

# Addiction and Withdrawal: Resource Rents and the Collapse of the Soviet Economy\*

Clifford Gaddy<sup>†</sup>      Barry W. Ickes<sup>‡</sup>

December 2006

## Abstract

Soviet resource rents grew dramatically in the 1970's peaking in 1981. At its peak, resource rents were more than \$250 billion (Gaddy and Ickes, 2005). Rents then declined dramatically. We examine the role of resource rents in the timing of the demise of the Soviet economy. Resource abundance played a crucial role in delaying full recognition of the inefficiencies of the regime, and postponed any day of reckoning. Resource abundance made it feasible to undertake costly decisions the consequences of which became fully apparent only much later. Resource abundance delayed reforms that were much costlier to implement as time passed. The explosion in rents in the 1970's was accompanied by an increase in expenditures and activities, creating an addiction to these revenues. When rents declined Soviet leaders struggled to cope with the decline much as an addict faced with a cutoff in the supply of a narcotic. A system built upon resource abundance lost coherence when resource abundance ended. Soviet leadership could not deal effectively with the claims on resources. Failed attempts to cope ended up weakening the system fatally.

## 1 Introduction

If one examines the numerous explanations for the Soviet collapse the hardest thing to understand is how it ever survived. Burdened with so many flaws the craft appeared

---

\*Preliminary:

<sup>†</sup>The Brookings Institution, cgaddy@brookings.edu.

<sup>‡</sup>The Pennsylvania State University, bwickes@psu.edu.

to never be airworthy. Yet, we know that the craft did fly for seven decades. Trying to understand the sources of collapse thus leaves us with an overabundance of possible causes. One way to narrow this down is to focus on the timing of collapse. A serious explanation of Soviet collapse needs to examine issues of timing. Our focus in this paper is on the flow of resource rents. These are interesting because, as we show, the timing of their expansion and contraction is significant for the topic of Soviet collapse.

Our analysis of resource rents focuses on the notion of addiction. Our argument is that when rents exploded the Soviet economy became addicted in a manner that made coping with their absence costly. While there is no universal definition of addiction, three elements are common to most analyses: tolerance, withdrawal, and willingness to sacrifice for the addiction.<sup>1</sup> We argue that the explosion of resource rents had just such an impact on the Soviet economy. When rents expanded they led to system-altering activities that heightened the need for these rents. These structural changes made withdrawal of the rents more costly to cope with and led to actions that made the economy more fragile than it was before the rents exploded. This fragility then helps explain how the system could unravel so quickly.

It is common to associate resource abundance with the resource curse. An increase in resource wealth has adverse consequences for an economy: deindustrialization via deterioration of the terms of trade, and/or an increase in corruption and rent-seeking. We argue, however, that in the Soviet economy resource rents had a more deleterious, and less easily reversible impact than resource rents in market economies. Resource abundance in the Soviet economy led to the expansion of value destroying activities. It delayed recognition of their cost to the economy precisely because of the absence of market signals, and it meant that the economy could seem to afford them. It led to dependence on these flows. In many economies resource abundance leads to wasteful activities. The key difference is that in the Soviet economy it is hard to determine which activities are in fact wasteful. This means that responding to a cut in rents is much more difficult. That is why withdrawal from rent addiction is more painful in the STE.

---

<sup>1</sup>We recognize addiction by a person's heightened and habituated need for a substance; by the intense suffering that results from discontinuation of its use; and by the person's willingness to sacrifice all (to the point of self-destructiveness) for drug taking.

## 2 Russian Oil and Gas Rents

Following Gaddy, Ickes (2006) we define rents from oil and gas as the revenue received from sale of the resource minus the cost of producing it. By this definition, rent is equal to economic profit, that is, revenues minus economic, or opportunity, costs (including depreciation of fixed assets and a “normal” return on capital).<sup>2</sup> To calculate rents we need estimates of market prices for oil and gas, the quantities of these commodities produced in Russia, and the cost of extraction and distribution for each. Production data for both oil and gas are readily available, as are world market prices for Russian oil. Because there is no single international market for natural gas, determining the true market price of gas presents special problems. Especially in the case of Russia, proxies are needed.

Obtaining good estimates for costs of extraction is even more difficult. There are both practical and conceptual problems. The practical difficulty stems partly from the fact that oil and gas are produced in Russia over a vast geographic area with widely differing cost conditions. The conceptual problem, however, is more fundamental. What we ideally want to estimate is the “natural” cost of production, as opposed to the reported cost at any point in time. By “natural” we mean the cost that would be incurred if the industry were organized efficiently, that is, the cost of production that would be incurred in a competitive market with free entry. The reported cost of production may include waste and inefficiencies. This was especially true during the Soviet period.

This distinction between natural and reported cost of production is important. Suppose, for example, that oil production is organized inefficiently. In particular, suppose that the wage bill is inflated by half, raising the reported cost of production. This reduces the profits of the oil sector. These extra wages, however, are distributed within the economy, so they still represent a share of the value from oil production. Hence, a proper measure of rents would not exclude this amount. Indeed, it is useful

---

<sup>2</sup>This is to be distinguished from the notion of Hotelling (or scarcity) rent, which is defined as the unit price of a resource minus the marginal cost of extracting it [Hotelling, 1931]. Hotelling rent is the theoretically correct measure of the value of resource depletion. It is often used in recent work in environmental economics (so-called green accounting). In practice, however, even these studies are forced to make the simplification of using average cost rather than marginal cost (thereby implicitly assuming a constant marginal cost). If marginal costs are rising, however, using average costs as a proxy will yield an overestimate of the Hotelling rent. This issue is not relevant for us, since it is the total cost of extraction of annual output that we seek.

to think about the decomposition of total rent a bit further.

