PART III

RESOURCES AND ENVIRONMENT

CHAPTER 13

RUSSIA'S DEPENDENCE ON RESOURCES

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Russia is the world's leading producer of hydrocarbons and a number of other natural resources. The country has been dependent on its resource wealth since the time of Peter the Great. Prior to World War I, the primary source of resource rents was agriculture (see Gregory 1994, 17). The Soviet economic model was characterized by extensive growth, that is, by the accumulation of inputs. During the Soviet period, the sources of rents shifted. Prior to World War II, agriculture and excess labor were the key factors behind extensive growth and industrialization. In the postwar period, however, resource rents from hydrocarbon production began to play a bigger role. The growth of oil and gas rents, especially after the development of deposits in west Siberia in the 1970s, fundamentally altered the structure of the Soviet economy and led to the dependence on resource rents that still dominates the economic system today.[1]

In this chapter, we define the concept of resource rent, measure the size of rents in Russia, and document their role in the country's economic growth over the past forty years. We also analyze the political economy of dependence on resource rents. The system by which resource rents are managed has evolved from the early Soviet period through the 1990s until the present. We trace that evolution, describe the nature of the current rent management system, and examine the consequences of that system for Russia's future economic growth.

The History of Russian and Soviet Resource Dependence

Oil and gas have been an important part of the Russian economy since the first discoveries of oil in Baku in the nineteenth century. By 1901, the Russian oil industry was

producing approximately 250,000 barrels a day, about on par with the United States.[2] Russian oil production suffered badly in the turmoil of the decade leading up to World War I and did not return to its turn-of-the-century output level until the mid-1930s. Even with the discovery of huge fields in the Urals and the growth of oil production, as late as 1959 nearly 65 percent of energy consumption was provided by coal, peat, shale, and firewood.[3] Soviet planners did not fully recognize the importance of oil and gas until the late 1960s and early 1970s. Yet resource abundance shaped the very development of the Soviet economy. From early on, the fact that oil and gas were domestically produced (and exported) allowed the command economy to develop without the imperative of a balance of payments constraint to limit waste and inefficiency. More recently, the discovery of oil in large amounts in western Siberia in the early 1970s, the development of the Urengoy pipeline delivering natural gas to Western Europe, and the sharp rise in world prices that raised the value of the new Soviet oil, altered the course of the Soviet Union.[4]

Similarly, the collapse of world oil prices in the mid-1980s had a dramatic impact effect on the country's economic and, ultimately, political fate. The oil industry was directly affected. The break-up of the Soviet Union and the demise of central planning dealt a double blow to Soviet oil, as the previously unified industry found itself spread across separate countries and the integrated support and supply chains (including suppliers of key oil field equipment) were broken into pieces. The number of producing organizations multiplied in the early 1990s, but rather than seeing gains from more competition, the industry suffered from acute problems of funding and equipment, resulting in idled wells and a decline in production. There were a few exceptions—notably, Lukoil and Surgutneftegaz, which emerged early as integrated companies—but most production companies saw significant output falls. It was not until the end of the decade that the oil sector was reconsolidated.[5]

The gas sector developed very differently. Gazprom developed as a unified integrated company out of the Soviet Ministry of Gas. It was responsible for both domestic and export markets.

These many changes notwithstanding, oil and gas remain a sector of overwhelming importance to the economy (see chapters 14 and 15 in this volume), and they are once again under the control of a small number of individuals.

Resource Rents

Measuring the importance of oil and gas for the economy can be confusing. By national accounts, the sectors account for about 11 percent of total gross domestic product (GDP).[6] In contrast, they are the source of nearly two-thirds of the country's total export revenues and almost half of federal budget revenues.[7] As we explain shortly, a complete picture of the role of oil and gas in the economy must begin with more than just export earnings, or profits, or budget revenues. Our starting point is the total value of the resources, or the total rent.

Defining Rents

The simple definition of *rent* is revenue received from the sale of the resource minus the cost of producing it.[8] 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).[9] It is important to be rigorous in the application of this definition. Rent is an opportunity cost measure. This means that both revenue and production cost must be understood from the vantage point of opportunity cost. First, the revenue from the sale of the resource is to be understood not as the actual revenue received from the sale but the potential revenue if the resource were sold at the market price. In other words, it is what would be obtained if resources were used efficiently. Although it might be assumed that the difference between what could potentially be received from the sale of a given quantity of the resource and the actual revenue received is forgone earnings and therefore not subject to analysis of total rent, we emphasize that this "forgone" amount is an essential element of the rent, and its very existence reflects decisions that are made concerning the deployment of the wealth.

Similarly, the cost of production is not the reported cost of production at any point in time but 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. We refer to this latter notion of cost as the "natural" cost of production. Any reported cost in excess of the natural cost is classified as "excess cost." As in the above case of forgone earnings when the resource is sold below the market price, the existence of excess cost is a further example of decisions made regarding the allocation of the total value of the resource.

We elaborate on these notions of rent more formally.

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

$$R_t \equiv P_t Q_t - C_t \tag{13.1}$$

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 resulting amount of rent will be smaller than the true level. Let the reported cost be $\hat{C}_t = C_t + \varepsilon_t$, where ε is the excess cost of production. Then the corresponding measure of rent, $\hat{R}$ will be

$$\begin{aligned} \hat{R} &= P_t Q_t - \hat{C}_t \\ &= P_t Q_t - C_t - \varepsilon_t . \end{aligned} \tag{13.2}$$

Furthermore, note that although *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 Commonwealth of Independent States (CIS) countries are made at below market prices. Let price subsidies per unit of

the resource (averaged out over the total quantity produced) be ρ. Then the total subsidy, $S = \rho Q$. The actual producer price, $\widetilde{P} = P - \rho$. Hence, pretax profits are given by

$$\pi_t = \widetilde{P}_t Q_t - \widehat{C}_t . \tag{13.3}$$

The pretax (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 nominally voluntary but in fact mandatory for a business that wants to survive. The most common form of these taxes in Russia are bribes paid to government officials and payments made by enterprises to support the social sector of towns and regions, cultural programs, philanthropic giving, and so on.[10] 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 τ and the informal tax rate be τ'. After-tax profits can then be written as:

$$\begin{aligned} \pi_t' &= \left(1 - \tau - \tau'\right)\pi_t \\ &= \left(1 - \tau - \tau'\right)\left[\widetilde{P}_t Q_t - \widehat{C}_t\right]. \end{aligned} \tag{13.4}$$

Notice that although π' is what is left over to the owners of the enterprise, it is R that matters to society. The difference between R and π' 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 category represents a share of the total rent. There are two reasons to emphasize these categories. First, unless we account for some of the ways rent is distributed, we cannot accurately gauge the actual magnitude of aggregate rent. For instance, measuring resource value by the reported sales price rather than the true market price ignores the category of rent being distributed as price subsidies and leads to an underestimate of total rent. Similarly, when the category of excess costs is ignored—which is nearly always the case, because excess costs are opaque by nature—any estimate of total rent is biased downward. The other reason to carefully analyze the categories of rent is because they are used to hide and divert flows from different actors. Each has its own advantages and disadvantages. Which category receives which share has important political consequences. It obviously affects the political economy of a resource-based society. Even more important, as we discuss shortly, it also affects the future path of production.[11]

Measuring Resource Rents

We now turn to the actual measurement of oil and gas rents. In principle, we need only three parameters for each resource: the quantity produced, the market value (price) per

unit produced, and the natural cost per unit. Data on the levels of output of oil and gas produced in the Soviet Union and the Russian Federation are readily available from official sources. The market value of oil is the world market price. For natural gas, by contrast, there is no single world price, making data collection considerably more difficult. Cost also presents problems of data availability, but in addition there are major conceptual issues involved.[12] We reserve more detailed discussion of the empirical determination of prices and costs for the Appendix. We focus here on the complexities of cost.

Notice that because our interest is in total rent, we focus not on the marginal cost of production but on the average cost. This is an especially important point about production in the second half of the 1980s, when marginal costs appeared to rise significantly (see, e.g., Gustafson 1989). Yet the Soviet Union was producing 11.1 million barrels of oil per day at that time. Steeply rising marginal cost is still consistent with a large volume of rents if the high marginal costs apply only to the last million barrels per day, let alone the last few hundred thousand.

In other words, we need to know how the whole average cost curve shifts. We do this because total rents is the quantity that is available for the planners to distribute.. As marginal costs rose significantly in the 1980s,[13] marginal rent may have gone to zero, but average costs rose much less. Hence the effect on total rent was much smaller. Discussion about the economics of the oil and gas industries often focuses on the issue of marginal rents. But total rents is the key for aggregate economic development. Even if marginal cost rises significantly at current levels of production, there may be large rents earned on inframarginal production, and these rents are available for distribution.

What is crucial, then, is how the cost curve varies over relevant output levels. If production from low-cost deposits remains steady, then rising marginal cost has little effect on average cost. If low-cost deposits are fairly quickly depleted and replaced with high marginal cost deposits, then average cost rises much more rapidly. This is an empirical question. Evidence seems more consistent with the former hypothesis (slow replacement of low-cost deposits), for both the Soviet period and the present.

A further complication of determining cost involves which elements to include—most important, capital costs. Oil and gas production are heavily capital-intensive activities, and a proper assessment of capital costs makes a big difference for the average cost of production. Pipelines, for example, are extremely expensive. If we are concerned with the profitability of natural gas production, we need to deduct an amount to account for the amortization of the cost of the pipeline. If we are concerned, however, with the amount of current rent that can be distributed among users from current aggregate production, then the cost of the pipeline is sunk. We need to account for operating costs of the pipeline as part of natural costs. Replacement expenditures are an investment decision regarding future rent production,[14] not current rent distribution.[15]

In principle, our notion of natural cost should include only what is necessary to lift the oil out of the ground (thus, we would always exclude costs related to exploration). All costs related to future production are discretionary and should be treated as a portion of rent. Nonetheless, there is some ambiguity here, because there are always more hasty ways to lift more oil today from a given deposit at the expense of future production.

