

Lecture Note on the Command System

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We now live in an age where there is a consensus about the virtues of a market economy. But that is quite a recent development. The history of the twentieth century can be told in terms of the clash of two political-economic systems.¹ It was not that long ago that many in the West questioned whether capitalism was dynamic enough to compete against the collectivist economic order.² This leads us to two questions. First, we need to understand how that system operated, for there are important legacies of this system for transition. Second, we need to ask how this system, so feared only a generation ago, could collapse so suddenly.

1 A Brief History of the Collectivist Economic Order

The idea of an economy, and society, ordered by command from above is an idea that dates back at least to Plato's Republic. But until this century no political-economic system was organized in such a fashion. The Soviet

¹This clash really begins in the 19th century or even earlier. The Marxist critique of capitalism, while not the only critique, certainly set the stage for the 20th century clash. Ideas in the 19th century led to practice in the 20th.

²Recall the response to Sputnik, and to Khrushchev's boast that the Soviet Union would bury the US.

economic system represents the first attempt to bring this idea to practice.³ This is important to understand. The Soviet system is more than government regulation and state ownership. It is more than interference in the market economy. The Soviet system represents an experiment to *replace* the market with a centralized economic order. This does not mean that Soviet-type economies were completely ordered from the center. But the logic of the system was precisely that of central planning, and the institutions of the STE developed to support that.

That central planning was the fundamental characteristic of socialism is somewhat ironic. It is true, of course, that Marx criticized capitalism for the anarchy created by the market system, and planning was posed as the superior alternative. But the key goal of socialism was social ownership of the means of production; in other words, the abolition of private property. Fundamentally, however, the irony disappears once we consider how an economy can operate without private property. To satisfy the latter goal, the institutions of the command economy developed. The key point here is that central planning replaces the market as a coordination device. Notice that this means that short-term plans that provide coordination services, are crucial; perspective planning recedes in importance.

The institutions of the command economy developed out of two imperatives: control and growth. Maintaining central control of all aspects of the economy was an imperative of the Soviet system. In principle, it is possible to organize an economy without private property in a decentralized fashion. But in practice central control was a political imperative. To satisfy this constraint, the planning system developed its characteristic features, and as this system crystallized, reforms that challenged central control were rejected by the system.

The second imperative of the system was the need to rapidly industrialize an underdeveloped economy. The Soviet Union inherited by the Bolsheviks

³To use the felicitous phrase of Nekrich and Heller, it represents "utopia in power."

was a predominantly rural underdeveloped country, surrounded by potential enemies. Once the possibility of global revolutions receded, the Soviet leadership pursued the path of "socialism in one country," and this led to an emphasis on growth to rapidly industrialize to meet potential threats.

Marx never left a blueprint of how the socialist commonwealth would be organized. The early history of the Soviet economy displayed lurches in several directions before the classical Soviet-type economic system crystallized in the late 1920's. The institutions of the command economy thus developed organically as the Soviet leadership responded to these imperatives. But once this system crystallized it was the model that was implemented in all other socialist economies.⁴

2 Basic Features of the Soviet-type Economy

To understand the nature of the Soviet-type economy it is important to realize that there is an inner logic to this system. As we shall see, the Soviet-type economy had its own inner logic according to which it operated. This logic permeated the entire economy and conditioned the behavior of agents in the economy.

What then are the basic features of the STE? We would like to distinguish the primary differences from those that are derivative. For example, lack of private property seems primary, soft-budget constraints seem to derive from the planning system,

- state-ownership of the means of production
- centralized control by means of an administered system of planning *in physical terms*.

⁴Although Yugoslavia eventually developed its own particular brand of socialism, it is important to recall that initially it was the most orthodox of Stalin's satellites. Tito was, until 1948, more Stalinist than Stalin.

- The system replaces the market with a set of directives from the center to the production units throughout the economy. These directives are *commands*, not suggestions. They are directives that have the force of law, and subordinates are responsible for fulfilling them, even if the plans are not feasible.
 - The absence of markets implies loss of information about opportunity cost
- absence of private property, except for households
 - soft-budget constraints
 - chronic sellers market
 - emphasis on heavy industry
 - gigantomania
 - dynamic incentives problems
 - state control of investment
 - restrictions on entry

The magnitude of state ownership in STE's is extensive. During the NEP Lenin emphasized state control of the "commanding heights" of industry. But in the mature command economy the state owned not only the "commanding heights," but the foothills, the prairies, and the valleys as well. In the Soviet Union, for example, the state and collective sectors accounted for some 88% of the value added in agriculture; controlled 98% of retail trade, and owned 75% of urban housing space [7, 13]. The industrial sector was exclusively state owned. Some idea of the ownership structure in a planned economy is apparent in table 1.4. In 1985, for example, 91% of employment was in state

| | <u>Agriculture</u> | <u>Industry</u> | <u>Services</u> |
|---|--------------------|-----------------|-----------------|
| <i>OECD (1991)</i> | | | |
| 8 richest countries | 5.5 | 29.8 | 64.7 |
| 8 middle countries | 5.8 | 30.4 | 63.9 |
| 8 poorest countries | 17.9 | 29.5 | 52.6 |
| <i>Centrally Planned Economies (1998)</i> | | | |
| GDR | 10 | 44.1 | 45.9 |
| Czechoslovakia | 11.6 | 46.8 | 41.6 |
| Hungary | 17.5 | 36.1 | 46.4 |
| Poland | 27.2 | 36.3 | 36.4 |

Figure 1: Sectoral Labor Shares in OECD and Centrally-Planned Economies

enterprises, and another 6% was in *kolkhozy*,⁵ which have been essentially state farms since the mid-50's. The extensive control of retail trade means that the smallest shops were state owned.

It is misleading, however, to focus too heavily on state ownership. Many economies have some degree of state ownership. The central distinguishing characteristic of the STE is hierarchical control. Planning replaces the market system. In STE's there are no market prices by which one could judge opportunity costs. Prices are simply accounting devices to record transactions. In pre-Thatcher Britain many large firms were nationalized, but for most goods there were market prices that signalled opportunity cost.⁶ Even for state-owned goods, foreign competition provided market information. This

⁵ *Kolkhozy*, or collective farms, differed from state farms (*sovkhkozy*) in Stalin's times. Workers in state farms received wages, while peasants in collective farms split what was left after the state took its share of output. Of course, in both cases actions were centrally directed. But this made collective farmers residual claimants, and during tough times, peasants suffered. Under Khrushchev the difference between the two essentially disappeared.

⁶ One might also note that because a British-owned enterprise faced market prices for inputs it could come closer to minimizing costs than a similar Soviet enterprise. In both cases incentives did not lead to cost minimization, but the informational differences must have exacerbated the differences.

| | <i>Socialist Countries^a</i> | <i>Capitalist Countries^b</i> |
|---|--|---|
| <i>Total Manufacturing</i> | | |
| Average employment per firm | 197 | 80 |
| Percentage of those employed in firms with more than 500 workers | 66 | 32 |
| <i>Textile Industry</i> | | |
| Average employment per firm | 355 | 81 |
| Percentage of those employed in firms with more than 500 workers | 75 | 17 |
| <i>Ferrous Metals</i> | | |
| Average employment per firm | 2,542 | 350 |
| Percentage of those employed in firms with more than 500 workers | 95 | 79 |
| <i>Machinery</i> | | |
| Average employment per firm | 253 | 82 |
| Percentage of those employed in firms with more than 500 workers | 61 | 28 |
| <i>Chemicals</i> | | |
| Average employment per firm | 325 | 104 |
| Percentage of those employed in firms with more than 500 workers | 79 | 35 |
| <i>Food Processing</i> | | |
| Average employment per firm | 103 | 65 |
| Percentage of those employed in firms with more than 500 workers | 39 | 16 |

Source: Ehrlich (1985)

^aSample, including Czechoslovakia, GDR, Hungary, and Poland.

^bSample, including Austria, Belgium, France, Italy, Japan, and Sweden

Figure 2: Size Distribution of Industrial Firms: International Comparison, 1970.

is completely different from the STE. In the STE prices were simply a planning instrument. The system was designed to implement the directives of the leadership.

One can also look at the structure of industry. In figure 1 we see that industry accounted for a much larger share of employment than in OECD economies, while services were much smaller. This is due to the heavy industry bias. Notice that agriculture shares are also much larger for CPE's than for advanced OECD countries. Only the poorest OECD countries have similar shares of agricultural employment. We also note the difference with regard to Poland. This is due to the lack of collectivization of Polish agriculture.

Related to the structural differences, we may also note important differences in firm size. In figure 2 we observe how much larger are socialist enterprises than capitalist ones.

This is true across different industries. It seems a quite general phenom-

| | 0-100 | 100-500 | 500 and more |
|-----------------------|--------------|----------------|---------------------|
| <i>West Germany</i> | 14.1 | 23.9 | 62 |
| <i>France</i> | 22.5 | 24.9 | 52.6 |
| <i>Italy</i> | 32.3 | 27.3 | 40.4 |
| <i>GDR</i> | 1 | 11.1 | 87.9 |
| <i>Czechoslovakia</i> | 0.1 | 3.4 | 96.5 |
| <i>Hungary</i> | 4.5 | 16.3 | 79.3 |
| <i>Poland</i> | 1.4 | 18.2 | 80.4 |

source: OECD data for West Germany, France and Italy are for 1987,
and for the other countries are for 1989.

Figure 3: Distribution of Employment in Industry by Size of Firms (percent shares)

enon.

Notice that these differences could be due to larger enterprises in CPE's or due to the absence of smaller ones. We see from figure 3 that it is the latter which is most significant. Notice how CPE's have larger shares of employment in the large enterprises, but the OECD countries also have substantial employment there. Notice the miniscule employment in firms with less than 100 workers. This difference has important implications that we shall discuss. It is related to two factors: restrictions on entry – due to lack of private property of course – and the difficulties of planning. The latter consideration works to have smaller numbers of enterprises to reduce the task of coordination (or push it within the enterprises rather than across them).

We thus observe that in planned economies there are fewer enterprises and fewer small enterprises than in market economies.⁷ Why? For now two important points. First, entry is completely restricted due to the lack of

⁷Since more employment is in smaller firms, then with equal populations socialist economies must have fewer firms than market economies.

private ownership. But that is how small firms enter in a market economy. A new enterprise enters a planned economy because the planners decide they need a new steel plant. But there is no reason to build a small plant to see if it is needed. The planners know that it is needed! Second, in an output maximizing world enterprises do not shrink – there is little downsizing, which is the only other way to get a small firm.

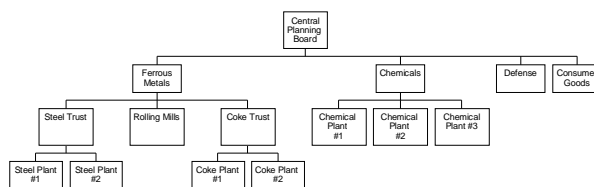


Figure 4: Sample Planning Hierarchy

Information in the planned economy flows only in the vertical direction: up from production units to the central planners, primarily in the form of reports on plan fulfillment, and down from the planners to the enterprises in the form of plan directives. There are, *formally*, no horizontal flows of information.⁸ This means that only at the top of the hierarchy can opportunity costs be assessed. At lower levels agents lack the means to assess the trade-offs between different activities. This is because prices in the planned economy are set administratively, and do not reflect marginal costs.⁹ The

⁸*Informally*, a parallel, or second, economy existed alongside the formal structure.

⁹Prices were typically set to reflect average cost of production, but this was usually estimated by *excluding* the least efficient producers. See 2.2.

advantage of this, from the systemic perspective, is that it facilitates central control and the implementation of central priorities.

We have a sample planning hierarchy in figure 4. The key point is that information flows up and down, but not across. Of course, in practice there will be many branches and many enterprises. Some will be sectoral like chemicals and steel. Others will be functional like defense. The verticality remains a key element.

2.1 The Soviet Growth Model

The Soviet Growth Model (SGM) is a mechanism for extensive growth, that is, growth via the accumulation of inputs rather than through more efficient use of inputs. Resources, human and physical, are mobilized to that task.

The key element here is mobilization. Haste, is important.

- In one sense, planners have a very low discount rate – they are willing to sacrifice lots of current consumption for future consumption.
- On the other hand, haste implies that they want to industrialize fast. So they cut corners, and ignore side effects and other costs.¹⁰
 - The rush to industrialize which produced early successes also sowed the seeds of the barriers to longer-term performance. In that sense, the rapid growth in output of the first couple of five year plans represent borrowing from future performance.
- The key defect of the SGM is that output growth is pursued without regard for the opportunity cost of that growth. Consequently, resources are used beyond the point at which they make a positive net contribution to the economy. Because planners used resources to maximize the

¹⁰"Haste, impatience, and radical action translate into a high rate of time preference, a high discount rate for future benefits for the sake of short-term goals [[30, 1799]]."

growth rate of production it is perhaps not surprising that this led to ecologic disaster.

– this is why environmental mess is so severe.¹¹

In practice this involved a high rate of capital accumulation. For planners this is not difficult. The planners *decide* the proportions of output to be devoted to consumption and investment.¹² In a market economy high savings rates may require incentives to get households to save. In a planned economy there is no need for incentives (if labor supply is perfectly inelastic, and if innovation and effort can be imposed). Suppose that labor supply in any period is $L \leq \bar{L}$, where \bar{L} is the full employment labor supply. and that the minimum subsistence level of consumption is \hat{c} . Then aggregate consumption can be no smaller than $\hat{c}L$ (that is, $\hat{C} \geq \hat{c}L$).¹³ Since the planners want to maximize the level of investment to increase growth, they will choose consumption to equal this amount: $\hat{C} = \hat{c}L^*$. If output is given by

$$Y = F(K, L)$$

then maximizing investment requires choosing L so that $F_L = \hat{c}$, which is playing the part of the wage. In figure 5 the labor supply that maximizes investment is given by L^* . But if the planners care about maximizing output

¹¹In the last decade of the 20th century, there are no leading industrial cities in the Soviet Union where air pollution is not shortening the life expectancy of adults and undermining the health of their children. The growth that made the USSR a superpower has been so ill-managed, so greedy in its exploitation of natural resources and so indifferent to the health of its people, that ecocide is inevitable [9]

¹²There is, in fact, an important division of labor in decisionmaking. The decisions about how fast the economy should grow (this was deemed to be subject to Party control in the absence of "wreckers") and the division of output between consumption and investment was a *political* decision, made at the highest levels of the Party. The planners role was to implement these decisions in the form of plans that could direct the activity of ministries and enterprises.

¹³This assumes that there is no provision for the unemployed. This is not so farfetched. Soviet-type economies did not recognize unemployment. Vagrancy was a crime, and unemployment compensation was less than meager.

they may just set $L = \bar{L}$. This will certainly be the case if they do not believe that there are diminishing returns.¹⁴ What is clear is that the planners simply choose to produce levels of consumption goods consistent with their investment plans. This leaves the supply of consumption goods determined as a residual.¹⁵

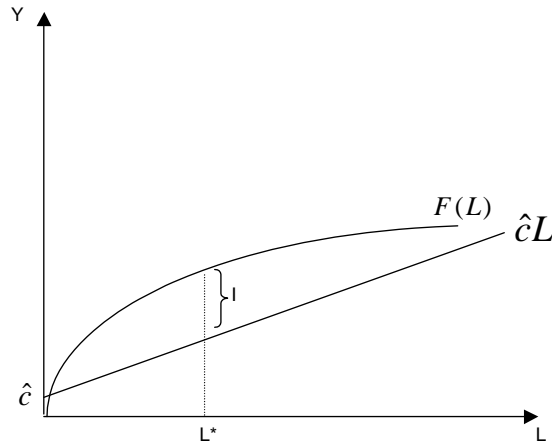


Figure 5: Output, Labor, and Investment

A key aspect is the Fe'dman model and *collectivization*.

- the Fe'dman model is the industrialization strategy: rapid expansion of heavy industry and the capital goods sector eventually leads to increases in consumption. The idea is to build the capacity to build future

¹⁴In that case $F(L)$ is a ray from the origin with slope equal to the average product of labor. As long as this is greater than the subsistence level of consumption, investment and output are maximized when $L = \bar{L}$.

¹⁵Notice that the plan determines the supply of consumption goods (independent of price), the level of the wage bill which, in turn, determines aggregate demand, and the price level. Presumably they could set prices to clear the market for consumption goods. Typically, however, they do not. Setting prices below market clearing levels facilitates bribe-taking. With goods in short supply it is possible to distribute rents without budgetary expenditure. It also means that queues and parallel market prices must rise to clear the market.

goods. Faster capital accumulation creates a base for future growth in total output. This became an important model for India as well.

- Collectivization was also critical to the process. Allen recognizes the negative impact of collectivization on agriculture, but nonetheless argues that it was beneficial because "without collectivization, rural-urban migration would have been less, the cities would have been smaller, and factory output would have been reduced. Soviet industrialization was anchored on a rapid transfer of labor from farm to factory, and collectivization sped up that process (p. 110)." The idea is that collectivization allowed the state to control the surplus in agriculture, and by driving people to cities created a labor force for industrialization.
 - If there is surplus labor you can reduce agricultural employment without reducing output. You gain this surplus. And the people can work in the cities. Think of a production function with a flat segment.
 - The problem is that you still have to feed the people, and if productivity falls in agriculture you do not gain. In the event, the Soviets had to shift more resources *to* agriculture to maintain output. But they did increase *control* over the rural population through machine-tractor stations.
 - There are echoes of the Lewis model here, but that model assumes that the marginal product of labor in agriculture is zero, but agricultural output fell during collectivization (not to mention the capital stock which required a large transfer of resources in the opposite of the intended direction). Moreover, it is not as if rural-urban migration does not occur pretty fast in other developing countries. Do you really need a terror-famine to achieve the optimal rate?

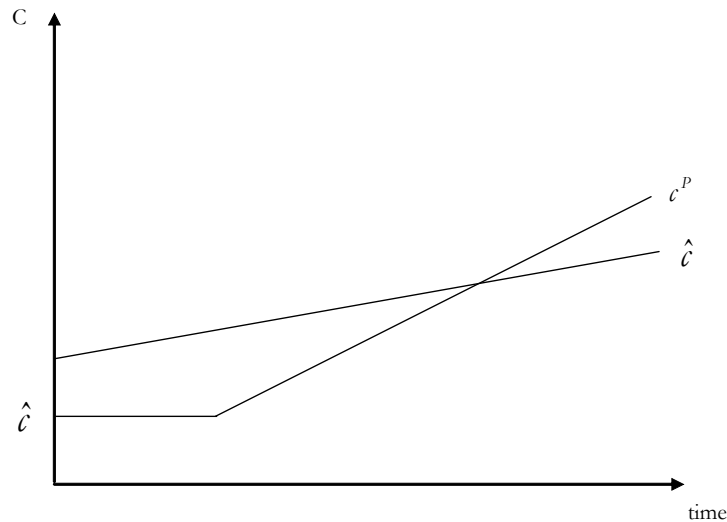


Figure 6: Stalinist and Optimal Consumption Path

- The problem is that Allen is looking exclusively at output growth not welfare or even value added as the criteria for assessing the success of policies. If you ignore the opportunity cost of collectivization I suppose you can say it was beneficial. The basic problem with an analysis that focuses exclusively on growth is that it ignores opportunity cost. It is growth of welfare, not just economic output that people value.
- We can compare the idealized Soviet time path of consumption with that of an optimal plan, where households choose consumption. Notice in figure 6 that the Stalinist path involves sacrifice of consumption today for higher future growth.
- But this ignores the costs of haste; this involves future costs
- Moreover, depressing current consumption may reduce incentives.

