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## The Natural Resource Curse: A Survey

Jeffrey Frankel

It is striking how often countries with oil or other natural resource wealth have failed to show better economic performance than those without. This is the phenomenon known as the “natural resource curse.” The pattern has been borne out in econometric tests across a comprehensive sample of countries. This paper considers seven aspects of commodity wealth, each of which is of interest in its own right but also a channel that some have suggested could lead to substandard economic performance. They are: long-term trends in world commodity prices, volatility, permanent crowding out of manufacturing, weak institutions, unsustainability, war, and cyclical Dutch disease.

Skeptics have questioned the natural resource curse. They point to examples of commodity-exporting countries that have done well and argue that resource exports and booms are not exogenous. Clearly, the relevant policy question for a country with natural resources is how to make the best of them. The paper concludes with a consideration of ideas for institutions that could help a country that is endowed with oil, for example, overcome the pitfalls of the curse and achieve good economic performance. The most promising ideas include indexation of contracts, hedging of export proceeds, denomination of debt in terms of the export commodity, Chile-style fiscal rules, a monetary target that emphasizes product prices, transparent commodity funds, and lump-sum distribution.

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### The Resource Curse: An Introduction

It has been observed for decades that the possession of oil or other valuable mineral deposits or natural resources does not necessarily confer economic success. Many African countries—such as Angola, Nigeria, Sudan, and the Congo—are rich in oil, diamonds, or minerals, yet their peoples continue to experience low per capita income and a low quality of life. Meanwhile, the East Asian economies of Japan, Korea, Taiwan, Singapore, and Hong Kong have achieved Western-level standards of living despite being rocky islands (or peninsulas) with virtually no exportable natural resources. Richard Auty is apparently the one who coined the phrase “natural resource curse” to describe this puzzling phenomenon.<sup>1</sup> Its use spread rapidly.<sup>2</sup>

Figure 1.1 shows a sample of countries during the last four decades. Exports of fuels, ores, and metals as a fraction of total merchandise exports appear on the horizontal axis, and economic growth is on the vertical axis. Conspicuously high in growth and low in natural resources are China (CHN), Korea (KOR), and some other Asian countries. Conspicuously high in natural resources and low in growth are Gabon (GAB), Venezuela (VEN), and Zambia (ZMB). The overall relationship on average is slightly negative. The negative correlation is not very strong, masking almost as many resource successes as failures. But it certainly does not suggest a positive correlation between natural resource wealth and economic growth.

How could abundance of hydrocarbon deposits—or other mineral or agricultural products—be a curse? What would be the mechanism for this counterintuitive relationship? Broadly speaking, there are at least seven lines of argument. First, prices of such commodities could be subject to secular decline on world markets. Second, the high volatility of world prices for energy and other mineral and agricultural commodities could be problematic. Third, natural resources could be dead-end sectors in the sense that they may crowd out manufacturing, which might be the sector to offer dynamic benefits and spillovers that are good for growth. (It does not sound implausible that “industrialization” could be the essence of economic development.) Fourth, countries in which physical command of mineral deposits by the government or a hereditary elite automatically confers wealth on the holders may be less likely to develop the institutions, such as rule of law and decentralization of decision making, that are conducive to economic development. These resource-rich countries suffer in contrast to countries in which moderate taxation of a thriving market economy is the only way the government can finance itself.

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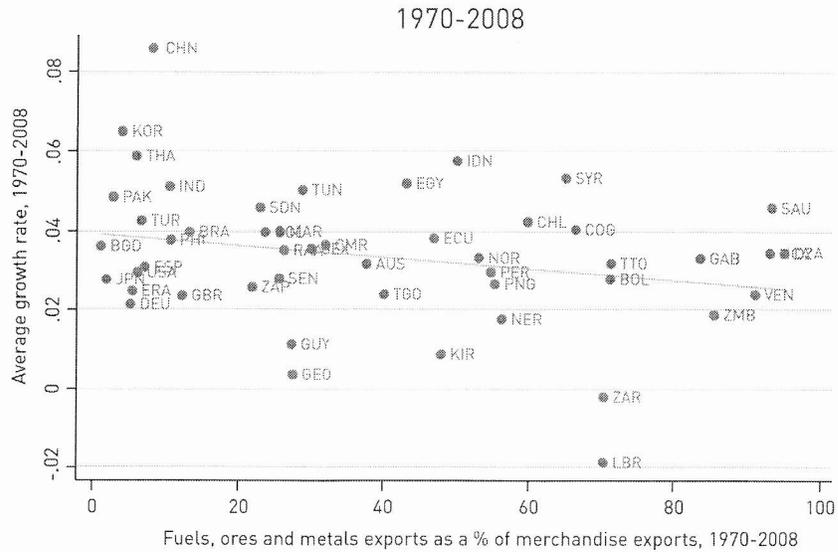


Figure 1.1 Statistical relationship between mineral exports and growth. World Development Indicators, World Bank.

Fifth, natural resources may be depleted too rapidly and leave the country with little to show for them, especially when it is difficult to impose private property rights on the resources, as under frontier conditions. Sixth, countries that are endowed with natural resources could have a proclivity for armed conflict, which is inimical to economic growth. Seventh, swings in commodity prices could engender excessive macroeconomic instability via the real exchange rate and government spending. This chapter considers each of these topics.