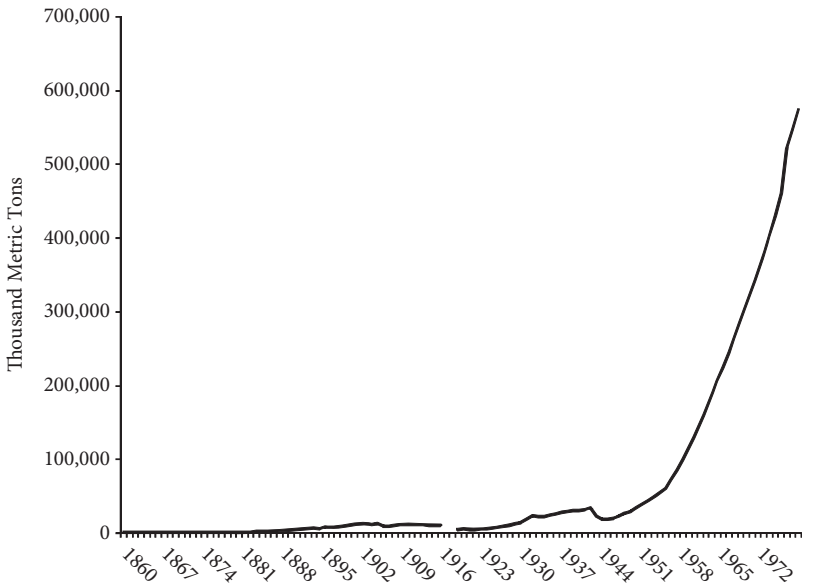

FIGURE 13.1 History of Russian Oil Production, 1860–1977

Source: Campbell (1968, table 16, p. 122); Goldman (1980, table 2.1, p. 14, and table 4.3, p. 74–75).

In principle, we define natural cost as that consistent with a competitive producer facing market interest rates, maximizing the expected discounted value of the deposit.

Finally, we also have to deal with the inclusion of excess costs in any reporting. All estimates of costs of production, to our knowledge, fail to distinguish excess costs from natural costs. Yet this distinction is absolutely critical for our purposes, because we consider excess costs to be part of the rent, not of production cost. Excess costs constitute a form of distributed rent.

The issue of excess costs in the Soviet system is especially complex. The Soviet centrally planned, command-administrative economy had lots of excess costs. During the Soviet period we have to assume that relative efficiency was roughly constant over time. We are interested in the best the Soviet Union could do given its technological and organizational level in the energy sectors.[16] In the end natural cost complexities do not matter significantly for aggregate rent because empirically, value trumps costs. We can see this as we apply our measures of rent to compute the total size of Soviet and Russian resource rent over time, including with different assumptions of costs.

The Size of Rents

Knowing the size of total rents in Russia over time gives an idea of the boost that natural resources provide to the economy as well as some idea of the spoils that are fought

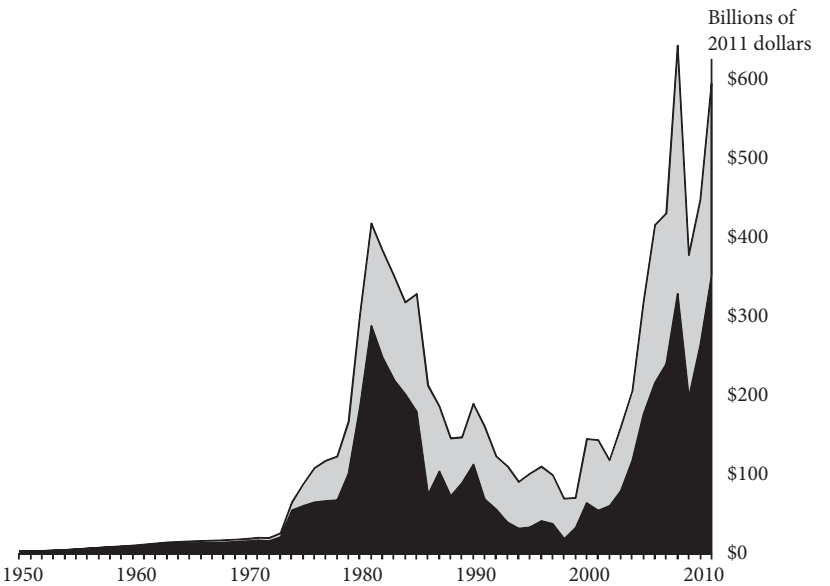

FIGURE 13.2 Russian Oil and Gas Rents since 1950

Notes: Oil rents in black, natural gas rents in gray. Oil and gas produced in the Soviet Union from 1950 through 1991 and in the Russian Federation from 1992 through 2011.

over. Figure 13.2 is an estimate, in 2011 U.S. dollars, of oil and gas rents produced in the Soviet Union from 1950 through 1991 and in the Russian Federation from 1992 through 2011. Note from the beginning that these estimates are approximate, mainly owing to uncertainty about the costs of production. However, as we explain, even fairly substantial changes in cost assumptions do little to the overall picture.

Several points stand out. First is the sheer size of the rents, especially in the most recent period. At their peak, in 2008, rents totaled nearly $650 billion, an amount that was larger than Russia's entire GDP in any year prior to 2003. Over the period 1999–2011, rents were on average 33 percent as large as GDP. This is in contrast to the Soviet period, when oil and gas rents were equivalent to roughly 11 percent of GDP.[17] The second point is the dramatic movement of the rent total, ranging from the 2008 high to a low of about $70 billion in 1998 and 1999. As the figure shows, after the 1981 peak, rent declined for seventeen years, with a particularly dramatic plunge in the first six years of that period and a somewhat milder downward trend afterward. Since 1999 there has been just as dramatic a recovery. Indeed, the growth in rents from 1999 to 2008 is eerily similar to the one leading up to 1981.[18] A third point is the importance of natural gas. Since the mid-1970s the aggregate rents from oil and gas have been roughly equal in size. However, in the lean years of 1991–2003, gas rents were nearly twice as large as rents from oil. Throughout, gas has tended to be the more stable component of total rent; the huge fluctuations in total rent came from oil rather than gas.

A further important point about total rent is that movements in the price of oil dominate fluctuations in costs (and even production quantities). This observation is robust

to a fairly wide range of assumptions about extraction cost. For example, doubling the production cost for oil and gas would only reduce total rents from the peak year level of about $650 billion in our baseline estimate to $600 billion. Costs clearly matter, and $50 billion is a significant figure, but the dynamics of total oil rent are governed primarily by oil prices and production levels.

One way to see how important price is relative to cost in determining the evolution of rents is to compare figure 13.2 with figure 13.3, which displays aggregate rents under the assumption that costs were growing 2 percent per year from 1970 to 2011. Under these alternative estimates, the cost of producing a barrel of oil or a cubic meter of gas is 100 percent higher than according to our base case. Yet figures 13.2 and 13.3 look nearly identical (note the scaling is the same). In particular, the aggregate dynamics look very much the same. Rents swell in the early 1980s, fall off until 2000, and then proceed to grow again. In figure 13.4 we display the two rent estimates together. One can clearly see that even using extremely pessimistic estimates for natural costs of production has little effect on aggregate rents.

The impact of the higher cost estimates are more apparent when one looks at periods when rents are lower. For example, in the late 1990s, when oil prices were very low, using our higher cost estimates results in rents that are 35 percent smaller than in our base case. But as prices recover and rents rise, the discrepancy between the two cases is only about 10 percent again today.

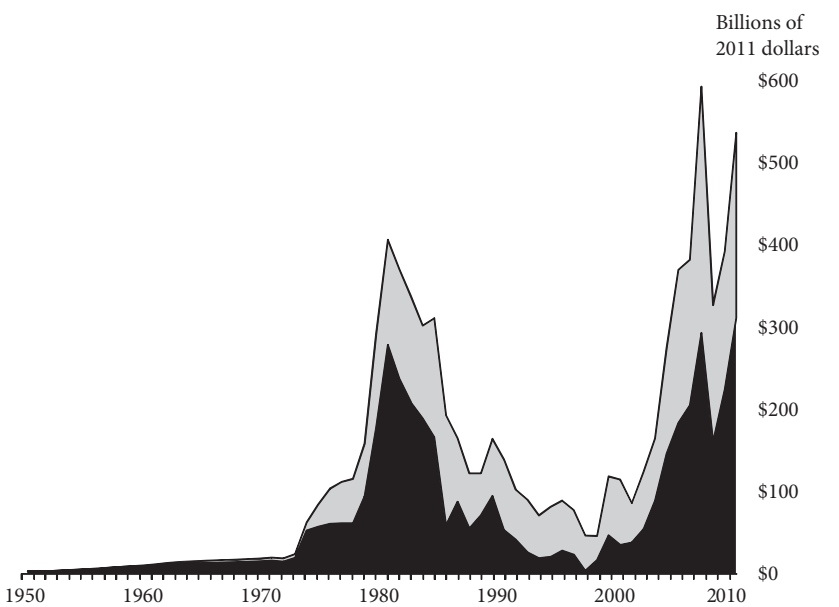

FIGURE 13.3 Russian Oil and Gas Rents with Costs with Increasing Cost of Production

Notes: Oil rents in black, natural gas rents in gray; billions of 2011 U.S. dollars. Oil and gas produced in the Soviet Union from 1950 through 1991 and in the Russian Federation from 1992 through 2011. Costs are assumed to remain constant in real terms from 1950 through 1970 and then increase by 2 percent a year from 1971 through 2011.