Let  $R_t$  denote the true total rent produced in period  $t$ , which is defined as:

$$R_t \equiv P_t Q_t - C_t \quad (1)$$

where  $P$  and  $Q$  are the current spot price and the actual quantity produced, respectively, and  $C$  is the *natural* cost of production. If, however, one measures the production cost using data on the reported cost, the measure of rent that is obtained will be different. Let the reported cost be  $\hat{C}_t = C_t + \varepsilon_t$ , where  $\varepsilon$  is the excess cost of production. Then the corresponding measure of rent,  $\hat{R}$  will be

$$\begin{aligned} \hat{R} &= P_t Q_t - \hat{C}_t \\ &= P_t Q_t - C_t - \varepsilon_t. \end{aligned} \quad (2)$$

Further, note that while  $P$  is the market price, producers may receive less than this if there is a price subsidy. For instance, in the specific case of Russian oil and gas, the domestic price is below the world price, and exports to CIS countries are made at below market prices. Let price subsidies per unit of the resource (averaged out over the total quantity produced) be  $\rho$ . Then the total subsidy,  $S = \rho Q$ . The actual producer price,  $\tilde{P} = P - \rho$ . Hence, pre-tax profits are given by

$$\pi_t = \tilde{P}_t Q_t - \hat{C}_t. \quad (3)$$

The pre-tax (or operating) profits, however, are subject to further deductions, notably in the form of taxes. Here, it is useful to distinguish between formal and informal taxes. Formal taxes are those prescribed by legislation. Informal taxes are payments made to government officials or for the support of public sector needs that are nominally voluntary but in fact mandatory for businesses. The most common such “taxes” in Russia are payments made by enterprises to support the social sector of towns and regions, cultural programs, philanthropic giving, and so on.<sup>3</sup> Both kinds of taxes are applied to the revenue received. For simplicity, assume that these taxes are levied as a share of profits, and let the formal tax rate be  $\tau$ , and the informal tax

---

<sup>3</sup>See [Gaddy and Ickes, 2002] for a discussion of formal and informal taxes.

rate be  $\tau'$ . After-tax profits can then be written as:

$$\begin{aligned}\pi'_t &= (1 - \tau - \tau')\pi_t \\ &= (1 - \tau - \tau')[\tilde{P}_t Q_t - \hat{C}_t].\end{aligned}\tag{4}$$

Notice that while  $\pi'$  is what is left over to the owners of the enterprise, it is  $R$  that matters to society. The difference between  $R$  and  $\pi'$  is distributed over a number of different categories, each accruing to a different claimant or group of claimants. Using the categories we have so far identified, we see that the total surplus,  $R$ , can be divided into five categories: excess extraction costs, price subsidies, formal taxes, informal taxes, and the after-tax profit of the enterprise. Each of the categories represents a share of the total rent. How the shares are allocated has important political consequences. It obviously affects the political economy of a resource-based society. Even more important, as we shall discuss below, it also affects the future path of production.<sup>4</sup>

In the Soviet case, of course, the state are the owners of the enterprise. It is still the case that enterprises earned profits, but these have no behavioral consequences. The key point is simply that the rents from a resource boom are manifested in several ways, not just in export earnings or state tax payments.

It could be argued that we have overstated the growth in rents during the late 1970s and early 1980s. There is compelling evidence that costs of production rose rapidly for energy during this period [Gustafson, 1989: 35].<sup>5</sup> Unfortunately, we do not have sufficient data to adjust costs accordingly. But we do know, for example, that the increase in energy investment between 1981 and 1985 absorbed *nearly 90 percent* of the increment allocated to industry [Gustafson, 1989: 39] Thus our rough estimates do not take into account the cost to other sectors of the economy. What

---

<sup>4</sup>Note that for any country  $P$  and  $C$ , are exogenous. The former is given by the world market and the latter by the state of technology and the location of deposits. What about  $Q$ ? Clearly it is endogenous. Typically the time path of production is taken to be given by the Hotelling rule: the production path should yield prices that grow at the rate of interest. A more subtle analysis would follow Adelman (e.g., [Adelman, 1990]) and argue that production depends on the marginal costs of discovery and development, net of taxes. But it is important to emphasize that in a case like Russia it is not the natural costs but the reported costs that matter.

<sup>5</sup>It is important to note for future reference the main source of this cost increase: the movement of the center of the energy industry to Western Siberia. This raised development and transport costs dramatically over what were the costs in European Russia [Gustafson, 1989: 60]. Today, the center is moving further east and transport costs are even more important than before.

