  \hfill (6.1)

### 6.1 Characterizing $U^*$

We now characterize $U^*$ formally. The value of being employed in a state firm absent restructuring is characterized by:

$$rV_E = \alpha x - z + dV_E/dt$$  \hfill (6.2)

Along the transition path, when $U$ is equal to $U^*$, unemployment benefits and thus taxes per worker, $z$ are constant. Thus, $dV_E/dt = 0$, and $V_E$ is given by $(\alpha x - z)/r$.

The values of being unemployed and of being employed in the private sector respectively are given by equations (1.5) and (1.6). If $U$ is constant, then $w, f(U)/U$ are also constant, and $dV_N/dt = dV_U/dt = 0$. Thus, $V_N$ and $V_U$ are given by:

$$rV_N = w = b + c(r + f(U^*)/U^*)$$  \hfill (6.3)

$$rV_U = b + (f(U^*)/U^*)(V_N - V_U)$$  \hfill (6.4)

Replacing in equation (5.1) and noting that $V_N = V_U + c$ gives:

$$\alpha x - z = b + cf(U^*)/U^* + \lambda cr$$  \hfill (6.5)
Equilibrium unemployment, $U^*$ must be such as to make the wage in the state sector, the left hand side of (6.5), equal to the sum of three terms. The first two are unemployment benefits, and the exit rate out of unemployment times $c$, the difference in value between being employed in the private sector and being unemployed. The third is the annuity value of being employed in the private sector over the value of being unemployed, times the probability of being employed in the restructured firm. If we had used condition (5.2) instead of (5.1), that is if restructuring had to be approved by those who knew they were going to lose their jobs, this third term would be absent.

How does the economy get to $U^*$? If, at the start of the transition, the unemployment from the initial shock, $U_0$, is less than $U^*$, there is a discrete amount of restructuring, and a discrete increase in unemployment until $U = U^*$. If instead, $U_0$ exceeds $U^*$, there is no restructuring until private sector growth has reduced unemployment to $U^*$.

To characterize $U^*$ further, rewrite (6.5) using the expression for $f(U)$ and the balanced budget condition that $z = bU/(1 - U)$. This gives:

$$ax - \lambda cr = A(U) \equiv \frac{ac}{(U + ca)}(y - cr) + \frac{U}{(U + ca)}(b/(1 - U)) \quad (6.6)$$

Figure 4 plots both sides of the equation. The left hand side is an horizontal line at $ax - \lambda cr$. The right hand side, $A(U)$ is equal to $y - cr$ for $U = 0$. If $y - cr - b > 0$, the condition that the marginal product of the private sector exceeds the lowest wage the private sector may pay, $A(U)$ is initially downward sloping. Eventually however, it increases and tends to $\infty$ as $U$ tends to one. Figure 4 shows that, depending on parameters, three configurations are possible:

In the first, state workers just do not want to restructure, and prefer to keep their state wages, which in part capture quasi rents, to the risks of restructuring and associated unemployment. This will be the case when $A(0)$ is below the horizontal
Figure 4.

\[ A(u) \equiv \frac{ca}{u + ca} (y - cr) + \frac{uu}{u + ca} \frac{b}{1 - u} \]
locus, or equivalently if \( ax - c\lambda r > y - cr \). In that case, if \( U_0 \) is initially equal to zero, the process of transition will never start. No restructuring will take place, and zero unemployment will lead to high private wages, preventing the growth of the new private sector as well. If unemployment is initially positive, private sector job creation will also be initially positive, but as unemployment decreases, job creation will stop altogether. In that case, the transition will fail, by being too slow.

In the second, state workers want to restructure no matter what the unemployment rate. This will be the case when the horizontal locus is so low as not to intercept the \( A(U) \) locus. The outcome will be instantaneous restructuring. If \( f(U_0 + (1 - \lambda)E_0) > 0 \), then all state firms will be restructured, and from then on, the new private sector will expand until unemployment has returned to zero. If instead \( f(U_0 + (1 - \lambda)E_0) < 0 \), then restructuring will take place up to the point such the unemployment it generates is such that \( f(U) = 0 \). At that point, the new transformed sector will break even, and the private sector will never start. Thus, the transition will also fail, this time from being too fast.