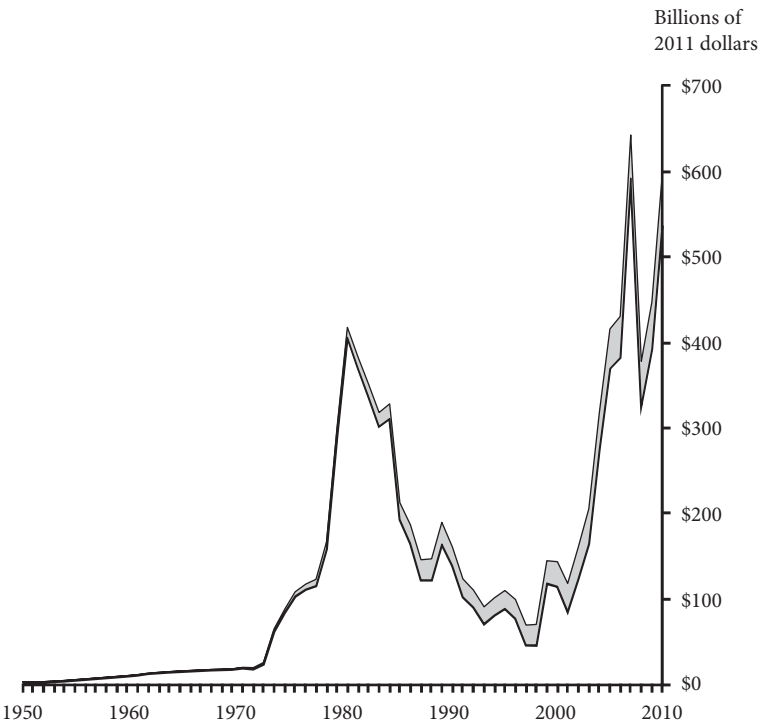

FIGURE 13.4 Aggregate Rents in the Benchmark and Increasing Cost Scenarios

Notes: Billions of 2011 U.S. dollars; rent with increasing average costs of production in white; additional rent in the constant cost scenario in gray.

Rent and its Components

The main components of rent were identified earlier. This section describes these components in greater detail and suggests who benefits from each. Figure 13.5 gives a schematic representation of the decomposition of rent. This chart is a highly stylized depiction. The division of total rent into six categories is rather arbitrary. Each of the categories could be further disaggregated. The relative sizes of the six components in the chart are not intended to reflect precise measurements.[19] It is more important to understand that each of the categories is significant and that each has a "constituency." That is, there are vested interests that are concerned with receiving and retaining claims to a share of the rents. How the shares are allocated has important political consequences.

Desai, Dyck, and Zingales (2007) argue that corporate governance battles between inside and outside shareholders have consequences for corporate tax liability, and tax policies may affect the conflict between insiders and outsiders. The various claimants to profits (insiders, outsiders, and the state) act to enhance and/or protect their shares through various means, and the actions are interdependent.[20] In our analysis, the battle

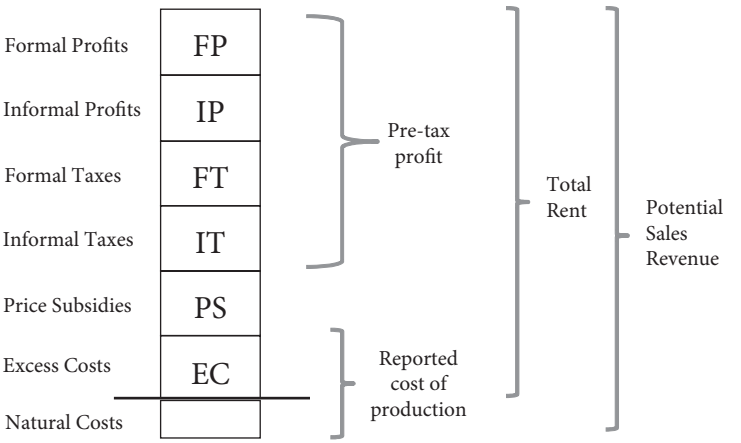

FIGURE 13.5 Total Value and Its Components

is over a larger volume of resources—the total rent—and involves an extra player: users. The game becomes more complex, but the key insight remains: actions to protect or collect flows are interdependent. As we examine the categories of rents, we return to this insight.

There are different ways to think about the components of total rent. One way would be to distinguish between the part of the rent retained by the controlling owners of the rent-producing assets and the parts distributed to other claimants in society (see figure 13.6). The part retained is the incentive for the owner to continue in business and invest for the future. However, such a distinction between retained rents and shared

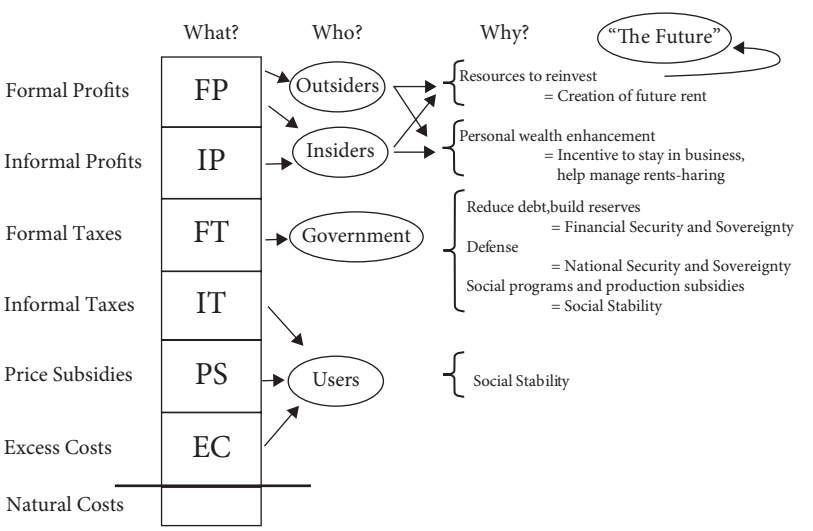

FIGURE 13.6 Categories of Rent Distribution

rents is illusory to some extent. Owners may also benefit from the shares distributed to other claimants. This fact is critical to a central argument of this chapter: for the resource owners, sharing rents with others is a way to enhance the security of their property rights. Rent sharing is, in other words, an investment in property rights protection.

Formal Rent Components

The formal categories—that is, profits plus taxes and other payments to the government—comprise those elements most frequently discussed and are usually treated as the only flows that benefit the economy. This is clearly not the case. What is true is that formal rent is the most transparent element.

Formal Taxes

Since 2000 there has been a significant increase in both the relative and absolute amounts of rent that have been collected by the Russian government in the form of taxes and other revenues paid by oil and gas companies, whether privately owned, state-owned, or quasi-state entities. Currently, Russian oil producers pay a marginal rate of well over 90 percent on exported crude oil. The combined marginal tax rate for crude oil production from the two main taxes alone—the crude oil extraction tax and the crude oil export duty—adds up to 87 percent.[21] In addition to these oil-specific taxes, companies also pay income tax, property tax, social taxes, value-added tax, and various local and regional taxes. As high as these tax rates are, it is important to remember that our prime consideration is not marginal rates but average rates. We are interested in the share of total rent that is collected by the government as formal taxes. That share is certainly less than 60 percent and may be as low as 50 percent.[22]

Profits

Profits are the share of total rents retained by the shareholders of resource companies. The objective of the owners is to retain as large as possible a share of the rents. Shareholders differ with regard to the form these rents take. Outside shareholders would prefer rents to be retained as formal profits. Insiders may prefer rents to take other forms. In particular, they may choose to allocate a portion of the rent as informal profits. There is an important distinction between these two kinds of profits. Outsiders share only in the formal profits. From the standpoint of the insiders, the whole point of informal profits is to conceal a portion of the rent from the outsiders as well as the government and the many others who would be attracted by formal profits, ranging from workers and natural monopolies to criminal organizations (*mafiya*) and corporate raiders [*reyderstvo*]). All of these groups might consider themselves in one way or another rightful claimants to that share of the rent that goes to the owners.[23]

However, there are also advantages to formal profits, even to the insiders. How interested those who run the oil companies are in formal profits depends to some extent on how well equity markets value formal profits. Informal profits render enterprises'

current performance and potential future success unobservable. They therefore make it harder to attract investment (Gaddy and Ickes 2002, 70). This was a conclusion drawn by the owners of Yukos, for example. That company clearly changed its behavior in the late 1990s when it became clear that the owners could gain more from high equity prices on their shares than from stripping assets from their company.

Informal Rent Sharing

Informal rent sharing is less transparent than formal rent sharing. This can be valuable to the resource owners because it makes it easier to direct where the rents will go. How a company's formal taxes are ultimately spent is governed by the political process. Informal rents, on the other hand, may be directed, to varying degrees, by the payee. This is particularly useful when rents are being used to purchase protection.

The use of nontransparent means to distribute the rents from energy windfalls for political purposes is not peculiar to Russia. In their review of the political economy of resource abundant states, Auty and Gelb (2001) note that "one characteristic of resource-abundant countries is … the use of indirect redistribution mechanisms to allocate natural rent" (p. 132). They write further that "the governments of predatory and factional oligarchic states prefer non-transparent methods for deploying the rents in order to maximize the scope for political maneuvering" (p. 142).

What is distinctive for Russia, however, is the scale of the informal rent redistribution. Like the part of the iceberg that lies beneath the surface, the informal rent categories are often ignored, yet they can be highly important in assessing current and future economic and political developments. For example, consider the debate about the resilience of the Russian economy to a decline in oil prices. The arguments on both sides of that debate are based solely on estimates of revenue flows to the budget and the size of the government's reserve funds. In fact, we see that the formal taxes and the formal budget are only a part of the picture. Informal rent sharing sustains a much broader part of the economy and society. Lower oil prices mean smaller overall rents and thus less to be shared among all the categories—not just the part represented by formal tax revenues that flow to the budget or are accumulated in the reserve funds.

Price Subsidies

To some extent price subsidies are an element of formal rent sharing. Russia charges lower prices for energy exported to certain CIS countries, and this is part of government policy. But price subsidies are also used informally as a means of buying protection.

Russian oil is sold domestically at prices much lower than the price that same oil brings on the world market. In recent years, the domestic price has been anywhere from 31 percent to 46 percent of the world price. The price of oil exported to the CIS countries tends to be about halfway between domestic and world prices.