The conclusion will be that natural resource wealth does not necessarily lead to inferior economic or political development. Rather, it is best to view commodity abundance as a double-edged sword, with both benefits and dangers. It can be used for ill as easily as for good.<sup>3</sup> The fact that resource wealth does not in itself confer good economic performance is a striking enough phenomenon without exaggerating the negative effects. The priority for any country should be on identifying ways to sidestep the pitfalls that have afflicted other commodity producers in the past and to find the path of success. The last section of this chapter explores some of the institutional innovations that can help countries avoid the natural resource curse and achieve natural resource blessings instead.

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## Long-Term Trends in World Commodity Prices

### Determination of the Export Price on World Markets

Developing countries tend to be smaller economically than major industrialized countries and more likely to specialize in the export of basic commodities, such as oil. As a result, they are more likely to fit the small open economy model: they can be regarded as price takers, not just for their import goods, but for their export goods as well. That is, the prices of their tradable goods are generally taken as given on world markets. The price-taking assumption requires three conditions: low monopoly power, low trade barriers, and intrinsic perfect substitutability in the commodity between domestic and foreign producers—a condition usually met by primary products such as oil, and usually not met by manufactured goods and services. Literally speaking, not every barrel of oil is the same as every other and not all are traded in competitive markets. Furthermore, Saudi Arabia does not satisfy the first condition due to its large size in world oil markets.<sup>4</sup> But the assumption that most oil producers are price takers holds relatively well.

To a first approximation, then, the local price of oil is equal to the dollar price of oil on world markets times the country's exchange rate. It follows, for example, that a currency devaluation should push up the price of oil quickly and in proportion (leaving aside preexisting contracts or export restrictions). An upward revaluation of the currency should push down the price of oil in proportion.

Throughout this chapter, we will assume that the domestic country must take the price of the export commodity as given, in terms of foreign currency. We begin by considering the hypothesis that the given world price entails a long-term secular decline. The subsequent section of the paper considers the volatility in the given world price.

#### *The Hypothesis of a Downward Trend in Commodity Prices (Prebisch-Singer)*

The hypothesis that the prices of mineral and agricultural products follow a downward trajectory in the long run, relative to the prices of manufactures and other products, is associated with Raul Prebisch and Hans Singer and

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what used to be called the “structuralist school.”<sup>5</sup> The theoretical reasoning was that world demand for primary products is inelastic with respect to world income. That is, for every 1 percent increase in income, the demand for raw materials increases by less than 1 percent. Engel’s Law is the (older) proposition that households spend a lower fraction of their income on food and other basic necessities as they get richer.

The Prebisch-Singer hypothesis, if true, would readily support the conclusion that specializing in natural resources is a bad deal. Mere “hewers of wood and drawers of water” (Deuteronomy 29:11) would remain forever poor if they did not industrialize. The policy implication that was drawn by Prebisch and the structuralists was that developing countries should discourage international trade with tariff and nontariff barriers to allow their domestic manufacturing sector to develop behind protective walls, rather than exploit their traditional comparative advantage in natural resources, as the classic theories of free trade would have it. This “import substitution industrialization” policy was adopted in most of Latin America and much of the rest of the developing world in the 1950s, 1960s, and 1970s. The trend reversed in subsequent decades, however.

#### Hypotheses of Upward Trends in Nonrenewable Resource Prices (Malthus and Hotelling)

There also exist persuasive theoretical arguments that we should expect prices of oil and other minerals to experience *upward* trends in the long run. The arguments begin with the assumption that we are talking about nonperishable, nonrenewable resources, that is, deposits in the earth’s crust that are fixed in total supply and are gradually being depleted. (The argument does not apply as well to agricultural products.)

Let us add another assumption: whoever currently has claim to the resource, an oil company, for instance, can be confident that it will retain possession unless it sells to someone else, who then has equally safe property rights. This assumption excludes cases in which private oil companies fear that their contracts might be abrogated or their possessions nationalized.<sup>6</sup> It also excludes cases in which warlords compete over physical possession of the resource. Under such exceptions, the current owner has a strong incentive to pump the oil or extract the minerals quickly, because it might never

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benefit from whatever is left in the ground. One explanation for the sharp rise in oil prices between 1973 and 1979, for example, is that private Western oil companies had anticipated the possibility that newly assertive developing countries would eventually nationalize the oil reserves within their borders and thus had kept prices lower by pumping oil more quickly during the preceding two decades than they would have done had they been confident that their claims would remain valid indefinitely.

#### HOTELLING AND THE INTEREST RATE

At the risk of some oversimplification, let us assume for now also that the fixed deposits of oil in the earth's crust are all sufficiently accessible and that the costs of exploration, development, and pumping are small compared to the value of the oil. Harold Hotelling deduced from these assumptions the important theoretical principle that the price of oil in the long run should rise at a rate equal to the interest rate.<sup>7</sup>

The logic is as follows: At every point in time, an owner of the oil—whether a private oil company or a state—chooses how much to pump and how much to leave in the ground. Whatever is pumped can be sold at today's price (this is the price-taker assumption) and the proceeds invested in bank deposits or U.S. Treasury bills, which earn the current interest rate. If the value of the oil in the ground is not expected to increase in the future or not expected to increase at a sufficiently rapid rate, then the owner has an incentive to extract more of it today so that it can earn interest on the proceeds. As oil companies worldwide react in this way, they drive down the price of oil today, below its perceived long-run level. When the current price is below its perceived long-run level, companies will expect that the price must *rise* in the future. Only when the expectation of future appreciation is sufficient to offset the interest rate will the oil market be in equilibrium. That is, only then will oil companies be close to indifferent between pumping at a faster rate and a slower rate.