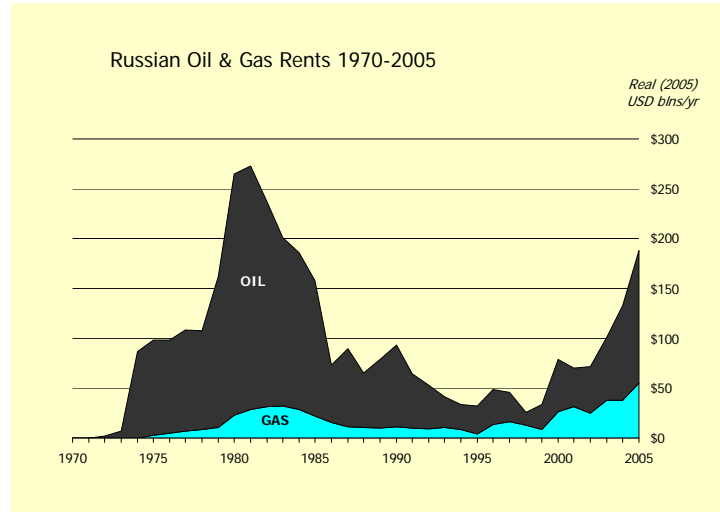


Figure 1: Russian Oil & Gas Rents 1970-2005.

is also important to note, however, is that the rise in oil prices in this period more than offset the increases in costs of production. But this also means that when prices began to fall the cost to the Soviet economy was even greater.

Even ignoring the cost to the rest of the economy, there is evidence that production costs viewed more narrowly increased dramatically during the 1970s. According to one source the marginal cost of production quadrupled between 1970 and 1980 and continued to increase thereafter [Sagers, 1987]. We need, however, to temper this conclusion because these are costs measured under Soviet conditions. The fact that the marginal cost of production was rising during the late Soviet period could mean that increasing production was becoming more difficult. But it could also mean that the inherent waste and inefficiency of the Soviet system were plaguing this sector. Centrally made decisions could have raised the marginal cost of production above what it naturally would have been in a market economy.<sup>6</sup> As noted earlier, for measuring true rent, it is the natural cost, not the reported cost, that is relevant. Moreover, the post-Soviet experience of privatized Russian oil companies and the fact that numerous Western oil companies have tried to enter Russia suggest that the rapid increase in costs of production in the late Soviet period reflected inefficiency,

<sup>6</sup>As Adelman [Adelman, 1995: 314] points out: "A necessary assumption was that aside from much incidental waste, the Soviet oil industry was not radically inefficient as compared with the capitalist world. Hence the 'rapidly rising marginal cost' was a fact of nature. But this was not true."

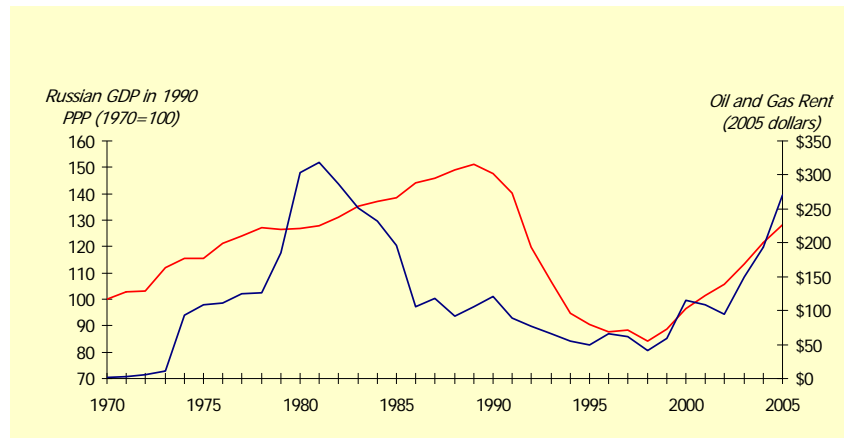


Figure 2: Oil and Gas Rents and GDP since 1970.

not an increase in natural costs.<sup>7</sup>

It is illustrative to compare the dynamics of rent to that of GDP. Figure 2 compares Russian oil and gas rents to Russian GDP; the picture would look similar if we replaced this with Soviet figures (which we should). The important point is that the explosion of rents leads the growth of GDP and the decline in rents leads the collapse. The subsequent post-Soviet time series are interesting but not part of our current story.

More important than matching the time series for GDP and resource rent perfectly, however, is to recognize the extent to which not just the Soviet "economy" but also the Soviet "system" rested on the huge volume of resource rents. This was a fact noted by Gregory Grossman:

"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 basis 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 [Grossman,

<sup>7</sup>Adelman [Adelman, 1995: 314] noticed this at the time: "But what proved it... was the fact of numerous private oil companies' crowding into the FSU, trying to obtain production rights..."

1983: 202].

If resource abundance was a pillar of the Soviet economic system, that abundance was itself in significant measure the result of another feature of the Soviet system, namely the extreme coercion that permitted the development of noneconomic resources. The prototypical example of this is the GULAG. Such projects as the White Sea Canal were only feasible in an environment in which labor was coerced. Hence some of the costs were shifted onto forced labor.<sup>8</sup>

The physical presence of a vast quantity of natural resources, in the context of a noneconomic environment, jump-started the resource abundance theme in the Soviet Union. Physical resources existed, but they were not economically viable. The coercion of the Soviet system and the failure to recognize true (opportunity) costs developed these resources, providing the wealth that in turn allowed the system to perpetuate the gigantic mistakes it did.