For gas, the same pattern holds. Gas is sold much cheaper domestically and to states of the former Soviet Union than to Western Europe. The price of gas to Russian users

is currently around one-fifth of the price charged to Western European clients.[24] It would, however, be improper to treat the European price as a benchmark world market price for Russia's gas. Because Russia has such a large share of the European market for natural gas, it does not face a "world price" for gas the way it does for oil. If it were to sell more gas to Europe, it would have to accept a lower price (Tarr and Thomson 2003). Nevertheless, by even rather conservative estimates of the normal market price of gas, the volume of implicit subsidies from the gas sector to households and enterprises in Russia are substantial. The Organisation for Economic Co-operation and Development (OECD 2002) has calculated that they were equal to about 5.5 percent of GDP in 2000.[25]

Informal Taxes

Informal taxes are payments, in cash or in kind, that are made outside formal tax obligations. They can be made to governments at all levels (special "voluntary" funds, etc.) This is familiar to Russians. They commonly refer to such payments as being "compulsorily voluntary." In some cases, the payments (especially in kind) are made directly to recipients in the community (repairing the school roof, equipping the local school with computers, building a community ice hockey arena, and so on). There is no formal legal obligation. But failure to comply subjects the company to harassment (regulatory pressure, etc.) or denial of special treatment. It is the compulsory nature of the payment that is informal. The contributions themselves are usually highly visible. They are even featured by modern firms as examples of social responsibility. Some informal taxes can be invisible—for instance, bribes, kickbacks, or padded contracts. In these cases, the rent is being diverted to government officials at one level or another. This is the type of rent diversion that is most commonly referred to as corruption.

Bribes are a major component of informal taxes. One recent study of the corruption market in Russia asserts that the volume of bribes paid by businesses in the country increased more than ninefold between 2001 and 2004. This is a growth rate four times that of the federal budget in the same period.[26]

For social spending, there has been an interesting shift toward more formality and more transparency. The examples of companies like Sibneft and Lukoil are instructive. Both companies have made a special effort to publicize their activities. In April 2004 Sibneft released its first-ever "annual social report"—in effect, a public account of its informal taxes. Lukoil published its first such report in September 2005.[27]

Excess Costs

Excess costs are, strictly speaking, another form of informal tax. We distinguish this as a special category for several reasons, the most important of which is that the rent allocated in this form goes exclusively to support production enterprises in the non–oil and gas sector. This is true of a large portion of another informal rent category, namely, price subsidies. But excess costs are an even more informal and opaque category of rent sharing than subsidies. It is the hardest of all the categories to empirically measure. To our knowledge, this category is universally ignored in analysis of rent.[28]

Why is this mode so important in Russia? First, it is the most fluid form of rent transfer. If the goal is diversion of rents from legal claimants (Desai, Dyck, and Zingales 2007), then the mechanism of excess costs can be efficient. It is particularly critical in Russia because it is the only politically acceptable way that rent can be transferred to the economy's noncompetitive (and therefore rent-dependent) sectors on the scale that it is. Were the same amount of rent to be transferred formally—that is, in the form of price subsidies or budget transfer payments—it would be apparent how much society pays to keep these sectors alive. Moreover, it would be clear how inefficient the latter are and how critically in need of reform they are. Because excess costs are the ultimate form of "hidden rent," they make it possible to avoid the reality of Russia's economy and the need for restructuring. They maintain the pretense of value-adding activity where in fact there is only value subtraction. Hiding excess costs is part of a conspiracy of silence about the true nature of the economy. In the Soviet period, pricing was the principal means to distort economic reality. Soviet prices produced a "circus mirror effect": they exaggerated the value of some activities and shrunk the value of others. Keeping excess costs hidden performs that function in today's Russian economy.

The principal mechanism to generate excess costs is coerced (compulsorily voluntary) contracts for goods and services placed with noncompetitive Russian manufacturers by resource companies, or by key intermediaries such as Russian Railways or Russian electricity producers. (In the latter case, the intermediaries are essentially transmission belts for the transfer of rent from the oil and gas companies to the noncompetitive manufacturers.)

Vladimir Putin, as the ultimate manager of the current rent management system in Russia, is the chief sponsor and beneficiary of the excess costs mechanism of rent sharing. His legitimacy rests on it. For this form of rent sharing, he gets credit for being the rent distributor to a greater degree than for the other channels through which rent is distributed to large parts of the population. Putin is not easily perceived as the benefactor in the case of formal and informal taxes, for instance. The amount of formal taxes paid by resource owners is a parameter nominally determined by the parliament. Similarly, the targets of spending of those tax revenues are set in a budget adopted by the parliament. A large portion of informal taxes flows directly from the resource owners (the oligarchs), something for which they publicly claim credit, even in corporate annual reports.

Examples of Excess Costs. Determining the excess costs of production precisely is difficult. Excess costs are "excess" only in relation to a counterfactual, market-determined benchmark. What we can do is give some examples of the kind of behavior that falls into this category.

It is well known that Russia's oil and gas industries are extraordinarily inefficient. One example is gas pipeline construction. Another is the example of rail transport of oil in recent years. Shipping oil by rail is several times more expensive than doing so by pipeline. The high cost of shipping by rail comes mainly from the high costs of the inputs—materials, labor—used to produce oil tanker cars. In other words, there is greater demand for inputs like steel and for workers in plants that can produce railway freight cars. The big producer of railway tank cars is Uralvagonzavod in Nizhniy Tagil—the military tank

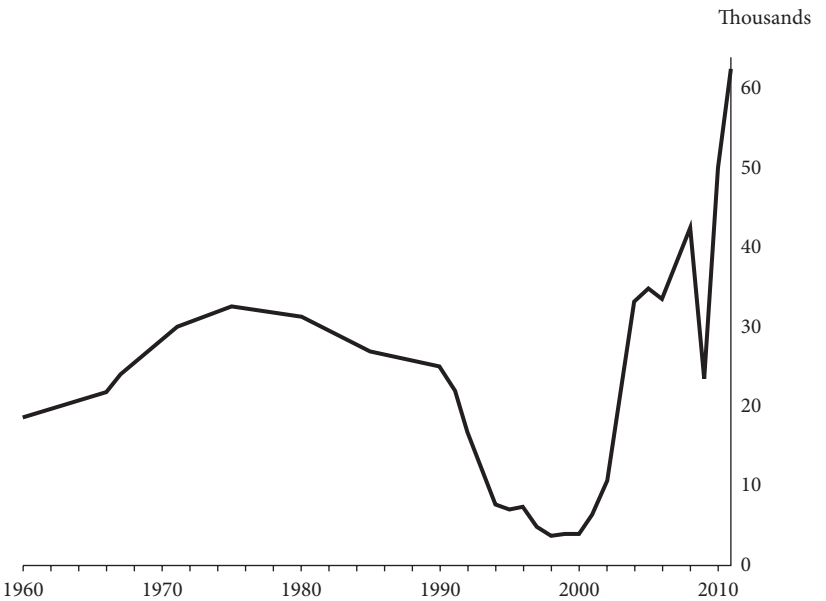

FIGURE 13.7 Russian Production of Railway Freight Cars, 1960–2010 (Thousands per Year)

manufacturer. This company has benefited greatly from the costly decision to ship oil by rail rather than pipeline. As figure 13.7 shows, railway tank car production is higher now than it ever was during the Soviet period.

Transporting oil by rail is inefficient. At the same time, it helps motivate the continued activity at one of the country's key industries left over from the Soviet times. Production itself—higher physical output—is thus part of the way the oil windfall is shared. This insight relates to the issue of Dutch disease. In the classical form of this "illness," that affects resource-abundant economies, the resource sector squeezes out manufacturing. But when excess costs are an important form of rent sharing, as in Russia, manufacturing industries may benefit, rather than suffer, from the existence of a large resource sector.

Although Dutch disease may afflict some countries, the rent-deployment system we describe means that Russia has a different condition. As a result of the demand from the oil sector firms, those parts of manufacturing that are contributors to excess cost benefit when Russian oil production increases.

There are two important points to note with regard to the Russian disease. First, although manufacturing as a whole may not be squeezed by real appreciation of the currency, those industries that are in the tradeable goods sector will be. Thus, there is a compositional shift in manufacturing, away from tradeables and toward those sectors that supply the oil sector. Second, the consequences for the economy of an increase in oil rents differ depending on whether the increase is due to a rise in price or to a rise in production. Excess costs are more sensitive to the latter than the former. If production is stagnant while prices rise, the distribution of rent across components shifts away from what it is with production growing at constant prices.

A Special Problem

Finally, there is one special category of rent distribution that presents special issues. Oil and gas are depletable resources. To ensure rent flows for tomorrow, some portion of today's rent should be allocated to find and develop new deposits. A comprehensive view of rents over time should include some amount in these so-called finding costs as a necessary cost of production. That is an investment that had to have been made at some point. For the current period, it is not relevant. It is a sunk cost. What ought to be invested in future production is also not an unavoidable category of expenditure in the present period. It can be shifted to the future. If this happens, then future claimants will suffer. There will either be less rent, or in some future period more will have to be deducted from current rent flows to cover exploration and development. This is not unlike shifts in shares among other claimants in any given period, for instance, when government claims more from owners (by raising taxes) or when owners divert rent from the government (by evading taxes).[29]

Rents and the Economic System

Rents shape the Russia economy at the aggregate level, in the relationship between the total volume of rents available and overall performance, and at the structural level. We examine each in turn.

Aggregate Relationship

Given the huge size of oil and gas rents and the manner in which these rents are distributed throughout the economy, one would expect the dynamics of rent to impact overall economic performance. It may therefore be useful to compare the increase and decrease of the rents with movements in GDP over time.[30] Figure 13.8 presents an index for GDP relative to the oil and gas rents in the Soviet period (1970–91) and post-Soviet Russia (1992–2011).