To say that oil prices are *expected* to increase at the interest rate means that they should do so on average; it does not mean that there will not be price fluctuations above and below the trend. But the theory does imply that, averaging out short-term unexpected fluctuations, oil prices in the long term should rise at the interest rate.

If there are constant costs of extraction and storage, then the trend in oil prices will be lower than the interest rate, by the amount of those costs; if

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there is a constant convenience yield from holding inventories, then the trend in prices will be higher than the interest rate, by the amount of the yield.<sup>8</sup>

#### MALTHUSIANISM AND THE “PEAK OIL” HYPOTHESIS

The idea that natural resources are in fixed supply and that as a result their prices must rise in the long run as reserves begin to run low is much older than Hotelling. It goes back to Thomas Malthus and the genesis of fears of environmental scarcity (albeit without interest rates necessarily playing a role).<sup>9</sup> Demand grows with population, and supply is fixed; what could be clearer in economics than the prediction that price will rise?<sup>10</sup>

The complication is that supply is not fixed. True, at any point in time there is a certain stock of oil reserves that have been discovered. But the historical pattern has long been that as the stock is depleted, new reserves are found. When the price goes up, it makes exploration and development profitable for deposits that are farther underground, underwater, or in other hard-to-reach locations. This is especially true as new technologies are developed for exploration and extraction.

During the two centuries since Malthus, or the seventy years since Hotelling, exploration and new technologies have increased the supply of oil and other natural resources at a pace that has roughly counteracted the increase in demand from growth in population and incomes.<sup>11</sup>

Just because supply has always increased in the past does not necessarily mean that it will always do so in the future. In 1956, oil engineer Marion King Hubbert predicted that the flow supply of oil within the United States would peak in the late 1960s and then start to decline permanently. The prediction was based on a model in which the fraction of the country’s reserves that has been discovered rises through time, and data on the rates of discovery versus consumption are used to estimate the parameters in the model. Unlike myriad other pessimistic forecasts, this one came true on schedule and earned subsequent fame for its author.

The planet Earth is a much larger place than the United States, but it too is finite. A number of analysts have extrapolated Hubbert’s words and modeling approach to claim that the same pattern will follow for extraction of the *world’s* oil reserves. Specifically, some of them claim the 2000 to 2011 run-up in oil prices confirmed a predicted global “Hubbert’s Peak.”<sup>12</sup> It remains to be seen whether we are currently witnessing a peak in world oil

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production, notwithstanding that forecasts of such peaks have proven erroneous in the past.

### Evidence

#### STATISTICAL TIME SERIES STUDIES

With strong theoretical arguments on both sides, one must say that the question whether the long-term trend in commodity prices is upward or downward is an empirical one. Although specifics will vary depending on individual measures, it is possible to generalize somewhat across commodity prices.<sup>13</sup> Terms of trade for commodity producers had a slight upward trend from 1870 to World War I, a downward trend in the interwar period, an upward trend in the 1970s, a downward trend in the 1980s and 1990s, and an upward trend in the first decade of the twenty-first century.

What is the overall statistical trend in the long run? Some authors find a slight upward trend, some a slight downward trend.<sup>14</sup> The answer seems to depend, more than anything else, on the end date of the sample. Studies written after the commodity price increases of the 1970s found an upward trend, but those written after the 1980s found a downward trend, even when both kinds of studies went back to the early twentieth century. No doubt, when studies using data through 2010 are completed, some will again find a positive long-run trend. This phenomenon is less surprising than it sounds. When a real price undergoes large twenty-year cycles around a trend,<sup>15</sup> estimates of the long-term trend are very sensitive to the precise time period studied.<sup>16</sup>

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#### THE WAGER OF PAUL EHRLICH AND JULIAN SIMON

Paul Ehrlich is a biologist who is highly respected among scientists but has a history of sensationalist doomsday predictions regarding population, the environment, and resource scarcity. Julian Simon was a libertarian economist frustrated by the failure of the public to hold Malthusians such as Ehrlich accountable for the poor track record of their predictions. In 1980, Simon publicly bet Ehrlich \$1,000 that the prices of five minerals would decline between then and 1990. (Simon let Ehrlich choose the ten-year span and the list of minerals: copper, tin, nickel, chromium, and tungsten.)

Ehrlich's logic was Malthusian: because supplies were fixed while growth of populations and economies would raise demand, the resulting scarcity would continue to drive up prices. He, like most observers, was undoubt-

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edly mentally extrapolating into the indefinite future what had been a strong upward movement in commodity prices during the preceding decade.

Simon's logic, on the other hand, is called cornucopian. Yes, the future would repeat the past. The relevant pattern from the past was not the ten-year trend, however, but rather a century of cycles: resource scarcity does indeed drive up prices, whereupon supply, demand, and (especially) technology respond with a lag, which drives the prices back down. Simon was precisely right. He won the bet handily. Not only did the real price of the basket of five minerals decline over the subsequent ten years, but also every one of the five real prices declined. Simon was also, almost certainly, right about the reasons: in response to the high prices of 1980, new technologies came into use, buyers economized, and new producers entered the market.

The Ehrlic-versus-Simon bet carries fascinating implications, for Malthusians versus cornucopians, environmentalists versus economists, extrapolationists versus contrarians, and futurologists versus historians. For present purposes, the main important point is slightly more limited. Simple extrapolation of medium-term trends is foolish. One must take a longer-term perspective. The review of the statistical literature in the preceding subsection illustrated the importance of examining as long a statistical time series as possible.