In short, the entire Soviet system was built on the assumption of a persistent stream of available resource rents to keep it going. Once this fundamentally nonviable structure had been created, continued injection of resources was required to sustain it. It became a vicious circle: the more resource wealth there was, the more mistakes could be made. The more mistakes that were made, the more resource wealth was required to perpetuate the system.

In the 1970s this structure received a boost with the rapid, and unexpected, growth in rents that occurred from the West Siberian oil boom and then the OPEC price shock. Not only did the Soviet Union's own rents grow directly as a result of the oil boom, but many OPEC and other oil-producing countries increased their purchases of Soviet military goods.<sup>9</sup> The windfall moved the Soviet Union away from what might have been a rather stable rent-deployment system to one where all the important political and economic groups drew up increasingly grandiose plans for the use of the windfall: expanding heavy industry domestically; building up a huge arms industry; engaging in adventures abroad that included subsidizing client states, more subsidies to CMEA countries, the war in Afghanistan, and so on. In effect the windfall was oversubscribed: there were too many claimants for too little value.

---

<sup>8</sup>The appropriate comparison, perhaps, is the cost to the Gulag of keeping forced labor alive versus the compensating differential that the Soviet state paid to free labor to work in northern climates. Many projects that were feasible at the former "wages" would be infeasible at the latter.

<sup>9</sup>See [Kotkin, 2001: 15] for a discussion of the oil windfall and bust and its impact on the demise of the Soviet Union.

The lesson is that resource abundance, misapplied, can be addictive. The experience of large rents induces policymakers to expect that these will continue. When prices start to fall — as they did in the 1980s — the only way to maintain rent levels is to increase production.<sup>10</sup> But when opportunity cost is not considered, short-term production increases are likely to come at the expense of future output.<sup>11</sup> Soviet leaders applied extreme measures to maintain high production levels, including postponed maintenance of equipment, excessive use of water and steam injection, and focusing investment on current production rather than development and exploration. As a result, production did rise in the short term, but this was at the expense of a much larger output fall in subsequent years.<sup>12</sup>

Thus, as oil prices collapsed in 1985, and production increases could not offset this fall, rents declined dramatically. This ultimately precipitated the collapse of the entire Soviet system. The Soviet collapse triggered the subsequent aggregate output fall. Part of that was illusory, as we pointed out above.

### 3 Resource Curse versus Addiction

How does the resource curse differ from addiction. There are several maladies that are features of the resource curse story. Dutch disease – the real exchange rate depreciation as a result of the export boom – leads to contraction of manufacturing. An import and investment boom are typical ways in which, it is argued, resource wealth is wasted. Corruption often results from the competition for rents. These are all important factors to consider. One important aspect, however, is that these tend to be reversible. When rents decline these factors are reversed. The real exchange rate appreciates and competitiveness is restored; the consumption boom ends; the

---

<sup>10</sup>Note that if maintaining total rent,  $R$ , is the goal, excess costs,  $\varepsilon$ , are not an impediment. Value will still be distributed. Of course the excess costs may not have been going to the constituents favored by Soviet authorities. It is also the case, however, that in the 1980's natural costs were rising due to investment and other mistakes. This did reduce total rents.

<sup>11</sup>Given the price of output and the costs of development and exploration for oil, and given an appropriate interest rate and any taxes, one can calculate an optimal rate of depletion. If prices were to fall the optimal depletion rate would decrease not increase. Raising the depletion rate in the wake of falling prices represents the response of authorities required to produce a given level of rents. The only way to increase the depletion rate would be to shift investment from exploration to development. But this is borrowing from the future. The alternative would be if some technological innovation could be applied to increase production, but presumably this would be deployed with or without a fall in prices.

<sup>12</sup>This is discussed in [4], for example.

competition for rents lessens as there is less to compete for.<sup>13</sup>

In the Soviet economy the resource boom takes on special features. One key factor for this is the lack of transparency in the Soviet economy due to the price system. A second crucial factor is the way the resource boom filters into the Soviet economy – *through production*. The interaction of these two phenomena lead to addiction, so that when rents decline withdrawal is very painful.

One way to note the difference is to compare deindustrialization with misindustrialization. In the Soviet economy the explosion of rents led to the creation of new enterprises and to increased subsidies for industry – this is an example of misindustrialization; the creation of industrial activity where it is not value creating. Misindustrialization creates addicts. In a market economy experiencing a resource curse, deindustrialization occurs – resource are shifted away from manufacturing. Soviet economy misindustrializes. In market economy the pain of losing the rents is deindustrialized manufacturing. Rentier state is what is left. In STE the problem is that you created addicts who need recurrent infusions of value. Thick layer of activity that gets you access to the rents. So you have to produce to get value but then you become a claimant. So loss of rents becomes something much more serious. The organism itself has been transformed by the consumption of the rents. This is like the physiological adaptation of an addict. The addict's body craves the substance, so that even the strongest will power cannot cope.