In the third case, the case we shall focus on, \( A(U) \) and the horizontal locus cross twice. This is the case actually drawn in figure 4. In that case, only the lower unemployment rate is stable, and we shall concentrate on it as we turn to comparative statics.

### 6.2 Comparative statics

Using figure 4, we can ask how changes in the various parameters affect both \( U^* \) and \( s^* \).

Take a decrease in \( \alpha \), a goal that the Polish government has tried to achieve through punitive taxation of wage increases in state firms in excess of wage norms. Such a decrease shifts the horizontal locus down, increasing equilibrium unemployment. This is because, while they have no direct effect on production in the
state sector, lower state sector wages makes state workers less reluctant to embark on restructuring. As they do so, unemployment increases. As \( f(U)/U \) is a decreasing function of \( U \), the exit rate from unemployment decreases until equation (6.6) holds with equality.

What happens to the speed of restructuring and to the speed of new private sector creation is however ambiguous. Note first that what happens to both is linked by the fact that if unemployment is constant, the flow into unemployment, which is proportional to the speed of restructuring, must be equal to the flow out of unemployment, which is equal to new private sector employment creation. What happens to both is thus determined by the value of \( f'(U^*) \), the effect of unemployment on hires at \( U^* \). As we saw in figure 1, \( f'(.) \) is initially positive, and becomes negative for unemployment high enough. And \( f'(U^*) \) cannot in general be signed. If \( f'(U^*) > 0 \), if the effects of unemployment through wages dominate the effects through taxes, then higher unemployment increases both the speed of restructuring and of private sector employment creation. But, if \( f'(U^*) < 0 \), then higher unemployment leads to slower restructuring and private sector employment creation. Our numerical simulations below suggest that the first case is the more relevant, but this is ultimately an empirical matter.

Take now an increase in \( \lambda \), a higher proportion of jobs saved in restructuring. It shifts the horizontal locus down, increasing equilibrium unemployment. This is because a higher \( \lambda \) decreases the probability of unemployment after restructuring. The exit rate from unemployment must thus decrease for equilibrium to be maintained, and the unemployment rate must therefore increase. Note however that this effect goes away if we assume condition (5.2) instead of (5.1), if those workers who know they will lose their job have to be in favor of restructuring. The same ambiguity is at work for the effects on the speeds of restructuring and new private sector employment creation. If \( f'(U^*) > 0 \), then both increase.

Finally, consider an increase in unemployment benefits, \( b \). This shifts the \( A(U) \) locus up, leading to more unemployment. This is both because higher unemployment...
ment benefits make unemployment less unattractive to state sector workers, and because higher taxes decrease the wage in the state sector. The effect this increase has on the speed of transition is again ambiguous, this time for two reasons. The first is the sign of $f'(U^*)$. But even if $f'(U^*) > 0$, the effect may still be negative because $b$ affects $z$ which enters $f(U)$: given unemployment, higher unemployment benefits lead to higher unemployment contributions, which reduce hires at any given unemployment rate.

These results raise the next obvious question. If a decrease in $\alpha$ raises unemployment, and, say, raises the speed of transition, should the government try to decrease $\alpha$? More generally, is the speed of transition too high or too low, and should the government try to affect it? This is the issue to which we now turn.

7 Optimal unemployment and speed of transition.

To answer whether the transition is too fast or too slow, we have first to answer two questions. Compared to what? And assuming what tools at the government's disposal?

We shall take as the objective function of the government the present discounted value of output. Thus, we focus on efficiency, and give no weight to income or unemployment distribution.

This leaves the issue of what the government takes as given, in solving its optimization problem. There is a sense in which the government can affect most of the parameters we have defined so far. For example, the strength of the effect of profitability on private sector job creation, the parameter $a$, must depend in part on the organization of credit markets, which the government can improve. But allowing the government to choose $a$ freely clearly makes the optimization problem both trivial and unrealistic. Thus, we shall assume that the government takes the unemployment benefits and their financing, the wage determination process, and the equation for private job creation, as given. This implies that the government
takes the function \( dN/dt = f(U) \) as given, and chooses the rate of restructuring. It can do this in our model, through changes in \( \alpha \), or by imposing top-down privatization and restructuring, or by modifying decision rules within firms. We shall not specify how at this point, but will just take the speed of restructuring as the control variable.