It is useful to think of the SGM as if the Soviet economy were a single corporation; USSR Inc. The corporation owns a large stock of natural re-

sources, has no outside shareholders (so that all "profits" can be retained for investment) and hires labor. Moreover, as a monopsonist in the labor market, USSR Inc. can minimize the expenditure on labor. Transactions between enterprises are merely transfer prices between "divisions." The exceptions are purchase of labor and engagement in foreign trade.¹⁶

This point about transfers is important. What does it mean? Most importantly it means that the prices used in transactions between parts of USSR Inc. are not terms of trade, and are not measuring opportunity costs.¹⁷ Because the transfers are directed from the center these prices could, in principle, be set at random without having an impact on behavior. That will turn out not to be true in practice, but the reason is because the system does not actually work as it is *formally* designed. Were the agents merely *executants* of plans as the command system implies then prices would be only accounting measures. The transfer prices merely determine where value will *appear* to be produced.

The objective for this firm could be the maximization of government consumption (primarily defense output), subject to the constraints that labor be supplied in proper quantities.¹⁸ In order to obtain sufficient labor the state must produce consumer goods, including agricultural output, to induce this supply. We can think of the stock of consumption goods as the wage bill necessary to induce the target level of labor. Services are similarly viewed as an input, not as value.¹⁹

¹⁶Notice that enterprises do not engage in foreign trade, only the division known as the FTM – Foreign Trade Ministry – trades with external prices.

¹⁷This very important point will become manifest when we talk about pricing. Note that in a market economy prices reveal information. The amount agents are willing to pay reveals information about demand, and the prices that firms charge reveals information about costs. But if prices are transfer prices this information function is not being provided. Hence, information about demand and cost must be acquired in other ways.

¹⁸Notice that the state acts as a *monopsonist* in the labor market: there is no alternative avenue of employment. This means that the cost of labor to the government is less than the marginal product of labor. In other words, the state is able to squeeze out a larger share of national income by exploiting its monopoly power in the labor market.

¹⁹This accounts for much of the difference between Net Material Product and GDP.

Notice how this problem differs from a standard planners' problem. In the conventional model the planner is assumed to maximize the discounted value of household consumption. Here, however, household consumption is a constraint: the planners maximize the residual *net* of household consumption. The economy is thus seen as a means of producing items for government consumption.²⁰ But the planning problem in the SGM is not a static one. The goal is to maximize not the current level of output, but the discounted value of the path of government consumption. It is this objective which justifies depressing consumption to enhance capital accumulation,²¹ and also producing heavy industrial goods, owing to the conception that to produce high growth emphasis must be placed on the machines that produce machines.²²

For example we may view the planners as trading off present and future defense output. Hence, we have them maximizing

$$\sum_{t=0}^{\infty} \beta^t G_t$$

NMP does not include services, except for freight associated with inputs.

²⁰In practice this was primarily military production, but it could take other forms.

²¹Another way to think of this is that the discount rate that the planners use to discount future government consumption is smaller than the rate which the public uses to discount consumption.

²²This is the essence of the Fel'dman-Mahalanobis model of economic growth. The economy is viewed as consisting of two sectors, machine producing (sector A) and goods producing (sector B). Both sectors rely on machines as an input. It is then argued that to maximize growth it is necessary to focus initially on the production of machines, expanding the capacity to produce goods in the future. The argument depends on the assumption that the key determinant of output in each sector is capital. A key conclusion is that the more capital that is retained in sector A, the higher the rate of growth of capacity, and hence, of the economy. By postponing consumption the eventual capital stock in sector B can be higher, so higher future consumption can be attained. Now the point is not that Stalinist planners followed the formulas of the Fel'dman model, but their decisions were consistent with the model. The key issue was how much to postpone consumption in order to hasten industrialization.

subject to the constraint that

$$G_t = Y_t - C_t - I_t$$

the consumption constraint

$$C_t \geq \widehat{c}L_t$$

and

$$K_{t+1} = K_t + I_t$$

so that investment is the means of obtaining future government output.

The planners must thus choose how to allocate output between current and future G which means how much to invest. But it is not investment versus consumption, but investment versus defense spending. Consumption is the constraint. That is once we have a target for output, from the production function we can figure out how much labor we need. Then we choose consumption to induce so much labor. Note that labor will be supplied quite inelastically, given that alternatives to work are heavily proscribed. Indeed, this is a monopsonist labor market, as in figure 7. The state purchases labor until the marginal cost of labor equals the marginal product. This determines the amount of labor this is hired, L^* , and from the labor supply curve we obtain the consumption wage, \widehat{c} . Notice that if everyone must work, so that labor supply is completely inelastic, then \widehat{c} is determined solely by minimum consumption needs.

Notice that the SGM, in this pure case, ignores any impact of consumption on the quality of labor supply. Moreover, it does not recognize the role of consumption on fertility decisions. When there is a lot of excess labor in the economy – say during collectivization – then L can grow through rising participation rates. But eventually you reach a limit on this. Then you can only grow through two other ways: increasing K or increasing productivity.

The SGM was effective, ignoring the cost, at rapidly industrializing the Soviet economy. A predominantly agricultural economy became, in less than

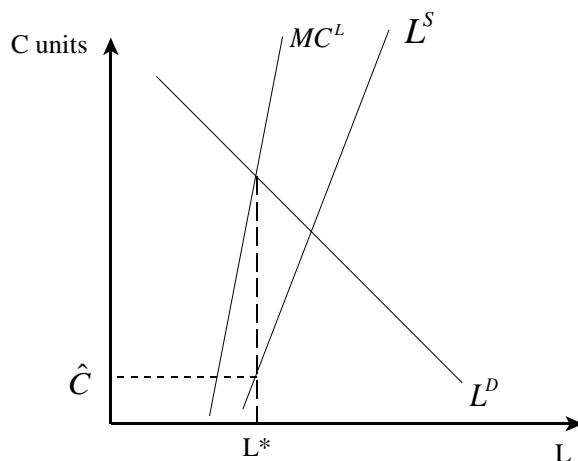


Figure 7: Monopsonist Labor Market

three generations, an industrial power, at least when measured by gross production of autos, cement, oil, and steel. What this system was really good at was *mobilizing* resources. Command is very good at achieving specific objectives – think about war. But command is less effective at dealing with tradeoffs. Command is also effective at extensive growth because this requires mobilizing resources. Saving a high portion of output to equip all workers with tools. But command is less effective at intensive growth which involves making better tools for the workers (see 2.1.1 below).

Claim 1 *An important element in the SGM is resource abundance.²³ Without it, the inefficiencies would have shown up much sooner. Balance of payments constraints are overcome when you are resource abundant. The SGM*

²³"In sum, the Soviet economic system became what it is in part thanks to the country's rich resource base, which permitted the planners largely to ignore the day-to-day discipline of the balance of payments and therefore also the imperatives of the market place and the pains of real economic cost. On this bases an elaborate and rigid institutional edifice sprang up. This economic system thrived for two human generations and achieved marked successes by its own criteria. But inevitably it hardened and came to be supported and protected by powerful vested interests [[17, 202]]."

could use resource wealth to pursue a growth model that might otherwise have shown its inefficiency sooner.

Over time, however, the performance of the SGM began to decline. Growth rates of output per worker decreased from 5.8% in 1950-59 to 2.1% in the 1970's and 1.4% in the 1990's [6]. Total factor productivity growth turned negative in the 1960's and remained so till the end of the regime.²⁴

The deterioration in performance of the SGM was common across the region. Although the exact timing of this decline varies depending on how output is measured, the steady decline was evidenced throughout the region. This is evident in table 8 which uses official data on output growth. Although this clearly overstates the absolute growth rate the downward trend in performance is unmistakable.

A fundamental defect of the SGM is that the return to capital is independent of other decisions. In particular, the model assumes that output is independent of labor's share.²⁵ Presumably, the amount of consumption will affect the supply (and quality) of labor effort. Any such feedback, however, is assumed away in the model. So the key to industrialization is seen in the growth of heavy industry. Now this model may have been effective when the level of terror was high. As socialism develops, however, it becomes more and more difficult to maintain such forced industrialization. Consumption cannot be deferred. But when growth is not achieved through forced industrialization it must be achieved through intensive means, primarily via

²⁴There is an important question of interpretation involved here. If one assumes that labor and capital could be freely substituted, then estimates of total factor productivity are as stated in the text. If one assumes, following Weitzman [36], that such substitution is costly, then total factor productivity does not become negative. Rather the slowdown in Soviet growth is explained by more rapid growth of capital inputs compared with labor, resulting in reduced output growth due to the inability to substitute inputs. Much debate has centered on which interpretation is correct [see [30] and [6], for example], but both explanations are consistent with the defects we discuss.

²⁵This is strictly true for the Fel'dman-Mahalanobis model, but not for the SGM, where, as we have seen, labor supply is taken to depend on the supply of consumer goods.

| | <i>German Democratic Republic</i> | | | | | | |
|---------|-----------------------------------|-----------------------|-----------------|----------------|---------------|----------------|-------------|
| | <i>Bulgaria</i> | <i>Czechoslovakia</i> | <i>Republic</i> | <i>Hungary</i> | <i>Poland</i> | <i>Romania</i> | <i>USSR</i> |
| 1951-55 | 12.2 | 8.1 | 13.2 | 5.7 | 8.6 | 14.2 | 11.3 |
| 1956-60 | 9.6 | 7.0 | 7.4 | 6.0 | 6.6 | 6.6 | 9.2 |
| 1961-65 | 6.6 | 1.9 | 3.5 | 4.5 | 6.2 | 9.1 | 5.7 |
| 1966-70 | 8.7 | 6.9 | 5.0 | 6.7 | 5.9 | 7.7 | 7.1 |
| 1971-75 | 7.9 | 5.7 | 5.4 | 6.3 | 9.7 | 11.3 | 5.1 |
| 1976-80 | 6.1 | 3.7 | 4.1 | 2.8 | 1.2 | 7.2 | 3.7 |
| 1981-85 | 3.7 | 1.8 | 4.5 | 1.4 | -0.8 | 4.4 | 3.2 |
| 1986-90 | -0.5 | 1.0 | -1.8 | -0.5 | -0.5 | -3.5 | 1.3 |

Figure 8: Growth Rates in Eastern Europe and the Soviet Union, 1950-90.
Source Lavigne 1995: 58

technical change. This the Soviet economy was ill-suited for; instead the SGM fell victim to the extensive growth trap.

2.1.1 The Extensive Growth Trap

There are two ways in which an economy can grow over time. First, it can use more and more inputs in the production process; this is called *extensive* growth. Second, it can use inputs more efficiently than before; this is called *intensive* growth. It makes a big difference which is which. This is a rather easy distinction to understand, but how do we know which is which?

It is useful to start by looking at the growth of inputs and outputs. Consider table 2.1.1 which presents growth rates of output per worker using several different measures.²⁶ All of the series show growth declining sharply since the 1950's. It is also clear that prior to WW2, in the early days of the SGM, growth was rather high. This is also the case somewhat in the immediate aftermath of the war, when recovery led to high growth rates. The major difference, vis-a-vis that of Western Europe, is that the decline in

²⁶Official and western in the table refers to who is making the estimate.

productivity growth is much sharper for the Soviet Union.

Note that for both the official and CIA estimates the capital-output ratio rises substantially. This is very different from the experience in the west; one of Kaldor's stylized facts, after all, is that the capital-output ratio remains constant.²⁷ The CIA data show the ratio rising four-fold between 1928 and 1987, while official data shows it almost tripling between 1958 and 1987. The Khanin data is the exception; this is because Khanin argues that hidden inflation is as high in capital goods as in consumer goods.

If we take either the official or CIA view, we have a picture consistent with the view of *extensive growth*.²⁸ For growth to be sustained under such circumstances, the ratio of investment to GDP must rise. Indeed, that is what occurred; between 1950 and 1975 the investment share doubled according to CIA estimates.

How unusual is this? In the Summers and Heston database for 1960-1985, out of 115 countries, only 16 experienced a doubling of the investment share. Of these, six were rapidly growing, middle-income countries; Botswana, Cameroon, Jordan, Korea, Lesotho, and Singapore. The remaining 10 are small, low-income countries; Burundi, Gambia, Mali, Mauritania, Rwanda, Somalia, Zaire, Dominica, Haiti, and Nepal. No industrial country experienced an investment increase as in the Soviet Union.

²⁷In the US, the capital (reproducible assets, from the flow of funds accounts) to GDP ratio was the same in 1990 as in 1960, 2.29.

²⁸Extensive growth refers to growth induced by accumulation of inputs, as opposed to intensive growth that is due to using inputs more efficiently.

Table 2.1.1: Soviet Growth, 1928-1987

| period | <i>Industry Official</i> | <i>Industry Western</i> | <i>Total Economy Western</i> |
|--|------------------------------|-----------------------------|----------------------------------|
| <i>Growth rate of output per worker</i> | | | |
| 1928-1987 | 6.3 | 3.4 | 3.0 |
| 1928-1939 | 12.5 | 5.0 | 2.9 |
| 1940-1949 | 0.1 | -1.5 | 1.9 |
| 1950-1959 | 8.9 | 6.2 | 5.8 |
| 1960-1969 | 5.7 | 2.8 | 3.0 |
| 1970-1979 | 5.2 | 3.4 | 2.1 |
| 1980-1987 | 3.4 | 1.5 | 1.4 |
| <i>Growth rate of capital per worker</i> | | | |
| 1928-1987 | 6.2 | 3.2 | 4.9 |
| 1928-1939 | 11.9 | 6.5 | 5.7 |
| 1940-1949 | 1.5 | -0.1 | 1.5 |
| 1950-1959 | 8.0 | 3.9 | 7.4 |
| 1960-1969 | 6.1 | 3.4 | 5.4 |
| 1970-1979 | 6.3 | 4.1 | 5.0 |
| 1980-1987 | 5.6 | 4.0 | 4.0 |

source: Easterly and Fischer (1994)

To study the sources of growth economists engage in growth accounting. Assume that the aggregate production function can be written as $Y_t = A_t F(K_t, L_t)$, where A_t is the level of technology in period t , K is the capital stock, and L is the labor force. If we take logs and differentiate with respect to time we obtain:

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \left(F_K \frac{K}{Y} \right) \frac{\dot{K}}{K} + \left(F_L \frac{L}{Y} \right) \frac{\dot{L}}{L} \quad (1)$$

where F_K is the marginal product of capital. The last term in (1) is the growth in total factor productivity (TFP). Notice that (1) implies that growth in income comes from three sources: growth in capital inputs, growth in labor inputs, and TFP growth. Note further that the terms for capital and labor input growth are multiplied by the shares of capital and labor income respectively.

To actually measure the growth rate of TFP economists use (1) and the fact that the growth rates of outputs and inputs are, in principle, observable. The terms in parentheses are also observable, at least in market economies. Why? Because they are just labor and capital's share in national income under the assumption that factors are paid their marginal products (i.e., $w = F_L$). Hence, if factors are paid their marginal products it is rather easy to use the wage and the return to capital to substitute for the marginal products. Then we just treat TFP as the residual. Robert Solow won a Nobel Prize for showing that this could be done, and that 80% of US per-capita income growth was due to TFP rather than input growth. Thus for market economies the difficult problem is to explain the residual.

For STE's the calculation is a bit more difficult. The problem is how to measure marginal products. Clearly we cannot assume that factors are paid their marginal products! Instead the returns to factor inputs had to be imputed, to a great extent by comparison with market economies of similar wealth. But the important result is that the residual is rather small. Input growth explains the vast majority of output growth. Moreover, over time TFP growth was seen to be decreasing.

How do we explain the decline in growth rates? Two alternative views are typically offered. Notice that (1) implies that growth in income comes from three sources: growth in capital inputs, growth in labor inputs, and TFP growth. Note further that the terms for capital and labor input growth are multiplied by the shares of capital and labor income respectively. Now suppose that the factor shares are constant; that is, the terms $F_K \frac{K}{Y}$ and

$F_L \frac{L}{Y}$ in (1) do not change as inputs grow. Then given that labor and capital growth rates do not fall over time, an explanation for the decline in growth is then that it is due to declining TFP.

Suppose that we assume that the production function is Cobb-Douglas,²⁹ and that labor's share in GNP is 0.6. Then Soviet growth is marked by negative growth in TFP, as is evident in table 2. The notable exception is the decade of the 1950's when growth performance was exceptional, but since then TFP has declined. On this explanation, Soviet growth was extensive, with little in the way of technological innovation and advancement. The growth in technical change was actually negative, so once accumulation of inputs slowed, growth performance declined. The continued decline in performance was due increasingly to the inability to innovate. Notice also that TFP growth is higher in industry than in GNP. Since industry was overbuilt in the SU, this suggests that non-industrial sectors were a real drag on growth performance. This was primarily due to abysmal TFP growth in agriculture.

The second explanation, due to Weitzman, suggested that the cause of the slowdown was rather the low elasticity of substitution between labor and capital combined with the observed secular increase in the capital-output ratio. During the postwar period capital grew much faster than labor. Using a CES production function Weitzman found the elasticity of substitution to be close to .4 not the implied unity of the Cobb-Douglas. With such a poor ability to substitute capital for labor, combined with rapid growth in k/y , diminishing returns set in quickly. Return to (1), and suppose that capital grows faster than labor. With an elasticity of substitution less than unity, capital's share declines. The reason is that when the elasticity of

²⁹This is a particular functional form for the production function. The economic meaning of this assumption is that the elasticity of substitution between capital and labor is unity. This means that as capital is substituted for labor (or vice versa) the factor shares will not change, because the rise in the capital-output ratio is exactly offset by the fall in the marginal product of capital. If this elasticity were less than one (see below) then the factor share would fall, because the decline in the marginal product of capital would be greater than the rise in the capital-output ratio.

substitution is less than unity, the marginal product of capital declines faster than the capital-output ratio rises. So the coefficient on capital growth is declining over time. Then output growth can decline without any decline in TFP. This is evident in table (10), where the implied TFP show no decline. The interpretation provided by table (10) is that Soviet growth was a result of capital accumulation, despite negative productivity growth. It stopped growing because the marginal productivity of capital declined so much that it no longer offset the negative productivity growth. Essentially the Soviet economy was pursuing extensive growth, but was unable to keep it up due to the inability to adjust factor combinations.

