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Economic Crisis in a Shortage Economy 1/

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Abstract

It is not unusual for reforming socialist economies to relax wage controls without hardening budget constraints on enterprises or freeing consumer goods prices. This policy can be dangerously destabilizing. While higher wages permit workers to purchase more of some goods, they also tend to exacerbate shortages and to breed waste and corruption. Beyond a certain level, economy-wide wage hikes will worsen worker welfare. This is true regardless of whether deficit goods are strictly rationed, are sold randomly at official prices to queuing workers, or are offered to workers by "insiders" only at black market prices. However, the form of allocation does influence output and worker welfare.

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Summary

It is not unusual for reforming socialist economies to relax wage controls without hardening budget constraints on enterprises or freeing consumer goods prices. This policy can be dangerously destabilizing. While higher wages permit workers to purchase more of some goods, they also tend to exacerbate shortages and to breed waste and corruption. Economy-wide wage increases tend to benefit middlemen more than workers, to reduce labor productivity, and, beyond a certain level, to hurt workers. This is true regardless of whether deficit goods are strictly rationed, are sold randomly at official prices to queuing workers, or are offered to workers only at black market prices. If workers pursue an economic strategy of "strike for higher wages until welfare improves," and if the government response is to "raise wages until workers stop striking," the economy could spiral downwards in a self-perpetuating economic crisis.

For any given wage and price level, rationing offers the maximum short-term benefit to workers. Output will be less than under corruption, but higher than under queuing. Rationing also raises the threshold beyond which wage hikes impoverish workers. If distribution of deficit goods is tied to labor effort, the economic crisis described above can in principle be remedied or averted. From a broader perspective, however, rationing is part of the problem. Shortage economies need more, not less, flexible distribution and pricing.

Recent Soviet economic development illustrates both crisis and a continuing search for remedies. Efforts to devolve authority from central planners to enterprises in practice gave the latter much more influence over wages than over product lines or prices charged to customers. The result was a surge in nominal demand, with wages rising in three years over 20 percent relative to official prices. This was a serious blow to an already ailing economy. Price reform was repeatedly delayed in an ultimately futile search for more politically palatable alternatives. By mid-1990, the normal retail distribution network had virtually collapsed. Sales were increasingly conducted by invitation only, often through factories and other workplaces that used them for payment-in-kind. The proliferation of barter and barter-like transactions also served to disrupt established economic links and further strained relations between republics.

The central lesson of this paper for policymakers in a reforming shortage economy is the need to keep wage liberalization from outpacing price liberalization, preferably through acceleration of the latter. Tinkering with distribution methods offers only limited potential for remedying the ill effects, as improvements in one sphere tend to be linked with deterioration in others.

"The position of the economy continues to deteriorate. The volume
of production is declining. Economic links are being broken.
Separatism is on the increase. The consumer market is in dire
straits. The budget deficit and the solvency of the government
are now at critical levels. Antisocial behavior and crime are
increasing. People are finding life more and more difficult and
are losing their interest in work and their belief in the future."

U.S.S.R. Presidential Guidelines for
the Stabilization of the Economy and
Transition to a Market Economy.
October 16, 1990

I. Introduction

In a classic Soviet-type economy, central planners fix wages and prices
and attempt to directly regulate production and wholesale trade. The
wastefulness of this system, which has been noted for decades by the
mainstream Western economic literature, is now almost universally conceded.
The pressing question for Soviet-type economies today is not whether they
should undertake market-oriented reform but how.

It must be admitted that results of reforms to date have not been
uniformly encouraging. Often the first steps on the path toward reform are
associated with worsening shortages, increasing income inequality and
corruption, and an absolute decline in output. Occasionally—e.g., Poland
in 1981, or the Soviet Union and Bulgaria in 1990—such phenomena have
reached crisis proportions.

This paper hypothesizes that crisis is brought on by improper
sequencing of reforms. Specifically, relaxation of wage controls in the
absence of hard budget constraints on enterprises and flexible prices for
consumer goods is shown to be dangerously destabilizing. Economy-wide wage
increases tend to benefit middlemen more than workers; such increases can
hurt productivity, and beyond a certain threshold they leave workers
unambiguously worse off. If workers pursue an economic strategy of "strike
for higher wages until welfare improves," and if the government response is
to "raise wages until workers stop striking," the economy will spiral
downwards.

The basic argument is as follows. Deficit goods have two prices: a low
official price and a higher unofficial market-clearing price. The
difference between the two is a shortage rent, accruing to whomever is
fortunate enough to buy at the official price. With this in mind, suppose
goods are allocated randomly but fairly on a "first-come, first-served"
basis. Consumers will queue for the deficit good until the marginal
expected return from the shopping effort equals the marginal disutility.

Due to externalities in shopping traffic (shoppers do not take into account the lower success probabilities they impose on other shoppers), much or all of the shortage rent may be dissipated. In equilibrium, the typical consumer may derive no direct benefit whatsoever from price controls. Moreover, consumers will be encouraged to divert effort from directly productive labor to shopping, which reduces output and intensifies the shortage.

Now consider the impact of a global wage increase. Ostensibly workers benefit since official consumer prices are fixed. In reality the impact is mixed. Workers can indeed buy more surplus goods at official prices. However, the shadow prices of deficit goods tend to rise, inducing more queuing and more social waste. More effort is shifted from productive labor to shopping, so more goods will be in deficit. If shortages are sufficiently widespread, the negative effects will dominate.