7.1 Optimal unemployment and speed

Let \( E_N \) denote employment in the transformed state sector. The optimization problem of the government is thus:

\[
\max \int_0^\infty (E_x + E_Ny + Ny)e^{-rt}dt
\]

subject to:

\[
1 = E + E_N + N + U; \quad E_N = \lambda(1 - E_0); \quad \frac{dN}{dt} = f(U)
\]

The first equation is simply the condition that people be either employed somewhere or unemployed. The second states the relation between employment in the transformed state sector and employment in the untransformed state sector. The third is the relation between private job creation and unemployment that the government takes as given.

Using the first two equations to eliminate both \( E \) and \( E_N \) gives:

\[
\max(1 - \lambda) \int_0^\infty [x - U(x - \lambda y) + N(y - x)]e^{-rt}dt
\]

subject to

\[
\frac{dN}{dt} = f(U)
\]

The solution is characterized by an optimal unemployment rate, \( U^o \), and an associated speed of private sector job creation, \( f(U^o) \). This in turn implicitly defines the optimal speed of restructuring, which must be such that the inflow
into unemployment is equal to private sector job creation, and is thus given by
\[ s^o = f(U^o)/(1 - \lambda). \]

If initially, \( U_0 < U^o \), then a discrete amount of restructuring takes place up to the point where \( U = U^o \). If instead, \( U_0 > U^o \), no restructuring takes place until private sector job creation has reduced unemployment to \( U^o \). From then on, the transition takes place at constant unemployment, \( U^o \).

\( U^o \) is implicitly defined by:
\[ x - \lambda y = f'(U^o)((y - x)/r) \quad (7.3) \]

The intuition is as follows: From the objective function (7.2), a marginal increase in \( U \) given \( N \) is associated with a change in output \(- (1 - \lambda)(x - \lambda y)\). If the gains in productivity from restructuring are large enough, if \( \lambda y > x \), an increase in unemployment can be associated with an increase in output. In addition, a marginal increase in \( U \) affects private sector job creation by \( f'(U^o) \). From (7.2), the present value of a marginal increase in \( N \) given \( U \) is given by \( (1 - \lambda)(y - x)/r \).

The optimal unemployment rate must be such that the net gain of a marginal increase in unemployment is equal to zero. Dividing both sides by \( (1 - \lambda) \) gives (7.3).

\( U^o \) is characterized graphically in figure 5, which, once again draws the locus \( dN/dt = f(U) \). The optimality condition is that the slope of the tangent be equal to \( r(x - \lambda y)/(y - x) \). Note that if \( \lambda y > x \), then the optimal speed of restructuring is such as to push unemployment beyond the point which maximizes new private sector growth, somewhere to the right of \( A \).

### 7.2 Comparing \( U^* \) and \( U^o \)

To compare actual and optimal \( U \)'s and associated speeds of transition, it is convenient to rewrite the equilibrium condition for \( U^* \) in terms not of the underlying
parameters, but in terms of \( w_E \) and \( w \), the wages in the state and the private sector. Using (6.4), (6.3), (6.2) and the equilibrium condition (5.1) yields:

\[
we - b = \lambda (w - b) + \frac{f(U^*)/U^*}{r}(w - w_e) \quad (7.4)
\]

The equation has the same structure as that for \( U^o \), but this time with the private benefits and costs as perceived by workers. Note in particular that from the point of the workers, what matters is not \( f'(.), \) the marginal effect of unemployment on private job creation, but rather the exit rate from unemployment \( f(U)/U \).

Can we sign \( U^* - U^o \)? In general, we cannot. Comparing (7.3) and (7.4) shows two opposite sets of effects at work.

To the extent that the difference in wages between the private sector and the state sector \( w - w_E \) is smaller than the difference in productivity \( y - x \), a condition which is likely to hold, the incentive to start restructuring will be weaker than is optimal, leading to too low unemployment. A second effect which goes the same way is that, if the decision to restructure is such that even those who will lose their jobs do not oppose it, so that the relevant condition is \( V_E = V_U \), then the first term on the right hand side of (7.4) disappears. This leads workers to be more reluctant to restructure and thus leads to a lower unemployment rate.