To see this consider figure 9 which presents a stark example. In 1960 we have output equal to Q_{60} and the input quantities (K_{60}, L_{60}) . Now suppose that labor is constant over the period from 1960 to 1980, but that capital inputs increase to K_{80} . If capital and labor are substitutes output rises as we are now on the isoquant labeled Q_{80} . Output has not increased as much as if capital and labor were perfect substitutes, but it has increased. But if capital and labor must be used in fixed combinations we are on isoquant $Q_{80(L)}$. Output is unchanged despite the capital accumulation because it is redundant without increased labor input – its marginal productivity is zero.

If the Weitzman explanation is correct, one is led to ask why did extensive growth continue on such an inefficient path? One explanation, of course, is that in a STE there is no self-correcting mechanism, as in a market economy. In a market economy if investments are earning inadequate rates of return, investment goes elsewhere. In the STE, however, investment continued to go into activities where the rates of return were very low. This of course points to a fundamental problem with planned economies, the absence of a market for capital.³⁰ Of course one of the key points about socialism was precisely

³⁰This is perhaps a key difference between the Soviet Union and the NIC's. In the NIC's the market may prevent investment from flowing to uses where the marginal product of capital is declining.

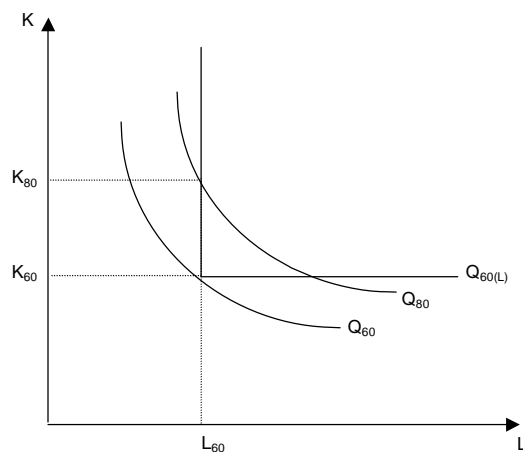


Figure 9: Capital-Labor Substitution

to eliminate private ownership of capital.³¹

One might also be tempted to ask why the elasticity of substitution is so low in the STE? This is also a rather deep question, one that points to the heart of the mechanism. To some extent it is due to the inability to substitute capital for labor in a functional sense. That is, the enterprise does not shed labor, it just under-employs it, due to an over-full employment system. In STE's the enterprise always wants to hoard as much labor as possible, as a reserve against taut plans. Moreover, enterprises always want to add capital to raise capacity. So additions to the capital stock were utilized inefficiently due to lack of incentives to use inputs in a cost-minimizing manner.

A second explanation has due to with the absence of organizational innovation. Capital is simply poured into existing enterprises; there are no entrepreneurs who are able to re-organize the production process. In STE's enterprises enter but do not exit. Inefficient enterprises may contract but they do not exit. In market economies an important source of productivity

³¹It is interesting to recall that Lange-Lerner solutions to planning problems dealt with static allocation problems, but did not deal with the problem of capital allocation in any fundamental way.

growth is the churning of firms as firms expand, contract, enter, and exit. This causes inputs to flow to higher valued uses. In STE's this process is limited by the absence of exit.

The fundamental point is that while STE's managed to invest increasingly greater shares of income, the investments were of poor quality because of the informational problems in the economy and the lack of incentives for efficient investment. The public was forced (savings were not voluntary, of course) to postpone consumption for the future, but these resources were invested so poorly that no positive return was earned.

The extensive growth trap arises because over time it becomes more and more difficult to mobilize resources.³² Extensive growth requires high input growth. In the early stages of industrialization high input growth can be achieved by shifting labor from traditional sectors, e.g., the countryside, to the modern sector. High growth in the labor force can be achieved by moving people from agriculture to industry. But as this reserve is used up, labor force participation reaches an upper limit. After that, labor force growth is constrained by fertility. One can still accumulate capital at a high rate, but now the capital-labor ratio will rise, and if this causes the marginal product of capital to fall, then the growth of output will lag.

The basic problem with extensive growth is apparent if we ignore, for the moment, technical change.³³ Then the growth rate of output per-worker can

³²The question of extensive growth now has a parallel with developments of the Asian Tigers. As Paul Krugman has pointed out a parallel between the NIC's and the Soviet Union of the 1950's is apparent. For once we control for input mobilization there appears to be little else to explain. "Asian growth, like that of the Soviet Union in its high-growth era, seems to be driven by extraordinary growth in inputs like labor and capital rather than by gains in efficiency" (Krugman, *Foreign Affairs*, 73, 6, 1994: 70). The question then is whether the NIC's will encounter the same extensive growth trap that the Soviet-type economies encountered, or will some other mechanism, present in markets but not in planned economies, allow them to avoid it.

³³This is, after all, the condition for zero intensive growth.

| Table 2: Total Factor Productivity Growth Rates, western estimates source: Easterly and Fischer (1994) | | |
|--|--------------------------|------------|
| <i>Period</i> | <i>Industrial sector</i> | <i>GNP</i> |
| 1928-1940 | 1.7 | -1.2 |
| 1940-1950 | -1.1 | -0.2 |
| 1950-1960 | 6.1 | 1.3 |
| 1960-1970 | 1.9 | -0.1 |
| 1970-1980 | 2.4 | -0.8 |
| 1980-1987 | -0.1 | -1.2 |

Figure 10: Growth in TFP, western estimates.

be written as³⁴

$$\frac{\dot{y}}{y} = \left(\frac{F_K K}{Y} \right) \frac{\dot{k}}{k}. \quad (2)$$

³⁴To see where this comes from start with (1):

$$\frac{\dot{Y}}{Y} = \frac{\dot{A}}{A} + \left(F_K \frac{K}{Y} \right) \frac{\dot{K}}{K} + \left(F_L \frac{L}{Y} \right) \frac{\dot{L}}{L}$$

Now set $\frac{\dot{A}}{A} = 0$. Then we can write:

$$\frac{\dot{Y}}{Y} = \left(F_K \frac{K}{Y} \right) \frac{\dot{K}}{K} + \left[1 - F_K \frac{K}{Y} \right] \frac{\dot{L}}{L}$$

where we have used the fact that $F_L \frac{L}{Y} = 1 - F_K \frac{K}{Y}$, since capital and labor are the only two factors of production. Now subtract the growth rate of labor from both sides to obtain:

$$\begin{aligned} \frac{\dot{Y}}{Y} - \frac{\dot{L}}{L} &\equiv \frac{\dot{y}}{y} = \left(F_K \frac{K}{Y} \right) \frac{\dot{K}}{K} - F_K \frac{K}{Y} \frac{\dot{L}}{L} \\ &= F_K \frac{K}{Y} \left[\frac{\dot{K}}{K} - \frac{\dot{L}}{L} \right] = F_K \frac{K}{Y} \frac{\dot{k}}{k} \end{aligned}$$

which is the result in the text, (2).

Because capital's share of income is necessarily less than one, this means that the growth rate of capital per-worker *must* be greater than the growth rate of output per worker. Moreover, for extensive growth to persist, capital's share must be constant, given the growth rates of y and k . This means that F_K must fall no faster than K/Y is increasing. This is, we have seen, the assumption that the elasticity of substitution is not less than unity.

Another way to see the problem with sustained extensive growth is to note that $\frac{I}{K} = \frac{I}{Y} \frac{Y}{K}$. Extensive growth implies that capital grows faster than income, so Y/K must be decreasing over time. Thus for constant growth rates of the capital stock (which is just $\frac{I}{K} = \frac{\dot{K}}{K}$), the investment-output ratio must rise continuously. Of course, the problem is not quite that stark, because as an economy develops the relative price of investment goods decreases over time. So some accumulation of machines can occur without I/Y rising due to the relative price adjustment. But once this price change has been absorbed, further extensive growth can only take place by devoting higher and higher proportions of income for investment.³⁵

That the Soviet economy was stuck in this extensive growth trap was recognized by the leadership rather early. Discussion of how to accelerate technical progress, so that growth could be achieved *intensively*, was discussed often. It is interesting, to compare the comments of Georgii Malenkov speaking in 1941 with Mikhail Gorbachev in 1987:

Malenkov ...highly valuable inventions and product improvements often lie around for years in the scientific research institutes, laboratories and enterprises, and are not introduced into products.

Gorbachev ...many scientific discoveries and important inventions lie around for years, and sometimes decades, without being introduced into practical applications.

³⁵Thus the ration of I/Y stood at around 14% in 1950, rising to 33% by 1980. Nonetheless growth rates of per-capita income declined during this period.

The problem is that the system was not designed to support innovation (e.g., [1] and [5]). There are myriad of reasons for this. Paramount is the emphasis endemic in planned economies on current plan fulfillment. The "virtuous haste" that characterizes Soviet planning imposes costs on potential innovators who would sacrifice current production for future gains. This is critical because the gains from innovation are taxed away by the dynamic incentives problem (e.g., the ratchet effect) that plagues these economies (see below 2.4). In this environment innovation is deterred.

An important question is why it proved so difficult to escape the extensive growth trap. One explanation is that in a STE there is no self-correcting mechanism. In a market economy if investments are earning inadequate rates of return, investment goes elsewhere. In the STE, however, investment continued to go into activities where the rates of return were very low. This reflects the absence of a market for capital. One of the key points about socialism was precisely to eliminate private ownership of capital.

One might also be tempted to ask why the elasticity of substitution was so low in the STE. To some extent it is due to the inability to substitute capital for labor in a functional sense. That is, the enterprise does not shed labor, it just under-employs it, as part of an over-full employment system.³⁶ In STE's the enterprise always wants to hoard as much labor as possible, as a reserve against taut plans. Moreover, it always want to add capital to raise capacity. The capital stock was employed inefficiently due to lack of incentives to use inputs in a cost-minimizing manner. At the same time, there was a built-in input-output conservatism. Plans were based on previous plans. This tended to inhibit substitution as well.

A second explanation focuses on the absence of organizational innovation. Capital is simply poured into existing enterprises; there are no entrepreneurs who are able to re-organize the production process. In market economies

³⁶There is some question as to whether this was due to soft-budget constraints (Kornai) or a planning commitment to full employment (Granick).

an important source of productivity growth is the churning of firms as firms expand, contract, enter, and exit. This causes inputs to flow to higher valued uses. In STE's enterprises enter but do not exit ([22]). Inefficient enterprises may contract but they do not cease operation.

In short, while STE's managed to invest increasingly greater shares of income,³⁷ the investments were of poor quality because of the informational problems in the economy and the lack of incentives for efficient investment. The public was forced to postpone consumption for the future, but these resources were invested so poorly that no positive return was earned.

The legacy of extensive growth, without reallocation, is that Soviet industry was dominated by large, over-manned enterprises with inefficiently allocated capital. In transition economies the problem is that in order for capital to be reallocated there must be an owner. The absence of property rights makes it difficult to transfer capital assets.³⁸ Thus even after transition begins the capital stock is rather rigid.

Extensive growth also meant that enterprises used natural resources inefficiently. Energy was underpriced and over-utilized. The same is true for other primary commodities. The implication is that when prices are liberalized many industries are producing negative value added: the value of output is less than the aggregate value of the inputs used in production.³⁹ This is fundamentally a pricing problem. In particular, when the cost of capital is not accounted for, it will be invested in inefficient ways. We discuss the

³⁷CIA recalculations of Soviet national income show the capital-output ratio rising four-fold between 1928 and 1987, while official data shows it almost tripling between 1958 and 1987. To accomplish this the Soviets had to continually increase the share of investment in national income; thus this share doubled between 1950 and 1975. See [30] and [6].

³⁸Notice that this is also true for leasing. Clearly it would be advantageous to have leasing. It would allow capital to be reallocated without ownership change. The problem, however, is that without ownership leasing is impossible, since possession in this case is 100% of the deal. The absence of property rights makes the allocation of capital rigid.

³⁹In 1935 Hayek had already noted that: "The best tractor factory may not be an asset, and the capital invested in it is a sheer loss, if the labour which the tractor replaces is cheaper than the cost of the material and labour which goes to make a tractor, plus interest" [14].

implications when we come to price liberalization.

The Nature of Extensive Growth in STE's Extensive growth in socialist economies was achieved through the mobilization of inputs. High savings was achieved, as in the Fel'dman model, by suppressing consumption. This is rather easy in an STE; you don't need to raise interest rates, the planners simply choose to produce levels of consumption goods consistent with their savings intentions. This may lead to shortages, and negative feedback, but this is typically ignored.

Another important factor, in the early stages of socialist development, was labor force growth. This was achieved in two ways. First, by shifting labor from the countryside to the urban areas. Second, by very high labor force participation rates. This is especially true for women. Rates were much higher in the socialist world than in the west (see table 11). But once these levels were achieved it is hard to find other means of inducing labor force growth. From 1950-65 the labor force in the Soviet Union grew at an annual rate of about 4.4%. Then it started to decline: 3.2% in 1965-70; 2.5% in 1970-75, 1.9% in 1975-80, 0.9% in 1980-85, and it fell by 0.5% during 1985-89 (Gros and Steinherr, p. 64).

The problem, of course, is that this source of growth gets exhausted once unemployment is reduced and participation is high. Of course there still may be underemployment. But that is much harder to deal with. It requires changing incentives so that labor hoarding is not advantageous for the enterprise.

Land, and by extension natural resources, is another factor extensively used in STE's. Land under cultivation in the Soviet Union increased by 0.8% on average during 1928-83 (Ofer 1987). A lot of this was due to territorial acquisition;⁴⁰ there was also reclamation, as in the "Virgin Lands" program. One reason why these resources were used to extensively was the absence of

⁴⁰Of course this is a technique of extensive growth that has a long history in Russia.

| Labor Force Participation Rates for Women, age 40-45. | | | |
|--|------|------|------|
| | 1950 | 1970 | 1985 |
| <i>Socialist Countries</i> | | | |
| Bulgaria | 78.6 | 88.5 | 93.3 |
| Czechoslovakia | 52.3 | 79.9 | 92.4 |
| East Germany | 61.9 | 79.1 | 86.1 |
| Hungary | 29.0 | 69.4 | 84.7 |
| Poland | 66.4 | 79.5 | 84.7 |
| Romania | 75.8 | 79.5 | 85.1 |
| Soviet Union | 66.8 | 93.2 | 96.8 |
| <i>North European Countries</i> | 30.9 | 53.8 | 71.1 |
| <i>West European Countries</i> | 34.5 | 46.4 | 55.6 |
| <i>South European Countries</i> | 22.4 | 29.7 | 37.1 |

source: Gros and Steinherr, p. 65.

Figure 11: Labor Force Participation of Women, Eastern Europe and Selected Regions

a price for them. The State owns the land, so it does not face a market price for its use. This encourages exploitation that is much too intense. For a non-renewable resource the rule is to produce so that the price (marginal cost) grows at the rate of interest. If the price grows faster than the rate of interest then it is better to keep the resource in the ground. But in the STE there is no interest rate reflecting preferences between present and future consumption. So the planners used these resources to maximize current production.⁴¹

The fact that the SGM produced an ecologic disaster is ironic, because many proponents of socialism had argued that social ownership would overcome the chaos of the market, especially with respect to resources. The problem, of course, is that without property rights, the tragedy of the commons is extended to all of society; one big tragedy.

The legacy of extensive growth, without reallocation, is that industry in post-communist economies is dominated by over-manned enterprises with inefficiently allocated capital. Under planning capital could not be reallocated due to the absence of exit, and the exigencies of the planning system. In transition economies the problem is the absence of markets for capital. The problem is that in order for capital to be reallocated there must be an owner. The absence of property rights makes it difficult to transfer capital assets.⁴² Thus even after transition begins the capital stock is rather rigid.

Note that extensive growth also meant that enterprises used resources inefficiently. Energy was underpriced and over-utilized. The same is true for other primary commodities. The implication of this is that when prices are liberalized many industries are producing negative value added: the value of output is less than the value of the inputs used in production.⁴³ This is

⁴¹Recall the comment by Feshbach and Friendly, quoted above.

⁴²Notice that this is also true for leasing. Clearly it would be advantageous to have leasing. It would allow capital to be reallocated without ownership change. The problem, however, is that without ownership leasing is impossible, since possession in this case is 100% of the deal. The absence of property rights makes the allocation of capital rigid.

⁴³In 1935 Hayek had already noted that: "The best tractor factory may not be an asset, and the capital invested in it is a sheer loss, if the labour which the tractor replaces

fundamentally a pricing problem. In particular, when the cost of capital is not accounted for, it will be invested in inefficient ways. We will discuss the implications when we come to price liberalization.

It is important to understand that these two explanations can be somewhat reconciled. A declining rate of TFP could be the result of sub-optimal investment policies as well as due to low returns from R&D. Similarly, a declining marginal productivity of capital can arise from the low-quality R&D, just as it could be due to inferior investment policy. Thus, from the perspective of the underlying phenomena the two competing explanations may result from the same source. What was missing in the Soviet economy was the ability to generate practical new ideas, and more importantly, to translate them into practice. Innovation was a problem; innovation adoption was a more severe problem.

One aspect of this was the static nature of organization. Innovation often takes the form of new organizations splitting off from old ones. Organizational innovation accompanies technological innovation. New firms need new space, new workers, etc. In the STE this was impossible. Groups of workers could not form new establishment; all entry is from above. Moreover, recall that an STE is supply constrained, so that there are no free resources available to start up new entities. This means that any new activity is costly in terms of other activities foregone; especially so to the planners.

The idea of going from extensive to intensive growth ought to be straightforward. Instead of producing machines to produce machines, produce machines to produce autos. In practice, of course, it is more tricky. Notice that in principle there are two main ways to grow intensively: first, by using existing capital more efficiently, and; second, by modernization, a shift towards sectors where there is greater technical progress. The idea was to move into electronics and other high-tech industries. In most STE's it was the second

is cheaper than the cost of the material and labour which goes to make a tractor, plus interest" (Hayek 1935).

variant that was chosen; choosing the first, while highly productive, would require serious reform.

The problem with modernization is that it did not reduce the emphasis on traditional industry. Heavy industry retained its priority also. As we have noted, extensive growth was energy intensive. This was costly for Eastern Europe, because these sectors were energy intensive. The energy shock was cushioned somewhat by Soviet pricing, which subsidized the region by about \$102 billion during between 1970 and 1981, by selling energy at below world prices. This was a relatively cheap way for the Soviet Union to maintain the political allegiance of the CMEA. But as growth slowed in the 1980's the cost of subsidization increased.

The major problem with modernization, however, was the difficulty of translating innovation into practice. Here the ratchet effect, among other problems, conspired to make this difficult. The ratchet effect reduces the incentive to innovate. Why? Because any gains that are obtained from innovation are taxed away through higher plan targets. Notice that the enterprise bears all the risk of innovation but loses the benefits due to the ratchet. Hence, enterprises preferred to add capital but not innovate. This is the reason why the diffusion of innovations in the STE was so slow. It is interesting to note that while Stalin was alive, and hence the costs of failing to adopt innovations were higher, diffusion was more rapid than in later periods.