Resource booms in market economies also lead to wasteful investments. One key difference, however, is that in market economies it is much easier to identify wasteful activities. The defective price system of Soviet-type economies makes it much harder to discern what is waste and what is not. It is well-known that Soviet pricing practice understated the share of value added produced in raw materials and overstated the share in manufacturing.<sup>14</sup> With an opaque pricing system it is perfectly feasible for addicted enterprises to claim that they are value producing – indeed since the subsidies come through distorted pricing these enterprises need not receive formal subsidies at all. The circus mirror effect (Gaddy and Ickes, 2002) implies that the value destroying enterprises can appear to be productive.

**Conjecture 1** *In the Soviet economy the price system hides the identity of the ad-*

---

<sup>13</sup>It could be argued that these maladies are somewhat less reversible. Corruption can become endemic, for example.

<sup>14</sup>See, for example, Ericson [2] for an excellent discussion.

*dicted enterprises. When rents decline it is not apparent which claimants should be cut. Withdrawal is thus much more painful than in market economies with similar resource booms.*

Thus we can imagine a market and a Soviet-type economy each experiencing a resource boom of similar magnitude. We can further suppose that in both economies wasteful investments take place in industries where there is no comparative advantage. In both cases subsidies are required. But in the market economy these take the form of formal subsidies – essentially budget expenditures. In the Soviet economy the subsidies are informal, as they arise from the mispricing of industrial output – they are thus a tax on other economic activity. When the boom ends, the cost of maintaining the subsidies in the market economy becomes apparent as the government budget tightens. Politics may prevent cutting the subsidies, but there is little problem of identifying the problem. In the Soviet economy, on the other hand, the end of the boom reduces the aggregate amount of value in the system, but identifying *where* to cut is much more difficult. Without an adequate price system it is not clear which enterprises are the problem. With the specific distortions of Soviet pricing, addicts can make legitimate claims on resources. Hence, coping with a contraction of rents is much more problematic in the Soviet economy.<sup>15</sup>

- relate addiction to lack of exit – Allen emphasizes that productivity was higher in industries where reconstruction investment was smaller. The existing enterprises were the addicts that were soaking up investment funds. What is important, however, is that without adequate market signals it is difficult to assess the differences in returns to different types of investment.
- in the boom ideological choice made to make it look like value was created in industry not resource sector. Conscious decision to avoid looking like a rentier economy. No direct distribution of loot, etc. Indirect distribution makes it opaque.

---

<sup>15</sup>We have the comments from Marshal Akhromeev. When asked by Shakhnazarov why it was necessary to produce so many weapons, Akhromeev answered: "Because at a great cost of many sacrifices we created first-class factories, no worse than the American ones. Would you order them to stop work and begin producing cooking pots?" (quoted in Odom, 1998: 105). Shakhnazarov described the "military-industrial mentality" as a "cancerous growth" that had metastasized to every sphere of Soviet life (quoted in Odom, 1998, 106). This is an example of addiction. The investment in factories created interests that were very costly to reverse.

- ideological commitment to manufacturing as source of value
- addiction leads to short-time horizon – inability to think long-term. This is not the case in rational addiction models, of course. This leads to an inability to implement reforms.
- cold turkey versus methadone?
- Why is it difficult to unwind the activities that were started when rents exploded? New claimants are as legitimate as old ones. Here the lack of price signals is important, since it is not clear what is value reducing activity.
- rent-seeking behavior results from shrinking pie. Agents who want to maintain their streams invest to maintain it. When rents are high new activities created – claimants of the pie; when that shrinks they fight over the pie. In a market the least efficient would be shut down.
- difference between virtual economy and classic corruption. The claims are through production. So it is impossible to know how to cut it. They are locked in. Cannot tell fat from muscle.
  1. if just corruption it would be easier to cut
  2. loot chain from the top; confusion of effort and value
- investment patterns could indicate addiction: if you had structure data it should be related to oil prices, if not, that is sign of addiction.
- ratchet effect explains the growth effect. It explains the diffusion through production and creates a new baseline.
- contrast with resource boom in market economy, anti-Dutch disease. You build up sectors whose profitability did not rise.
- Allen points about investments in different branches

## 4 Addiction

Definition of Addiction.

There is no universally accepted definition of addiction. But most definitions emphasize three features of behavior:

1. tolerance - the need for an increasing amount of the substance to obtain the same effect
2. withdrawal - severe unpleasant effects when the addict ceases to use the substance
3. craving - "willingness to sacrifice all (to the point of self-destructiveness)" in order to obtain and use the substance.<sup>16</sup>

The resource sector itself was an example of addiction. Investment in the energy sector exploded during the period of high rents: between 1975 and 1985, "energy as a whole increased its share of the industrial investment budget from 28 percent to 39 percent" (Allen 2003: 204). This may be seen as an appropriate response to the increase in the value of energy, but at the same time, productivity in the oil sector was plummeting: during this period, the capital stock increased by a factor of 2.45, employment by 25%, while output fell by 21 percent. Hence, this seems to be a clear example of tolerance.

The primary mechanism by which the Soviet economy became addicted to energy rents is through creation of new

### 4.1 The Meaning of Addiction

The Concept of Addiction

[...]

Addiction is defined by tolerance, withdrawal, and craving. We recognize addiction by a person's heightened and habituated need for a substance; by the intense suffering that results from discontinuation of its use; and by the person's willingness to sacrifice all (to the point of self-destructiveness) for drug taking.

