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Optimal Social Insurance, Incentives, and Transition

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ABSTRACT

We study transition in a model in which the process of moving workers from matches in the state sector to new matches in the private sector takes time and involves uncertainty. When there are incentive problems in this rematching process, the optimal scheme may involve forced layoffs, involuntary unemployment, and a recession.

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Introduction

In the long run, the process of transition in the former communist countries of Eastern Europe and the Soviet Union will involve moving large numbers of agents from old production activities in the state sector into new production activities in the emerging private sector. There is a rapidly emerging literature on this process of transition. From a positive standpoint, striking features of this process include large drops in output and increases in unemployment during the initial stages of transition. (See, for example, the recent papers of Calvo and Coricelli 1992 and Aghion and Blanchard 1994.) There is also some preliminary evidence of rising income inequality during transition (see Marcet and Schwartz 1993, Milanovic 1994, and Naujoks 1991). From a policy standpoint, a major issue is the design of appropriate social insurance schemes during the transition. A prime concern for policy is that increased opportunities for private initiative will lead to an increase in income inequality both during and after the transition. One view is that policy should dampen this rising inequality. (See for example Ahmad 1992, Atkinson and Micklewright 1992, and the references given therein.) A second view is that while it is important to provide some social insurance to help lessen this increasing inequality, providing too much social insurance will have adverse incentive effects and disrupt the whole process of transition. For example, McAuley (1991, p. 101) suggests that "benefit levels should be reasonably generous so as to reduce resistance to the idea of structural change. But they should not be so generous—or longlasting—as to undermine the incentive to reenter employment" (see also Blanchard et al. 1991 and Newbery 1993 for similar views).

This paper presents a simple general equilibrium model of the process of transition which generates a drop in output and an increase in unemployment during transition. It also highlights the tension between the policy goals of dampening income inequality and providing appropriate incentives for agents to take advantage of new opportunities. Specifically, we find that the optimal social insurance policy necessarily leads to both a recession and a spreading of the cross-section distribution of consumption. We also find it may lead to forced layoffs and involuntary unemployment.

At the microlevel, the model emphasizes that the process of matching workers to the new production activities takes time and involves uncertainty. It captures the incentive problems in the design of social insurance by assuming that agents must exert unobserved effort to search for a new production activity. In the model, complete social insurance equalizes consumption across agents and, with such incentive problems, prevents any transition. To encourage agents to exert effort in search during the transition, it is necessary to spread the distribution of consumption by having higher consumption for successful searches and lower consumption for unsuccessful ones. Furthermore, the optimal incentive compatible scheme may involve layoffs that are "forced" and unemployment that is "involuntary" in the sense that agents who are required to leave their old matches and search for new matches are made strictly worse off in terms of ex-ante expected utility than agents who are allowed to remain in their old matches.

We offer two interpretations of this model and the reason for the transition. The first is a major tax reform in a closed economy. Under the original policy, the government taxed the returns in the private sector activities at such a high rate that it was optimal for agents to work in the state sector. The government then undertakes a major tax reform which reduces the taxes on the private sector activities. The second interpretation is one of a small economy opening up to trade in goods. Under the original policy barring trade, domestic prices differed substantially from world prices and induced agents to enter activities which had low productivity when productivity is measured at world prices. The government then opens the economy to balanced trade in goods at world prices.

The basic structure of the model draws on elements of the search literature (for a comprehensive discussion see Mortensen 1986 and Pissarides 1990). More specifically, our model is related to models of sectoral reallocation in the labor market (see, for example, Rogerson 1987). Recently, several authors have used sectoral reallocation models to study the dynamics of transition, including Aghion and Blanchard (1994), Dixit and Rob (1991), and Fernandez and Rodrik (1992). Aghion and Blanchard presents a model of the dynamics of the transition of the labor force from the state sector to the private sector which builds in several market imperfections. They then analyze the effect of unemployment benefits and incomes policy on the transition. Fernandez and Rodrik consider a model of sectoral adjustment following trade reform that focuses on agents' incentives to block the reform when they face idiosyncratic uncertainty about the cost of the reform. The most closely related paper is Dixit and Rob. They consider a model of sectoral adjustment and they study the impact of social insurance on agents' incentives to move between sectors. Their model, however, focuses on the properties of the stochastic steady state and the impact of social insurance on the hysteresis bands.