Random distribution to shoppers is, of course, not the only way to allocate deficit goods. One alternative is to sell to workers only at black-market prices, with nonworker "insiders" pocketing the shortage rent. In that case workers will have no incentive to divert productive effort to queuing. In any case, the benefits of higher productivity will mostly accrue to the insiders or to state investment reserves. Indeed, workers may fare no better materially under corruption than under queuing, and resentment of insiders may make them feel worse off.

A third allocation procedure is rationing, whereby the shortage rent is transferred directly to workers. With costless resale on unofficial markets, at any given wage workers are better off under rationing than under queuing or corruption. The wealth effect of rationing increases workers' demand for leisure, thus output is less than under corruption, but the more socially-efficient use of labor leaves output higher than under queuing. Higher wages raise the shadow prices of deficit goods, which in turn increase the weight of rationing in wealth. Effort declines and shadow prices rise further. Once again, beyond a certain threshold higher wages serve to impoverish workers as well as the state.

Methodologically, the key feature of this paper is the conversion of a problem of quantity-constrained household choice at official prices to a problem of unconstrained choice at shadow prices. The only "complication", as it were, is that household wealth must be modified to include shortage rents, which in turn depend on the equilibrium shadow prices. In economic terms this amounts to the observation that households should be indifferent at the margin between transactions on official and "shadow" markets.

The same basic approach has been taken by Stahl and Alexeev (1985) and by Bennett (1990). 1/ Stahl and Alexeev incorporated Tullock's (1967) classic analysis of queuing into a general equilibrium trading model of a multi-good fixed-price economy. With heterogeneous consumers, they demonstrated that black markets could harm society by fostering more socially wasteful queuing. More recently, in a general equilibrium model with production, rationing of a homogeneous consumer good, and demand for nominal money balances, Bennett has identified fairly broad conditions under which output is increasing in both official prices and nominal wages.

This paper, the main outlines of which were completed prior to acquaintance with Bennett's work, allows for production of various consumer goods and for a mix of queuing, rationing, and corruption. For tractability and ease of exposition, the heterogeneous households of the previously mentioned authors are constrained to have identical Cobb-Douglas utility functions. Also, as in Stahl and Alexeev, but in contrast to Bennett, there is no explicit demand for money balances. In effect, this rules out aggregate excess demand for goods (since otherwise the shadow prices in money would be infinite), which at first glance seems inappropriate in a model of a crisis-ridden shortage economy. The exclusion is defended here on two grounds. First, consumption in the model can embrace both present and future goods, in which case money holdings can be viewed as future spending. Second, it seems inappropriate to have the utility of nominal money balances depend on present consumption and official prices only, as in Bennett's model, without reference to present and future shadow prices. Correction of this shortcoming warrants a separate treatment. 2/

Kemme (1989), drawing on the voluminous work of Kornai (e.g., 1980), offers additional arguments for avoiding models with excess aggregate demand for goods. Kemme contends that so-called "chronic shortage" models, in which shortages of some goods coexist with surpluses of others, are best able to capture key features of centrally planned economies. He concedes, however, that the microeconomic foundations of such models have tended to be weak. To use Kemme's terminology, this paper attempts to build a chronic shortage model on rigorous microeconomic foundations.

1/ Other examples include Hare (1987), Alexeev (1987), and Bennett and Phelps (1989). That this approach is not standard partly reflects a continued technical lag, relative to other branches of economics, in the study of noncapitalist economic systems. It also reflects the once-popular belief that shadow market activity is unimportant in socialist economies. As Nuti (1986) has indicated, the institutional literature on the "second economy" (e.g., Grossman (1977)) tended to be ignored in analytic work on repressed inflation in favor of the disequilibrium approach exemplified by Barro and Grossman (1974).

2/ In particular, Bennett's conditions for labor supply to rise with the nominal wage do not appear to be sufficient once the utility of nominal money balances is adjusted for shadow prices.

The paper is organized in the following manner. Section II introduces a pure queuing model and discusses key assumptions. Section III examines the impact of nominal wage hikes and demonstrates that both workers and the state may be left worse off. Section IV compares alternative mechanisms for allocating shortage rent and considers a mix of dissipation of shortage rents, transfer to workers, and capture by nonworkers. Remedies for economic crisis and various obstacles to their implementation are discussed in Section V, with particular reference to the current Soviet economic crisis. Section VI offers a brief summary of the paper's main conclusions and some closing remarks on methodology.

II. General Equilibrium With Queuing

This section develops a model of a productive economy in which general equilibrium is achieved through black market transactions and queuing rather than through adjustment of official prices. For a good with the official price 1, let P denote its trading price on unofficial markets, assuming transaction costs are negligible. For deficit goods, buying at official prices and reselling at P offers a positive gross profit, or shortage rent, of P-1. To capture this rent, consumers are willing to invest resources into shopping. Let W denote the (constant) opportunity cost of shopping time for each of the N shoppers competing for the goods, and assume that each minute of shopping time offers the same prospect of success as any other. Also, let each shopper take every other shopper's behavior as given (e.g., the size of the crowds in stores).