There is a big difference in the rent–GDP relationship in the two periods. As pointed out earlier, rent is much larger (by a factor of approximately three) relative to the entire economy in Russia than in the Soviet Union. Apart from the levels of the curves, the trends differ starkly. Although the rent and GDP curves trend closely in the Russian period, there appears to be much less of a correlation, if any, during the Soviet period. Before the early 1980s Soviet rents grew faster than GDP. When rents collapsed in the early 1980s, GDP continued to grow at almost the same rate as before. The rent collapse seemed to have no effect. We believe the explanation for this lag is that the reported steady growth of GDP after the rent collapse in the 1980s was partly an illusion, as it flies in the face of other evidence of a deep and growing crisis throughout the economy

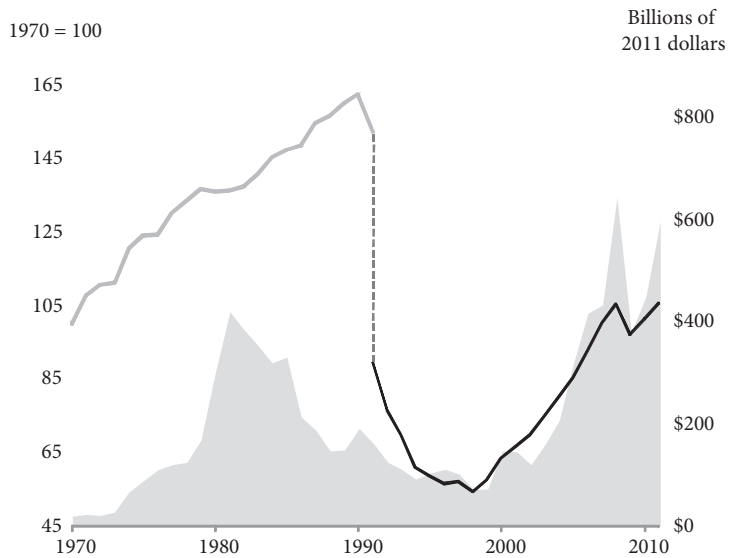

FIGURE 13.8 Soviet/Russian GDP and Rents, 1970–2011

Notes: The gray area shows oil and gas rents in 2011 U.S. dollars (right axis) for the Soviet Union (1970–91) and Russia (1992–2011). The line is an index of GDP (left axis; 1970 = 100) for the Soviet Union (1970–91) and Russia (1991–2011).

during the decade. The operation of the Soviet system meant that output could continue to grow in physical terms and be assigned ever-greater value by the arbitrary pricing system, regardless of the actual market value of the goods produced. Its true value could not be realized until after price liberalization. Illusory value constituted a large part of Soviet output in the 1980s. It was not until the market reforms of the 1990s that the bubble of fictitious value burst.[31]

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 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.[32]

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 their extraction was 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 its gigantic mistakes.

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, unexpected growth in rents that occurred from the west Siberian oil boom and then the Organization of the Petroleum Exporting Countries (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.[33] The windfall moved the Soviet Union away from what might have been a rather stable rent-deployment system to one in which 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 Comecon countries, the war in Afghanistan, and so on. In effect the windfall was oversubscribed: there were too many claimants for too little value.

The lesson is that resource abundance, misapplied, can be addictive. The experience of large rents induces policy makers 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.[34] But when opportunity cost is not considered, short-term production increases are likely to come at the expense of future output.[35] Soviet leaders applied extreme measures to maintain high production levels, including postponing 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.

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 collapse triggered the subsequent aggregate output fall. Part of that was illusory, as we pointed out already. But the decline in oil and gas output was real. Oil output on Russian territory fell from 569 millions tons a year (11.4 million barrels a day) in 1988 to 300 million tons a year (6 million barrels a day) by 1996. The decline in gas

production was less severe: from 641 billion cubic meters in 1991 to 571 billion cubic meters in 1997.

The combination of a decline in both price and quantity meant that oil rents in particular nearly vanished (see figure 13.2). Natural gas, on the other hand, continued to yield positive rents throughout the period. Gas sustained the economy—possibly including even the oil sector—during the mid-1990s. The elaborate and curious schemes of barter, mutual offsets, arrears, and other nonmonetary settlements that we described as Russia's virtual economy evolved as the survival mechanism to allocate those gas rents on the thinnest of margins (see Gaddy and Ickes 2002 for a discussion).

The period of low oil rents and continued stable gas rents extended through the crisis of 1998 (see figure 13.2). When, in the late summer of 1999, oil prices began to recover, this ended a period of sub-$20-a-barrel oil prices that had prevailed almost without interruption since 1985–86. The oil price rise dramatically changed the rent reallocation system. Before, the focus was on how to survive without cash. The burning issue now became how to share the cash produced by the oil export revenue windfall.

Looking back on the period before 1998, it is important to note that thanks to the value-transfer mechanisms of the virtual economy, much of the old, Soviet-style economic structure was preserved. Given that this structure was built up with the rents that were so high during the pre-1985 period, one would have expected that the extended period of low oil rents in the second half of the 1980s and throughout the 1990s would have been sufficient to force a much greater transformation of the Russian economy than actually occurred. That Soviet-era structure was clearly no longer affordable once rents declined. Market reforms should have led to extensive restructuring. That did not happen, primarily because rents from natural gas remained sufficient to support the structure. Thus, when cash flows increased after 1999, the old claimants were still present, demanding their share of the now-burgeoning rents.

Structural Impact: The Inverted Funnel

As the oil and gas rents grew from the 1970s, and as they were used to sustain a growing structure dependent on them, the industrial economy of the Soviet Union began to resemble an inverted funnel. That is, at the top was a concentrated source of wealth (oil, gas, and other mineral resources) which was distributed to sectors that were much broader (in terms of people, plants, and territories). The broad base depended on the rent flowing down from the resource sectors to survive. It was like an inverted funnel.

That base is dominated by the heavy manufacturing sector, what was traditionally known as machine-building. This includes the defense industry.

The most distinctive, the most opaque, and the most important form of informal rent distribution in this inverted funnel economy is the constraint placed on resource companies to directly participate in the production and supply chains linking the enterprises inherited from the Soviet economy.[36] This constraint ensures that rent is distributed in the form of excess costs of production. Suppliers of material inputs (fuel and energy, metals,

components) and services (rail and pipeline) are bound to serve the machine-building enterprises. The produced machinery and equipment are then shipped predominantly to those same input sectors. Figure 13.9 is a schematic version of the flows involved, encompassing five core industrial sectors: (1) oil and gas, (2) machine building (including defense industry), (3) transport (mainly railroads), (4) electric power, and (5) metals and materials. Figure 13.10 arranges these sectors by their positions in the funnel.

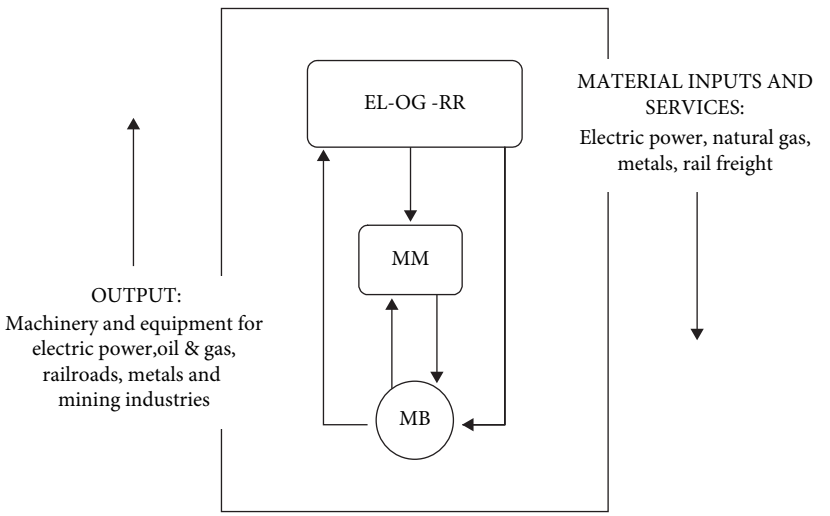

FIGURE 13.9 Schematic Version of Rent Distribution through Production

Notes: OG, oil and gas; MB, machine building; RR, railroads; EL, electric power; MM, metals and materials.

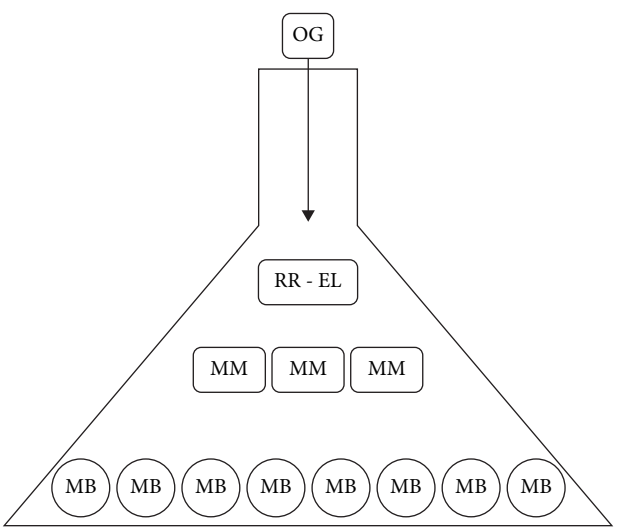

FIGURE 13.10 The Inverted Funnel

Regarding rent distribution, the importance of the scheme depicted in figure 13.9 is that rather than having the oil and gas rents exclusively collected as formal taxes and redistributed by the center, the oil and gas producers provide much of them directly, either in physical form (as inputs) or in monetized form (as payment for orders) to the equipment manufacturers, or via intermediate production sectors that serve the oil and gas industry, such as transport infrastructure construction, the electric power sector, or the processing (refining) industries. The supply and production chains can thus be regarded as rent distribution chains. They are mechanisms to disperse rent in the form of excess costs from the narrow part of the inverted funnel to the broad base. The distribution of rent through production is the most important way rent is shared in today's Russian economy, and it is all informal: it is not prescribed by law; it does not proceed through the budget; no formal taxes are involved.

Rent Management Systems

The crucial issue for any economy that is resource abundant is how to control the flow of rents. The system that evolves to control the flow of rents we refer to as the rent management system (RMS).[37] The function of the RMS is to prevent the dissipation and/or diversion of rents. Systems of rent management can differ in several ways. They can be strong or weak, centralized or decentralized, formal or informal. We designate an RMS as strong when rent allocation takes place according to given rules. We refer to it as weak when rents are grabbed.. An RMS can be centralized, as in the case of Joseph Stalin's Soviet Union, or decentralized, as in Boris Yeltsin's Russia or as it is organized in Alaska today.[38] Furthermore, RMSs can be formal or informal. Interesting combinations can arise. As we discuss, Putin's Russia has an RMS that is strong, centralized, but informal.