---

<sup>16</sup><http://peelee.net/lib/moa1.html>

Peele, S. (1985), *The Meaning of Addiction. Compulsive Experience and Its Interpretation*. Lexington: Lexington Books. pp. 1-26.

## 5 Rent Declines and Soviet Collapse

Many observers have written of the critical role of oil and gas in the end of the USSR, notably Stephen Kotkin in *Armageddon Averted*. This was not always so. The more common explanations have been some combination of Gorbachev's mistakes (notably in Russia) and Reagan's defense buildup.

- Rents were an important source of GDP growth – they were a critical source of investment. Note that GDP was underestimated due to the waste of energy resources.
- when rents collapsed, so does investment funds, so future growth is really jeopardized
- claims by addicts include the E. European recipients of energy subsidies.

The most recent and most detailed version highlighting the role of oil and gas is Yegor Gaidar's new book, *Fall of an Empire*. Gaidar tells the following story. With Stalin's death in 1953, the USSR leadership moved from a regime based on extreme coercion to a softer one, based on a social contract between the leadership and the population. A key element in the contract was cheap food. However, the Soviet agricultural sector itself proved incapable of providing that food. Moreover, the alternative of importing food appeared to be ruled out owing to the noncompetitiveness of Soviet manufactured exports. The social contract model would have failed had not the world price of oil soared in the early 1970s just as the USSR was able to bring on line its massive new discoveries of oil and gas in Western Siberia. Oil and gas exports saved the Soviet system. But when the world prices collapse in the mid-1980s, the leaders — wed to the provisions of the social contract that required providing food in the same volumes — turned to loans from Western banks. That was a brief respite because the complete lack of macroeconomic discipline left the USSR such a credit risk that only government loans could work. But the latter came with political strings attached. And once the Eastern European satellite countries realized the USSR's hands were tied by its dependence on Western official loans, they bolted. The empire came crumbling down.

This story is simple and compelling. However, it misses the critical importance of the nature of Soviet Union's dependence on oil. Gaidar argues that the leadership

was pulled step by step into a sequence of policy mistakes because it was desperate to keep a system afloat and keep themselves in control. We propose that the dependence on oil and gas was more fundamental than that. Oil and gas revenues did not simply permit the continuation of an existing model; they helped shape the structure of the system. It is like the difference between an individual who becomes used to a level of consumption and is unhappy if it cannot continue, on the one hand, and one whose very organism is so altered physiologically by consumption of a substance that he has no choice. The latter state is addiction.

We propose that the USSR was addicted to oil and gas in this sense.

To what extent did food imports rise? Almost surely not as much as oil rents rose. Other addicts were created.

## 5.1 Why the Crisis in Food Supply?

Food appears to be the most important part of Gaidar's story because that is where the crisis appears. But the food crisis was actually caused by something even more fundamental, namely the demands of Soviet industry for cheap energy (heat and electricity) as well as imported machinery and equipment. Industry was addicted to rents from energy exports as well physical flows of energy.

In a stylized model, imagine that all the oil produced in the USSR is divided equally into one half that is exported to the global market and one half that is consumed domestically. The first half is sold at world market prices; revenues are used to purchase food and consumer goods. The oil consumed at home is given away for free.

Imagine that in a world price regime like that of 1974-1985, the export revenues suffice to provide enough food and other imports to keep the system going. Let world oil prices then drop by half. If the oil continues to be divided into equal shares being exported and being consumed, the USSR imports only half as much food. The oil consumed domestically is not affected by the world price change. (Rents are cut in half – that is, the market value of the oil consumed is reduced by half – but the opportunity cost of the consumed oil is also reduced by half).

The key is that the entire burden of the price decline hits the recipients of the imported food. The pain is concentrated to that group. However, the reason that this is so is because the sector that consumes oil domestically was not required to

adjust its consumption downward. It escapes the pain.

This suggests that the real subject to investigate is the factors explaining why this second sector could continue as before.

Notice that the assumption that oil is consumed at a zero price domestically is equivalent to the assumption that domestic use is a key priority, and that export of oil is not. This must be due to the fact that domestic uses are backed by greater political strength.

## 6 Addiction and the Alteration of System Structure

How did the increase in oil rents alter the system *physiologically*? It created value that allowed for investment in activities that could not otherwise be supported. These constituencies create future claims on value, that cannot easily be cut back when rents subside. One problem is that once these investments take place it cannot be clearly assessed the extent to which they are dependent on "excess value." The price system makes dependence non-transparent. Is this an early example of "inefficient diversification?"

## 7 The "Bank Run"

The preceding analysis explains how the system grew increasingly fragile. The explosion of rents created addicts dependent on their continuation. When rents decline the leadership undertook increasingly desperate actions to cope with the situation. In this section we turn to the suddenness of collapse. This has been likened by some, notably Steve Solnick in *Stealing the State*, to a bank run. When officials at the top of the organization prove unable to control the activities of those below this sows doubts about what resources they actually control. Subordinates begin to wonder whether they should remain loyal, *even if they intrinsically* are loyal. The problem is that if the system collapses even (especially) loyal agents will become disenfranchised. At the point where confidence is lost, there is a race to cash in on those assets that are left, but of course these assets are state assets. As Solnick notes,