The actual way in which CMEA countries tried to modernize was through importing technology in the form of capital goods from the west. This became possible as the SU allowed the CMEA countries to borrow to finance imports from the west. Two important points should be stressed about this. First, the method of modernization via imported capital goods was unsuccessful because without a change in incentives the productivity of the capital goods was lower in the East than in market economies. Second, the CMEA countries acquired a large debt, which became unserviceable when real inter-

est rates rose in the late 70's. Thus Poland's debt, for example, was some \$25 billion in 1982, while its debt-service to exports ratio was about 96%. CMEA countries had acquired debt without a concomitant increase in productivity, and hence, an inability to pay.

Modernization thus increased tension within the CMEA. The fundamental problem was that the Eastern European countries needed to export to the west to earn the hard currency needed to service debt. But the CMEA was organized for socialist-bloc trade. The idea was to develop a socialist common market. The Eastern European economies produced goods that were exported to the SU in exchange for energy and other items. This meant that production was oriented towards goods that could be sold the CMEA rather than in the west. The simple problem was that the goods that Eastern European economies produced could not be sold in the west; they were soft goods, that could be sold only for soft currencies. The problem was most severe the more industrialized the economy. Bulgaria could sell agricultural goods for hard currency. But the products of heavy industry in Czechoslovakia or the GDR could not, because for manufactured goods quality is critical.

The debt crisis thus created a tension within the CMEA that was impossible to resolve. The Eastern European economies needed to re-orient their economies to sell in hard currency markets, but this was impossible without systemic reforms. To SU the cost of selling energy to the Eastern European economies was increasingly costly. Modernization thus failed to solve the crisis in performance, while at the same time exacerbating tensions that arose from trade diversion.

How to actually make the economy more efficient without providing incentives for that. The standard ways thought up by reformers were to "perfect" the system of planning (computers, obedinnenye), and decentralization. But market reform without property rights introduces additional problems (supply diversion is just one of them). Another idea would be new investment programs to modernize (uskorenje, "acceleration"), campaigns against ab-

senteeism, and then perestroika. The latter was much more comprehensive, but the problem of incentives always remains. The key problem here was *uvranilovka* (leveling). The inability of the planners to commit to linear tax schemes spoiled the incentive effects of reforms. This points to the role of property, as opposed to other incentive mechanisms, in generating real change in economic performance.

Note that the problem of limits to extensive growth plagued other STE's. In all of Eastern European growth rates were lower in the period 1975-85 than in the prior ten years. Even according to official statistics the decline in growth rates was significant. In Bulgaria NMP grew by 12.2% in 1950-55; it grew by 3.7% in 1980-85. The same qualitative story is true for all of the CMEA countries. Table 12 is rather instructive in this regard.

The point that stands out in table 5 is the decline in performance in STE's in the decade of the 1980's. Spain, Portugal, and Greece are apt comparators, because they are at roughly the same level of development. Notice that prior to the 1980's the STE's consistently outgrow these economies, but that for the last decade there is a significant reversal.⁴⁴ From the fourth column it is apparent that over the period the STE's grew faster.

Yet is that really the case? Compare Spain and Poland, which in 1950 had about the same income per capita. Over the next 40 years Poland grew faster than Spain (6.6% on average compared to 4.9%), as table 5 indicates. Yet when Poland liberalized and was opened to the world market, it turned out that Poland was not richer than Spain. The market valued Polish GDP per capita at about \$2000, while Spanish per capita GDP was over \$10,000.⁴⁵ The same is true for Russia. The CIA estimated that per capita GDP of the Soviet Union was 68% of the US level in 1989, compared to 31.5% today. And this is a big overstatement. At PPP the relevant numbers are 41.3% and 19.1%. This is a great difference.

⁴⁴Recall also that growth in STE's is perhaps overstated because of the lack of market prices.

⁴⁵As of 1994 they are \$2410 and \$13,440 respectively (WDR 1996: 189).

| | 1952-60 | 1960-70 | 1970-80 | 1952-80 | 1980-90 |
|----------------|---------|---------|---------|---------|---------|
| Yugoslavia | 8.1 | 5.4 | 5.8 | 6.3 | -0.3 |
| Hungary | 4.6 | 5.5 | 6.2 | 5.5 | 1.3 |
| Czechoslovakia | 4.9 | 3.5 | 4.7 | 4.3 | 1.4 |
| Poland | 4.6 | 6.0 | 8.7 | 6.6 | 0.0 |
| USSR | 6.1 | 7.4 | 6.1 | 6.6 | 2.3 |
| Spain | 3.6 | 7.3 | 3.5 | 4.9 | 2.8 |
| Portugal | 4.3 | 6.8 | 2.4 | 4.5 | 2.9 |
| Greece | 6.5 | 7.5 | 4.8 | 6.2 | 1.6 |

source: OECD, Historical Statistics and Economic Outlook and World Bank, World Tables.
note: NMP for Czechoslovakia 1970-1990 and USSR 1980-90

Figure 12: Relative Growth Performance (average annual pct change in GDP and NMP)

What is going on here? Let us focus on the Poland case. We will turn to the Russian case later when we discuss the decline in output. What happens when prices are liberalized is that it becomes apparent how many goods are produced that nobody wants. First there is the pricing problem. At world market prices the relative price of manufactured goods declines, because of the low quality of STE output. Second, because enterprises are no longer subsidized, and because output fulfillment is no longer the key determinant of production, effective demand for many goods declines. The relative price again declines. So much of what is produced is really worth less than it was valued under STE conditions.

A point to recall for the future is that the immediate cause of output decline is not liberalization, but the over-valuation of output at the pre-reform situation.

Some Questions to Think About

1. We can describe the SGM as a steam engine that once was shiny and new and effective but that now has grown rusty and old. The seals no longer fit, steam leaks, and the energy required to produce output has increased. How far can you carry this analogy to explain the SGM? What accounts for the rust? What is the real analog to the decline in pressure through the system? Are there important features of reality that this analogy misses?

2. What explanations might be given for the low elasticity of substitution in the Soviet economy? Why might the Asian NIC's be able to avoid the extensive growth trap? Can you think of features of the Soviet-type economy that exacerbated the problems of extensive growth?

3. What features of the Soviet-type economy were most inimical to intensive growth? To what extent were these features systemic?

2.2 The Price System

An important feature of the planned economy was a pricing system unrelated to true costs.⁴⁶ Indeed, since planning was in physical units we can ask why have prices at all? This is an important question.

Pricing under Soviet planning was an accounting device designed to measure enterprise performance, not a signal of terms of trade or of opportunity cost.⁴⁷ The price system was designed to support the planning system, not the other way around. As we already noted, this is the key difference between transfer prices and market prices. Only the latter reveal information about preferences and costs.

Producer prices in the STE's were set primarily on the basis of "socially necessary costs." In effect, this meant that costs were based on average, rather than marginal, cost.⁴⁸ An important consequence was that land rent and rental rates for capital were not included in costs of production. At the same time, prices were often set to encourage certain types of behavior: for example, low prices for modern agricultural machinery to encourage diffusion [?, 150]. Prices also differed according the user. The same output would have a higher price when shipped to consumer goods industries compared with defense and heavy industry.

Prices for the same good differed based on the user.⁴⁹ Most important, perhaps, with pricing based on supply considerations, changes in demand

⁴⁶[15] provides a good discussion of the principles of Soviet pricing.

⁴⁷And correspondingly, money was not sufficient, nor sometimes even necessary, to complete transactions. What was needed was the authority to purchase the goods.

⁴⁸In the command economy, "the relevant cost has had to be average cost for the industry, rather than marginal cost or average cost of the marginal firm. After all, with the establishment of the command economy the chief function of wholesale prices became the 'accounting' (*uchetnaia*) function, i.e., planning and controlling the financial flows of the enterprise and the branch. For this purpose, industry average cost is clearly suited better than the other two kinds of cost" [16, 135].

⁴⁹Industrial prices can be divided into enterprise wholesale prices *received*; wholesale prices *paid* (which are the sum of received plus taxes and markups) and; settlement prices, which differ for each producer, used in branches such as mining, where costs vary widely among producers.

did not result in changes in price. This means that costs measured at Soviet prices do not reflect actual values.⁵⁰ When prices were liberalized a new picture of the economy emerged. This had important implications for the structural changes that were necessary.

Prices tended to remain fixed for long periods of time.⁵¹ This is problematic because even if they had been initially set correctly, cost conditions change, let alone demand, so after a few years prices are becoming more distorted. The one exception to this is that new goods get new prices; hence, enterprises that wish to increase the price of their product (say because production costs have increased) try to convince the authorities that their product is really new. This leads to "hidden inflation."

Raw material inputs were under-priced in the Soviet economy. Their prices were based on the operating costs of extraction, ignoring rent; i.e., the opportunity cost of using the resources now rather than in the future. No doubt this harmonized with the goal of increasing production today; scarcity pricing might have induced more conservation, which is inimical to current production.

This bias in raw material prices fed into the system of industrial prices. Heavy consumers of energy were, in effect, subsidized. So too were heavy users of capital, thanks to the absence of interest charges. Costs of production were thus calculated based on an incomplete enumeration of costs.

In addition to incomplete cost-based pricing, the system was biased towards certain users. The same commodity would carry a different price if it were used by heavy industry or light industry. This would then feed into the calculation of costs of production of these goods, so that high priority sectors would *appear* to have lower costs of production than low priority sectors. This meant that the apparent distribution of productivities at the onset of

⁵⁰Prices were set so that the branch would earn profits as a whole. Hence, more productive enterprises would earn higher profits, rather than produce a larger share of production.

⁵¹Following the Soviet price reform in 1966-67 prices in industry were not changed until the price revision of 1982.

transition, what we may think are efficient sectors, was liable to mask the true picture.⁵²

An important consequence of the socialist price mechanism was that it hid the true sectoral production of value added in the economy.⁵³ Industry and manufacturing appeared to generate a larger share of value added than was actually the case. This was especially true in the Soviet Union, where the extent to which value added was generated by the raw materials — especially energy — sector was hidden from view. Soviet pricing thus created a distorted picture of the actual economy. Moreover, the nature and extent of these distortions would only be revealed after liberalization.

A related implication of the socialist price mechanism was that it created artificial returns to specific activities. From the standpoint of the leadership, the returns to specific assets were irrelevant, since they (or "the State") owned all property anyway. But with the onset of transition, the distorted picture of relative productivities would be a serious problem. Economic liberalization — freedom to set prices based on supply and demand and free consumer and producer choice — began to unmask the true relative efficiencies of various activities and pointed to their true viability. It showed the extent to which the Soviet-type economy had been producing the "wrong things in the wrong way." Many sectors that had appeared to be value-creating turned out to be value-destroying.⁵⁴ In the case of the former Soviet Union, price

⁵²See [8] for an analysis of the implications of arbitrary pricing on the apparent and actual production of value added in the Soviet economy.

⁵³The implications of Soviet pricing on the perceived structure of the economy is examined extensively in a recent study by Richard Ericson [8]. He shows how the input-output tables of the Soviet economy — which appeared to provide a consistent picture of the underlying structure — could appear to describe an economy where sectors are able to cover average cost when in fact they do not. The fundamental factor, of course, is pricing that is not based on scarcity. Since prices were based on costs and costs were measured arbitrarily, there was a "circularity in definition" as Ericson calls it, one that could not be eliminated within the structure of the Soviet system.

⁵⁴This effect was magnified by the decision to open up transition economies to the world market, thus imposing world prices as the new standard of value. Once domestic prices moved to market-clearing levels, many industrial enterprises could not cover costs. Raising

liberalization revealed the extent to which value added was really created in the energy and raw materials sector. For many people, however, it had the effect of making reform appear to be the destroyer of the manufacturing sector.⁵⁵

2.3 The Chronic Seller's Market

Another important characteristic of the SGM was a chronic seller's market. The primary cause of this was the emphasis on growth at all costs. Fulfilling the output plan replaced other considerations, and became the criterion on which performance was judged at all levels. Plans were designed to be *taut*,⁵⁶ to press on possibilities. The hunt for "hidden reserves" permeated the system.

The primacy of output over other considerations was associated with the phenomenon of *soft budget constraints*.⁵⁷ In order to insure that enterprises would fulfill their plans it was essential that financial shortages not hamper production. Hence, enterprises were subsidized, *ex post*, to cover any losses associated with plan fulfillment. The result of this was to eliminate any restraint on the part of enterprises in demanding resources needed for production. The absence of hard budget constraints combined with the pressure to fulfill plans implied that enterprises were always demanding resources. This led to chronic excess demand, which had several deleterious effects, most notably the priority for quantity over quality. When goods are in short supply customers will accept what they can get; they cannot afford to reject inferior quality goods.

A perpetual seller's market also created an excess demand for labor. En-
prices only led to unsold output.

⁵⁵The argument sometimes goes as far as blaming the reforms for deindustrialization of the economy and degradation of the society.

⁵⁶See [18] for an analysis of the role of taut plans in Soviet planning.

⁵⁷See [24] for a comprehensive analysis of the phenomenon, by the originator of the term.

terprises could always find uses for more labor because performance was measured by output rather than profits or costs. Overfull employment planning eliminated the need to have an explicit policy for treating unemployment, which was considered to be a malady of capitalism.

At the same time, excess demand meant chronic shortages of certain goods. Political control and distribution of these goods were used to enforce regime priorities. Privileged access to education, housing, careers, travel, and consumer goods, were reserved for members of the *nomenklatura*. Moreover, such access allowed for the collection of bribe income. In this sense shortage was a necessity; without the items being in short supply no rents could be derived from positions of power.

While access to "deficit goods" provided power and privilege, possession of money was of less importance. With goods in short supply it was not possession of money, but rather access that made purchase possible. In the STE one could always find a way to pay for a good if one had access. But money without privilege was of much less value.

The combination of shortage and privileged access created a system where *personality* dominated. Allocation and reward were made on the basis of one's identity and position as opposed to the market ideal of anonymous rewards based on productivity. Of course no social system has achieved complete anonymity in rewards, but the Soviet system enhanced the role of personality to the greatest extent. An important consequence of this is the belief, most common among Russians, that those who succeed do so because of who they know rather than what they have accomplished. This creates a cynicism that has plagued reform in Russia.⁵⁸

⁵⁸To an important extent this belief predates the Soviet period, and has been prevalent in Russia, especially in villages, for centuries. The Soviet period merely enhanced it.

2.4 Dynamic Incentives

The Soviet economy provided material incentives to decisionmakers based on performance relative to planned targets. This concentrated attention to the problem of fulfilling plan targets, linked, somehow, to measures of output.⁵⁹ The emphasis on growth led planners to base targets on previous achievements: "planning from the achieved level." Another factor motivating this type of planning was the information problem – it is so difficult to create an integrated plan, it is much easier to simply plan from the last period. Thus if an enterprise produced 100 tons of steel this year, its target for next year would be, say, 106 tons. This created a dynamic incentives problem,⁶⁰ undermining the power of static incentives. If an enterprise produces a high level of output today, its future bonuses will be jeopardized. To combat this, enterprises would limit the extent of current performance, to preserve a "safety factor" which could be used against future uncertainty. Planners, however, recognized that enterprise directors engaged in such behavior, so they made plan targets even more taut and, so on. Misinformation was intensified.

Under planning, the enterprise exploited its private information to increase its share of enterprise income in the form of bonuses or slack. The form that this behavior took typically involved exaggerating current production and under-reporting true productive capacity. Of course, the planners were not ignorant of these activities, and set higher plan targets. The outcome was the familiar game played between planners and enterprise directors, where each side found it in its own interest to depart from the full-information signal.⁶¹

⁵⁹At first targets were specified in physical units, usually gross output. Later these were converted to net output targets and then to value-based measures. See [28] for a discussion of the success indicator problem.

⁶⁰Sometimes termed the ratchet effect, which agents underperform this period because they know that the evaluation of their performance next period will depend on current performance.

⁶¹Thought of this way, the dissimulation that was the fundamental behavior of central

Consider the director of an enterprise and the planner in a simple 2-person game. The enterprise director can signal truthfully what his production capabilities are (T) or fudge and add a safety factor (L). The planner, meanwhile, can either take the request at face value, (T), or issue a taut plan to uncover the hidden reserves (L). We can suppose that from the director's preferences (with director's choices first):

$$U_D(L, T) \succ U_D(T, T) \succ U_D(L, L) \succ U_D(T, L)$$

while for the planner:

$$U_P(T, L) \succ U_P(T, T) \succ U_P(L, L) \succ U_P(L, T)$$

which follows because a taut plan based on correct information will force the enterprise to work extra hard to fulfill the plan. We can summarize this in a payoff matrix with illustrative numbers to represent payoffs.

| | | | |
|----------|--------------|--------------|------------|
| | | planner | |
| | | <i>Truth</i> | <i>Lie</i> |
| director | <i>Truth</i> | 2, 2 | -2, 4 |
| | <i>Lie</i> | 4, -2 | -1, -1 |

The director prefers to lie if he thinks the planner will tell the truth. The planner prefers the taut plan if he thinks the director tells the truth. Hence, we end up in the equilibrium of both lying.

To get the director to reveal how productive they are, the planners offer an incentive system with a bonus that is increasing in the degree of plan

planning is analogous to tax evasion. Transition has changed the form of tax evasion. Enterprises reduce taxation by understating revenues. Considered in this way, it is hardly surprising that enterprise directors responded to corporatization by altering the form, but not the substance, of their use of private information. In order to survive the tumult of transition, and more generally to simply maximize net income, enterprise directors engage in activities to hide income from the tax authorities. And, just as under planning, the government responds by setting high, and a large number of, tax rates. Transition does not eliminate the game, it simply alters the form.

fulfillment. Let \hat{q} be the plan target. Then the bonus function is given by:

$$B = \begin{cases} B_0 & \text{if } q < \hat{q} \\ B_0 + \bar{B} + \alpha(q - \hat{q}) & \text{if } q \geq \hat{q} \end{cases} \quad (3)$$

where \bar{B} is some fixed bonus level for plan fulfillment. Why do planners compensate directors for *over-fulfilling* the plan? Why isn't this bad as underfulfilling? One reason is that if some enterprises overfulfill it can offset other enterprises that underfulfill. So the extra output is valuable to the authorities, especially if they do not know which enterprise is more productive. A second reason is to get the enterprise to work harder, especially if it is productive (again this is likely to be private information, so directors must be induced to reveal this).