Our first task is to determine the equilibrium expenditures on shopping. This is essentially the problem investigated by Tullock (1967) in his pathbreaking paper on rent seeking. To solve it, let q_j denote the queuing time of shopper j, and Q_{-j} the total queuing time of all shoppers other than j. With a total X units of deficit goods for sale in official markets, a risk-neutral shopper chooses q_j to maximize

$$(1) \qquad X(P - 1)\frac{q_j}{Q_{-j} + q_j} - Wq_j$$

which is expected shortage rents received minus shopping costs. First-order conditions, which in this case are sufficient for solution, require

$$(2) \qquad X(P - 1)\frac{Q_{-j}}{Q^2} = W$$

where $Q \equiv Q_{-j} + q_j$ denotes the total time spent shopping. Since (2) is the

same for all shoppers, in equilibrium all the q's are equal and Q = Nq, implying

$$(3) \qquad WQ = \frac{N-1}{N} X(P-1)$$

The left-hand side of (3) equals the value of total time spent shopping. The right-hand side equals 1-1/N times the shortage rent. In other words, all but a fraction 1/N of the shortage rent is dissipated in shopping. As N gets large, the net expected gain from shopping shrinks to zero. Indeed, if the shopper thinks of total shopping time rather than Q_{-j} as being exogenously given (the standard conjecture under models of perfect competition), the entire shortage rent will be dissipated.

Dissipation occurs due to a congestion externality. The individual shopper contemplating an extra shopping minute compares the marginal personal disutility to the expected marginal reward, but does not factor in the expected marginal loss to others. In fact, the marginal loss to others exactly balances the marginal reward, since the shopping price—the aggregate shortage rent—is fixed. The socially optimal amount of queuing is zero, provided a suitable alternative distribution system can be found.

Let us now embed the queuing model in a broader framework. Let there be a continuum of (types of) goods, indexed by $i \epsilon [0,1]$, 1/ with each good measured so that official price is 1. Price of good i on shadow markets, assumed free of transaction costs, is p_i, with the vector of p_i's denoted by p. Each worker has one unit of labor capacity to allocate between leisure h, directly productive effort (i.e., time actually spent working, rather than simply time registered at work) e, and queuing time q:

$$(4) \qquad h + e + q = 1$$

Workers have identical utility functions U(x,h), where x_i is the consumption of good i and x is the vector of x_i's. Each worker receives a wage w per unit of productive effort (due to the widespread use in shortage economies of piece rates and other performance-based rewards, this need not be inconsistent with a roughly constant official work day), which then must also equal the opportunity cost of shopping time W. All workers will be assumed to achieve the same overall success in shopping, so that consumption bundles are identical.

There are two equivalent ways to model utility maximization. In the first, official salaries are distinguished from other income. Wages are spent on goods at official prices, so

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1/ A continuum of goods turns out to be easier to work with than a discrete set of goods. As will become clear, it allows for simpler terminology and better captures the notion of "breadth" of shortage.

(5) $we = \int_0^1 x_i di$

With complete rent dissipation and equal shopping outcomes, q must satisfy

(6) $wq = \int_0^1 (p_i-1)x_i di$

Subject to (4)-(6), workers choose e, h, q, and x to maximize utility.

The second approach is to consider that each worker has a full income of w to spend at market-clearing prices on goods and leisure. Thus the worker chooses h and x to maximize U(h,x) subject to

(7) $w = \int_0^1 p_i x_i di + wh$

To check that the two approaches are equivalent, apart from the split in non-leisure time between productive effort and queuing (to which the individual worker is indifferent), add (5) and (6), and simplify using (4) to obtain (7). The equivalence reflects the real coexistence between the unofficial markets which clear without queuing and the official queue-burdened markets. With constant marginal returns to shopping, the worker who queues for cheap goods from the official markets is no better or worse off in equilibrium than the non-queuing worker who purchases expensive goods from the unofficial markets.

First-order conditions for utility maximization require the ratio of marginal utilities to equal the ratio of market-clearing prices, or

(8) $\dfrac{\partial U/\partial x_i}{\partial U/\partial h} = \dfrac{p_i}{w}$

To complete the model it is necessary to relate labor supply to output. It will be assumed that output is linear in productive effort, and that output proportions have been fixed by central planners. The definitions of surplus and deficit goods are summarized in the complementary slackness conditions

(9) $k_i e \geq x_i, \quad p_i \geq 1, \quad (k_i e - x_i)(p_i - 1) = 0$

where $k_i e$ denotes the output per worker of good i. In other words, consumption never exceeds supply, official prices never exceed shadow prices, the shadow price equals the official price if supply exceeds

consumption, and consumption equals supply if the shadow price exceeds the official price. Some of the surplus goods not sold to consumers may be directed to domestic investment, export, or consumption of nonworkers. Within the present model, these considerations affect worker labor supply and welfare only to the extent that they alter the output coefficients k.

By substituting (6) into the budget constraint (7) and making use of (9), it is seen that for $w > k_{av} \equiv \int_0^1 k_i di$, e must equal 0. In other words, wages cannot exceed the official value of output. This is required because workers as modeled have no incentive to hoard money. Any money not absorbed in official retail trade would serve to drive shadow prices up to infinity, and all incentives for productive labor would disappear.

The next section explicitly calculates the equilibrium solution e, h, q, x, and p to equations (4) and (6)-(9) for the case of Cobb-Douglas utility and examines the solution's properties. The remainder of this section considers possible objections to the modeling assumptions.

The assumption that shortage rents are completely dissipated by queuing is made simply to facilitate the exposition and to highlight the potential social waste caused by price controls. The general model in Section IV will allow for a mix of dissipation of shortage rents, transfer to workers, and capture by nonworkers.