In our model we show that the optimal incentive compatible social insurance scheme may involve involuntary unemployment. There is a body of work that investigates a type of involuntary unemployment (or underemployment) that arises as part of the optimal contracts designed to solve the incentive problems that arise when the employer has private information about the workers' productivity. (See, for example, Chari 1983, Cooper 1987, and Green and Kahn 1983.) There is also a literature that investigates a type of involuntary unemployment that arises in models with nonconvexities such as indivisibilities in hours worked. (See, for example, Rogerson and Wright 1988 and Greenwood and Huffman 1988.) Our model differs from these two strands of literature both in terms of the conditions under which there is involuntary unemployment and in the interpretation of the model. In both of these literatures involuntary unemployment (or underemployment) occur if and only if leisure is an inferior good.[1] In our model our type of involuntary unemployment occurs under different conditions, namely the derivative of the inverse utility function for consumption goods is convex. Moreover, in these other models, the optimal contracts are between private firms and workers. Here we interpret the social insurance problem as that of a state which both employs the workers in their old matches and pays their social insurance when they search.

1. Environment and Interpretation

We consider an economy that lasts two time periods, $(t = 0,1)$ has a continuum of agents, and has two sectors in which production takes place. The two production sectors are labeled sector 1 and sector A. An agent who works in sector 1 produces 1 unit of output each period. An agent who works in sector A produces either A_1 or A_2 units of output. We assume $A_1 > 1$ and $A_1 > A_2$. All agents are assumed to be in sector 1 at date 0. At this time, agents can either work in sector 1 or move to sector A. To move to sector A, an agent must spend one period searching for a good match with an activity in that sector. Agents who exert effort in search find a good match with an activity in that sector with probability π and produce A_1 at date 1, or they fail to find a good match with probability $(1-\pi)$ and produce A_2 at date 1. Agents who don't exert effort in search find a bad match with probability 1.

Each agent is endowed with one unit of time at each date. Agents have preferences over consumption in the two periods and search effort. Agents who exert effort have utility $U(c_0)$ + $\beta EU(c_1)$ while those who don't have utility $U(c_0) + \beta EU(c_1) + \tilde{v}$ where $\tilde{v}$ is a positive constant. Let U be a strictly increasing and concave function.

Let $z \in [0,1]$ denote the fraction of agents who search for an activity in sector A at date 0. Let c_0^z denote the consumption at date 0 of an agent who searches for an activity in sector A and c_0^1

denote the consumption at date 0 of an agent who works in sector 1. Let $c_1^{A_1}$ denote the consumption at date 1 of an agent who searches at date 0 and finds a high productivity activity in sector A, $c_1^{A_2}$ the consumption at date 1 of an agent who searches at date 0 and fails to find a high productivity activity in sector A, and c_1^1 the consumption at date 1 of an agent who works both periods in sector 1. The resource constraints for this economy are given by

$$(1) \qquad (1-z)c_0^1 + zc_0^z \le (1-z)$$

$$(2) \qquad (1-z)c_1^1 + z\pi c_1^{A_1} + z(1-\pi)c_1^{A_2} \le (1-z) + z\pi A_1 + z(1-\pi)A_2$$

$z \in [0,1]$ and $c_0^1, c_1^1, c_0^z, c_1^{A_1}, c_1^{A_2} \ge 0$.

Consider next the incentive constraints. If agents who search are to be induced to put effort into their search, it must be the case that

$$(3) \qquad U(c_0^z) + \beta\left[\pi U(c_1^{A_1}) + (1-\pi)U(c_1^{A_2})\right] \ge U(c_0^z) + \beta U(c_1^{A_2}) + \tilde{v}$$

or that

$$(4) \qquad U(c_1^{A_1}) \ge U(c_1^{A_2}) + v$$

where $v = \beta\pi\tilde{v}$.

We interpret this model of transition as that of an economy that undergoes a major tax reform. We imagine that the production activities in sector 1 and the production activities in sector A require different types of labor. The production activities in sector 1 each require one unit of raw, homogenous labor. There are many different types of production activities in sector A each of which require one unit of task-specific skilled labor. Agents are endowed with raw, homogeneous labor and an inherent ability in a subset of the many different task-specific skills. Ex-ante, agents do not know the skills in which they have inherent ability. For an agent to work in sector A, he first must spend a period acquiring one task-specific skill. If an agent has acquired the skill which matches his inherent ability, his output in that activity is A_1. If he acquires a skill which does not match his ability, his output is A_2. We suppose that, under the original tax system, the effective tax rate on skilled activities is so high that all agents choose to work in unskilled activities. This effective tax rate is meant to capture the full range of distortionary policies which discourage enterprising agents from investing the time necessary to find a good match for their skills. The tax reform corresponds to changes in policies which lower this effective tax rate enough to encourage agents to attempt to find good matches in skilled activities.