When the RMS is weak rents may be dissipated at the production stage, or they may be diverted to nonlegitimate recipients. If the RMS is centralized *and* powerful, rents will flow upward to the leadership and be under the control of the rent manager. But if the system is centralized and weak, as in the late Soviet period, rents are dissipated and diverted, and the center loses control over their distribution. Finally, we could envision a weak, decentralized RMS, which would involve decentralized production of rents, but in which weak law enforcement allows the producers to dissipate and divert them to their own uses.[39]

A further dimension in which rent management systems differ is in respect to decisions about the size of the rent in the current period and in the future. In a highly decentralized system, production and investment decisions will be left to the owners. They can make those allocations (other claimants cannot). In a centralized system, one of the key functions of the head of the RMS is to decide for the system as a whole how much will be invested in reproducing the resource base—that is, how much of current rent is allocated to the future.

History of RMSs

In the Soviet economy, the RMS had to take a peculiar form. Rents could not be transformed into consumption on anywhere near the scale in which they were earned. Nor could rents be easily shifted to private accounts abroad. This was simply impossible in a controlled economy. Thus, the use of rents in a Soviet system was constrained in some ways that differ from nonplanned economies. The primary use of rents in the Soviet-type economy was in production. What else could you do with rents but build factories, industries, cities, canals, and railways on permafrost? With a price system that was opaque, those involved in the production of these monuments could naturally believe they were performing valuable services to the economy.

This is the primary source of the deep dependence on rents that developed in the Soviet economy: it stems from the limited uses to which rents can be employed in a Soviet-type economy.[40] Leaders who control these rents use them to produce things that enhance their stature or authority in the Soviet state. Once these activities are under way, however, they must be continually fed with more resources because they are not actually value-producing. The process is thus costly for the leadership because it leads to a future drain on rents.

Leaders face another problem in collecting rents—dissipation from below. Leaders need to prevent rents from being absorbed at the production level or along the path of collection to the center. Dealing with dissipation has been a recurrent problem in the Soviet period and the Russian economy.

In the Stalinist period, the RMS used terror to minimize dissipation of rents. Terror is an effective means of deterring dissipation, but it is harmful to the production of rents. Terror inhibits risk taking and initiative. Over time the benefit-cost ratio of terror may shift. Lavrentiy Beria clearly recognized that this had happened when he shut down the gulag after Stalin's death.

After Stalin, the RMS was altered primarily by the reduced employment of terror.[41] The constraints on rent usage, however, were not changed. Moreover, the decline in the use of terror meant that rent dissipation increased. A larger share of the rents remained at lower levels in the hierarchy. Had this process continued unabated, the economy might have been squeezed dramatically during Leonid Brezhnev's leadership, but starting in 1970 the Soviet Union experienced a dramatic upturn in the production of rents. The greater influx of rents allowed the Soviet leadership to use resources to prop up Eastern Europe and engage in military buildups and adventurism. At the same time, however, a combination of a laxer RMS and greater inflow of rents meant even more dissipation.

Under Mikhail Gorbachev the RMS became even weaker as economic reforms further loosened the control of the center over the use of rents. At the same time, the production of rents declined as oil prices collapsed. This dual hit of lower production and a weakened RMS fatally weakened the Soviet state and led to its collapse in a process that resembled a bank run. The Soviet state had insufficient resources to prop up its Eastern European allies or maintain the flow to its own rent-dependent industrial sectors.

The demise of the Soviet system of central planning led to a serious transformation of the RMS. In the first decade this was manifest on the one hand in the behaviors and phenomena that became known as the virtual economy. At the same time, it was now possible for individuals—eventually called oligarchs—to amass personal fortunes and for capital to flee abroad. The RMS under Yeltsin was spectacularly ineffective in restraining rent dissipation. The fundamental conception underlying the economic reforms of the 1990s was that the rule of law would constrain the owners of rent-producing assets. The problem is that the funnel nature of the Russian economy allowed the asset owners to buy protection against the state and the RMS and prevent the state from collecting its share of rents.[42]

Russia's current RMS, managed by Putin, evolved out of the system of the 1990s. It combines a strong state with private ownership. The particular role of private owners in this system begs comment. Ownership of most of the companies in Russia's core industrial sectors had shifted from state to private in the 1990s. Most of the changes persisted in the 2000s. The only significant exception is the oil company Yukos, which was effectively renationalized after the 2003 arrest of its owner, Mikhail Khodorkovsky.[43] The lucrative metals and mining sector is almost entirely in private hands.[44] The Putin leadership strongly believes in the superiority of private ownership over state ownership to achieve economic efficiency. The highest priority for the regime with respect to private owners is to ensure that they continue to support the rent distribution chains.[45] The political economy system of today's Russia is in effect an RMS in which corporation owners (the oligarchs), certain top government officials, and governors of the most important regions are on nearly equal footing: they all are "rent management division heads" in the gigantic enterprise of Russia, Inc. This is a system aimed at combining the virtues of stability (by ensuring that rent is distributed to the socially and politically most important regions, cities, and plants—the broad base of the funnel) and efficiency (by having private owners of rent-generating industries with incentives to maximize profits and thereby create more rents).

The commitment to share rents through support of the production chains is a central feature of the peculiar Russian version of the market economy. But it also represents a constraint on efficiency in creating the rents. In a normal market economy, private ownership is based on secure property rights and a system that gives owners both the power and incentives to be fully efficient by choosing optimal location, product range, volume of production, and mode of production, including choice of suppliers and partners. In the Russian economy, the nominal owners of the companies operating in the key sectors are highly constrained in all of those critical choices because they are subject to the imperative to preserve the rent distribution chains. Suppliers of material inputs are locked into the chain. They are constrained to deliver their electricity, gas, steel, aluminum, and so on, and to provide their rail freight and other services to the core machine-building enterprises. That means that one of the main features of the system is to eliminate competition among suppliers and autonomous decision making on the part of companies in the supply chain.

To appreciate how well developed the notion of rent distribution chains is, consider the statements made by Prime Minister Putin in April 2011, as he presented plans for the future development of a key subsector of the machine-building industry, the sector that builds heavy machinery and equipment for Russia's electric power–generating plants. He stated: "In addition to a system of long-term contracts between energy companies and equipment manufacturers, we need to develop a system of long-term contracts for the entire production chain connected to the energy machine-building sector—suppliers both of fuel, and of iron and steel, and of nonferrous metals. [We need to] thoroughly build out the entire chain of relationships with subcontractors and suppliers of raw materials, … rail transportation, … electricity, primary raw materials, and natural gas" (Putin 2011).

Why is this system of rent sharing not operated in a formal fashion, with only formal taxes and profits, with the state appropriating excess rents via taxation and redistributing this to the population in an equitable fashion? This would facilitate optimum development of the sector at minimum cost. It is efficient ("the efficient solution"), and certainly would be in the interest of the state.[46] We will show why it hasn't happened and why it cannot happen.

The explanation is directly tied to the failure of the political Coase theorem (PCT).[47] The PCT states that the form of government, like an assignment of property rights, will not impede economic efficiency. Acemoglu (2003) argues that the PCT fails because governments lack the ability to make commitments needed to achieve efficiency in intertemporal allocation problems. In the case of Russia with its inverted funnel economy, the PCT cannot hold. The extreme inequity in the distribution of wealth creates fundamental risk for the rent producers of any change in control over rents. Suppose Russia did create a formal, strong, decentralized RMS. Then the current owners would be compelled to purchase control of the government to avoid any subsequent redistribution. Hence, any government that did not wish to be purchased would act preemptively to constrain the political activities of oligarchs.

The efficient solution can only work if political power is insulated from economic wealth.[48] An efficient reform that protected property rights would lead to massive concentration of wealth due to the importance of oil and gas rents. Economic power means political power. So a regime of taxing rents would not be sustainable. Oligarchs would purchase the government and limit taxation, hence, they would limit redistribution and thus violate the commitment that was necessary to the protection of property rights.

Conclusion

The production and distribution of oil and gas rents is crucial for the Russian economy. In the absence of significant structural changes, this relationship will continue in the future. We conclude by briefly examining the type of structural changes that would be necessary to lessen the dependence on oil and gas rents.

The basic problem Russia faces is the inverted funnel. As long as the structure of the economy continues to bear this character, rents will continue to dominate the economic system. Hence, some observers conclude that Russia needs to diversify its economic structure, a conclusion that our analysis would seem to entail. It is important, however, to think carefully about the meaning of diversification in this context.

There are at least two ways to think about diversification in our context. First is diversification of production. This is the conventional view—the idea is that if modernization of the manufacturing sector can be accelerated, a greater share of value added will be produced and the sectoral contribution of oil and gas to the economy lessened. This is most likely wishful thinking and often a claim to a share of rents. The economic structure inherited from the Soviet period uses rents to preserve, not modernize. Moreover, Russia faces obstacles (we refer to these in Gaddy and Ickes [2013] as "bear traps") that handicap seemingly sensible reforms when undertaken in the Russian context. These bear traps result from specific structural locational, and institutional legacies that burden both physical and human capital. Consequently, use of rents to diversify production is likely to result only in more dependence on these flows.

The second meaning of diversification has to do with income. Given the importance of rents, and given the documented dependence of the magnitude of rents on oil prices that are highly volatile, Russian GDP is also quite volatile. Sharp fluctuations in income are, however, inimical to welfare, as households prefer smooth consumption profiles. Moreover, when oil prices are highly volatile, investments in the sectors that produce rents face sharp fluctuations in returns. When oil prices are low, investments that seemed quite profitable may become nonviable. This is a consideration of tremendous importance given that future reserves of Russian oil and gas will likely be found in even less hospitable places than western Siberia. Gas from the Yamal Peninsula and oil and gas reserves in eastern Siberia will require large investments in infrastructure. Natural gas also requires investment in pipelines,[49] which are also upfront investments. With uncertain prices, there is an option value to waiting, which means that investments in future reserves may be delayed. This cannot be good for Russia.