But two other effects work in the opposite direction: unemployment benefits make unemployment less painful, leading to higher equilibrium unemployment. And, while the marginal effect of unemployment on private job creation, \( f'(U) \) is what is relevant for optimal unemployment, what matters to workers is the average effect \( f(U)/U \). By concavity of \( f(\cdot) \), the marginal effect is always smaller than the average effect; this factor leads again to too high unemployment.

Assuming we can sign \( U^* - U^o \), can we then sign \( s^* - s^o \)? Here again, the answer is ambiguous, and depends on the sign of \( f'(U^*) \) and \( f'(U^o) \). If both of them are positive, which will be the case as long as the two unemployment rates are less
than A in figure 5, too low an unemployment rate will also imply too low a speed of transition.

These ambiguities capture the complexity of effects at work. In light of these ambiguities, statements that transition is obviously too fast or too slow appear to us to be too bold. But we do not want to end on this note. We think that, for plausible parameter values, many of the ambiguities can be removed, and that equilibrium speed is indeed likely to be too low. This is what we turn to in the next section.

8 Cautious calibrations.

Choosing numbers for the various parameters of the model is not easy. While much empirical work is currently going on, our knowledge is not at the point where we can confidently choose parameters. This caveat being made, we define benchmark parameters as follows:

8.1 Choosing parameters

We normalize the marginal product in the state sector, \( z \) to be equal to 1. Assuming that workers appropriate the returns to capital in the state sector, we take \( \alpha = 1.3 \). We take the marginal product in the private sector, \( y \) to be equal to 1.8. We take unemployment benefits, \( b \) to be equal to .5, or about a third of the wage in the state sector. We take the interest rate, which here is an index of effective horizons, to be relatively high, .1 per year.

This leaves three parameters where even more guess work is involved. We take \( \lambda \) the proportion of state employment which can be saved by restructuring to be equal to .4. This is lower than the numbers observed so far, but restructuring of the worst firms is still to come. This implies that the direct effect of restructuring on the output of a state firm is to reduce it from 1.0 to 1.8 \( \times .4 = .72 \). We take \( c \) to be 2, leading to a difference between the value of being employed in the private
sector and the value of being unemployed of $0.1 \times 2 = 20\%$ on annual basis. Finally, and without shame, we choose $a$, the effect of profit on private job creation, in such a way as to generate roughly the speed of new private sector creation in Poland, or about $4\%$ of the labor force per year. This yields a value of $a$ of $0.1$.

### 8.2 Optimal and equilibrium unemployment and speed.

The results of these assumptions are given in Table 1. Table 1 gives three unemployment rates, $U^*$, the equilibrium unemployment rate obtained assuming the condition $V_E = \lambda V_N + (1 - \lambda)V_U$, $U^{**}$, the rate obtained assuming instead $V_E = V_U$, and $U^\circ$, the optimal rate. For each of the three, it also gives the speed of new private job creation, $f(U)$, and the marginal effect of unemployment on that speed, $f'(U)$.

The first line gives the implications of the benchmark parameters. Equilibrium unemployment $U^*$ is equal to $12\%$, and the rate of private sector creation is $3.9\%$ of the labor force per year. This implies a total increase in private employment, from both restructuring and new private sector job creation, of $6.5\%$ per year. When restructuring decisions have to be such that those who lose their job are not worse off, equilibrium unemployment $U^{**}$ is equal to $8\%$, and private sector job creation to $3\%$. Both unemployment rates are lower than the optimal rate of $20\%$, which is associated with a speed of $4.8\%$. And all three are much lower than the unemployment rate at which $f'(.)$ becomes negative, which is equal to $31\%$.