Alternatively, if we assume that $A_2 = 1$, we can interpret workers in sector 1 as working in activities in which they are badly matched. In this case, the movement of workers into sector A in the model can be interpreted as workers attempting to find good matches. Moreover, we can interpret the distortionary taxes as a social insurance scheme which allows a sufficiently small dispersion of consumption so that the incentive constraint is violated and enterprising agents are discouraged from searching for good matches. In either case, we think of this model as capturing in a simple way the idea that the old system did not lead workers to find good matches with their production activities, whereas the new system does.[2]

In terms of the empirical implications of the model, it is important to note that the shifts across activities may well not show up as shifts across sectors as conventionally measured. For example, imagine workers in a state restaurant in Russia just after privatization. They may well attempt to set up new restaurants on their own, "searching" across restaurant types to find a good match, where types are characterized by, say, ethnicity, price range, and location. Moreover, even within a given restaurant a worker that had a certain position under the old regime may "search" for a new position which involves new responsibilities in the new economic environment for which the previous experience provides little guidance. This search process will not involve movements across sectors as defined in GNP accounts but rather across activities within the same sector and perhaps even within the same firm. Some of this search may be done while workers still officially retain their old jobs. If so, then some of this search will show up as a rise unemployment while some will show up as a drop in productivity of existing firms.

2. The Transition Following a Reform

We imagine that before the reform, distortions result in all agents working in sector 1. All agents consume the same amount, 1, and aggregate output is one. At date 0, a reform occurs which eliminates the distortions. Date 1 corresponds to the future after the reform. We characterize the equilibrium as a solution to a planning problem. This problem is to maximize the ex ante utility of agents subject to the resource constraints (1) and (2) and the incentive constraint (4).

In solving this problem it is convenient to let the choice variables be the utility levels and the number of searchers rather than consumption levels and the number of searchers. To that end let $C = U^{-1}$ denote the inverse utility function, so that $c = C(u)$ is the amount of consumption goods it takes to give utility level $u = U(c)$. Notice that since U is strictly increasing and concave, C is strictly increasing and convex. The planning problem is to choose nonnegative levels of z and utilities u_0^1, u_0^z, u_1^1, $u_1^{A_1}$, $u_1^{A_2}$, to solve

$$(5) \qquad \max\ z\left(u_0^z + \beta\left[\pi u_1^{A_1} + (1-\pi)u_1^{A_2}\right]\right) + (1-z)(u_0^1+\beta u_1^1)$$

subject to

$$(6) \qquad u_1^{A_1} \geq u_1^{A_2} + v$$

$$(7) \qquad zC(u_0^z) + (1-z)C(u_0^1) \leq (1-z)$$

$$(8) \qquad (1-z)C(u_1^1) + z\pi C(u_1^{A_1}) + z(1-\pi)C(u_1^{A_2}) \leq (1-z) + z\pi A_1 + z(1-\pi)A_2.$$

The solution to this problem either has $z = 0$ and no transition or $z > 0$ and a transition. If there is a transition then aggregate output and consumption fall in period 0 to $1 - z$ from the pre-reform level of one. If $z > 0$ then the incentive constraint (6) binds as an equality. (To see this suppose by way of contradiction that $z > 0$ and (6) doesn't bind. But then the optimal allocations require $u_1^{A_1} = u_1^{A_2}$ which violates (6).) Under a transition the utility of successful searchers $u_1^{A_1}$, is v units higher than the utility of unsuccessful searchers $u_1^{A_1}$, and hence the same is true for consumption levels of successful searchers is higher than that of unsuccessful searchers, so $c_1^{A_1} > c_1^{A_2}$. Thus a transition necessitates a spreading out of the distribution of consumption.

We turn next to ranking the discounted expected utility of searchers to the discounted expected utility of the workers that stay in sector 1. We can do this if we assume C' is convex. The first-order conditions of the planning problem include

(9) $\quad C'(u_0^1) = C'(u_0^z)$

(10) $\quad C'(u_1^1) = \pi C'(u_1^{A_1}) + (1-\pi)C'(u_1^{A_1}-v).$

Note that since $C'(\cdot)$ is strictly increasing, (9) implies that the per period utility assigned to each type of agent in the first period is the same. The expected utility assigned in the second period to agents who stay in the old sector is u_1^1. The expected utility assigned in the second period to agents who search is $\pi u_1^{A_1} + (1-\pi)(u_1^{A_1}-v)$. Using (10) and the convexity of C' we have

(11) $\quad C'(u_1^1) = \pi C'(u_1^{A_1}) + (1-\pi)C'(u_1^{A_1}-v) > C'\Big(\pi u_1^{A_1} + (1-\pi)(u_1^{A_1}-v)\Big).$

Since C is convex, C' is increasing so

(12) $\quad u_1^I > \pi u_1^{A_1} + (1-\pi)(u_1^{A_2}-v).$

Thus agents who search get lower discounted expected utility than agents who work in sector 1.