It is crucial to the model that official prices and output proportions not adjust quickly to changes in labor supply and consumer demand. The slow responsiveness (modeled for simplicity as nonresponsiveness) stems partly from fetishization of the central plan, partly from popular resistance to higher consumer goods prices, but mostly from planners' inability to collect all the relevant information and process it efficiently. Even if average sectoral output and prices are set correctly, micro-level shortages and surpluses are inevitable. Admittedly, the model in its present form does not address the influence of private and semi-private production. Nevertheless, the consideration of a pure planner-run economy is interesting both in its own right and as a benchmark for future comparisons.

Less straightforward is the assumption that transaction costs are negligible on shadow markets. While unofficial markets are pervasive in most shortage economies, their operation is usually hampered by weak legal protection, limitations on advertising, and the like. Fortunately, transactions costs do not appear to change the main qualitative results. Indeed, with identical preferences and roughly equal shopping outcomes, p_i can be interpreted as the money value of consuming a marginal unit of good i, with or without a functioning unofficial market.

To verify this claim, suppose that the worker who shops q_i hours for good i expects to receive $q_i X_i / Q_i$ units, where X_i is the aggregate supply of good i and Q_i the aggregate shopping time for good i. The worker chooses e, h, q, and x to maximize $U(h,x)$ subject to (4), (5), and the restriction

$x_i = q_i X_i / Q_i$ for deficit goods. The first-order conditions for the associated Lagrangean are:

$$(10) \qquad \frac{\partial U / \partial x_i}{\partial U / \partial h} = \frac{1}{w} + J_i \frac{Q_i}{X_i}$$

where J_i is an indicator variable equaling 0 for surplus goods and 1 for deficit goods. If p_i is defined as 1 for surplus goods and $1+wQ_i/X_i$ for deficit goods, then (11) will match (8). In equilibrium Q_i/X_i equals q_i/x_i, so that $(p_i-1)x_i = wq_i$ which in turn integrates to (6). Hence, with perfectly homogeneous consumers, a smoothly functioning shadow market is merely an aid to interpretation.

The assumption most likely to be challenged is that workers have no demand for money balances, which in turn implies that some goods are surplus. To reconcile this assumption with the empirical evidence, the range of goods should be regarded as embracing future goods too; in which case present savings can be identified with future spending. Admittedly this does not take into account the possibility, noted by Grossman (1979) and Hartwig (1983), that transaction demands for money on high-priced shadow markets may directly absorb otherwise involuntary money holdings. The shortcoming will need to be addressed in subsequent work.

III.   Wage Hikes and Economic Crises

Using the model developed above, this section explores the comparative statics of nominal wage increases. Of central interest is their impact on worker welfare. If worker welfare declines in the wage, and if, as seems likely, pressures for wage hikes rise when welfare declines, maintenance of price controls can result in a self-perpetuating economic crisis.

For tractability, it will be assumed that workers have Cobb-Douglas utility functions,

$$(11) \qquad U(h,x) = \beta \ln h + \int_0^1 \alpha_i \ln x_i \, di$$

where x_i is the consumption of good i, x is the vector of x_i's, and β and α_i are positive parameters such that the α_i integrate to 1. Without loss of generality each α_i can be assumed to equal 1, since every good i can be reindexed as good $\int_0^i \alpha_i \, di$.

Calculation of the equilibrium is greatly facilitated by the Cobb-Douglas property (easily verified by substitution of (11) into (8)) that shares of full income spent on goods and leisure, when measured at shadow prices, are proportional to utility weights. To express the solution more compactly, it is helpful to reorder the goods so that k is weakly decreasing

in i. From (9) and the equality of $p_i x_i$, it follows that p will be weakly increasing in i, and there will be a unique threshold index r separating strictly or weakly surplus goods (indices below r) from strictly deficit goods (indices above r). If k is continuous at r, then the market for good r will exactly clear at the official price.

Note that r also represents the budget share of surplus goods in total purchases of goods, when measured at shadow prices. If purchases are measured at official prices, however, the share of surplus goods will not be r but some larger fraction θ, where $\theta = 1 - \frac{1}{w}\int_r^1 k_i di$. Finally, define $b = 1/(1+\beta)$. The equilibrium solution can then be expressed as:

$$(12) \qquad h = b\beta$$

$$(13) \qquad k_r = w\theta/r$$

$$(14) \qquad e = w/k_r = br/\theta$$

$$(15) \qquad q = b - br/\theta$$

$$(16) \qquad x_i = bw \qquad for \; i \le r$$

$$= k_i e = bk_i r/\theta \qquad for \; i > r$$

$$(17) \qquad p_i = 1 \qquad for \; i \le r$$

$$= k_r/k_i = w\theta/rk_i \qquad for \; i > r$$

Equation (13) specifies r, on which all variables other than h depend, only implicitly. However, this does not prevent analysis of the solution's properties. For example, by differentiating (13) with respect to w, we see that

$$(18) \qquad \frac{dr}{dw} = \frac{1}{r k_r'}$$

whenever k_r' exists and is not zero. Since k is continuous, the range of deficit goods will always expand as wages increase possibly with discrete jumps. It follows that the prices of deficit goods also increase with the wage. Hence shortage worsens in two senses: it widens (smaller r) and deepens (larger p_i for deficit goods).

The shape of the productive labor supply curve can be determined by differentiating (14) with respect to w.