However, one should seek to avoid falling prey to *either* of two reductionist arguments at the philosophical poles of Malthusianism and cornucopianism. On one hand, the fact that the supply of minerals in the earth's crust is finite does not in itself justify the apocalyptic conclusion that we must necessarily run out. As Sheik Ahmed Zaki Yamani, the former Saudi oil minister, famously said, "The Stone Age came to an end not for a lack of stones, and the oil age will end, but not for a lack of oil." Malthusians do not pay enough attention to the tendency for technological progress to ride to the rescue. On the other hand, the fact that the Malthusian forecast has repeatedly been proven false in the past does not in itself imply the Panglossian forecast that this will always happen in the future. Rather, one must seek a broad perspective in which all relevant reasoning and evidence are brought to bear in the balance.

### Medium-Term Volatility of Commodity Prices

Of course, the price of oil does not follow a smooth path, whether upward or downward. Rather, it experiences large short- and medium-term swings

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around a longer-term average. The world market prices for oil and natural gas are more volatile than those for almost any other mineral and agricultural commodities. (Copper and coffee are two major runners-up.) Most other mineral and agricultural commodity prices are also far more volatile than prices of most manufactured products or services.

Some have suggested that it is precisely the volatility of natural resource prices, rather than their long-term trends, that is bad for economic growth.<sup>17</sup>

#### Low Short-Run Elasticities

It is not hard to understand why the market price of oil is volatile in the short run or even the medium run. Because elasticities of supply and demand with respect to price are low, relatively small fluctuations in demand (due to weather, for example) or in supply (due to disruptions, for example) require a large change in price to re-equilibrate supply and demand. Demand elasticities are low in the short run largely because the capital stock at any point in time is designed physically to operate with a particular ratio of energy to output. Supply elasticities are also often low in the short run because it takes time to adjust output. Inventories can cushion the short-run impact of fluctuations, but they are limited in size. Some scope exists to substitute across different fuels, even in the short run. But this just means that the prices of oil, natural gas, and other fuels tend to experience their big medium-term swings together.

In the longer run, elasticities are far higher, both on the demand side and the supply side. This dynamic was clearly at work in the oil price shocks of the 1970s—the quadrupling of prices after the Arab oil embargo of 1973 and the doubling of prices after the Iranian revolution of 1979—which elicited relatively little consumer conservation or new supply sources in the short run but a lot of both after a few years had passed. People started insulating their houses and driving more fuel-efficient cars, and oil deposits were discovered and developed in new countries. This is a major reason why the real price of oil came back down in the 1980s and 1990s.

In the medium term, oil may be subject to a “cobweb cycle” due to the lags in response. Under this scenario, if the initial market equilibrium is a high price, the high price reduces demand after some years, which in turn leads to a new low price, which raises demand with a lag, which pushes the price back up again, and so on. In theory, if people have rational expectations, they should

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look ahead to the next price cycle before making long-term investments in housing or drilling. But the complete sequence of boom-bust-boom during the past thirty-five years looks suspiciously like a cobweb cycle nonetheless.

Is Volatility per se Detrimental to Economic Performance?

Gamblers aside, most people would rather have less economic volatility than more. But is variability necessarily harmful for long-run growth? Some studies and historical examples suggest that high volatility can accompany the rapid growth phase of a country's development (the United States before World War I).

Cyclical shifts of movable resources (labor and land) back and forth across sectors—mineral, agricultural, manufacturing, and services—may incur needless transaction costs. Frictional unemployment of labor, incomplete utilization of the capital stock, and incomplete occupancy of housing are true deadweight costs, even if they are temporary. Government policy-makers may not be better than individual economic agents at discerning whether a boom in the price for an export commodity is temporary or permanent. But the government cannot completely ignore the issue of volatility with the logic that the private market can deal with it. When it comes to exchange rate policy or fiscal policy, governments must necessarily make judgments about the likely permanence of shocks. Moreover, because commodities are inherently risky, a diversified country may indeed be better off than one that specializes in oil or a few other commodities, all other things being equal. However, the private sector dislikes risk as much as the government does and will take steps to mitigate it; thus, one must think where the market failure lies before assuming that a policy of deliberate diversification is necessarily justified.

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Later parts of this chapter will consider the implications of the medium-term boom-bust cycle further, under the heading "Dutch Disease and Procyclicality" and will consider how to deal with short-term volatility further, under the heading "Institutions and Policies to Address the Natural Resource Curse."

**More Possible Channels for the Natural Resource Curse**

The natural resource curse is not confined to individual anecdotes or case studies but has been borne out in some statistical tests of the determinants

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of economic performance across a comprehensive sample of countries. Jeffrey Sachs and Andrew Warner (1995) kicked off the econometric literature and found that economic dependence on oil and minerals is correlated with slow economic growth, controlling for other structural attributes of the country. Sachs and Warner (2001) then summarized and extended previous research to show evidence that countries with great natural resource wealth tend to grow more slowly than resource-poor countries.<sup>18</sup> They say their result is not easily explained by other variables or by alternative ways to measure resource abundance. Their paper claims that there is little direct evidence that omitted geographical or climate variables explain the curse or that there is a bias in their estimates resulting from some other unobserved growth deterrent. Many other studies find a negative effect of oil in particular on economic performance.<sup>19</sup>

The result is by no means universal, especially when one generalizes beyond oil. Norway is conspicuous as an oil producer that is at the top of the international league tables for governance and economic performance.<sup>20</sup> As many have pointed out, Botswana and the Congo are both abundant in diamonds, yet Botswana is the best performer in continental Africa in terms of democracy, stability, and rapid growth of income<sup>21</sup> while the Congo is among the very worst.<sup>22</sup>