To see the role of the canonical bonus function (3), let us assume that directors differ in the amount of effort it takes them to produce effort. This could be due to favorable productive facilities, better workforces, or just being more able. Further assume that this is private information. Effort creates disutility for the director. They value bonuses of course. Hence, the directors' indifference curves in $B - q$ space would be positively sloped. Consider figure 13, where we have plotted the canonical bonus function and two sets of indifference curves. The indifference curve, U^L is that for the low-productivity director. Effort is more costly relative to the other director, so he requires a greater bonus to produce more output at the margin. The indifference curve U^H is that for the high productivity enterprise. Notice that the low-productivity director fulfills the plan, and the high-productivity director overfulfills (produces at $q_1 > \hat{q}$). This is called separation: the incentive system has induced the agents to reveal their private information. It is evident that if there was no bonus for over-fulfillment – e.g., if $\alpha = 0$ in expression 3 – then the high-productivity would produce at \hat{q} .

The canonical bonus function solves the static incentives problem – it gets the high productivity director to reveal that he is productive. But it set

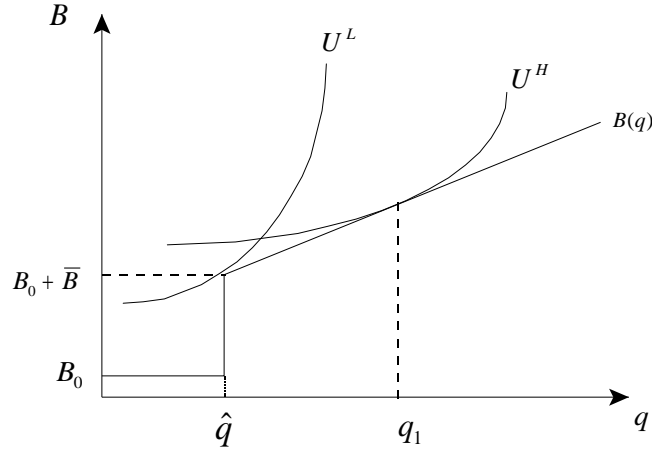


Figure 13: The Canonical Bonus Function

up the dynamic incentives problem. The reason is that when the next period rolls around the planner *knows* which plant is more productive – the private information has been revealed. Hence, there is no reason to give them each the same plan. The high productivity enterprise will get a plan target that will be at least q_1 , and this will make it harder to fulfill the plan next period. Essentially, the planner is taxing the more productive enterprise. But the director is rational – he knows that the plan will be tougher next period. So he will be less likely to reveal this in the current period. If he pretends to be a lower productivity plant – this is called pooling – he will get easier plans for many periods. He loses some bonus, but he gains an easier life. This is rather important, since with a tough plan he risks losing \bar{B} in future periods. Even if we assume that the director always fulfills the tougher plan his utility will be lower in the future since it is harder to produce q_1 than \hat{q} . Let $U^H(\bar{B}, \hat{q})$ be the utility associated with just fulfilling the plan for the high productivity director. Then the current gain from revealing you are productive is $U^H(\bar{B} + \alpha(q_1 - \hat{q})) - U^H(\bar{B}, \hat{q})$. The loss next period will be

$U^H(\bar{B}, \hat{q}) - U^H(\bar{B}, q_1) \equiv \Delta U_{t+1}^H$.⁶² But there are many future periods, so the comparison for the director is given by:

$$U^H(\bar{B} + \alpha(q_1 - \hat{q}) - U^H(\bar{B}, \hat{q}) \leq \sum_{i=1}^T (1 + \delta)^{-i} \Delta U_{t+i}^H \quad (4)$$

where δ is the discount rate, and T is the last period the director is in office.⁶³ The LHS of (4) is the current gain and the RHS is the discounted value of the future losses. Clearly, the longer the time horizon, the smaller the discount rate and the larger the utility loss, ΔU_{t+1}^H , the more likely the director will be to pool.

2.4.1 Directors Incentives and Stock Options: A Comparison

Enron, Quest, Global Crossing, WorldCom, all of these accounting scandals are attempts to prop up current performance so that managers can benefit from incentives tied to current values the the stock of their companies. The torrent of news is shocking, but to scholars of the Soviet economy it is reminiscent of the behavior of enterprise directors. In the Soviet economy managerial bonuses were tied to current performance – in particular to fulfillment of plans (monthly, quarterly, and annual) for output. The nature of these incentives were such that a very large bonus was achieved for plan fulfillment, and a further bonus for over-fulfilling the plan (producing more than the target level). Wo to the manager who did not fulfill the plan. While corporate CEO's struggle to fulfill the expectations of Wall Street, their Soviet predecessors struggled to meet similar, short-term expectations embodied in

⁶²Notice that if supplies or production is subject to stochastic disturbances then with positive probability the loss next period may be even greater. Let π be the probability that the (higher plan, q_1) can be fulfilled next period. Then the expected value of the loss next period will be $U^H(\bar{B}, \hat{q}) - [\pi U^H(\bar{B}, q_1) + (1 - \pi)U^H(B_0)]$, which is clearly larger than the expression in the text.

⁶³We ignore the fact that the director has no incentive to hide information in the last period. Assume that this terminal period is uncertain.

the Plan.

Notice that in both cases there are discontinuous bonus functions. If the share price exceeds the strike price there is a big payoff. Similarly, if output tops the target level. Else income is much lower. This creates a great asymmetry, and it focuses behavior.

Under these conditions Soviet enterprise directors, like top managers with options on stock, engaged in all sorts of activities to fulfill their targets. Primarily *simulation* – pretending to achieve rather than actually doing so. Soviet directors would claim that output was produced but damaged in delivery. They would fulfill the output plan by sacrificing important elements of the good. For example, if a ball bearing is made to half the required tolerance it requires less resources. Eventually someone may find out (hopefully not the pilot of an airplane) but by then the bonus has been achieved.

All simulations imply borrowing from the future. The cost will eventually be paid, but after the bonus is paid.

Now why does simulation work? Clearly it is because of *incomplete information*. If superiors knew what was happening below there would be no gains to simulating. When there is incomplete information there can be rewards to strategic use of information. The enterprise director manipulates information about plan fulfillment. The manager at Enron manipulates information about future (and even present) earnings. But incomplete information is not a sufficient condition for such behavior. After all, the manipulations and simulations will eventually be uncovered. When that happens there will be costs to bear. So it is also necessary that rewards be skewed in such a way that the current benefits of manipulation outweigh future costs, especially if there is some ability to shift those costs on to others in the future.

2.5 The Basic Structure of the Soviet-type Economy

Because a modern economy is characterized by a significant degree of division of labor it is imperative that some degree of coordination be achieved

between producers and between producers and consumers. Grossman called this "*micro-balance*," by which he meant "that minimal degree of coordination of the activities of the separate units (firms) which assures a tolerably good correspondence between the supply of individual producer and consumer goods and the effective demand for them [16, 101]. The use of the term was partly to point out the contrast with market processes. Hence, balance rather than equilibrium or efficiency. Note that balance is the most basic of criteria: "without balance a social economy could not carry on for long, but many actual economies function quite adequately at rather low levels of efficiency."

Grossman suggested that there are three main solutions to the coordination problem: tradition, market, and command. Of course these are ideal types: in practice, their will be gradations of each form. Moreover, there will be differences between the formal and informal.

Our concern is with the command economy. In the command economy information flows vertically in the form of commands or instructions to *executants* to must carry them out. If the command system were absolute there would be no discretion whatsoever; executants would carry them out exactly. Notice that a necessary condition for this is that the plan be balanced. If tolerable coordination is not achieved then some plans necessarily cannot be carried out. This will force on some agents the need to exercise discretion. This leads to an important point: *the primary reason why the command economy departs from its absolute nature is the imbalances that result from the planning process*. It is the fact that the formal planning process cannot generate micro-balance that requires agents to act in informal ways to achieve it. This point is critical to understanding the operation of the STE. But to fully understand it we first have to understand how plans were generated.

2.5.1 Material Balances

How can plans be formulated if there are no horizontal information flows? The method of planning is known as *material balances*, and as with planning in general there is an inner logic here.

The process of planning begins with control figures, determined by the central planners and distributed to the enterprises.⁶⁴ These control figures express the regime's priorities. They include targets for gross production and final goods production. The gross production targets are disseminated to enterprises. The enterprises then respond with their requests of inputs. In practice, what they do is descend on Moscow to get revisions in their targets, "to defend their plan." The purpose for the director is prevent increases in targets and to get more inputs and wage funds. This is essentially a negotiating process, and higher priority enterprises are likely to be more successful at this negotiation. But this process only takes place because the plan as implemented is not feasible. To see this let us consider how material balance planning works.

The basic idea of material balances is *iterative*. The Central Planning Board (CPB) issues a target and subordinates respond. This continues until a plan is created. To see this, consider an enterprise that is given a target to produce 1000 units of output (autos, for example). This enterprise will require certain inputs (for example, steel, chemicals, rubber, electricity,...) in order to produce such a level of output. Let the input requirement of good i per unit of output, j , be given by:

$$a_{ij} \equiv \frac{X_{ij}}{X_j} \quad (5)$$

The enterprise will then have a list of input requirements, $(a_{1j}, a_{2j}, \dots, a_{nj})$. Confronted with a target for output X_j^0 , the enterprise will respond by re-

⁶⁴We are abstracting here from the intermediate bodies, trusts and ministries, as well as the material supply committees.

questing the following inputs:⁶⁵

$$(X_{1j}^0, X_{2j}^0, X_{3j}^0, \dots, X_{nj}^0) = (a_{1j}X_j^0, a_{2j}X_j^0, a_{3j}X_j^0, \dots, a_{nj}X_j^0) \quad (6)$$

where the superscript refers to the initial iteration. Notice what this list is: it is a list of input requirements needed to meet the initial plan target. The manager then sends this list, equation (6) to Moscow (through intermediate steps, of course).

The CPB receives lists of input requirements, like equation (6) from enterprises all over the economy. The CPB can simply add up the requirements for each input, *across enterprises*, and obtain the total required intermediate input needs:

$$\hat{X}_1 = \sum_{j=1}^n X_{1j}^0, \quad (7)$$

$$\hat{X}_2 = \sum_{j=1}^n X_{2j}^0, \quad (8)$$

$$\dots$$

$$\hat{X}_n = \sum_{j=1}^n X_{nj}^0$$

Performing the addition in equation (8), the CPB acquires aggregate input needs for the economy. Now they must compare these needs to what is available: they create a material balance. Let Y_j be the final good target for good j . Then the material balance equation for good j can be written as:

$$Y_j + E_j + \hat{X}_j = X_j^0 + M_j + S_j \quad (9)$$

where E_j , M_j , and S_j are exports, imports and inventories of good j , respec-

⁶⁵This assumes that the enterprise responds truthfully. More likely, however, the enterprise may respond *strategically* and ask for more than it needs so as to aid plan fulfillment.

tively. The LHS of (9) are the *uses* of good j , and the RHS are the *sources*. The CPB starts with some final goods target and knows inventories. It then estimates import and export possibilities. It then fills in the items in (9) using the summation in (8). Notice that we have an equation like (9) for each good in the economy. The goal of the planners is to satisfy such an equation for each good.⁶⁶

Now there is no reason why the material balance condition should be satisfied. Sources could be greater or less than needs. Let us suppose the latter:

$$(Y_j + E_j + \widehat{X}_j) - (X_j^0 + M_j + S_j) = D_j > 0 \quad (10)$$

What then are the planners choices? Inventories could be sacrificed, but presumably they have already been scraped to the barrel in the search for growth. More could be imported; but this requires more exports to pay for them, and that could alter the material balance of some other good.⁶⁷ They could cut the final good target, but this would be politically difficult. Hence, the likely choice is to raise the output target for good j by the deficit: $X_j^1 = X_j^0 + D_j$, and issue new targets to the enterprises. The planners will do this for all goods (if the deficit is zero they just issue the same target as before). Of course, this will cause the enterprise to calculate a new list of input needs:

$$(X_{1j}^1, X_{2j}^1, X_{3j}^1, \dots, X_{nj}^1) = (a_{1j}X_j^1, a_{2j}X_j^1, a_{3j}X_j^1, \dots, a_{nj}X_j^1) \quad (11)$$

and then the CPB will make a new set of sums, and a new set of material

⁶⁶Notice that this would still only produce a *feasible* plan. It would not necessarily be optimal. The latter requires that the final goods assortment maximize some objective function. That is not the point of material balancing, however. Of course, in practice, the planners chose final goods targets preferred by the *politburo*.

⁶⁷This explains why STE's were *not* mercantilist in orientation. Indeed, they sought exports only in order to import. They were, if anything, *anti-mercantilist*.

balances:

$$(Y_j + E_j + \sum_{i=1}^n X_{ji}^1) - (X_j^1 + M_j + S_j) = D_j^1 \quad (12)$$

The process continues until all the D_j^1 's are zero.

Now the interesting point about this process is that it is very simple to operate. All that is required is addition and multiplication. Simple arithmetic. Yet it can produce a feasible plan. That is, *if a sufficiently large number of iterations* are carried out, the plan targets will converge to the solution to the system of linear equations, $X = (I - A)^{-1}Y$, the fundamental equation of input-output analysis. This is a rather remarkable result, because the system was created before the input-output model was developed, and long before computers were available that could solve a system of simultaneous equations.

It is important to note that to achieve feasibility a *large* number of iterations are needed. In practice, Soviet planning had one or at the most two iterations.⁶⁸ This means that the plan *as implemented* was almost never feasible. Some enterprises had plans that were too taut; others had plans that were too slack.⁶⁹ Most often plans were too taut because of the growth imperative. In either case the life of the manager was to cope with the inconsistencies in the plan; to find ways to procure inputs.

An important consequence of this system is that final goods production often was treated as a residual. The control figures for inputs (steel, coal, iron, the X_j^1 's) took precedence over final goods production. The reason is not hard to discern. Shortages of inputs cascade throughout the system, because they make it harder for others to fulfill their plans. Plan fulfillment is critical but final goods production is a luxury. Of course, not all final goods are the same. Defense was *the* priority sector, and investment goods

⁶⁸Of course the planners usually started the process using last year's achievements ("planning from the achieved level"). This means they may have started with something close to a feasible plan, if last year's plan was achieved.

⁶⁹The point of one-man management (*edinonachalnye*) was to force the managers to deal with the consequences.

were also important. Consumer goods picked up the slack. These are critical only to the extent that people stop working altogether.

2.5.2 Central Control

This last point is important and merits further discussion. The need for central control to enforce regime priorities stems from the imperative of rapid growth. There is a tradeoff between rapid growth and welfare. Suppose, realistically, that heavy industry is overbuilt while light industry is de-emphasized, and that consequently, greater value can be produced by shifting capital and labor from heavy to light industry. The greater supply of consumer goods would increase welfare measured by national income. But this transfer may be inconsistent with rapid industrialization. The preferences of the leadership in STE's favored the latter. Now if subordinates have independent autonomy they will shift resources to their most highly valued uses (if they know them), but this conflicts with central priorities, so vertical control and directive-planning limits their discretion to prevent independent activity.

One means of enforcing central control was to make plans *taut*. A plan is taut when it presses greatly on production possibilities. Taut planning has the effect of creating a sellers market. This makes it hard for buyers, leading to rationing. Enterprises are only able to receive inputs that are in the plan, so it enforces regime priorities. But it is also responsible for the emphasis of quantity over quality that is characteristic of Soviet planning. When the consumer has no choice, the seller can get away with shoddy goods. And when plans are taut, the best way to increase quantity is to sacrifice quality. Even though plans specified quality targets, the only *binding* target was for quantity, so that is what enterprises sought.

The primary rationale for taut plans, however, was to press on production possibilities in a desire to enhance growth. During the 1920's there was a debate between two schools of thought over how to plan. One group, the "ge-

neticists” argued that plans must be consistent with initial conditions; they should evolve from past outcomes. The alternative group, the ”teleologists,” argued that plans should be designed over the ultimate goals, and constraints should not bind plans. Stalin decided the outcome, and the geneticists were most shot. Subsequently, plans press on the capacities of subordinates to maximize the amount of effort they supply. This was combined with the notion of *subordinate responsibility* which made the director of an enterprise responsible for plan fulfillment.⁷⁰ The upshot is that enterprises received plans that were technically infeasible, and directors sought ways to make plan fulfillment possible.

The combination of taut plans and subordinate responsibility had important effects on the nature of planning. The interests of the subordinate were clearly to obtain a plan that would be easy to fulfill. The mechanism for accomplishing this was to communicate to their superiors less capacity than they actually had. Thus when the planners would issue initial targets, the subordinates would respond not with their true production possibilities, but rather with a safety factor built in. The planners recognized this, and so they issued taut plans, precisely to appropriate the safety factor. Notice that the combination of taut plans and excessive input demands is a Nash equilibrium.⁷¹ If enterprise directors know that the planners are going to issue taut plans, their best response is to ask for more than they need. And if planners know that enterprise directors are going to ask for a safety factor, their best response is to issue a taut plan. As a result the information flows – plan targets and input requests – are made must noisier. This only serves to increase the likelihood that the resulting central plan is infeasible.

⁷⁰Or one-man management (*edinonachalnik*). This was introduced at about the same time as economic accounting, *khozrchet*, in the period after War Communism. The upshot of these institutions is to shift responsibility for fulfillment to the enterprise level.

⁷¹i.e., both players (here the planner and the manager) are playing mutual best responses; in other words, given the choice of the other player neither would prefer to deviate (in this case, act truthfully), as this would lead to even lower utility.

Whip and Cake Because the planned economy produced chronic shortages of goods the system developed the character of "whip and cake" (*metod knuta i prianika*). The economic system produced chronic shortages of certain goods. Political control and distribution of these goods could then be used to enforce regime priorities. Privileged access to education, housing, careers, travel, and consumer goods, were entitlements to members of the *nomenklatura*. Moreover, such access allowed for the collection of bribe income. In this sense shortage was a necessity; without the items being in short supply no rents could be derived from positions of power.

While access to "deficit goods" provided power and privilege, possession of money was of less importance. With goods in short supply it was not possession of money, but rather access that made purchase possible. In the STE one could always find a way to pay for a good if you had access. But money without privilege was of much less value.

3 The Mormon Comparison

Gregory Grossman has pointed out the interesting comparison between the experience of the Mormons between 1847 and 1896 and that of the Soviet Union. This may seem farfetched, but the comparison is distinctly illuminating. The collapse of the Mormon economic system resembles that of transition, and stems from similar causes, which only adds to the value of the comparison. It is thus worth some discussion here.

The LDS moved to Utah in the mid 1840's escaping persecution. Geographically speaking, the Saints were settling in the Great Basin of the American West, a vast, forbidding, almost empty region of arid and rugged terrain with extremes of temperature.

Their religion's basic tenets are central to understanding their economic system. Like other Christians, Mormons (also called "Saints") believe in the Second Coming of Christ. But they also believe it may well happen soon, and

that the society that receives him must be materially suited as well as spiritually and morally perfect. Accordingly, their whole socio-politico-economic system and its institutions and policies were crafted to serve the ultimate goal under pressure of time. This overarching purpose comprised two partly mutually competing tasks: development, the technical and economic task of constructing – from naught and against severe odds – a country with a functioning economy worthy of the Advent, for themselves and an expected rapidly growing population; and the quest of utopia, the educational and socio-psychological task of raising a community of the highest moral and ethical standards in line with the tenets of the faith, also worthy of the Advent. Under strong leadership and with great determination and speed the Saints proceeded to construct their “Zion”, build villages and towns and an extensive irrigation.