"...the image of a "disintegrating" state...is...seriously incomplete. So-

viet institutions did not simply atrophy or dissolve but were actively pulled apart by officials at all levels seeking to extract assets that were in any way fungible. Where organizational assets were more specific to their particular use by the state, as in the case of draft boards, for example, hierarchical structures proved more resilient. Where organizational assets were chiefly cash and buildings, hierarchical breakdown was almost total. At both ends of the spectrum, the catalysts of state collapse were the agents of the state itself. Once the bank run was on, these officials were not merely stealing resources from the state, they were stealing the state itself. (1998, p.7)"

How does a bank run occur? The bank takes liquid deposits and invests in longer-lived assets that pay a higher return. The bank operates on the assumption that only a small fraction of agents will have immediate liquidity needs and withdraw their money. So they can hold some liquid assets to meet withdrawals but invest the bulk of deposits that pay higher returns. Everyone is better off. Depositors do not know if they will have sudden liquidity needs. They could just store under the mattress at zero interest. But by using the bank they can earn a higher return by pooling their deposits and allowing for investment in illiquid projects.<sup>17</sup> The bank run problem arises when suddenly more agents need liquidity than was forecast. Because the bank serves people sequentially, there is an incentive to get to the front of the line. But most of the banks assets are illiquid. Liquidation means that there is not enough to meet all depositors. If you are patient during a run you will surely get zero. So a run can be an equilibrium.

Now translate this to the party official. If everyone stays loyal then the system guarantees a decent life to each official in the economy. Some agents die or are purged each period, but they can be replaced and order maintained. But if suddenly there is a shock to loyalty, then there may be more withdrawals and a sudden collapse in resources at the center. If too many officials exit there is not enough authority to raise revenue at the center. This jeopardizes official income. If enough leave then official income may be less than the value of what you can steal. If officials think that other officials are going to exit, it may pay to exit first. Why? Because the assets of the state are finite, and insufficient to compensate all officials. It pays to steal early,

---

<sup>17</sup>Projects that are illiquid pay higher returns  $R > 1$ , but if they are liquidated early they return less than 1.

*if the system is going to collapse.* Notice you cannot steal too early – then you go to the Gulag. The problem here is that there are two equilibria, and a sudden switch in expectation can cause a significant switch in performance.<sup>18</sup>

We consider a situation where loyalty is purchased with both positive and negative incentives. Post-Stalin punishment was not the only (primary?) incentive mechanism. Positive incentives were also used, especially for officials in the industrial economy. But the ability to use such incentives depends on income. We suppose that during the period of high rents income was sufficient to keep loyalty at a tolerable level. An equilibrium mix of incentives was attained. The decline in rents is thus a shock to the previous equilibrium, and the bank run is the consequence of this shock.

To see this we develop a simple toy model. Suppose that the output per official is given by:<sup>19</sup>

$$y = \alpha K n^2 \tag{5}$$

where  $0 \leq n \leq 1$  is the fraction of officials who remain in office, and  $\alpha$  and  $K$  are parameters ( $K$  is naturally the capital stock). So official income is an increasing function of loyalty. If an official leaves he can earn  $w$ . But there is a chance of getting caught. Let  $\pi = \beta n^\beta$  ( $\beta \leq 1$ ) be the probability of getting caught being disloyal. The key point is that this probability is an increasing function of  $n$ . So the expected value of leaving is  $(1 - \pi)w$ . We see that the expected value of leaving is a decreasing function of  $n$ . That follows because when  $n \rightarrow 1$  it is easier to detect the disloyal. We can solve for the critical value  $n^*$  such that the expected value of disloyalty equals the return to loyalty:

$$(1 - \pi)w = \alpha K n^2 \tag{6}$$

or

$$n^* = \left( \frac{(1 - \pi)w}{\alpha K} \right)^{\frac{1}{2}}. \tag{7}$$

---

<sup>18</sup>It is important to understand that in equilibrium the punishments that support the prescribed behavior (that deter the proscribed behavior) do not have to be imposed. If the threats are credible then agents do not play off the equilibrium path. The equilibrium is self-enforced. But if beliefs are altered the equilibrium can become more fragile. If the threats are then not forthcoming, the system can collapse suddenly. Prior to the collapse people in Eastern Europe thought that bullets would be the response to rebellion (as in Hungary in 1956 for example). But when Gorbachev did not reply that way it altered expectations in a fundamental way.

<sup>19</sup>For simplicity we assume that each official earns his average product. We could just as easily make official income some constant fraction of average product.

It is clear from (7) that a higher probability of detection lowers  $n^*$ . This makes sense: if officials are more likely to get caught they will not leave unless there are greater numbers. If  $w$  rises, on the other hand, then  $n^*$  goes up – it is now a better deal to defect.

Now let  $n_t$  be the fraction of loyal agents at time  $t$ . If  $n_t > n^*$  then loyalty is maintained, else defection is a better option. This critical value,  $n^*$ , is the tipping point. Presumably the leaders choose  $\alpha$  and  $\pi$  so that this condition will be satisfied. We can plot official income and the expected value of disloyalty as in figure 3.