Among the statistical studies, Jacques Delacroix, Graham Davis, and Michael Herb all find no evidence of the natural resource curse.<sup>23</sup> Most recently, Michael Alexeev and Robert Conrad find that oil wealth and mineral wealth have *positive* effects on income per capita when controlling for a number of variables, particularly dummy variables for East Asia and Latin America.<sup>24</sup> In some cases, especially if the data do not go back to a time before oil was discovered, the reason different studies come to different results is that oil wealth may raise the *level* of per capita income while reducing or failing to raise the *growth rate* of income (or the end-of-sample level of income, if the equation conditions on initial income).<sup>25</sup>

In some cases, the crucial difference is whether “natural resource intensity” is measured by true endowments (“natural resource wealth”) or by exports (“natural resource dependence”). The skeptics argue, in several different ways, that commodity exports are highly endogenous.<sup>26</sup>

On one hand, basic trade theory readily predicts that a country may show a high mineral share in exports, not necessarily because it has a higher endowment of minerals than other countries (*absolute* advantage) but because

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it does not have the ability to export manufactures (*comparative advantage*). This is important because it offers an explanation for negative statistical correlations between mineral exports and economic development, an explanation that would invalidate the common inference that minerals cause low growth.

On the other hand, the skeptics also have plenty of examples in which successful institutions and industrialization went hand in hand with rapid development of mineral resources. Economic historians have long noted that coal deposits and access to iron ore deposits (two key inputs into steel production) were geographic blessings that helped start the industrial revolutions in England, the vicinity of the lower Rhine, and the American Great Lakes region. Subsequent cases of countries that were able to develop their resource endowments efficiently as part of strong economy-wide growth include: the United States during its prewar industrialization period,<sup>27</sup> Venezuela from the 1920s to the 1970s, Australia since the 1960s, Norway since its oil discoveries of 1969, Chile since its adoption of a new mining code in 1983, Peru since its privatization program in 1992, and Brazil since it lifted restrictions on foreign mining participation in 1995.<sup>28</sup> Examples of countries that were equally well endowed geologically but failed to develop their natural resources efficiently include Chile and Australia before World War I and Venezuela since the 1980s.<sup>29</sup>

It is not that countries with oil wealth will necessarily achieve worse performance than those without. Few would advise a country with oil or other natural resources that it would be better off destroying them or refraining from developing them. Oil-rich countries can succeed. The question is how to make best use of the resource. The goal is to achieve the prosperous record of a Norway rather than the disappointments of a Nigeria. The same point applies to other precious minerals: the goal is to be a Botswana rather than a Bolivia, a Chile rather than a Congo.

Let us return to a consideration of various channels whereby oil wealth could lead to poor performance. Based on the statistical evidence, we have already largely rejected the hypothesis of a long-term negative trend in world prices while accepting the hypothesis of high volatility. But we have yet to spell out exactly how high price volatility might lead to slower economic growth. In addition, we have yet to consider the hypotheses according to which oil wealth leads to weak institutions—including in countries experiencing

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military conflict and authoritarianism—that might in turn lead to poor economic performance.

#### Is Commodity Specialization per se Detrimental to Growth?

What are the possible negative externalities to specialization in natural resources, beyond volatility? What are the positive externalities to diversification into manufacturing?

Outside of classical economics, diversification out of primary commodities into manufacturing in most circles is considered self-evidently desirable. Several false arguments have been made for it. One is the Prebisch-Singer hypothesis of secularly declining commodity prices, which we judged to lack merit in Part I of this chapter. Another is the mistaken “cargo cult” inference that is based on the observation that advanced countries have heavy industries such as steel mills and concludes that these visible monuments must therefore be the route to economic development. But one should not dismiss more valid considerations just because less valid arguments for diversification into manufacturing are sometimes made.

Is industrialization the *sine qua non* of economic development? Is encouragement of manufacturing necessary to achieve high income? Classical economic theory says no; it is best for countries to produce whatever is their comparative advantage, whether that is natural resources or manufacturing. In this nineteenth-century view, attempts by Brazil to industrialize were as foolish as it would have been for Great Britain to try to grow coffee and oranges in hothouses. But the “structuralists” mentioned early in this chapter were never alone in their feeling that countries only get sustainably rich if they industrialize (oil-rich sheikdoms notwithstanding). Nor were they ever alone in feeling that industrialization in turn requires an extra push from the government at least for latecomers, often known as industrial policy.

Kiminori Matsuyama provided an influential model formalizing this intuition: the manufacturing sector is assumed to be characterized by “learning by doing,” yet the primary sector (agriculture, in his paper) is not.<sup>30</sup> This is the channel through which the resource curse works in Sachs and Warner (1995). The implication is that deliberate policy-induced diversification out of primary products into manufacturing is justified and that a permanent commodity boom that crowds out manufacturing can indeed be harmful.<sup>31</sup>

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On the other side, it must be pointed out that there is no reason why “learning by doing” should be the exclusive preserve of manufacturing tradeables. Nontradeables can enjoy learning by doing.<sup>32</sup> Mineral and agricultural sectors can as well. Some countries have experienced tremendous productivity growth in the oil, mineral, and agricultural sectors. Since the late nineteenth century, American productivity gains have been aided by American public investment in such institutions of knowledge infrastructure as the U.S. Geological Survey, the Columbia School of Mines, the Agricultural Extension program, and land grant colleges. Although well-functioning governments can play a useful role in supplying these public goods for the natural resource sector, this is different than mandating government ownership of the resources themselves. In Latin America, for example, public monopoly ownership and prohibition on importing foreign expertise or capital has often stunted development of the mineral sector, whereas privatization has set it free.<sup>33</sup> Moreover, attempts by governments to force linkages between the mineral sector and processing industries have not always worked.<sup>34</sup>