(19) $\quad \dfrac{de}{dw} = -\dfrac{b(1-\theta)r}{\theta^2 w} < 0$

Even though leisure is independent of the wage, the productive labor supply is backward bending. By intensifying shortage, higher wages serve to divert productive effort to queuing.

As w approaches k_{av} (the limit beyond which effort drops to zero), then from (18) r will approach zero provided k is strictly decreasing, while from (13), θ/r will approach k_0/k_{av}. At $w = k_{av}$, e equals bk_{av}/k_0 and p_i equals k_0/k_i. The more distorted relative official prices are compared to relative shadow prices, the lower the minimum positive effort will tend to be.

Worker utility in equilibrium can be written, after some algebra, as

(20) $\quad \beta\ln\beta - (1+\beta)\ln(1+\beta) + \ln w - (1-r)\ln k_r + \displaystyle\int_r^1 \ln k_i \, di$

so that

(21) $\quad \dfrac{dU}{dw} = \dfrac{1}{w} - \dfrac{1-r}{r k_r} = \dfrac{1}{w} - \dfrac{1-r}{\theta w} = \dfrac{\theta + r - 1}{\theta w}$

As w rises to k_{av}, dU/dw approaches $-\infty$. It follows that there is some wage beyond which utility is monotonically declining. Indeed, since θ strictly exceeds r, a sufficient condition for U to decline with w is $\theta \leq \frac{1}{2}$: that is, queuing is required for half or more of all goods purchased at official prices. 1/

Every individual worker will, of course, continue to benefit from a higher wage, when holding other wages fixed. Once higher wages become general, however, every worker may suffer. If workers respond by demanding ever-higher wages, and if the authorities give in to their demands without raising deficit good prices, output and welfare will spiral downward.

For further insight into the result, it is helpful to distinguish between what might be called the official real wage and the shadow real wage. The official real wage equals the nominal wage divided by the official price level: in this case, w. The shadow real wage equals the nominal wage divided by the shadow price level. As official purchasing power rises, purchasing power on shadow markets for deficit goods actually falls (since from (14) and (16), w/p_i is proportional to e). An average shadow price level embracing all goods can be constructed by dividing total shadow value of consumed goods by total quantity:

1/ It should be noted, however, that θ need not be monotonic in w.

$$(22) \quad p_{av} = \int_0^1 p_i x_i \, di \, / \, \int_0^1 x_i \, di = \frac{w(e+q)}{we} = \frac{wb}{wb\tau/\theta} = \frac{\theta}{\tau}$$

In this case the shadow real wage, w/p_{av}, equals $w\tau/\theta$, and its derivative with respect to w works out to $\tau(2\theta-1)/\theta^2$, which will be negative for sufficiently widespread shortage. [1]/

The particular results are sensitive to the utility specification, but the qualitative results seem broadly applicable. Assuming fixed output proportions, it is always the case that extra income from higher wages would have to be spent disproportionately on surplus goods, so generally (unless relative preferences between surplus and deficit goods shift dramatically with wealth) shadow prices will have to rise for deficit goods. This will induce more queuing relative to productive effort, so either output or leisure must fall. The narrower the range of surplus goods—and typically the range will narrow as wages rise—the less likely it is that the marginal utility of extra surplus goods can compensate for the marginal disutility of fewer deficit goods or less leisure. Similarly, the lower the elasticity of substitution between goods, the sharper the rise in shadow prices is likely to be and the greater the diversion of effort to queuing, and hence the more likely higher wages are to reduce worker welfare.

The roles of both the "breadth" of shortage and the elasticity of substitution between goods can be illustrated by revising the model above to allow for perfect substitutability between surplus goods. This is formally equivalent to replacing the k_i values for individual surplus goods with the average k value for surplus goods. The only difference as w rises is that τ will be fixed and equation (13) for k_τ will cease to apply. Even equation (21) for dU/dw will remain in force, but now dU/dw need not be negative, or (since θ will now rise monotonically with w) it may be negative for some w but turn positive again for higher w. Of course, as before the economy will completely collapse once shortage is universal.

IV. Other Methods for Allocating Shortage Rent

The preceding analysis assumes complete dissipation of shortage rents. Dissipation will be only partial if shopping success is strictly concave in shopping time or if shopping and productive labor are not perfect substitutes. Moreover, one can easily imagine alternative distribution methods that do not involve queuing. A perfect rationing system might restrict a worker's deficit good purchases to a maximum x_i. A completely corrupt distribution system might allow a handful of nonworker "insiders" to buy deficit goods at official prices without queuing, leaving workers no

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[1]/ Utility and the shadow real wage are maximized at different nominal wages due to the substitution effects of relative price changes.

choice but to purchase on unofficial markets at prices p. A perfect in-kind distribution system might forego money wages entirely for payments in goods.