The next three lines give the effects of changing unemployment benefits. Increasing unemployment benefits lead to higher equilibrium unemployment. Interestingly, higher benefits and higher unemployment both imply higher taxes, and from equation (6.2) and (6.1), lower values of being employed in either sector, and of being unemployed. But this has nearly no effect on the speed of transition. The effects of higher unemployment on wages are offset by the effects of increased benefits on equilibrium wages and of higher unemployment contributions. At the same time, higher unemployment benefits lead to lower optimal unemployment:
Table 1. Unemployment and Speed of Transition

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>$U^*$</th>
<th>$f(U^*)$</th>
<th>$U^{**}$</th>
<th>$f(U^{**})$</th>
<th>$U^o$</th>
<th>$f(U^0)$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benchmark</td>
<td>12</td>
<td>3.9</td>
<td>8</td>
<td>3.0</td>
<td>20</td>
<td>4.8</td>
</tr>
<tr>
<td>$b = .6$</td>
<td>15</td>
<td>3.8</td>
<td>10</td>
<td>3.1</td>
<td>18</td>
<td>4.1</td>
</tr>
<tr>
<td>$b = .4$</td>
<td>10</td>
<td>3.8</td>
<td>7</td>
<td>3.0</td>
<td>23</td>
<td>5.7</td>
</tr>
<tr>
<td>$b = .3$</td>
<td>9</td>
<td>3.6</td>
<td>7</td>
<td>3.0</td>
<td>26</td>
<td>6.7</td>
</tr>
<tr>
<td>$\alpha = 1.4$</td>
<td>8</td>
<td>3.0</td>
<td>5</td>
<td>2.1</td>
<td>20</td>
<td>4.8</td>
</tr>
<tr>
<td>$\alpha = 1.2$</td>
<td>20</td>
<td>4.8</td>
<td>13</td>
<td>4.0</td>
<td>20</td>
<td>4.8</td>
</tr>
<tr>
<td>$\alpha = 1.1$</td>
<td>–</td>
<td>–</td>
<td>22</td>
<td>5.0</td>
<td>20</td>
<td>4.8</td>
</tr>
</tbody>
</table>

All numbers as percentages of the labor force. Benchmark values for the parameters are $x = 1, y = 1.8, \alpha = 1.3, b = .5, \lambda = .4, c = 2, r = .1$
higher benefits decrease the marginal effect of a given level of unemployment on job creation. 

The last three lines show how the effects of changing $\alpha$, one of the potential instruments at the government's disposal to affect the equilibrium speed of transition. Decreasing $\alpha$ from 1.3 in the benchmark to 1.2 lead to more unemployment, and an equilibrium unemployment rate and speed nearly equal to the optimal ones. Interestingly, further decreasing $\alpha$ to 1.1 leads to the second configuration studied in figure 4 earlier. Staying in state jobs becomes so unattractive that all state firms are instantaneously restructured, leading to high unemployment. At this high level of unemployment, $f(.)$ is still positive however, so that positive private sector job creation eventually reduces unemployment to zero.

9 Conclusion

We have presented a model of transition where unemployment affects both the rate of private job creation and the speed of restructuring of the state sector, and where both in turn affect unemployment over time.

We have characterized the equilibrium rate of unemployment and speed of transition. We have concluded that, while ambiguous on theoretical grounds, the equilibrium speed of transition is likely to be too slow, justifying measures by the government to accelerate the transition. These measures may include restraints on wages in the state sector, and top-down privatization and restructuring, imposed on firms rather than chosen by them. But we have also pointed to the dangers of going too fast, and of sticking to inflexible policies, which do not reduce the speed of restructuring in the face of high unemployment. Going too fast may lead to too high unemployment and derail the transition. Inflexible policies open the scope for self fulfilling expectations of an unsuccessful transition.

We have at various points in the paper discussed formalization choices, and potential extensions. In ending this paper, we put the list together:
(1) We have assumed throughout that state firms were subject to a hard budget constraint. With the exception of firms in very bad shape, this has been true so far in the major Central European countries. But this should not be taken as an assumption. It is better thought of instead as the outcome of a game, a game which will be played for many years to come.

(2) We have assumed, in parallel, that the government ran a balanced budget. Transition has been associated with a large loss of revenues, and the temptation to have recourse to inflation finance is there. So far, the temptation has been mostly avoided. But the same caveat applies.

(3) We have assumed simple interactions between the tax burden and the process of transition, namely that the tax burden depended only on the level of unemployment. But in fact, the composition of employment and the financial position of firms also matter. Profit taxes from state firms have largely vanished. Collecting taxes on private firms has proven difficult. New, across the board taxes, such as VAT's, are not yet in place.