The solution to these dilemmas is diversification of income and consumption, and the policy instrument for that is foreign investment: Russian investment of profits abroad to diversify returns and make them less dependent on oil price fluctuations, and foreign investment in Russian oil and gas to share the risk of price volatility. International risk sharing is a win-win solution for both Russia and the rest of the world.[50]

The fundamental problems that Russia faces are not oil and gas but the structure that abundant oil and gas rents produced and the RMS that operates today. The fundamental problem is that you cannot reform the structure of the economy until the RMS is reformed. It is necessary to break the link between the structure of rent production and the claims on rent. If that link could be broken, Russia could become a larger, colder Norway. The hard part is to see how the RMS can be reformed while oil and gas rents are so important and the funnel remains.

Notes

1. The notion of dependence on resources for Russian economic growth has been widely discussed (e.g., Ofer 1987; Gregory 1994). Typically this is discussed as extensive growth verus us intensive growth. The literature on the notion of resource rents and their importance for the economy is, to our best knowledge, virtually nonexistent. The exceptions to this are discussed in a later note.
2. See Grace (2005, chapter 1) for a discussion of the early history of the Russian oil industry.
3. Petroleum and petroleum product exports were important even in the 1930s, but the share of oil and gas in total energy output fell from 1928 through the 1940s (Campbell 1968, 2–10). Coal, wood, shale, and peat were increasingly used. Not till the 1960s was the emphasis put on increasing the share of oil and gas.
4. Our reference here and elsewhere to "oil prices" rather than "oil and gas prices" is shorthand. The two are closely related. Natural gas pipelines require huge upfront investments, and hence long-term contracts for gas delivery are the norm. These contracts almost always tie natural gas prices to oil prices, so sharp rises in oil prices lead to increases in the price of gas as well. The same occurs when oil prices decline.
5. For further details see Grace (2005) and Gustafson (2012).
6. These measures are from the state statistics service. They include the categories of oil and gas extraction, oil and gas services, and oil products manufacturing.
7. The average share of crude oil, natural gas, and oil products in Russia's overall export revenues for the years 2005–10 was 63 percent (data from the Central Bank of Russia). The share of federal budget revenue classified as oil and gas revenues was 46.1 percent in 2010 (Ministry of Finance of the Russian Federation 2011, table 3.3). This share has risen steadily since 2000, when it was only 20 percent. Oil and gas revenues come from the following sources: the mineral extraction taxes on oil and gas and export duties on crude oil, natural gas, and petroleum products. They do not include taxes on the profits of oil and gas companies.
8. Our discussion here follows Gaddy and Ickes (2005).
9. 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 environmental economics (so-called green accounting). In practice, 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, because we seek the total cost of extraction of annual output.
10. See later in this chapter for a discussion of formal and informal taxes
11. 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.

12. Fortunately, however, it turns out that prices and quantities are much more important for calculating rents than costs, as we discuss and show shortly.
13. Under Soviet techno-organizational conditions. These differ from post-Soviet conditions, where marginal cost seems to have risen much less significantly.
14. Even competitive firms might choose to invest their profits in alternatives to future oil production, for example, buying back shares or paying dividends. So including an extra charge for exploration and development in our definition of natural cost would make no economic sense.
15. Thus, the decision about how much of current rent should be used to secure future rents, that is, exploration and development costs, is in principle governed by the rent management system. We discuss this later in the chapter.
16. There were two conceptually distinct sources of inefficiency in the Soviet oil and gas sectors. On one hand, there was "normal" Soviet inefficiency, or the inefficiency that necessarily resulted from the very essence of the economic system. On the other hand, there was the inefficiency that resulted from the choices made by planners and other economic managers to allocate rent to certain industries (especially in heavy manufacturing) by designating them as suppliers of equipment and other inputs to the oil and gas sectors for political and social reasons rather than economic reasons. The latter type of inefficiency constituted excess costs in the Soviet system. When the Soviet system collapsed, the first type of inefficiency was eliminated (in principle), but the second remained and was carried forward into post-Soviet Russia. This is yet again an example of the "iceberg below the surface" in the Russian economy, a phenomenon that has huge significance but is typically ignored.
17. Here we need to draw attention to the complexity of this calculation. It would be wrong to to say that oil and gas rents were *equal* to 11 percent of Soviet GDP. Consider this counterfactual. Suppose the Soviet Union had exported all of its oil and gas production at world market prices. Soviet GDP would have been higher than it actually was. This is the essence of the inefficiency of resource use. Our rent concept, as we have pointed out, is an opportunity cost measure—what the rents could have been. But Soviet GDP is an actual measure, and due to its inefficiencies the economy operates well inside its production frontier.
18. Figure 13.2 also provides a different lens through which to view recent Russian history. Rather than see the decade of 2000–2010 as a recovery from the 1998 financial crisis, one sees the years since 2000 as a recovery from the rent crisis that began in 1981.
19. Also, drawing such tidy lines of distinction between categories does not imply that one could as easily make the empirical assignment. For instance, when the oil company provides a high-paying front-office job to the daughter of the region's deputy governor in charge of the security services, is that excess cost of production or part of the informal tax?
20. They note: "Most transactions aimed at diverting corporate value toward controlling shareholders also reduce corporate tax liabilities. Similarly, many procedures aimed at enforcing a corporate tax liability make it more difficult for controlling shareholders to divert corporate value to their own advantage. More generally, the level of diversion and the amount of taxes paid are determined in a game that involves three parties—the state, insiders, and outside shareholders" (Desai, Dyck, and Zingales 2007, 592).
21. The actual marginal tax rate depends on the world price of oil. For detailed discussion of tax issues see chapter 10 in this volume.
22. This estimate differs, of course, from the companies' estimates of the tax take, because their accounting ignores the effects of regulated prices and price subsidies in calculating

total rent. On the basis of figures presented in Lukoil's Annual Report for 2010 (p. 168), for instance, the government tax share of rent (sales revenues less production costs and depreciation and amortization) for oil and gas operations in Russia in 2008–10 was around 68 percent.

23. Informal profits are a diversion of profits from other claimants: the state, minority shareholders, household and industrial users of oil and gas, suppliers of material inputs and services to oil and gas companies, transportation companies—a list that directly or indirectly includes most of the population. For a fuller discussion of the distinction between formal and informal profits, see Gaddy and Ickes (2002, 69–74).
24. The extent of price subsidies on domestically sold gas was explained by Prime Minister Vladimir Putin as follows: "Foreign sales make it possible to keep gas prices low within the country.... Currently our average gas price is just over 400 euros per 1,000 cubic metres for Europe, whereas the domestic price is several times lower, around 80... And this low domestic price is made possible by Gazprom's high export price." Putin (2012).
25. The OECD figure includes subsidies in the form of both cheap gas from Gazprom and cheap electricity from UES (mainly generated by gas).
26. INDEM Foundation (2005). The total amount of bribes paid in 2004 is estimated at $300 billion (see also chapter 11 in this volume). That figure seems inordinately high. (Russia's GDP in 2004 was around $600 billion.) The high figure might be justifiable, however, if one assumes that it includes multiple counting of funds used for bribery. That is, the bribes received by one agent become the source of bribe money paid by that person to others in a possibly long loot chain.
27. These examples show that informality does not always mean complete nontransparency. Social and charitable spending are informal forms of rent sharing in the sense that the company can choose the recipient of the rents. It often does so in an opaque manner. After the distribution has occurred, however, the company sometimes values publicity about how much was given and to whom. This practice is, of course, not unique to Russia. In the United States, it is referred to as corporate social responsibility.
28. Gurvich (2010) identifies subsidized oil and gas sales as part of the rent and uses the phrase "hidden rent." He does not distinguish excess costs as a category of hidden rent. Markandya and Averchenkova (2001, 290, table 17.7) calculate what they call "potential rent" from Russia's natural resources (oil, gas, coal, and iron ore) for the years 1994–97. The authors explain that they multiply total output of the resources by "the world price for Russian exports, f.o.b. From this is subtracted the cost of production, including transport to the point of export. The remaining amount is the potential rent." The actual rent, in this definition, is what remains from the potential rent after deducting the subsidies to different groups. Note that in our definition, we emphasize that the subsidies are part of the rent.
29. Note also that when the current period claimants divert rent from the future stakeholders by failing to adequately invest in exploration and development, this is not a final allocation. The next period's claimants can do the same and pass this cost on to their future.
30. We use Maddison's (2001, HS3, table 3b) estimates of the output of the Russian Federation for the data prior to 1992.
31. Again we need to address the question of comparing rent and GDP in the Soviet-type economy. Though it is true that the illusory value exagerated Soviet GDP, as we have previously noted, there is a countervailing effect: much of the rent in the Soviet period did not contribute its full value to national income. It is difficult to conclude which of these two effects dominates. Nonetheless it is apparent from figure 13.8 that Russia's rent is far

larger relative to GDP than was the case for the Soviet economy. However, it is important to note that Russia inherited the preponderance of the obligations for the use of the rent, namely, the defense-industrial sector. Russia, which accounted for only about half of the population of the Soviet Union, inherited over 70 percent of its military industry (Gaddy 1996, 18).

32. 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.
33. See Kotkin (2001, 15) for a discussion of the oil windfall and bust and its impact on the demise of the Soviet Union.
34. Note that if maintaining total rent, R, is the goal, excess costs, ε, 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 1980s natural costs were rising due to investment and other mistakes. This did reduce total rents.
35. 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.
36. In other places we have referred to this process as addiction through production. There we use the term addiction in a very specific sense, quite different from the quite casual use of the term in phrases such as the United States is addicted to cheap oil. We are not using the term addiction to refer to any consumption-related dependence. Rather, we use the term addiction to refer to structural changes in the economy that make withdrawal of rents exceptionally costly, and hence, lead to excessive efforts to avoid this. The term addiction is appropriate because such structural changes create characteristics similar to medical notions of addition: tolerance that is an ever increasing demand for the addictive substance; withdrawal, the painful reaction to denial of the substance; and, as a result, willingness to sacrifice for the addiction.This addiction was created by the use of the rents in production. These rents flowed through the economy in a highly opaque way that led to deep structural connections. This is what makes it so costly to respond to a withdrawal of the flow of rents. In a rent-addicted economy, a resource boom filters into the economy through production. Rent addiction intensified over the period of the boom preceding the global crisis. It did not disappear when rents collapsed in late 2008 and early 2009. It remains a major problem for the future of the Russian economy.
37. Every resource-abundant economy has an RMS, but in many economies it will have little complexity—for example, in a bandit-type state the leader may simply appropriate all the rents for personal luxury, à la President Mobutu Sese Seko in Zaire. In any case, the RMS governs the allocation of rents.
38. Consider a pure market economy with the rule of law enforced and private property in oil production. The rents from producing oil will accrue to the owners of the deposits. If the laws are enforced the owners will appropriate all the rents. Thus, the RMS in this case will

be strong, formal and decentralized. Notice that there was no specific organization of the RMS in this case, but nonetheless rules enforce who gets the rents.