3.1 Similarities

- Sense of encirclement⁷²
- holistic vision of utopian future combined with a leadership ready to pursue unconventional means to meet the end – virtuous haste
- authoritarian or totalitarian leadership, a hierarchical system of authority that was responsible for command and control
 - though the Mormons did not use terror
- similar values, and almost identical expressions
 - positive, such as primacy of collective over individual
 - negative, such as hostility to speculation, private economic initiative, deprecation of “unproductive gainful activity.”

⁷²For the Mormons this was due to differences with the laws of the US, especially with regard to polygamy.

- Insulation
 - geography initially isolated the Mormons, but the Union Pacific Railroad soon ended that. A sustained autarkic policy was implemented. The Church reacted by minimizing personal contacts with gentiles, limiting Mormon employment in gentile firms, channeling external trade through selected co-operatives (much like the Soviet “monopoly of foreign trade”), and in other ways.
 - Isolation necessitated a consistent and sustained policy of autarky, which in turn strongly shaped the course of domestic economic development. But, again as in the USSR, the quest of economic independence rested not on ideological (theological) grounds alone. Pragmatic reasons – defense needs and a persistent shortage of valuta (i.e. U.S. dollars) – called for the establishment of various manufacturing industries (e.g., iron, machinery, textiles, beet sugar) and of cotton growing, the imposition of sumptuary prohibitions (coffee, tea), and even led to territorial reach (notably, a brief venture on Hawaiian Islands for the sake of tropical products). A good deal of this was expensive and in the long-run economically wasteful.
- Leadership. The Mormons were led by their President, who as President is “ ‘Prophet, Seer, Revelator’... not even the pope of Rome carries such status as God’s direct spokesman on earth with such a thoroughgoing control of a religious organization”.
- Like the Soviet economy, though not always in the same degree, Zion’s economy was collectivist, mobilizational, centrally planned, largely command-managed, and often redistributive in regard to factors, products, and the economic surplus.

- Property arrangements were very complex, but all organized by the Church. Land and natural resources were only owned by the church.
- Capital formation. The economic surplus was obtained not through a turnover tax, but through *tithing*. This was mostly in kind, whether in labor or goods.
- Prices were mainly used as accounting devices to monitor transactions. The economy was essentially demonetized.
- Reforms were a recurrent feature in both systems – a three-way contest between utopia, development and power.⁷³
- The cooperative variant of organization – leaning less towards utopia, thus also closer to the Soviet model-to-be – predominated, as indeed befitted the imperative of urgent construction of an advanced, populous, defensible civilization under refractory conditions. And there were reforms within the bounds of the cooperative variant, as well.

3.2 Differences

The main key difference was that the Mormons were a voluntary group that were attuned to the system. They chose to belong. They were great human material for the experiment. In the Soviet Union on the other hand the system was imposed on mass society. The leadership may have believed, but everyone else had to be coerced. This explains the differential use of terror. But later generations of Mormons would have been born into the system just like in the Soviet Union.

⁷³Along the communitarian dimension, there was a wide rainbow of (local) United Orders, the extreme ideal being inspired by the biblical account of the community of first Christians. Though important theologically, socially, and historically, the United Orders represented a minor and usually short-lived part of Mormon reality.

The other key difference was that the Mormons did not have to build on top of a previous historic and cultural legacy. The Bolsheviks had to tear down as well as build up. The Mormons started on virgin soil.

3.3 Seeds of Transformation

The fundamental seed of transformation was eerily similar – the end of isolation. Gentile craftsmen and tradesmen moved to Utah and began to undermine from within. They competed against the official businesses and were more successful. In the Soviet Union the *Second Economy* was a similar undermining force from within, leading to the proliferation of system-alien forces and corruption of officials.

It was the threat from the US that eventually undermined the system. Hostile legislation forced the Mormons to become a regular church, and dismantle their peculiar economic system. But it was not just legislation, the rapid growth of the economy and declines in transportation costs made it harder to enforce autarky. Harder to keep out the alien forces.

Both disequilibrated economies inevitably spawned system-alien phenomena – creeping privatization, sub rosa dealing with gentiles in Zion; corruption and the second economy in Soviet-type lands – brittling the order for a final blow . Both conducted debilitating decades-long cold wars with the USA. Zion's was, of course, the much more uneven contest.

Could one compare the desire of Utah to become a state – and the need to do it on US terms, with the impact of the Helsinki accords on the Soviet Union?

4 Legacies

The Soviet economy was designed to support planning. As a consequence key institutions necessary to the support markets were either underdeveloped or

non-existent. This legacy from the past is one of the most important constraints on transition in Russia. There are two types of legacies we consider in this section. *Institutional* legacies refer to institutions that are relevant to a market environment that are missing due to the nature of the planning system, and to inherited institutions that are not ill-suited to transition. *Structural* legacies refer to aspects of economic structure, such as the composition of industry that are necessarily altered in the process of transition.

4.1 Institutional Legacies

The most important institutional legacy from the Soviet period is the absence of private property in the means of production. The vast majority of productive assets at the onset of transition were state-owned. With the object of transition being the creation of a market economy, a process of privatization that would transform ownership was necessary. Such a process, however, takes time to implement.⁷⁴ In the interim, ownership is ambiguous.

4.1.1 Underdevelopment of the Financial System

The primacy of planning in the Soviet system relegated finance to a secondary role. The purpose of financial flows were to record activities and to insure adherence to the plan. Financial flows were utilized as a form of monitoring; they did not motivate economic activity. The purpose of the Soviet financial system was not to intermediate between savers and investors; this task was accomplished directly through the State budget. The financial system was thus passive. Indeed, it was crucial that financial matters not interfere with the dictates of the plan. To achieve this the Soviet economic system introduced the system of dual monetary circuits.

⁷⁴The Russian experience is one of the most rapid. Vouchers were distributed to the population in October of 1992, and most of industry was privatized by June of 1994, probably a record speed when one considers the amount of assets that needed to be privatized.

Cash and Non-Cash Money An important peculiarity of the STE was the dual circuits of money: cash (*nalichnye*) and non-cash (*beznalichnye*). The former was (still is) used by households: wages are received and goods purchased with cash money. Enterprises make transactions with non-cash, or book money. The rationale is easy to grasp if we think of the planning problem.

As we have noted the essential reason for having monetary transactions in the production sphere was monitoring. There needs to be a system of measuring plan fulfillment, and monitoring accounts is an easy method. So enterprises had financial plans that mirrored the physical plans, and when goods were shipped, financial paper went in the opposite direction. If an enterprise had a deficit in its account then the planners knew it was not fulfilling its plan. But even if the enterprise had a deficit, *this could not be taken as a reason to prevent it from purchasing inputs*. The reason is clear. If an enterprise cannot purchase inputs it cannot fulfill its plan, and then other downstream plans, those of the users of the products from this enterprise, are jeopardized. So the banking system (*Gosbank*) would always extend credit to enterprises in deficit. But this explains why the money had to be non-cash. For cash money can be used to purchase consumer goods, and these were already in short supply. Hence, if credit is automatically extended to enterprises it must be in a form so that it cannot *leak* back into the household sector of the economy.⁷⁵

The key element of this system is that payments are a result of economic activity, not the motivating force. Enterprises do not borrow to invest or finance current production. Rather they accumulate debts when failure to

⁷⁵Of course in practice such leakage did occur. The means were several. One was to not report when workers passed away, continue to argue for the same wage bill, and pocket the wages due to these "dead souls." Another was to raise the wages of workers and then take some of this back from them by agreement. The cooperative movement under Gorbachev became a notorious sieve in these matters. An enterprise would enter a fictitious contract with a cooperative, say to paint a warehouse. Such a transaction would require a payment to the cooperative in cash. The enterprise and the cooperative would then split the cash.

do so would jeopardize plan activities. Thus the banking system inherited from the Soviet period was hardly commercial in nature. Moreover, it was not very effective in the most fundamental aspect of exchange: making payments. The reason is that finance followed activity, so an order to pay for goods was issued when goods were to be shipped. There was no need for the payment to arrive before the goods were shipped: after all both enterprises were owned by the same authority. Hence, there was little need to invest in the payments system; especially in the speed of clearing. Payments used the surface mail, and often took weeks and even months to transit from one account to another.

As a consequence of this, the Russian economy inherited a financial system where the most routine aspect of exchange, making payments, was anything but routine. In the absence of planning the consequences this were severe. Indeed, the payments system was a major contributor to the problems that plagued Russia in 1992, and the inter-enterprise arrears crisis in particular [20].

4.1.2 Absence of the Rule of Law

”Who’s the Boss: we or the law? We are masters over the law, not the law over us – so we have to change the law; we have to see to it that it is possible to execute these speculators.” (Khrushchev (1961) quoted in Simis (1982)).

This statement aptly describes the nature of the legal system under planning. A system designed to maximize the scope for the leadership to govern events necessarily placed no restrictions on the type of interventions they could make. Moreover, the rule of law made very small inroads into Czarist Russia.⁷⁶ The consequences of this legacy for Russian transition are crucial, although their appearance would not be immediate.

⁷⁶Witness the following remark of Count Witte: ”[Russia] in one respect represents an exception to all the countries in the world.... The exception consists in this, that the people have been systematically, over two generations, brought up without a sense of property and legality....Under these conditions, I see one gigantic question mark: what is an empire with

The structure of the Soviet system gave primacy to the party over the rule of law. The plan that directed economic activity had the force of law, but was subject to change at the whim of the party officials. The predictability that is afforded by a system of contracts was inconsistent with the planners' perceived need to intervene to insure plan fulfillment. Although the adverse consequences of such discretion were often recognized, and attempts to limit discretion were embodied in reform programs,⁷⁷ this remained an endemic feature of the system. The costs of this were severe under planning, but the cost of this legacy for transition is even greater.

A rule of law is important to governments because it is critical to their ability to collect taxes and regulate the behavior of firms in the event of market failure. But, it is also critical to firms. Laws provide standards of behavior, which can coordinate behavior and reduce transaction costs. Under Soviet planning the rule of law was replaced by the rule of the plan and party. Market activity unsupported by the legal system degenerates in important key aspects.

From an economic perspective a key advantage of the market economy over the planned economy is the development of relationships based on mutual advantage rather than authority and personality. Legal institutions are very important in this process because they enable individuals and enterprises to make and sustain relationships based on impersonal criteria, such as price and quality. When legal institutions are ineffective parties must rely on informal contract enforcement mechanisms, most importantly, a history of personal relations with particular individuals or enterprises.. These mechanisms may be efficient for sustained relationships, but they make it very costly for firms to enter new relationships where no history exists.⁷⁸ Inef-

one hundred million peasants who have been educated neither in the concept of landed property nor that of the firmness of law in general?[quoted in Pipes (1991)]

⁷⁷Most notably, perhaps, in the Andropov experiment in the early 1980's, but also the *Shchekino* experiment of the 1970's. See [25] for an analysis of the costs of discretion under Soviet planning.

⁷⁸Informal enforcement mechanisms are typically reputation based. These systems are

fective legal institutions can thus act as a barrier to entry, or in some cases, to changes in the boundaries and organization of firms will be required to facilitate transactions.

4.1.3 Foreign Trade

An important feature of the SGM was the control of foreign trade by a centralized agency, the Ministry of Foreign Trade (MFT). This institution acted as agent for the economy in its transactions with the rest of the world. This had several important consequences for the economy.

Most important, the MFT acted as an insulator which allowed the divorce of domestic and world prices. The MFT purchased commodities from producers at domestic prices and traded on world markets in world prices; it acted the same way, in reverse, for imports. The MFT, and thus the state budget, pocketed (absorbed in some cases) the difference between domestic and foreign prices. Domestic producers were not allowed access to world markets until the very late stages of *perestroika*. This insulation provided implicit protection for industrial producers whose costs exceeded those of producers elsewhere, and it allowed energy and other raw materials to trade domestically at prices far below world levels.

An important consequence of this price insulation is that domestic producers had little incentive to produce for export, even when world prices were higher than domestic prices. This had a negative impact on the quality of domestic production; without the competitive pressure to produce for the world market, producers faced only a domestic seller's market [see section 2.3]. As long as the insulation was maintained this system could persist, albeit with negative effects on quality. But an important implication is that many industries that produced value added at domestic prices were destroying value

rather effective when the parties expect to transact frequently. As they rely on informal, typically personal, relationships, however, they are difficult for outsiders to penetrate. Thus informal enforcement introduces a bias to status quo relationships.

added at world prices.⁷⁹ Thus the economy built up large sectors of industry which became upon liberalization unviable; notably in light industry.

Another implication of the MFT system was currency inconvertibility, but of a specific form. Most countries with inconvertible currencies suffer from an exchange rate that is over-valued, creating an excess demand for foreign currency. In the Soviet economy the currency was institutionally inconvertible. Foreigners could only purchase goods through the MFT, which operated only in hard currencies. Hence, the foreign demand for Soviet rubles would be non-existent at any exchange rate. In practice the currency was seriously over-valued, which became apparent even before price liberalization went into effect.

Russia entered transition with an over-valued ruble; hence, the impact effect of external liberalization was a significant nominal depreciation. This occurred for several reasons, most associated with a flight from domestic assets due to inflationary expectations. The nominal depreciation had the effect of increasing the profitability of export sectors, mainly in energy and raw materials, and of cushioning the impact of imports on domestic producers. This effect is temporary, however. The initial nominal depreciation has been followed, as in all transition economies, with real appreciation of the currency as domestic prices move towards world market levels. This has been an important source of the structural change that has accompanied transition.

4.2 Structural legacies

Structural legacies are the distortions in the economy that Russia has inherited from the Soviet period. The command system altered the landscape of the Russian economy in fundamental ways. These distortions complicate the process of transition.

⁷⁹As we have discussed above, many producers were in fact producing negative value added even at domestic prices. See section 2.2.

4.2.1 Industrial Structure

The STE displayed a special industrial structure. Output and capital were skewed towards heavy industry and away from consumer goods. Industry was favored over services. In 1980, for example, the services sector employed 37% of the workforce in the Soviet Union, compared with 50% in a sample of countries with similar GDP's.⁸⁰ The nature of the bias was determined by the emphasis on growth. It clearly does not reflect the preferences of Soviet society. Soviet-type economies focused on heavy industry because that was seen to be the key to growth. Investment was thus biased by industry, and industrial investment was biased towards heavy industry.⁸¹

Table 1: Sectoral Distribution of Capital Stocks, 1987 (percent)

| | Agriculture | Industry | Dwellings | Other |
|-----------------------------|-------------|----------|-----------|-------|
| Soviet Union | 14.2 | 32.2 | 18.6 | 35.0 |
| Industrial Market Economies | 5.0 | 23.4 | 35.9 | 35.6 |
| United States | 2.8 | 22.4 | 45.6 | 29.2 |
| Finland | 7.5 | 19.9 | 33.8 | 38.8 |
| Federal Republic of Germany | 3.6 | 20.1 | 44.2 | 32.1 |

source:[30]

From this table we can see the extent to which the capital stock was skewed towards industry and agriculture. It is important to note, however, that the over-emphasis on industry is intentional, while the large agricultural sector is more a reflection of low productivity in that sector. The ultimate irony of Soviet agricultural policy is that in the wake of collectivization, which was supposed to extract more resources from the countryside, Soviet planners had to continuously increase investment in agriculture to produce

⁸⁰The results for output shares are similar: 40% for the Soviet Union and 54% for the comparison group. The comparison group is from Chenery and Syrquin's work on patterns of structural change. Similar results hold for a comparison with European members of OECD, where the employment service share for 1980 was 50%, and for output 57%. See [30].

⁸¹Some estimates for the Soviet Union put the share of heavy industry in total industrial investment between 1917 and 1976 at 84%[24, 173].

INDUSTRIAL STRUCTURE BY SECTOR OF ORIGIN AND URBANIZATION

A. Shares in Labor Force and GNP (percentage)

| | Soviet Union | | | | | C & S | | E-OECD | |
|--|--------------|------|------|------|------|-------|------|--------|------|
| | 1926 | 1940 | 1950 | 1970 | 1980 | 1950 | 1980 | 1950 | 1980 |
| <u>Employment Shares</u> | | | | | | | | | |
| 1. Agriculture | 71 | 54 | 54 | 32 | 26 | 38 | 16 | 29 | 15 |
| 2. Manufacturing | 14 | 23 | 23 | 34 | 35 | 25 | 34 | 37 | 36 |
| 3. Services | 15 | 23 | 22 | 34 | 37 | 37 | 50 | 34 | 50 |
| 4. A/(A + M) | 84 | 70 | 70 | 48 | 43 | 60 | 32 | 44 | 29 |
| <u>GNP (Current Prices)^a</u> | | | | | | | | | |
| 5. Agriculture | — | 29 | 31 | 21 | 20 | 18 | 9 | 15 | 4 |
| 6. Manufacturing | — | 34 | 31 | 39 | 41 | 31 | 36 | 34 | 39 |
| 7. Services | — | 37 | 38 | 40 | 40 | 50 | 54 | 51 | 57 |
| 8. A/(A + M) | — | 46 | 50 | 35 | 33 | 37 | 20 | 31 | 9 |
| <u>Urbanization (percentage of population)</u> | 18 | 33 | 39 | 56 | 63 | 55 | 70 | — | 78 |

Figure 14: Structural Comparison

even moderate growth.⁸²

One can also see the structural differences by sector (figure 14). Notice the large discrepancy with regard to agriculture and services. The former is much larger than in OECD countries and the latter is much smaller. Although it is interesting that the direction of changes are in the same direction (see figure 15). This implies that the Soviet Union was very far from normal when industrialization started and so it takes an enormous amount of time to correct.

There are two reasons why industrial structure in the Soviet economy departed so dramatically from "normal" market economies. The primary reason is the nature of the Soviet growth model itself, which we have already examined.⁸³ The second reason is the hypermilitarized state of the Soviet

⁸²Perhaps the classic example of this is the substitution of the Machine Tractor Stations for livestock. The former was viewed as more scientific and therefore more productive. Its more important function, however, was increased control over the affairs of the countryside.