### Institutions

#### INSTITUTIONS AND DEVELOPMENT

A prominent trend in thinking regarding economic development is that the quality of institutions is the deep fundamental factor that determines which countries experience good performance and which do not<sup>35</sup> and that it is futile to recommend good macroeconomic or microeconomic policies if the institutional structure is not there to support them. Dani Rodrik, Arvind Subramanian, and Francesco Trebbi use as their measure of institutional quality an indicator of the rule of law and protection of property rights (taken from Daniel Kaufmann, Aart Kraay, and Pablo Zoido-Lobaton).<sup>36</sup> Daron Acemoglu, Simon Johnson, and James Robinson use a measure of expropriation risk to investors.<sup>37</sup> Acemoglu, Johnson, Robinson, and Yonyong Thaicharoen measure the quality of a country’s “cluster of institutions” by the extent of constraints on the executive.<sup>38</sup> The theory is that weak institutions lead to inequality, intermittent dictatorship, and lack of constraints to prevent elites and politicians from plundering the country.

Institutions can be endogenous—the *result* of economic growth rather than the cause. (The same problem is encountered with other proposed

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fundamental determinants of growth, such as openness to trade and freedom from tropical diseases.) Many institutions, such as the structure of financial markets, mechanisms of income redistribution, social safety nets, tax systems, and intellectual property rules, tend to evolve *endogenously* in response to the level of income.

Econometricians address the problem of endogeneity by means of the technique of instrumental variables. What is a good instrumental variable for institutions, an exogenous determinant? Acemoglu, Johnson, and Robinson introduced the mortality rates of colonial settlers.<sup>39</sup> The theory is that out of all the lands that Europeans colonized, only those where Europeans actually settled were given good European institutions. These scholars chose their instrument on the reasoning that initial settler mortality rates determined whether Europeans subsequently settled in large numbers.<sup>40</sup> One can help justify this otherwise idiosyncratic-sounding instrumental variable by pointing out that there need not be a strong correlation between the diseases that killed settlers and the diseases that afflict natives, and that both are independent of the countries' geographic suitability for trade. The conclusion of Rodrik's study is that institutions trump everything else; the effects of both tropical geography and trade dim in the blinding light of institutions.

This is essentially the same result found by Acemoglu, Johnson, and Robinson; William Easterly and Ross Levine; and Robert Hall and Chad Jones: institutions drive out the effect of policies, and geography matters primarily as a determinant of institutions.<sup>41</sup> Clearly, institutions are important, whether the effect is merely one of several important deep factors or whether, as these papers seem to claim, it is the only important deep factor. #

#### OIL, INSTITUTIONS, AND GOVERNANCE

Of the various possible channels through which natural resources could be a curse to long-run development, the quality of institutions and governance is perhaps the most widely hypothesized. Roland Hodler and Francesco Caselli are among those finding a natural resource curse via internal struggle for ownership.<sup>42</sup> Carlos Leite and Jens Weidmann find that natural resource dependence has a substantial statistical effect on measures of corruption in particular.<sup>43</sup> Elissaios Papyrakis and Rever Gerlach estimate effects via corruption but also via investment and other channels.<sup>44</sup> Others find a negative effect via inequality.<sup>45</sup> Gylfason reviews a number of possible channels that could explain natural resource dependence, as measured by labor allocation, that leads to worse average performance.<sup>46</sup>

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It is not necessarily obvious, a priori, that endowments of oil should lead to inequality or authoritarianism or bad institutions generally. Macartan Humphreys, Jeffrey Sachs, and Joseph Stiglitz point out that a government wishing to reduce inequality should in theory have an easier time of it in a country where much wealth comes from a nonrenewable resource in fixed supply because taxing it runs less risk of eliciting a fall in output.<sup>47</sup> This is in comparison to the more elastic supplies of manufactures and other goods or services, including agricultural goods, produced with a higher labor component. But the usual interpretation is that most governments in resource-rich countries have historically not been interested in promoting equality.

The “rent cycling theory” as enunciated by Richard Auty holds that economic growth requires recycling rents via markets rather than via patronage.<sup>48</sup> In high-rent countries, the natural resource elicits a political contest to capture ownership, but in low-rent countries the government must motivate people to create wealth, for example, by pursuing comparative advantage, promoting equality, and fostering civil society.

This theory is related to the explanation that economic historians Stanley Engerman and Kenneth Sokoloff make as to why industrialization first took place in North America and not Latin America (and in the U.S. Northeast rather than the South).<sup>49</sup> Lands endowed with extractive industries and plantation crops (mining, sugar, and cotton) developed institutions of slavery, inequality, dictatorship, and state control, whereas those climates suited to fishing and small farms (fruits, vegetables, grain, and livestock) developed institutions based on individualism, democracy, egalitarianism, and capitalism. When the industrial revolution came along, the latter areas were well suited to make the most of it. Those that had specialized in extractive industries were not because society had come to depend on class structure and authoritarianism rather than on individual incentive and decentralized decision making. The theory is thought to fit Middle Eastern oil exporters especially well.<sup>50</sup>