In principle both perfect rationing and perfect corruption can capture the entire shortage rent, although the recipient is different in the two cases. In practice perfect rationing and perfect corruption are as rare as perfect queuing. Rationing schemes are costly to administer and rarely eliminate queues. With corruption, people may compete in socially wasteful ways to become an insider. Accordingly, this section will allow for a mix of queuing, rationing, and corruption. 1/

Let σ_q denote the share of shortage rent dissipated through queuing, σ_c the share of shortage rent captured corruptly by insiders, and σ_r [$=1-\sigma_q-\sigma_c$] the share of shortage rent transferred to workers through rationing. Equation (6) for equilibrium shopping time is replaced by

$$(23) \quad wq = \sigma_q \int_r^1 (p_i - 1)k_i e\, di = \sigma_q s$$

where r as before marks the threshold between deficit and surplus goods and s denotes the shortage rent. With Cobb-Douglas utility, the full-income budget-share equations become

$$(24) \quad wh = b\beta(w + \sigma_r s)$$

$$(25) \quad p_i x_i = b(w + \sigma_r s).$$

Assume that insiders spend all of their income on goods, which they consume in the same relative proportions that workers do. Let $\hat{x}_i$ denote total insider consumption of good i divided by the number of workers. The budget share equation for insiders is then

$$(26) \quad p_i \hat{x}_i = \sigma_c s.$$

Total consumption of deficit goods per worker must equal total production per worker, or

$$(27) \quad x_i + \hat{x}_i = k_i e \qquad for\ i > r.$$

The relations e+h+q = 1 and p_r = 1 complete the system. To simplify the notation, let $\delta = \sigma_c + b\sigma_r$ denote the net fraction of shortage rent spent on goods. It is readily verified that in equilibrium

$$(28) \quad k_r = w\theta/r$$

$$(29) \quad e = \frac{b\tau}{(1-\delta)\theta+\delta\tau}$$

$$(30) \quad s = \frac{b(\theta-\tau)w}{(1-\delta)\theta+\delta\tau}$$

$$(31) \quad p_i = 1 \quad for \ i \leq \tau$$

$$= k_\tau/k_i = w\theta/\tau k_i \quad for \ i > \tau.$$

Note that (28) and (31) are identical with (13) and (17). In other words, the degree of shortage is (for this particular model) independent of the allocation mechanism. This independence simplifies considerably the comparison of different equilibria. For example, since utility is a function of full income and shadow prices, it follows that workers are indifferent between queuing and corruption provided there is no rationing.

It is fairly easy to see why queuing and corruption yield the same pricing outcome. All of the gains of insiders come out of the shortage rent that would have been squandered in queues. It is true that insiders add to gross money expenditures, but this is balanced by the increased production of goods. The balance hinges on the linearity of aggregate income in effort. If workers receive a fixed nonwage income, the percentage increase in production from eliminating queues will exceed the percentage increase in purchasing power. In that case prices will be lower under corruption than under queuing, and workers will be better off.

Linearity of income in effort also helps to explain the pricing equivalence between corruption and rationing. Aggregate production and aggregate spending on goods will both be linear in productive effort. It then follows that price will be independent of the <u>level</u> of effort.

Consideration will now be given to <u>ranking alternative allocation methods</u>. Output for any given wage is an increasing function of δ, so it must rise with any shift from queuing to rationing or from either queuing or rationing to corruption. Intuitively, corruption eliminates both the incentive to queue and the leisure-encouraging wealth impact of rations. Rationing must induce more directly productive effort than queuing because otherwise prices would be higher: more shadow money income would be chasing the same or fewer goods.

For a given wage and corresponding price level, workers' utility can be ranked according to $\sigma_r s$. Any shift from queuing or corruption to rationing not surprisingly favors workers. Provided there is at least some rationing, a shift from queuing to corruption will also benefit workers, because corruption raises productive effort which in turn raises the value of the rations.

For a given wage and price level, insider utility depends on σ_cs. Naturally, any shift from queuing or rationing to corruption benefits nonworkers: they get a larger share of a larger output. Insiders also benefit from shifts from queuing to rationing, since output rises and hence so does shortage rent.

Therefore, for any given wage, rationing is strictly better for workers than corruption, which in turn is almost always (except for the extreme case $\sigma_r = 0$) better than queuing. From the perspective of output or insiders' welfare, corruption is always preferred to rationing, which in turn is always preferred to queuing. Queuing comes out at the bottom of all three rankings, while the choice between corruption and rationing pits workers against both insiders and general interests of state.

These rankings neglect such nonmaterial indicators of worker welfare as resentment of insider privilege and the various administrative costs of allocation. In terms of social perceptions of fairness, rationing probably ranks ahead of queuing, with corruption last, but the likely ranking in terms of ease of administration is the opposite. These conclusions are summarized in Table 1.

Table 1. Rankings of Three Allocation Methods

Ranking	Worker Welfare	Insider Welfare	Output	Perceived Fairness	Ease of Administration
First	rationing	corruption	corruption	rationing	corruption
Second	corruption	rationing	rationing	queuing	queuing
Third	queuing	queuing	queuing	corruption	rationing

With one exception, neither rationing nor corruption eliminate the possibility of a wage-driven economic crisis. As w rises, both τ and θ approach zero as before, with θ/τ approaching k_0/k_{av}. If $\sigma_c = 0$ (perfect corruption), e will equal b regardless of the wage. Otherwise e will shrink monotonically since

$$(32) \quad \frac{de}{dw} = -\frac{b(1-\delta)(1-\theta)\tau}{[(1-\delta)\theta + \delta\tau]^2 w}.$$

Worker utility in equilibrium equals

$$(33) \qquad \ln(1+\frac{\sigma_r s}{w}) + \ln w - (1-\tau)\ln k_\tau + \int_\tau^1 \ln k_i di + \beta\ln\beta - (1+\beta)\ln(1+\beta)$$

or $\ln(1+\sigma_r s/w)$ greater than utility with no rationing. It follows that

$$(34) \qquad \frac{dU}{dw} = \frac{\theta+\tau-1}{\theta w} + \frac{\sigma_r(1-\theta)\tau}{[(1-\sigma_c)\theta+\sigma_c\tau][(1-\delta)\theta+\delta\tau]w} .$$

As w approaches k_{av}, it is straightforward to show that dU/dw will approach or be less than $1/\theta w$ times $-H/(H+1)$, where $H\equiv(1-\delta)(k_0-k_{av})/k_{av}$ is strictly positive. In other words, regardless of the division of shortage rent, there is always some threshold beyond which utility declines with the wage. However, the lower σ_c is, the higher the threshold will be. In this sense a shift to allocation by rationing or corruption does make a crisis less likely.