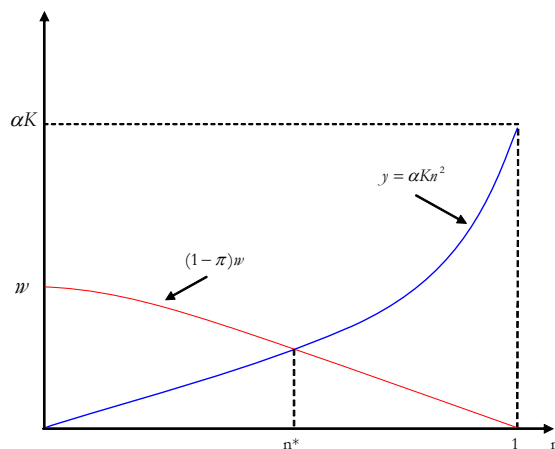


Figure 3: Critical loyalty value

Now suppose that initially the economy was stable,  $n_t > n^*$ . A shock occurs which lowers  $\alpha$  or  $\pi$ .<sup>20</sup> Consistent with our story is a decline in  $\alpha$  due to the decline in rents. Officials know that  $n^*$  has risen. If they think that  $n^*$  is now greater than  $n_t$  they know that bailing out is a better option.

We can further develop the model by allowing officials to take assets. Notice that stealing is a race. The sum total of what is stolen will exceed the total value of the assets. Suppose, for example, that each official steals some amount  $\sigma_i$  and that  $(1 - n^*)\sigma_i > K$ . This means that if only  $n^*$  agents stay loyal there will be no capital stock left. Hence, the official income curve will collapse to zero long before we reach

<sup>20</sup>An even more interesting example, which we turn to shortly, would be if leaving officials take some  $K$ . That would cause official income to fall faster as more steal. It would mean that  $n^*$  is higher for other values of the parameters.

$n^*$ . In the case with theft, official income is now

$$y = \alpha K [1 - (1 - n)\sigma] n^2 \quad (8)$$

where  $0 < \sigma < K$ . Clearly output now falls faster as  $n$  decreases, and it goes to zero when  $(1 - n)\sigma = K$ . But the collapse happens sooner than this. Once  $\alpha K [1 - (1 - n)\sigma] n^2 = (1 - \pi)[w + \sigma]$  there is no reason for any official to remain. So everybody surely leaves at that point ( $n'$  in figure So the system collapses. This

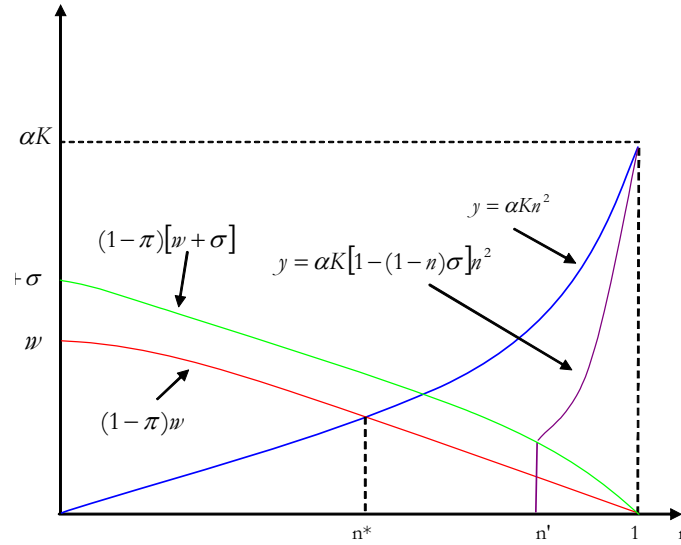


Figure 4: The Bank Run Case

is the true bank run. Even loyal officials will want to leave because they know that if they stay there will be nothing left.

In our model agents are homogeneous, so when the bank run occurs everybody runs. In the actual case we have heterogenous agents with different abilities, skills and preferences. For some agents, sticking together with a less than totally complete rent-collection system is preferable to being alone. So we have a run by some groups and preservation by others. The run causes the system to collapse, but those who stay try to protect themselves. The virtual economy persists after the collapse of the big system.

It is this bank run nature that explains why the collapse was so sudden. The problems of the STE were long-lived. But the collapse was a chain reaction, fueled by

the recognition that the authorities were unwilling to use violence to impose authority, and the realization that without it, allegiance was evaporating.

## References

- [1] Allen, Robert, *Farm to Factory*. Princeton University Press, 2003.
- [2] Ericson, Richard E., "The Structural Barrier to Transition Hidden in Input-Output Tables of Centrally Planned Economies," *Economic Systems*, vol. 23, no. 3, September 1999, pp. 199-224.
- [3] Grossman, Gregory, "The Economics of Virtuous Haste: A View of Soviet Industrialization and Institutions," in P. Desai, ed., *Marxism, Central Planning, and the Soviet Economy: Economic Essays in Honor of Alexander Erlich*, Cambridge, MA, MIT Press, 1983.
- [4] Gustafson, Thane, *Crisis Amid Plenty: The Politics of Soviet Energy Under Brezhnev and Gorbachev*. Princeton, NJ, Princeton University Press, 1989.
- [5] Kotkin, Stephen, *Armageddon Averted*. New York, Oxford, 2001.
- [6] Odom, William E., *The Collapse of the Soviet Military*. New Haven, Yale University Press, 1998.
- [7] Solnick, Steven L., *Stealing the State*. Cambridge, Harvard University Press, 1998.