Jonathan Isham and his coauthors find that the commodities that are damaging to institutional development, which they call “point-source” resources, are: oil, minerals, plantation crops, coffee, and cocoa (versus the same small-scale farm products identified by Engerman and Sokoloff).<sup>51</sup> Other authors find that the point-source resources which undermine institutional quality and thereby growth include oil and some particular minerals, but not agricultural resources.<sup>52</sup> Halvor Mehlum, Karl Moene, and Ragnar Torvik observe the distinction by designating them “lootable” resources.<sup>53</sup> Rabah Arezki and Markus Brückner find that oil rents worsen corruption.<sup>54</sup>

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Some have questioned the assumption that oil discoveries are exogenous and institutions endogenous. In other words, they posit that oil wealth is not necessarily the cause and institutions the effect; rather, it is the other way around. Catherine Norman points out that the discovery and development of oil is not purely exogenous but rather is endogenous with respect to, among other things, the efficiency of the economy.<sup>55</sup> But many authors have argued that the important question is whether the country already has good institutions at the time that oil is discovered, in which case it is more likely to be put to use for the national welfare instead of the welfare of an elite.<sup>56</sup> Alexeev and Conrad find no evidence that oil or mineral wealth interacts positively with institutional quality.<sup>57</sup> But Rabah Arezki and Frederick Van der Ploeg use instrumental variables to control for the endogeneity of institutional quality and trade; they confirm that the adverse effect of natural resources on growth is associated with exogenously weak institutions and, especially, that it is associated with exogenously low levels of trade.<sup>58</sup> Pauline Jones Luong and Erika Weinthal, in a study of five former Soviet republics that have oil and similar initial conditions, conclude that the choice of ownership structure makes the difference as to whether oil turns out to be a blessing rather than a curse.<sup>59</sup>

#### Unsustainability and Anarchy

Two hundred years ago, much of the island of Nauru in the South Pacific consisted of phosphate deposits derived from guano. The substance is valuable in the fertilizer industry. As a result of highly profitable phosphate exports, Nauru in the late 1960s and early 1970s showed up globally with the highest income per capita of any country. Eventually, however, the deposits gave out. Not enough of the proceeds had been saved, let alone well invested, during the period of abundance. Today, the money is gone, and so is the tropical paradise: the residents are left with little more than an environmentally precarious rim of land circling a wasteland where the phosphates used to be.

What happens when a depletable natural resources is indeed depleted? This question is not only of concern to environmentalists. It is also one motivation for the strategy of diversifying the economy beyond natural resources into other sectors. The question is also a motivation for the “Hartwick Rule,” which says that all rents from exhaustible natural resources should be

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invested in reproducible capital so that future generations do not suffer a diminution in total wealth (natural resource plus reproducible capital) and therefore in the flow of consumption.<sup>60</sup>

Sometimes, as in the Nauru example, it is the government that has control of the natural resource, and excessive depletion is another instance of a failure in governance. Robinson, Torvik, and Verdier (2006) show that politicians tend to extract at a rate in excess of the efficient path because they discount the future too much. They discount the future because they are more intent on surviving the next election or coup attempt.

Privatization would be a possible answer to the problem of excessive depletion, if a full assignment of property rights were possible, thereby giving the private sector owners adequate incentive to conserve the resource in question. But often this is not possible, either physically or politically. The difficulty in enforcing property rights over some nonrenewable resources creates a category of natural resource curse of its own.

#### UNENFORCEABLE PROPERTY RIGHTS OVER DEPLETABLE RESOURCES

Although one theory holds that the physical possession of point-source mineral wealth undermines the motivation for the government to establish a broad-based regime of property rights for the rest of the economy, another theory holds that some natural resources do not lend themselves to property rights whether the government wants to apply them or not. Overfishing, overgrazing, and overuse of water are classic examples of the so-called “tragedy of the commons” that applies to “open access” resources. Individual fishermen, ranchers, or farmers have no incentive to restrain themselves, even while the fisheries, pastureland, or water aquifers are being collectively depleted. The difficulty in imposing property rights is particularly severe when the resource is dispersed over a wide area, such as timberland. But even the classic point-source resource, oil, can suffer from this problem, especially when wells drilled from different plots of land hit the same underground deposit.

This unenforceability of property rights is the market failure that can invalidate some of the standard neoclassical economic theorems in the case of open access resources. One obvious implication of unenforceability is that the resource will be depleted more rapidly than the optimization of the Hotelling calculation calls for.<sup>61</sup> The benefits of free trade are another possible casualty: the country might be better off without the ability to export the resource, if doing so exacerbates the excess rate of exploitation.<sup>62</sup>

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Common pool resources are (i) subtractable (as are private goods). At the same time, (ii) it is costly to exclude users from consuming them (as with public goods). Yet (iii) it is not impossible to exclude users from them.<sup>63</sup> Elinor Ostrom investigates ways that societies have dealt with water systems and other such common pool resources, institutions that lie between pure individual property rights and government management.<sup>64</sup>

Enforcement of property rights is all the more difficult in a frontier situation. The phrase “Wild West” captures the American experience, including legendary claim-jumping in the gold or silver rushes of the late nineteenth and early twentieth centuries. Typically, only when a large enough number of incumbents have enough value at stake are the transactions costs of establishing a system of property rights overcome.<sup>65</sup> Frontier rushes went on in many other parts of the world during this period as well.<sup>66</sup> Today, anarchic conditions can apply in the tropical forest frontiers of the Amazon Basin, Borneo, or the Congo.<sup>67</sup> Edward Barbier argues that frontier exploitation of natural resources can lead to unsustainable development characterized by a boom-bust cycle as well as permanently lower levels of income in the long term.<sup>68</sup>

#### DO MINERAL RICHES LEAD TO WARS?

Domestic conflict, especially when violent, is certainly bad for economic development. Factions are more likely to fight over a valuable resource such as oil or diamonds when it is there for the taking, rather than when production requires substantial inputs of labor and capital investment. James Fearon and David Laitin, Paul Collier, and Macartan Humphreys all find that economic dependence on oil and mineral wealth is correlated with civil war.<sup>69</sup> Chronic conflict in oil-rich countries such as Angola and Sudan comes to mind. Civil war is, in turn, very bad for economic development.