The ratio of insider full income to worker full income, $\sigma_c s/(w+\sigma_r s)$, is readily seen from (29) to be an increasing function of θ/τ, provided σ_c is positive and the allocation shares do not change too much. Applying (18) and (30), $\frac{d(\theta/\tau)}{dw} = \frac{1-\theta}{w} > 0$. Hence an increase in wages tends to increase the relative advantages of insiders over workers and may exacerbate social inequality. Indeed, if corruption is sufficiently pervasive, insiders need never suffer from wage increases, provided at least some incentives to productive effort remain. If insider utility is measured by $\hat{U} = \int_0^1 \ln\hat{x}_i di$, then

$$(35) \qquad \frac{d\hat{U}}{dw} = \frac{\theta+\tau-1}{\theta w} + \frac{(1-\theta)\tau}{(\theta-\tau)[(1-\delta)\theta+\delta\tau]w}$$

For δ sufficiently close to 1, (35) is certain to be positive, as it approaches $\tau(1-\tau)/\theta(\theta-\tau)$.

V. Remedies and Obstacles to Implementation

The previous sections have shown how dangerous nominal wage increases can be in an economy with fixed official prices. This section considers various options for countering the ill effects. General concerns are illustrated with reference to recent Soviet experience.

An obvious remedy for the economic crisis discussed above is to reduce the official real wage, presumably through higher official prices for

deficit goods. 1/ In a queuing equilibrium, higher official prices will shift effort from shopping to material production. In a corruption equilibrium, higher official prices will reduce the purchasing power of insiders. In a rationing equilibrium, higher official prices will shift income from rations to wages, which will induce more productive effort. In all three cases, shadow prices will fall and the range of deficit goods will shrink. If all prices are allowed to float, there will be no deficit goods and nominal wage increases will leave real variables unchanged, apart from money balance effects not considered here.

Of course, official price hikes are extremely sensitive politically, for a variety of reasons:

- They are a convenient target for pent-up public grievances having little to do directly with official prices.
- In many shortage economies, a combination of strong traditions of government intervention, dislike of speculators, and popular reaction against ruling elites have encouraged a radical democratic sentiment, according to which prices should be pegged by majority vote.
- By resisting official price increases, people may hope to force a reallocation of resources toward consumer goods (higher k).
- Most people have privileged access to a few deficit goods, and a few have privileged access to a great many deficit goods. The value of such privileges is directly threatened by higher official prices. Any particular price hike may arouse a storm of protest even if the great majority of people would benefit, because the losses are concentrated and the benefits diffused. 2/

Slogans of social justice are often invoked against price increases, but the real benefits or price controls to the poor are often meager. For example, in the Soviet Union the state allocations of meat go almost exclusively to the cities, with the poorer countryside left to fend for itself. Major cities are favored over minor cities, and even within cities allocations go disproportionately to the more affluent. In 1987, Soviet families with per capita monthly incomes exceeding 150 rubles were reported to pay, on average, 31 percent less per kilogram of meat purchased than families with per capita monthly incomes of less than 50 rubles. Taking into account differences in the amounts of meat purchased, higher-income families received three times the meat subsidies of lower-income families (Izvestia, November 19, 1987).

At first glance, price controls benefit the poor insofar as their opportunity costs of queuing are low. High-wage workers may directly or

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1/ Note that higher prices for surplus goods, which in this model are analogous to an upward shift in k for i<τ coupled with reduction of utility by an appropriate constant, need not have any immediate impact on a crisis.

2/ In this respect, a broad price reform may garner more support than a narrow one.

indirectly pay low-wage workers to queue for them. However, as Stahl and Alexeev (1985) and Gang and Tower (1985) have shown, the costs of shopping congestion may outweigh the superficial benefits even for the poor. Moreover, as the preceding analysis has shown, price controls may exacerbate inequality.

Paradoxically, the economic polarization facilitated by shortage is likely to increase political pressures to control prices. In spring 1989 in China, massive student demonstrations protested not just lack of democracy, cadre corruption, and growing inequality, but also increases in consumer good prices. With some exceptions, the students appear not to have understood the connection between corruption and the multi-tiered system of price controls. Relaxation of price controls, not reimposition, would have better suited the students' aims. As long as price controls are maintained, campaigns against corruption may even be economically damaging insofar as they reintroduce fair but socially wasteful queuing.

A possible alternative to official price increases is improved supply (higher k), through redirection of state production, expansion of non-state domestic production, or import of foreign goods. If the state does import, both workers and the state benefit from sales at market-clearing prices rather than at the low prices for domestic substitutes. This is what Poland did in the 1980s through the Pewex network of state stores. The Pewex stores offered Western goods in return for dollar-backed certificates, and therefore did not formally challenge domestic price controls. However, since dollar certificates were traded for zlotys at black-market prices (with trading becoming increasingly open over the course of the decade), Pewex goods were in effect sold for zlotys at domestic shadow prices.