⁸³Thus the emphasis on gross rather than net output. Soviet planners started with control figures for gross output of key inputs, like cement, coal, iron, rather than with net

B. Changes Over Time (percentage points)

| | Soviet Union | | | Range | C & S | | E-OECD |
|---|--------------|---------|---------|-------|---------|---------|---------|
| | 1928-80 | 1950-80 | 1950-70 | | 1928-80 | 1950-80 | 1960-80 |
| Employment Shares | | | | | | | |
| 9. Agriculture | -45 | -28 | -22 | -55 | -33 | -22 | -14 |
| 10. Manufacturing | 21 | 12 | 11 | 24 | 13 | 11 | -1 |
| 11. Services | 22 | 15 | 12 | 28 | 20 | 13 | 16 |
| 12. A/(A + M) | -41 | -27 | -22 | -56 | -38 | -28 | -15 |
| GNP (Current Prices)^a | | | | | | | |
| 13. Agriculture | — | -11 | -10 | -43 | -17 | -9 | -11 |
| 14. Manufacturing | — | 10 | 8 | 23 | 11 | 5 | 5 |
| 15. Services | — | 2 | 2 | 18 | 5 | 4 | 6 |
| 16. A/(A + M) | — | -17 | -15 | -60 | -31 | -17 | -22 |
| Urbanization | 45 | 24 | 17 | 57 | 26 | 20 | — |

Sources: Soviet Union: Labor shares, 1926, 1940—Ofer (1973, Table E-1, p. 187); 1950-83—Rapawy (1985, Tables 1, 4, pp. 1, 8). Product shares, 1937, 1950—Kaplan (1969, Table A-6.1, p. 123); 1960-80—in current prices; 1950-80—CIA (1983, Table 10, p. 10). Urbanization levels, Narkhoz—various years. Other countries: C & S, Chenery and Syrquin (1975, Table 3, pp. 20-21); E-OECD and U.S., OECD (1982, various tables).

Note: Here, too, as in earlier tables, data for the period up to 1950 are not fully consistent with later data. The definition of the sectors is as in Table 1. "1950" and "1980" under C & S stand for GNP per capita values of approximately \$600 and \$1,500 of 1965. The "range" in Part B of the table stands for changes from a level of GNP per capita of about \$70-\$1,500. "1928-80" covers the income range of \$300-\$1500. In each case the dates attached correspond to the approximate time when Soviet GNP per capita was at the corresponding level. Data for E-OECD are based on GDP and represent the structure of the sum of the entire group of countries.

^a Data for 1940 is for 1937. Data for GNP in current prices for 1950 is in 1955 prices. The bias created must be very small.

Figure 15: Changes over Time

economy, to which we now turn.

Hypermilitarization It is hard to over-emphasize the extent to which the Soviet economy was designed for, and around, military production. This holds for the Soviet Union more than for other socialist economies, and for Russia more than other former republics. In 1985, for example, with 51.8% of the population of the Soviet Union, Russia accounted for 71.2% of defense-sector employment [10]. A hyper-militarized economy favors heavy industry over light, because the former are required for defense production.

To obtain some idea of the importance of the military in the Soviet economy consider one of the most important branches of industry, machine-building and metal-working (MBMW).⁸⁴ This is a key branch of industry, which was the heart of heavy industry in the Soviet Union. According to official Soviet statistics, some 30% of production in this sector went for arms, 20% was consumer goods (cars, tv's, refrigerators, etc.), and the remaining 50% was investment goods. But this calculation was based on official prices,⁸⁵ and thus understates the true magnitude of defense orientation. The reason is that production for defense received inputs at prices below that of industry in general, thus making defense output appear less burdensome to the economy than it actually was. The key point, however, is clear. The Soviet

outputs of final goods. In this sense, Khrushchev was not that far off in his boast. Soviet production of cement, oil, and many other inputs did overtake US production. It is in terms of final goods that the system failed.

It is also to note the important exception to the emphasis on inputs over final goods: the military sector. Indeed, one could argue that the primary objective was maximization of military output.

⁸⁴This and the next several paragraphs follow [10].

⁸⁵Suppose that we converted all MBMW output to world prices, a quite difficult task given the thousands of major products in the sector. Economists at the Institute for Forecasting tried to do this for 1988, and found that at world prices only about 5-6% of production was consumer goods; investment goods accounted for 32%, and the military took the remaining 63%. Of course, even this calculation probably understates the importance of the military in the economy, because the investment goods are presumably used to produce output, and it is not clear how much of that is used to produce output for the military.

economy was highly militarized; it was a hyper-militarized economy.

It is difficult to provide a precise assessment of the size of the defense sector, VPK (for *Voyeno-promyshlennaya komissiya*) compared to the rest of the economy. The reason is not so much secrecy; the problem was never that of finding out the number of *things*. Rather it is the absence of prices that is the issue. Without market prices it becomes problematic to assess the *cost* of military (and non-military) production, and therefore it is impossible to say with certainty how much of society's resources were used for this. In all economies it is difficult to value the military production because there is no market for the output.⁸⁶ But in the Soviet-type economy there is the added (and more difficult) problem of the pricing of inputs. In the STE, the price of inputs differs according to the *user*. Inputs to enterprises in the military sector are priced lower than the same inputs to the non-military part of the economy.

What are the implications of a system that prices aluminum cheaper for the defense sector? We are ignoring here the appropriateness of the regime's preferences; our concern is with the consequences of these choices. Such pricing policies have two important effects. First, the defense enterprises will appear to produce more output with the same amount of inputs as the civilian sector; the military sector will appear to be more productive than non-civilian production, owing simply to pricing. Why? Because the same accounting value of shipments implies more aluminum for defense enterprises. Notice that this advantage is an illusion due to pricing, but the belief that this is a real productivity difference has had important implications for the operation of the system, and for transition.

The second implication of "unequal pricing" is that the cost of producing military output is under-estimated. The lower price that VPK enterprises pay for aluminum is like a hidden tax on the rest of the economy. The

⁸⁶Excluding arms sales, but these are often made for political reasons, and hence the prices often do not reflect costs.

opportunity cost of producing military output is understated because of the lower accounting price for defense. Think of how we would measure the cost of producing 100 Stealth fighters if Congress passed legislation which required aluminum producers to supply the Pentagon at half the market price. The budgetary cost of producing Stealth fighters would be reduced. But the cost, of course, is not eliminated by this law. Rather it is shifted on to non-military uses of aluminum (and from there to the rest of the economy). To assess the true cost of the Stealth fighters we would have to know the extent to which non-military aluminum prices were increased to compensate for the below-cost deliveries to the government.

Now in the case of the Soviet economy we must multiply the number of pricing distortions by many orders of magnitudes. For it is not just aluminum, but almost all inputs that are priced differently in the two sectors. Moreover, prices in the civilian sector are not reflective of opportunity cost either. So even though we know that costs are shifted from the VPK to the civilian sector, we are unable to measure them until we can value civilian production at market prices.

Another reason why it is hard to estimate the size of the VPK is that a good deal of civilian production took place in this sector. All aluminum production, for example, was produced in the VPK. The VPK also produced a very large share of consumer electronics, such as sewing machines (100% of total production), radios (100%), TV's (100%), video-cassette recorders (100%), cameras (100%), chainsaws (100%), freezers (93%), vacuum cleaners (69%), washing machines (66%), refrigerators (40%),^[10] and the like. This was not the result of a strategic decision to diversify production, as might be the case with a western defense manufacturer. Rather it was a means of augmenting the capacity of the military in the case of war, since civilian production facilities could be mobilized for military purposes at low cost. The reason is that civilian production used the same inputs,⁸⁷ and often similar

⁸⁷Although often not of the same quality. The military had first claim to inputs. Those

specifications, as military output. This is why Russian trucks are typically too big for small commercial use and too small for inter-city freight hauling; their specifications are those for military use. The question is how should we classify this production? Is it civilian or military?

The legacy of hypermilitarization was a defense burden that could not be maintained in a liberalized economy. The cost of maintaining this structure was simply too high. But this left a large segment of industry producing goods for which no effective demand could be found, and is at the heart of the problem of industrial restructuring in Russia. This cost is enhanced by the location of many defense enterprises in cities where they are often the dominant or sole employers. This makes the social cost of cutting defense expenditures even greater. Defense conversion is always a difficult task. For Russia, however, defense conversion and industrial restructuring are almost the same thing due to the overwhelming importance of this sector.

Industrial Concentration The industrial structure Russia inherited from the Soviet system has important characteristics that affect transition: an emphasis on size and an absence of small enterprises. Stalinist planners emphasized gigantic plants, known as *gigantomania*.⁸⁸ Soviet plants were often extremely large. One reason for this is that Soviet enterprises tended to be located in a single area, whereas large western companies tend to have plants dispersed geographically. This tendency has led to significant *geographical* concentration of industry. The Russian economy is much more

rejected for military use would go for civilian production. For example transistors, as reported to Hedrick Smith by a worker in a plant: "Military officers sit in each factory—in the big factories, these are generals—and they operate with strict military discipline. They are empowered to reject *brak* [junk or substandard items], and they reject great quantities of *brak*, often at great expense...I have seen how they make transistors. They would make 100 and the military representative would select only one or two. Some would be thrown out as defective and the rest would go to the [civilian] market" [35, 291].

⁸⁸As Wiles noted: "There is something 'socialist' and 'progressive' about mere size, even if unaccompanied by lower costs. Gigantomania as such, then, reinforces the view that large capital expenditures are a good thing, even where smaller ones will do" [37, 304]

regionally specialized than western economies, including the United States.

While the extent to which enterprises in the Soviet Union were excessive in size has often been exaggerated in the literature,⁸⁹ what is critical is that small enterprises were missing from the Soviet landscape. It is interesting to compare the size distribution of industry in Russia with that of the United States.⁹⁰ In the latter most employment is concentrated in small firms (less than 250 workers) or in very large firms (greater than 10,000 workers). These enterprises comprised two-thirds of industrial employment in the US compared with only 25% in Russia. Russia has both less extra large firms and less small firms. Most striking is the difference with respect to small firms, where in Russia 91.5 percent of civilian employment and an estimated 94.5 percent of total (i.e., including defense) employment in manufacturing is provided by enterprises with employment of 250 or greater, while only 73.1 percent of US. manufacturing employment is provided by similar firms.

The lack of small enterprises in the Soviet economy no doubt was an important factor inhibiting innovation and technical change. New ideas often are developed in new firms, and most new firms start out small. The absence of the dynamism created by small firms may be an important element in the deterioration of performance in the Soviet economy.

In addition to the absence of small firms in the Soviet economy it is usually asserted that Russia suffers from a monopoly problem. This is less of a problem than is usually recognized, however. As is shown in [3], Russian industry is not that highly concentrated.⁹¹ While Russia has many concentrated industries these tend to be small and account for a small proportion of employment. Most employment takes place in sectors that are not highly concentrated.

⁸⁹See [3] for a comparison of the size distribution of Soviet enterprises with other countries.

⁹⁰This section follows [3]. The comparison is made using the 1987 census of manufacturing for the US, and the 1989 Soviet census of industry for Russia.

⁹¹Where highly concentrated is taken, for example, to be a four-firm concentration ratio in excess of 60%.

What is important about Russian industrial structure, however, is that potential competition is inhibited by poor transportation infrastructure.⁹² Russia is, after all, a very large country, and the transportation and distribution system inherited from the Soviet period was not designed to create national markets. Moreover, the underdevelopment of the financial and legal system serve as entry barriers. These supporting institutions (distribution, finance, law, and transportation) may much more important to developing competition as any technological barriers (i.e., economies of scale). Although the potential for competition to develop through changing product lines and new entry appears significant, the inadequacy of these supporting institutions may prove to be an significant barrier to effective competition for years to come.

4.2.2 The Legacy of an Inefficient System

The legacy of the Soviet experience is that of an inefficient economic system. These inefficiencies are myriad, but we can consider three main types: those that are *internal* to organizations; those that are *external* in the sense of misallocation of resources, and; those that are *dynamic*.

Internal versus External Inefficiency Internal inefficiency arises primarily from the lack of high-powered incentives in STE's. Enterprises primary responsibility was plan fulfillment not profit maximization. Enterprise directors that were successful were those that found ways to fulfill the plan. Producing a better mousetrap, or finding a method of producing a mousetrap at a lower cost was not rewarded.⁹³ The emphasis on plan fulfillment came

⁹²As the authors of the IMF-World Bank-OECD-EBRD joint study on the Soviet economy argued: "Even where more than one enterprise exists, the national aggregates hide a high degree of regional monopoly power that is protected by generally poor communications and transportation and by administered marketing channels which, in turn, are insulated from one another by ministerial lines of responsibility" [23, 16].

⁹³Indeed, the system biased against such efforts, as any gains would be taxed away via the ratchet, while the costs of achieving such gains would fall on the director.

at the expense of cost minimization. Reducing costs was not important to the director of a Soviet enterprise. This could risk plan fulfillment, and any gains would be taxed away anyway.

Many observers emphasize internal inefficiencies when thinking about transition. This is reflected in the view that the primary problem of transition is to get new owners who are more suited to the market economy. Privatization will alter the incentives that enterprises face, and lead to substitution of better managers.

Dynamic Inefficiency: Difficulties with Innovation The inefficiencies in resource allocation were endemic to the Soviet system, but they were tolerated as long as the rate of economic growth remained high. Deteriorating economic performance is a different matter. Slowdowns in the rate of growth struck at the very heart of the SGM. Moreover, a shrinking pie increased the cost of poor resource allocation. Thus the deterioration in the growth performance of the economy struck at the very core of the system.

We discussed earlier the competing explanations for deteriorating economic performance: declining rates of growth of technical change versus a low elasticity of substitution. It is important to understand that these two explanations can be somewhat reconciled. A declining rate of TFP could be the result of sub-optimal investment policies as well as due to low returns from R&D. Similarly, a declining marginal productivity of capital can arise from the low-quality R&D, just as it could be due to inferior investment policy. Thus, from the perspective of the underlying phenomena the two competing explanations may result from the same source. What was missing in the Soviet economy was the ability to generate practical new ideas, and more importantly, to translate them into practice. Innovation was a problem; innovation adoption was a more severe problem.

One aspect of this was the static nature of organization. Innovation often takes the form of new organizations splitting off from old ones. Organiza-

tional innovation accompanies technological innovation. New firms need new space, new workers, etc. In the STE this was impossible. Groups of workers could not form new establishment; all entry is from above.⁹⁴ Moreover, recall that an STE is supply constrained, so that there are no free resources available to start up new entities. This means that any new activity is costly in terms of other activities foregone; especially so to the planners.

The idea of going from extensive to intensive growth ought to be straightforward. Instead of producing machines to produce machines, produce machines to produce autos. In practice, of course, it is more tricky. Notice that in principle there are two main ways to grow intensively: first, by using existing capital more efficiently, and; second, by modernization, a shift towards sectors where there is greater technical progress. For example, there was the idea to move into electronics and other high-tech industries. In most STE's it was the second variant that was chosen; choosing the first, while highly productive, would require serious reform.

The problem with modernization is that it did not reduce the emphasis on traditional industry. Heavy industry retained its priority also. As we have noted, extensive growth was energy intensive.⁹⁵

The major problem with modernization, however, was the difficulty of translating innovation into practice. Here the ratchet effect, among other problems, conspired to make this difficult. The ratchet effect reduces the incentive to innovate. Why? Because any gains that are obtained from innovation are taxed away through higher plan targets. Notice that the enterprise bears all the risk of innovation but loses the benefits due to the ratchet. Hence, enterprises preferred to add capital but not innovate. This is the reason why the diffusion of innovations in the STE was so slow. It is interesting to note that while Stalin was alive, and hence the costs of failing

⁹⁴Moreover, because exit was essentially non-existent planners were reluctant to create too many new enterprises. This exacerbated the static nature of economic organization. See section .

⁹⁵See table 2, below.

to adopt innovations were higher, diffusion was more rapid than in later periods.

4.2.3 Summary

The upshot of these structural legacies is that at the onset of transition the Russian economy was dominated by large numbers of enterprises that produced goods at costs that could not be recovered in the market. The Soviet industrial system was an edifice built up on the basis of natural resources, and the value added that appeared to be produced in manufacturing was simply transferred from other sectors through the pricing system.

With liberalization the magnitude of the distortions in the economy became manifest. With the cost of energy and other raw materials moving towards world prices large numbers of enterprises could not cover their costs. Enterprises raised the price of output to cover costs, but there were no buyers at these prices.

The key factor that conditions the structural adjustments caused by liberalization is Russia's position as a raw materials exporter. The legacy of the Soviet period is a high-cost industrial sector financed by abundant endowments of raw materials, especially energy. Soviet industry exploited these endowments, and the resulting industrial structure used energy and raw materials much more intensively than market economies (see table 2). Soviet industry used more inputs to produce a dollar of GDP than was the case in large western industrialized countries. Table 2 presents comparison for the Soviet Union and the US, Germany, and Japan. The data indicates that Soviet industry was extremely input-intensive. Hence, when price liberalization raised the opportunity costs of inputs the existing structure of production was not competitive. In many cases it is simply cheaper to export the inputs. This implies that as Russia moves towards more efficient use of inputs in production, some decline in industrial production could be expected,⁹⁶ since the

⁹⁶Unless the residual could be shifted to exports.

same value of GDP could be produced with less inputs. Indeed, a shift of resources towards other sectors could be possible with no decline in value added.

Table 2: Indicators of Raw Materials and Energy Consumption, 1988

| | USSR | USA | Germany | Japan |
|---|-------|------|---------|-------|
| Crude Steel production (millions of metric tons) | 280 | 19 | 11 | 34 |
| ratio USSR to | | 14.7 | 25.5 | 8.2 |
| Refined Copper Production (thousands of metric tons) | 1,173 | 381 | 114 | 307 |
| ratio USSR to | | 4.5 | 15 | 5.6 |
| Primary aluminum production (thousands of metric tons) | 4,116 | 809 | 200 | 11 |
| ratio USSR to | | 5.1 | 20.6 | 374.2 |
| Synthetic rubber production (thousands of metric tons) | 4,262 | 477 | 132 | 418 |
| ratio USSR to | | 8.9 | 32.3 | 10.2 |
| Primary energy consumption (millions of bbls/day oil equivalent) | 46 | 8 | 1 | 2 |
| ratio USSR to | | 5.8 | 46 | 23 |

source: Handbook of Economic Statistics,
CIA (1989), IFS, IMF; and the Economist.

This explains why the liberalization of foreign trade that is a part of transition dramatic effects. Liberalization of foreign trade results in a shift towards greater exports of raw materials. Russian raw material exports are the motive force of the real appreciation of the ruble that followed liberalization. This real appreciation, however, worsens the competitive situation of an already inefficient industrial sector.

4.3 A Legacy of Never-ending Reform

The last 30 years of the Soviet system were marked by a succession of attempts to reform the system.⁹⁷ Beginning with Khrushchev's creation of regional ministries (*sovnarkhoz*), followed by the Kosygin reforms of the mid 1960's, Brezhnev reforms in the late 1970's and the Andropov reforms in 1983, and finally Gorbachev's *perestroika*. Gertrude Schroeder referred to this as a treadmill of reform. The system directors recognized problems, tried to fix them but always ended up in the same place.

Why a treadmill?