We summarize our discussion as follows

Proposition. If there is a transition ($z > 0$) then both output and consumption fall in period 0 and the distribution of consumption spreads out in period 1. If, in addition, C' is convex then agents who work in sector 1 in both periods receive higher expected utility than agents who search.

Note that when utility takes the CARA form $u(c) = -\exp(-\gamma c)$, then C' is convex. When utility takes the CRRA form $u(c) = (1/\gamma)c^{\gamma}$, $\gamma \leq 1$, then the function C' is convex when $\gamma < ½$. More generally the convexity of C' depends on the derivatives of U in a complicated way.

We think of this social insurance problem as capturing elements of the problem faced by a reforming government that employs a large number of workers in the state sector and also pays employment insurance during transition. The government decides a fraction of the workers in the state sector to layoff, the amount of unemployment insurance to pay those that are laid off, and the unemployment insurance premiums to charge those who work in the state sector and those that find new matches in the private sector so as to maximize the expected welfare of all citizens. Clearly, to implement such a scheme, not all agents can be allowed to *choose* to stay in their matches in the old sector. It is because of this element of coercion that we interpret the layoffs as "forced" and the unemployment as "involuntary."

Conclusion

This paper is a first attempt to highlight the issues in the design of social insurance in the presence of incentive problems. To the best of our knowledge it derives a new result on the possibility of involuntary unemployment and forced layoffs which is to be contrasted with the earlier work in the labor literature.

Notes

[1]Indeed Nosal, Rogerson, and Wright (1992, p. 507) summarize these results by "A classic result in the theory of labor contracts with asymmetric information is that underemployment results if and only if leisure is an inferior good. A classic result in models where unemployment occurs because of indivisibilities, including implicit contract models and some equilibrium macroeconomic models, is that unemployment is involuntary if and only if leisure is an inferior good."

[2]We can also interpret the model as one of a small open economy where transition arises as the economy opens to trade. Here, we imagine that the activities in both sectors require task-specific skilled labor but differ in that they produce different goods. The production activities in sector 1 all produce one final consumption good x and the activities in sector A all produce another final consumption good y. In sector 1, agents who are matched to their activity produce B_1 (equal to 1 in the model) units of good x and agents who are not matched produced B_2 (not observed in the model) units of good x. In sector A, agents who are matched to their activity produce A_1 units of good y and agents who are not matched produce A_2 units of good y. Agents who leave either sector have a probability π of finding a good match in the other sector on any given attempt to find a match. Agents have period utility for these two goods $v(x,y)$. Let q be the price of y in terms of x. Then agents have indirect utility $\hat{u}(c,q)$ defined by

$$\hat{u}(c,q) = \max_{x,y} v(x,y)$$

subject to

$$x + qy \leq c.$$

When the economy is closed to trade, the relative price q that prevails when every agent has found a good match is $q = A_1/B_1$. We assume that preferences are such that most of the labor force produces good x. (For instance, let $v(x,y) = \alpha\log(x) + (1-\alpha)\log(y)$ with α close to one.) When this small economy opens to trade, it is faced with world price $q = 1$. To take advantage of its comparative advantage in good y, agents move from producing x to producing y. The period utility function in the model $u(c)$ corresponds in this case to the indirect utility function $\hat{u}(c, 1)$. The resource constraints (1) and (2) then correspond to the condition that trade be balanced each period and thus we abstract from international borrowing and lending. Here, we interpret the initial conditions with all workers well-matched in sector 1 as arising as the steady state outcome of the old trade regime. In this old steady state, all bad matches have been dissolved and are thus not observed.

In an example of the empirical implications of this interpretation imagine Polish producers who under the CMEA trading system manufactured mediocre goods, which after the reform were unprofitable at the world prices. These producers may search for new types of goods to manufacture that will be profitable at world prices. If the search takes place across activities while workers officially retain their old jobs it will show up as a drop in productivity rather than an increase in unemployment.

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