39. The concept of dissipation or diversion of rents is related to the notion of theft as in Desai, Dyck, and Zingales (2007). They focus on corporate finance and the control of cash flow. We discuss rents, a much larger category than just profits. In addition to their three agents—the state, insiders, and outsiders—we have a fourth: the head of the RMS (Putin).
40. This is the central irony of the Soviet system. Had there been less ideological and command limitations on looting at a mass scale, rents would have been consumed or saved in Swiss bank accounts—wasted from the view of Soviet production, perhaps, but non–habit forming.
41. Terror was certainly not eliminated, but the frequency of its use was reduced and recurrent purges essentially ceased.
42. Of course, most observers both inside and outside of Russia also failed to recognize the importance of resource rents to the economy and thus overestimated the potential of conventional economic reforms to transform the country.
43. We stress that the Yukos case was exceptional. The popular notion that Putin has pursued a campaign of renationalization of companies and wholesale disappropriation of the oligarchs is wrong.
44. The dominance of resource sectors as the source of wealth for private owners can be seen by studying the list of the richest Russians according to *Forbes* magazine. Of the forty-six Russians with personal wealth of over $2 billion in the 2011 list, all but three made their fortunes in the oil, gas, and mining, metals, and materials sectors. Source: "200 bogateyshikh biznesmenov Rossii 2011," http://www.forbes.ru/rating/100-bogateishih-biznesmenov-rossii/2011, and "The World's Billionaires," http://www.forbes.com/wealth/billionaires/list.
45. The assertion made in this sentence reflects the central problem of political economy in today's Russia, namely, how can privately owned resource companies be compelled to share so much of the rents via the informal schemes described here? We call this enforcement mechanism "Putin's protection racket." See Gaddy and Ickes (2011).
46. This is the solution that was described in Gaddy and Ickes (2002, 119°20) as "the L/T system." That is, it is the "winner-take-all" privatization lottery (the L-distribution) combined with a subsequent heavy tax on the resource sector and redistribution of the tax revenues: "L-distribution + a transparent tax on Gazprom."
47. Acemoglu (2003, 621) explains the PCT as follows: "The Coase theorem maintains that, if property rights are well-defined and there are no transaction costs, economic agents will contract to achieve an efficient outcome, irrespective of who holds the property rights on particular assets. An extension of this reasoning to the political sphere suggests that political and economic transactions create a strong tendency towards policies and institutions that achieve the best outcomes given the varying needs and requirements of societies, irrespective of who, or which social group, has political power. According to this approach, policy and institutional differences are not the major determinant of the differences in economic outcomes, because societies choose, at least approximately, the appropriate policies and institutions for their conditions."
48. One might think that there is an alternative, namely, redistribute oil company shares so that they are held by a large portion of the population, who would have an interest in protecting property rights. But this solution abrogates the property rights of the current owners. Moreover, how can such a redistribution take place if the political power is currently in

the hands of Putin and his oligarch allies? This was precisely the problem that Acemoglu (2003) discussed. The notion that the peasants promise to compensate the landlords after they are disposessed is not dynamically consistent. Once the serfs have the land, they will not make the promised payments. The landlords know this.

49. Given the need to ensure the supply of Russian gas, much investment takes place in alternative routes, such as Nordstream, to circumvent traditional pipelines that can be taken hostage. This results in extra investment for the same quantity of rent produced. It is a costly insurance program to protect against hostage taking by transit countries.
50. See, for example, Cosar, Ickes, Tintelnot (2012), who show how international financial integration can increase Russian welfare in a calibrated two-country model.
51. "US Crude Oil First Purchase Price," availableat http://www.eia.gov/dnav/pet/hist/LeafHandler.ashx?n=PET&s=F000000_ _3&f=A.
52. "IMF Primary Commodity Prices," available at http://www.imf.org/external/np/res/commod/index.asp.
53. Ibid.
54. EIA, "Annual Energy Review," table 6.7, Natural Gas Wellhead, City Gate, and Imports Prices, 1949–2011, available at http://www.eia.gov/totalenergy/data/annual/index.cfm#naturalgas.
55. This observation is highly relevant for the current situation today as well. Today, the center of production is moving further east and north, and transport costs are even more important than before.
56. Adelman (1995, 314) points out that many outside observers assumed 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."
57. Again, 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."

References

Acemoglu, Daren 2003. "Why Not a Political Coase Theorem? Social Conflict, Commitment, and Politics," *Journal of Comparative Economics* 31: 620–652.

Adelman, M. A. 1990. "Mineral Depletion, with Special Reference to Petroleum," *Review of Economics and Statistics* 72(1): 1–10.

Adelman, M. A. 1995. *The Genie out of the Bottle: World Oil since 1970*. Cambridge, MA: MIT Press.

Auty, R. M., and A. H. Gelb. 2001. "Political Economy of Resource-Abundant States." In *Resource Abundance and Economic Development*, ed. R. M. Auty. New York: Oxford University Press, 126–46.

Campbell, Robert W. 1968. *The Economics of Soviet Oil and Gas*. Washington, DC: Resources for the Future.

Cosar, Kerem, Barry W. Ickes, and Felix Tintelnot. 2012. *"Oil Price Volatility and the Gains from Financial Integration,"* CRIFES at the Pennsylvania State University, March.

Desai, Mihir A., Alexander Dyck, and Luigi Zingales. 2007. "Theft and Taxes," *Journal of Financial Economics* 84: 591–623.

Gaddy, Clifford G. 1996. *The Price of the Past: Russia's Struggle with the Legacy of a Militarized Economy*. Washington, DC: Brookings Institution.

Gaddy, Clifford G., and Barry W. Ickes. 2002. *Russia's Virtual Economy*. Washington, DC: Brookings Institution.

——. 2005. "Resource Rents and the Russian Economy," *Eurasian Geography and Economics* 46(8): 559–83.

——. 2011. "Putin's Protection Racket." In *From Soviet Plans to Russian Reality*, ed. Iikka Korhonen and Laura Solanko. Helsinki: WSOYpro Oy.

——. 2013. *Bear Traps on Russia's Road to Modernization*. New York: Routledge.

Grace, John D. 2005. *Russian Oil Supply: Performance and Prospects*. New York: Oxford University Press.

Gregory, Paul R. 1994. *Before Command: An Economic History of Russia from Emancipation to the First Five-Year Plan.* Princeton, NJ: Princeton University Press.

Grossman, Gregory. 1983. "Economics of Virtuous Haste: A View of Soviet Industrialization and Institutions." In *Marxism, Central Planning, and the Soviet Economy: Economic Essays in Honor of Alexander Erlich*, ed. P. Desai. Cambridge, MA: MIT Press, 198–216.

Gurvich, Ye. 2010. "Neftegazovaya renta v Rossiyskoy ekonomike" [Oil and gas rent in the Russian economy]. *Voprosy ekonomiki* 11: 1–32.

Gustafson, Thane. 1989. *Crisis amid Plenty: The Politics of Soviet Energy under Brezhnev and Gorbachev.* Princeton, NJ: Princeton University Press.

——. 2012. *Wheel of Fortune: The Battle for Oil and Power in Russia*. Cambridge, MA: Harvard University Press.

Hotelling, Harold. 1931. "The Economics of Exhaustible Resources." *Journal of Political Economy* 39(2): 137–75.

INDEM Foundation. 2005. "Diagnostics of Corruption in Russia, 2001–2005," available at http://www.indem.ru/en/publicat/corr5720.htm.

Kotkin, Stephen. 2001. *Armaggedon Averted.* New York: Oxford University Press.

Lukoil. 2010. *Annual Report 2010*. Available at http://www.lukoil.com.

Maddison, Angus. 2001. *The World Economy: Historical Statistics.* Paris: OECD Development Centre.

Markandya, Anil, and Alina Averchenkova. 2001. "Reforming a Large Resource-Abundant Transition Economy: Russia." In *Resource Abundance and Economic Development*, edited by R. M. Auty. New York: Oxford University Press, 277–95.

Ministry of Finance of the Russian Federation. 2011. "Osnovnyye napravleniya byudzhetnoy politiki na 2012 god i planovyy period 2013 i 2014 godov" [Basic directions of fiscal policy for 2012 and the 2013 and 2014 planning period], July 8, available at http://www.minfin.ru.

OECD (Organisation for Economic Co-operation Development). 2002. *OECD Economic Survey: Russian Federation 2002*. Paris: OECD.

Ofer, Gur. 1987. "Soviet Economic Growth: 1928–1985," *Journal of Economic Literature* 25(4): 1767–833.

Putin, Vladimir. 2011. Speech on the Energy Machine-Building Sector in the Russian Federation, St. Petersburg, April 8, available at http://archive.premier.gov.ru/eng/events/news/14796/.

——. 2012. Speech to University Students in Tomsk, January 25, available at http://archive.premier.gov.ru/eng/events/news/17866/.

Sagers, Matthew J. 1987. "Oil Production Costs in the USSR." In *PlanEcon Long-Term Energy Outlook.* Washington, DC: PlanEcon, 43–54.

Tarr, David, and Peter Thomson. 2003. *"The Merits of Dual Pricing of Russian Natural Gas,"* World Bank, July 19.