- One aspect was attempts to utilize decentralization – to make people who are closer to information have more autonomy. This seems sensible.
 - the problem is that with arbitrary prices agents have no idea what the opportunity cost of activities are; increased autonomy can decrease efficiency as it alters allocation from planned. Suppose an enterprise director shifts production to goods with higher prices. This may lead to improved enterprise performance. But the low-priced use may actually have a higher social value. The price is low because of planners preferences, not market balance.
- Another aspect would be reforms to increase commitment. Many reforms tried to reduce the frequency of plan changes. But these were ineffective. Why? When planners observe increased output or performance they need those resources elsewhere. Very hard for them to limit their own discretion.

⁹⁷Beginning with Khrushchev's creation of regional ministries (*sovnarkhoz*), followed by the Kosygin reforms of the mid 1960's, Brezhnev reforms in the late 1970's and the Andropov reforms in 1983, and finally Gorbachev's *perestroika*. The characteristic feature of all these reforms was the attempt to improve the system of planning rather than to replace it. Thus they are all characterized as *partial* reforms. See [15] for an analysis of this experience. See [26] for an analysis of how frequent reforms and discretionary policymaking affects the ability of policymakers to make commitments.

The characteristic feature of all these reforms was the attempt to improve the system of planning rather than to replace it. Thus they are all characterized as *partial* reforms. See [15] for an analysis of this experience. See [26] for an analysis of how frequent reforms and discretionary policymaking affects the ability of policymakers to make commitments.

- The problem with partial reforms is that the system rejects them, much as antibodies reject a foreign organism. The only reforms that stuck were those that did not jeopardize the planning system itself.

An important legacy for transition of the Soviet reform experience is the expectation on the part of people that reforms issued from above are not likely to be persistent. A history of reforms that were frequently (recurrently) reversed makes it hard for future reforms to be *credible*. People come to lack faith in announcements of new policies. Rather people search for ways to get around the reforms and to protect themselves against reversal.

The frequent reversals probably make it harder to implement gradual reforms. The lack of credibility may jeopardize such reforms because people will question whether announced reforms will really take place. A plan of sequenced reforms may fall victim to pessimistic expectations.

5 Collapse and Transition

The collapse of the Soviet system set the stage for transition.

5.1 The End of the Story

The process by which the Soviet economy imploded is multi-faceted, and this is not the place to fully examine, let alone assess, all of the causes. There are several points, however, that are worth considering here.

As STE's struggled to cope with declining performance they experimented with reforms that altered the mechanism without changing the fundamental nature of the system. One important aspect of this was the weakening of central control. To a large extent this was a process that began with "Brezhnev-communism." This was aptly described as *Stalinism without the terror*.⁹⁸ The key element was stability in the bureaucracy. The result of this was an institutionalization of the system of bribes and payoffs to the *nomenklatura*. Stalin implicitly recognized that without regular purges in the bureaucracy officials would turn the system to their own interest.⁹⁹ Terror is the instrument by which the command economy deters the exploitation of rents by executives. Abolition of terror gives executives the capacity to siphon off the rents attributable to their positions. In effect, the cost to the planners of acquiring profits is increased by the rents that are paid to subordinates.¹⁰⁰ Another way to put this is that the associated decline in revenues that accrued to the center led to increasing budgetary shortfalls, just as these resources were needed to finance modernization and accumulation for growth.

During *perestroika*, and in related reforms in the EE economies, elements of decentralization were introduced.¹⁰¹ As with most cases of partial reform this reform tended to have unforeseen consequences. The idea of such reforms is to give discretion to managers who have greater information about what goes on in the enterprise, and to give them greater scope to use initiative. The problem, however, is that this reform is introduced in a system that is

⁹⁸This period is usually referred to now as the period of *zastoi* (stagnation).

⁹⁹Notice that as shortage becomes universal access to goods is the source of privilege. This provides an incentive for the elite to maintain the system of shortage. Moreover, distributing benefits in this way makes them opaque; the public cannot see the inequity built into the system.

¹⁰⁰A related problem is that only the center has economy-wide information, so the increased discretion by agents lower in the hierarchy leads to less effective allocation of resources.

¹⁰¹Most important, in this context, is Gorbachev's Law on State Enterprise, which introduced a system of state orders, *gosakhazy*. Under this system, enterprises were required to fulfill state orders and were allowed to make contracts for above-plan output.

not fundamentally altered.

One important consequence was supply diversion [27], as enterprises used their increased discretion to earn the rents associated with non-market allocation. Of course not all supply diversion goes to more efficient uses. The reason, of course, is that the diverter acquires the resources at below opportunity cost, and plan prices may not reflect social value. Hence, the production sector can be starved of key inputs as goods are diverted to other uses. The planning system depends on deliveries that support the plan. The attempt to utilize the initiative of enterprise directors resulted in a decline in performance in the production sector.

Example 2 *Timber and Boxcars.*

5.1.1 Partial Reform: The Murphy-Shleifer-Vishny Model

This model illustrates the effects of partial reform. The idea is straightforward. There is a state sector and a new private sector that compete for the same input. The former is subject to the planning system, the latter is not. The total supply of timber must be distributed among the two competing uses, boxcars and houses.¹⁰²

In the left panel we have the supply and demand for timber. At the price p there is excess demand. The plan allocates Q^* to boxcars and houses respectively. Given the plan allocations the goods are efficiently rationed, in that p^* is the same in the two sectors. Notice that p^* is the shadow price of timber.

If the timber industry is able to sell timber, freely to whomever it chooses, then at price p it will sell q_m to the housing industry,¹⁰³ cutting back deliveries to boxcars by the amount X . Notice that the change in deliveries, X , is the same in the two panels, it is just the scales that are different. The shadow

¹⁰²We assume that initial rationing is efficient. It is also possible to consider inefficient rationing. In that case the welfare comparisons are not as clear cut.

¹⁰³It actually sells the timber to the housing industry at $p + \epsilon$.

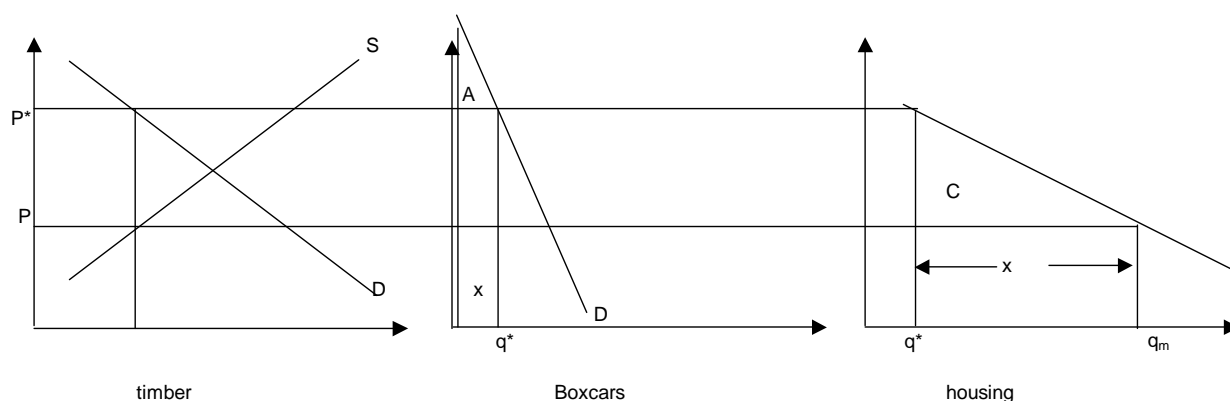


Figure 16: The allocation of timber

value of wood in boxcars rises dramatically. Consumer surplus in boxcars falls by A , and producer surplus falls by B , while in housing it rises by C . Welfare clearly falls, since rationing was efficient before, the shadow value was p^* for housing and timber, but now the shadow values are vastly different. Note that as long as the demand for timber by the housing industry is more elastic than for the boxcar industry, A must be large than C . Moreover, notice that area $B = 2C$.

Notice that the welfare loss is largest when the demand for timber in the state sector is most inelastic. This makes sense. In the state sector we can almost assume fixed coefficients in the short run, while in the private sector we can expect more flexibility.

Notice that the problem arises because the boxcar industry cannot compete for timber, and the capital in that sector cannot flow to housing. The moral of this story is that as the state loses control over the state sector, diversions make things worse. It is an example of a breakdown in coordination due to partial reform. Notice that in this equilibrium every state firm is short of inputs and every private firm is short of capital. This is an important point to think about.

- We could think of the diversion in terms of labor, to the second economy, as well.
- even if quantities cannot be diverted, quality can, due to incomplete monitoring.

Which sectors do private firms enter? M-S-V argue that it is the sector where they can do the most damage. Why? Because where the input is most underpriced the private firm can make the most money. Since they enter where inputs are most scarce, they do the most damage as the result of their misallocation. Why does this occur? *Because prices are distorted.* The private firm buys timber even when it is valued more by the boxcar industry. This is because the latter faces a fixed price that does not reflect its marginal social value. The state firm cannot compete for the input. Notice that much of what the private firm gets is *redistribution of rents*. So private gains can be positive while social gains negative.

Notice the difference with a socialist firm in a market economy. The latter still faces correct prices. The socialist firm does not get inputs below cost. It may lose money, but that is a check on its expansion. The private firm in a socialist economy, on the other hand, has a very strong incentive to expand because it is buying underpriced inputs. So the private firm in a socialist economy expands on the margin where it creates the greatest negative externality. "This result explains why having a few state firms in a market economy, as is common in Western Europe, is not nearly as damaging as a small dose of the market can be to a socialist economy" (Murphy, Shleifer, Vishny 1992: 905).

Quotas Now consider quotas. The center delivers to the boxcar industry its quota, and is allowed to sell above-plan output on the market. We now have Q_b delivered to the boxcar industry and Q_h to the housing industry. The previous welfare loss is reduced.

This is the scheme China used. It strictly enforced the quota, but allows above-quota sales. This constrains supply diversion, but allows for efficient allocation. Why the difference? One factor is the decline in power of Communist Party in EESU countries. In China it still has power to enforce quotas. The SU tried to enforce laws; it established special police and clamped down on cooperatives on the presumption that they were engaged in these activities.

Pseudo-Privatization. Supply diversion not only caused a deterioration in performance; it also led to the *pseudo-privatization* of profits. Enterprise directors, and other agents, used their added discretion to secure rents that were present in a system where prices did not clear markets. As long as the center could limit discretion agents were limited in their attempts to siphon rents. With decentralization, however, enterprise directors were presented with myriad opportunities to divert resources to their own benefit. This was always a feature of the system, but in late *perestroika* this accelerated greatly. Not only did this reduce budget revenues; it created a growing public recognition of the inequities in the system.

Decentralization also led to less control over wages. As power shifted from the center to the enterprises the latter used this to increase wages. As political power weakened, the response of the center was to increase wages. But prices did not rise, and as there was no acceleration in production, this led to more repressed inflation; the monetary overhang. Wage increases were financed by larger infusions of central bank credit, but this only worsened the imbalance between supply and demand. Of course in parallel markets prices rose. But this only accelerated the emptying of shelves in official markets. Hence, the last stages of socialism were marked by increasing shortages, and lengthening of queues.

We can describe the ultimate crisis of the command economy in three parts. As the system imploded production declined and shortage intensified,

as goods were increasingly diverted. The implosion in the economy led to a decline in budgetary revenues which created a macroeconomic crisis. And the collapse in budgetary revenues caused a crisis in the system of central control and state orders. This meant that the system build on central control became increasingly inviable, and millions of workers found themselves in jobs that were not productive of value, and now unsupportable.

The legacy of this collapse featured both microeconomic and macroeconomic dimensions. The macroeconomic dimension manifested in the monetary overhang and increased monetary financing of budget deficits. This led to increased shortages, and increasing pressure on the system of controlled prices. Hence when transition commenced macroeconomic stabilization was an imperative; a problem that greatly complicated transition, but was distinct from the fundamental elements of transition.

A result of the collapse of the Soviet Union is that the misallocation of resources that was endemic to the system was laid bare. Liberalization makes transparent the inviability of the inherited structure of production. to restructure the economy, however, requires markets. Yet property is still socially owned when transition begins. Without property rights, however, markets do not operate properly. The absence of market institutions are thus an inhibiting factor to adjustment. The point is that the disequilibrium implied by the structural legacy is not immediately eliminated because that requires market adjustment, which is, in turn, inhibited by the lack of market institutions.

5.2 Key Point

The key point is that the system collapsed when it did not because of some determined outcome, but because all the attempts to reform the system made its operation even weaker. As the directors sought to alleviate problems they tinkered and aggravated the problems. The terror needed to hold it together weakened. The system collapsed because of a lack of will to hold it together.

In the absence of reforms the system could perhaps have muddled through for a while. The problem, however, is that deteriorating economic performance jeopardized the legitimacy of the system – economic performance was the justification for the elimination of liberty. Growth of information made it harder to contain knowledge of deteriorating performance. Competition heightened the need for improvement.

5.3 The Basic Problem Facing Reformers

The basic problem facing Russian reformers in the fall of 1991 was that while the fundamental aspects of reform involved institutional changes such as privatization and liberalization of the economy, the reform *environment* was that of macroeconomic crisis. This meant that stabilization would necessarily take the center stage. This problem was, in fact, exacerbated by liberalization itself, which created open inflation. Given the initial conditions that the reformers faced reformers possessed little flexibility in designing a reform program.

5.3.1 Monetary disequilibrium

Monetary disequilibrium was at the heart of the crisis at the onset of Russian transition. As we have already noted, the implosion of the command economy led to a hemorrhage in the budget. Toward the end of the Soviet period monetary financing of the budget deficit approached 20% of GDP.¹⁰⁴ With price fixed in official markets this led to shortages in state stores and growing prices in unofficial markets. The gap between official and market clearing prices increased as the state weakened. As wage pressure increased and production deteriorated the monetary disequilibrium grew. Moreover, the deterioration of the state led to an inability to collect taxes which only increased the pres-

¹⁰⁴See [31] for an analysis of Soviet budget problems, and see [4] and [12] for a discussion of the macroeconomic problems experienced by Russian reformers in the attempt to stabilize the economy.

sure to monetize deficits. The monetary overhang that resulted meant that price liberalization would be associated with an increase in the price level to absorb the excess purchasing power.

An important legacy of monetary disequilibrium is that when price liberalization was implemented inflation became open and dramatic. Of course the key Soviet pricing problem was distorted *relative* prices, and the necessity of price liberalization was to remedy this malady. The costs of this adjustment, as we have noted, are severe. Monetary disequilibrium meant that these costs would be exacerbated by high inflation. The debilitating effects of inflation necessitated a stabilization program which diverted the attention of reformers (whose time, political capital, and capacity are, after all, finite) from the important process of market creation. A sad consequence is that much of the debate and effort in the early years of Russian economic reform were devoted to stabilization, leaving the more fundamental aspects of reform to a later date.¹⁰⁵

5.3.2 Institutional Underdevelopment

While the difficulties of stabilizing the economy presented the immediate problem for reformers, the fundamental task of transition is to create market institutions. This task involves privatization of state-owned enterprises and the development of market infrastructure.

The most important lacuna that affects transformation is the lack of property rights. Creating a viable system of private property is a key aspect of privatization, but the process is more complex than this. Privatization is the process by which ownership of state-owned assets are assigned. This is a crucial step, and how it is implemented has important effects on corporate governance and restructuring. But creating property rights involves more than just assignment. It also requires that such rights can be transferred.

¹⁰⁵ Although one could argue that the attention drawn to fighting inflation made it easier to implement privatization. The argument is that without this diversion greater political opposition to privatization may have developed.

If property cannot be transferred the ability to restructure is greatly limited. First, capital markets will not develop if creditors cannot attach the property of debtors who default. More important, however, is that without transferable property entrepreneurs face great hurdles in obtaining space, nor can they lease machinery that may be more productively used in other lines of production. The absence of transferable property means that the inherited structure of production is rigidified. Hence, the urgency in the creation of property rights. But this process requires progress on the rule of law.

A Hydraulic Example To make this point clearer we can develop a natural example of feedback and the lack thereof. Suppose that we have two tanks of liquid, and that a pipe runs from the first vat to the second. Initially the two vats are under the same pressure, and the distribution of the liquid is in equilibrium. Now suppose that an exogenous change in the environment causes greater pressure in the first vat. If the valve that connects the two vats is open we would expect the liquid to flow from vat A to vat B until the disequilibrium is eliminated. This is analogous to the situation in former STE's. Liberalization is like the opening of the valve. The structural imbalance in the system should be relieved by a flow of resources. This is the conception that underlies the optimistic views on transition. The Soviet period created imbalances that market forces, once unleashed, will correct.

Suppose, however, that the pipe which connects the two vats is frozen. Then the motion of the molecules ceases. This prevents the flow between vats that is needed to relieve the imbalance of pressure. The absence of market institutions is analogous to the frozen pipe, because without market institutions resources cannot flow. Exchange requires market infrastructure.

To make this analogy more pressing, suppose that before the change there was no pipe, and that to balance the amount of liquid between the two vats workmen dipped ladles into the vats and carried it to the other vat. Allocation was by design, not by an automatic feedback mechanism (the

pipe). Lack of knowledge about the pressure and heat in each vat meant that they may not have been in actual balance, but presumably the workmen could relieve liquid before it would spill over the top of the vat. We can think of the vats as being in different rooms and that the workman in one room does not know the situation in the other room. They are only given orders by the chief supervisor who hears about liquid levels from reports of the respective workmen.

Economic reform in this system occurs when a pipe is laid and it replaces the workmen and the ladles: the market is an automatic feedback mechanism. The workmen are superfluous as is the supervisor. But if the pipe is laid across frozen terrain (the absence of market infrastructure) then the flow will not occur. The pipe is ineffective when the environment is hostile to its use. In our analogy the problem is temperature. In the transition the problem is the absence of property rights. The only fallback is for the workmen to continue the manual adjustment of resources, but as the system of communication via the supervisor (the planning system) has been abolished the flow of resources is even less effective (until the pipe is no longer frozen) than before.

It is important to recognize that the collapse of the command economy lays bare the costs of the system. As long as the center commands and the prices are controlled the costs of the system are hidden from view. These only become apparent when prices are freed and enterprises must cover the real costs of production.

6 Evaluation

Given all the problems of the system, and all the difficulties of reforming it, it may be tempting to conclude that it just could not work. But this would also be wrong. The system was effective, at least for a while, at generating growth, and it did produce a large military power.

The important point about the Soviet-type economy is that what it generated it did at a high *cost*. But these costs were rarely recognized. These are not just ecological. They are economic as well. Critical to the system is the monopsony in the labor market: where could agents go? They had to work for very low consumption because they had no alternative. That is how resources could be mobilized at such high rates in this system.

One should think about the political aspects of this system. Could an STE operate in an open political environment? Certainly not: people would compare the costs to what happens in alternative systems. What really hurt the STE was international competition. Two sources played a large role. One was information. In the 1970's many Soviet citizens still believed that they lived better than in the west. But TV and travel broke this down.

Second, the electronics revolution weakened the competitive situation of a key aspect of the STE: defense.

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