(4) We have only skirted the issues of decision-making within firms. The specific roles of ministries, workers, unions, and managers are crucial to the outcome and vary across countries. We have also skirted a number of issues by associating restructuring and privatization. Some firms have been able to partly restructure without privatization, and some privatized firms, in particular those privatized through buy-outs, have not restructured.

(5) We have assumed that, except a number of firms affected by the initial shock, state firms were identical and could survive, albeit at a low level of productivity. This is not true. There is a distribution of marginal revenue products across state firms. And the degree to which state firms can really wait and see, while maintaining employment, is unclear.

(6) We have taken a black box approach to private job creation. Looking within the black box, by exploring in particular the role of credit markets, could poten-
tially modify some of our conclusions. We also have not distinguished between two types of private job creation, the initial burst of job creation in trade and services, which aimed at filling holes left by the previous economic regime, and private sector growth aimed at competing with and replacing state firms. The process so far has been dominated by the first; much of the success of the transition depends on the success of the second.
Notes

*Oxford University and EBRD, and MIT and NBER respectively. An early draft of this paper owed a lot to discussions with Stanislaw Gomulka, Richard Layard and Mark Schaffer. We also thank Fabrizio Coricelli, Peter Diamond, Stanley Fischer, John Fleming, Michael Gavin, Martin Hellwig, Michael Kremer, Marcus Miller, Andrei Shleifer and Jean Tirole for comments and suggestions.

Our paper is short on facts, which have been documented elsewhere. The reader is referred in particular to the papers presented at the NBER Conference on Transition in Eastern Europe. Our analysis is very much based on the interpretation of what has happened in Poland over the last three years, presented in Blanchard and Dabrowski [1993], and by the evidence on the evolution of labor markets summarized in Blanchard et al. [1993]. Other more specific references are given along the way.

In Poland, the first shock was felt in early 1990, the second in early 1991. In those countries which started reform in early 1991, such as Czechoslovakia, the two were roughly coincident. In most countries also, while the decline in output was sudden, the effect on employment was much slower. These additional dynamics are ignored here.

This is however only an interpretation, as a retained earnings constraint leads to a slightly different formulation: If all finance is internal, if \((y - w - z)\) is the net cash flow from employing one worker, earnings will be equal to \(N(y - w - z)\). Thus, if a proportion of earnings are reinvested, and if job creation is proportional to investment, job creation will be given by \((dN/dt)/N = a(y - w - z)\), a rate of change rather than a change relation as in the text. As discussed below, our specification turns out to be more tractable.

Chadha et al. [1992] develop a model, which is a cousin of ours, but where the growth of the private sector is based explicitly on learning by doing.

The evidence is that things are more complex. First, there is substantial turnover in the private sector. Second, a substantial fraction of hires from the private sector is directly from the state sector. See Blanchard et al. [1993]. Both aspects can be integrated, but in general at the cost of analytical simplicity. One extension which can be straightforwardly incorporated is that the pool of potential hirers includes not only the unemployed but
also a proportion of those employed, in either the private or the state sector.

6 Another interesting extension would be to consider the possibility of deficit finance, and its interaction with the dynamics we analyze below.

7 The details of the end process depend on the corner conditions. Under our assumptions, when unemployment reaches A, the private sector closes, so that unemployment increases discretely at that point. Thereafter the private sector remains closed, and unemployment increases until everybody is unemployed.

8 While B' is a saddle point, point E can be either a sink or a node. If initial unemployment is smaller than $U_1$, then, even if E is a sink, the economy can only be on one of the two paths we describe.

9 This effect also plays an important role in Gavin [1993].

10 Many of these countries have long collected and are still collecting detailed data on wages, flows and stocks. Results from country studies using those data are reported in Blanchard et al. [1993].

11 A clear warning is needed at this point. As in the Harris-Todaro model, unemployment benefits appear to be unambiguously bad in our model. But this comes from our Harris-Todaro like assumption that, even if the unemployed are ex-post worse off, unemployment is the result of the voluntary decision to restructure. In a more realistic model, some of the unemployed would be involuntary unemployed, and the case for unemployment benefits reappears.

12 A warning that this might indeed happen was sounded by McKinnon [1991].


14 These issues are closely related to how to buy off stakeholders in top-down privatization plans. See Shleifer and Vishny [1992].

15 See for example Pinto et al. [1993] for recent survey evidence on Polish state firms.
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