If both the official prices and supplies are inflexible, and nominal wage controls are inadequate, crisis might still be averted or overcome by tying the distribution of deficit goods directly to productive labor effort. If all goods are allocated in proportion to productive labor, then money, in principle, is superseded as a medium of exchange and price controls are irrelevant. However, transaction costs in a "payment-in-kind" economy are likely to be very high.

Soviet economic development over the last few years illustrates both the crisis of perestroika, or "restructuring," described in this paper and a still-continuing search for remedies. The economic cornerstone of perestroika was intended to be the devolution of authority from central planners to firms. This concept was embodied in the Law on State Enterprises, promulgated in June 1987 and implemented in January 1988. In practice, enterprises gained much more influence over wages than over product lines or prices charged customers. From January 1988 through December 1990 official real wages rose 24 percent, or 21 percent if one allows for understatement of official retail price inflation by about

1 percent per year prior to 1990. 1/ Official real money income rose even
faster. For comparison, over the previous 12 years official real wages rose
only 25 percent, or 11 percent adjusted for understatement of inflation.
For an economy already in precarious condition, the surge in nominal demand
was a serious blow. By late 1989, the economy was unmistakably in crisis.
Prices on black markets were soaring, output falling, corruption spreading,
inequality growing. Labor tensions were escalating, with managers decrying
the erosion of labor discipline and workers complaining of declining living
standards.

Price reform was imperative. Food prices in state-run retail stores
had not changed since 1962, even though procurement prices paid farmers had
risen subsantially, with a sharp increase in 1983. By 1990 subsidies for
meat and milk alone amounted to 9 percent of Soviet GDP. Price reform
proposals, with various mixes of higher administered prices, price
decontrol, and monetary compensation, were repeatedly broached but could not
overcome popular opposition and the reluctance of sparring political
factions to take responsibility for higher prices. Indeed, the announcement
in May 1990 of retail price increases contributed directly to the downfall
of the Ryzhkov government, although the pricing decision itself was quickly
retracted.

Attempts to improve the supply of consumer goods were of limited help.
The campaign launched in May 1985 against alcohol consumption was intended
to raise labor productivity, but may well have been counterproductive
insofar as restraints on alcohol sales (16 percent of total state retail
sales in 1984) deprived the state of significant tax revenue and aggravated
shortages of other goods. Commitments to modernize the machine-building
industry and to maintain a large defense sector limited the resources
immediately available for production of consumer goods. Except for a brief
period in 1990, falling oil prices and/or desire to limit external deficits
discouraged large-scale import of consumer goods.

By mid-1990, the normal retail distribution network had virtually
collapsed. Sales were increasingly conducted by invitation only, often
through factories and other workplaces which used them for payment in
kind. 2/ Without the direct linkage between goods allocation and labor,
work discipline would presumably have been worse. However, the
proliferation of barter and barter-like transactions also served to disrupt

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1/ Measures by Soviet authorities of official price inflation until
recently tended to overstate the value of (often-spurious) quality
improvements. An adjustment of 1 percent for years prior to 1990 (when
Soviet statistical procedures were changed) is based on a rough comparison
of Soviet figures and Western-derived purchasing power indices. It is
likely to be conservative.

2/ Such distribution methods have been used in the Soviet Union since its
founding, but they were much less common two years ago than today.

established economic links and in particular strained relations between republics that for other reasons were already tense.

In spring 1991, the central Soviet authorities at last conceded the futility of further delay, and announced a large-scale retail price reform would take effect on April 2. The reform raises substantially the controlled prices of consumer staples and decontrols the prices of some consumer durables, while offering cash compensation to households. Whether cash compensation can be restrained sufficiently to stabilize consumer markets remains to be seen.

VI. Closing Remarks

The main conclusions of this paper were indicated already in the introduction and will be summarized only briefly here. When prices are fixed, nominal wage increases for workers can serve to reduce labor productivity, to exacerbate social inequality, and, if shortages are sufficiently widespread, workers are harmed. For any given wage and price level, rationing offers the maximum short-term benefit to workers. Output will be less than under corruption but higher than under queuing. Rationing also raises the threshold beyond which wage hikes impoverish workers. If distribution of deficit goods is tied to labor effort, crisis can in principle be remedied or averted. However, from a broader perspective rationing is part of the problem. Shortage economies need more, not less flexible distribution and pricing.

The central lesson for policymakers in reforming shortage economies is the need to keep wage liberalization from outpacing price liberalization, preferably through acceleration of the latter. Tinkering with the methods for distributing shortage goods offers only limited potential for remedying the ill effects of excessive wages.

On a technical level, an attempt has been made to build a chronic shortage model on rigorous microeconomic foundations. In such a model, assuming economic agents are rational, shadow markets will co-exist with official markets, and discrepancies between official and shadow prices will give rise to shortage rents. To close the system, it is necessary to specify how the shortage rents are allocated.

The particular model examined the relationship between wages, effort, breadth and depth of shortage, and utility under a variety of methods for allocating shortage rent. To keep the model tractable and to facilitate exposition, a number of simplifying assumptions were made, including: unit elasticity of substitution among goods and between goods and leisure (Cobb-Douglas utility); perfect substitution between productive effort, shopping time, and leisure, with linearity of both production and shopping success schedules in labor time applied; no flexibility in state production and no production outside the state sector; no transaction costs on shadow markets; and zero demand for money balances. Relaxation of these assumptions offers many challenges for further research.

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