The conclusion is not unanimous: Christa Brunnschweiler and Erwin Bulte argue that the conventional measure of resource dependence is endogenous with respect to conflict and that instrumenting for dependence eliminates its significance in conflict regressions.<sup>70</sup> They find conflict increases dependence on resource extraction, rather than the other way around.

#### Oil and Democracy

Hussein Mahdavy was apparently the first to suggest—followed by Giacomo Luciani, Dirk Vandewalle, and many others—that Middle Eastern govern-

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ments' access to rents, in the form of oil revenue, may have freed them from the need to tax their peoples and that this in turn freed them from the need for democracy. The need for tax revenue is believed to require democracy under the theory "no taxation without representation."<sup>71</sup>

Statistical studies across large cross-sections of countries followed. Michael Ross finds that economic dependence on oil and mineral wealth is correlated with authoritarian government.<sup>72</sup> So do others.<sup>73</sup> Some find that authoritarian regimes have lasted longer in countries with oil wealth.<sup>74</sup>

But Terry Karl points out that Venezuela had already been authoritarian when oil was developed and in fact transitioned to democracy at the height of its oil wealth.<sup>75</sup> None of the Central Asian states are democracies, even though Kazakhstan is the only one of them with major oil production. Inspired by such observations Stephen Haber and Victor Menaldo to look at historical time series data for a link to democracy from the share of oil or minerals in the economy; fail to find the statistically significant evidence that is typical of cross-section and panel studies.<sup>76</sup> Similarly, Marcus Noland finds that oil rents are not a robust factor behind lack of democracy in Middle Eastern countries.<sup>77</sup> When Thad Dunning introduces fixed effects to take into account country-specific differences within Latin America, he finds that the negative correlation between oil profits and democracy reverses.<sup>78</sup> Romain Wacziarg, too, finds no effect of oil prices on democracy.<sup>79</sup>

The question of whether oil dependence tends to retard democracy should probably not be regarded as a component of the causal relation between oil and economic performance. Some correlates of democracy—rule of law, political stability, openness to international trade, and initial equality of economic endowments and opportunities—do tend to be good for economic growth. But each of these other variables can also exist without democracy. Examples include predemocratic Asian economies such as Korea or Taiwan. Some believe that Lee Kwan Yew in Singapore and Augusto Pinochet in Chile could not have achieved their economic reforms without authoritarian powers (though the former was far more moderate and benevolent than the latter). On a bigger scale, it is said that China has grown so much faster than Russia since 1990 because Deng Xiaoping chose to pursue economic reform before political reform while Mikhail Gorbachev did it the other way around.

The statistical evidence is at best mixed as to whether democracy per se is good for economic performance. Robert Barro finds that it is the rule of law,

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free markets, education, and small government consumption that are good for growth, not democracy per se.<sup>80</sup> Jose Tavares and Romain Wacziarg find that it is education, not democracy per se.<sup>81</sup> Alberto Alesina and his coauthors find that it is political stability.<sup>82</sup> Some scholars even find that, after controlling for important factors such as the rule of law and political stability, democracy has if anything a weak negative effect on economic growth. One *can* claim good evidence for the *reverse* causation—that economic growth leads to democracy, often assisted by the creation of a middle class—much more reliably than the other way around.<sup>83</sup> Examples include Korea and Taiwan.

Of course democracy is normally regarded as an end in itself, aside from whether it promotes economic growth. Even here, one must note that the benefits of the formalities of elections can be overemphasized. For one thing, elections can be a sham. Western-style or one-man, one-vote elections should probably receive less priority in developing countries than the fundamental principles of rule of law, human rights, freedom of expression, economic freedom, minority rights, and some form of popular representation.<sup>84</sup>

### Dutch Disease and Procyclicality

#### The Macroeconomics of Dutch Disease

Dutch disease refers to some possibly unpleasant side effects of a boom in oil or other mineral and agricultural commodities.<sup>85</sup> The phenomenon arises when a strong, but perhaps temporary, upward swing in the world price of an export commodity causes:

- large real appreciation in the local currency (taking the form of nominal currency appreciation if the country has a floating exchange rate or the form of money inflows and inflation if the country has a fixed exchange rate<sup>86</sup>);
- an increase in spending (especially by the government, which increases spending in response to the increased availability of tax receipts or royalties—discussed below);
- an increase in the price of nontraded goods (goods and services such as housing that are not internationally traded) relative to traded goods (manufactures and other internationally traded goods other than the export commodity);

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- resultant shift of labor and land out of non-export-commodity traded goods (pulled by the more attractive returns in the export commodity and in nontraded goods and services); and
- a possible current account deficit (thereby incurring international debt that may be difficult to service when the commodity boom ends).<sup>87</sup>

When the crowded-out, noncommodity tradable goods are in the manufacturing sector, the feared effect is deindustrialization. In a real-trade model, the reallocation of resources across tradable sectors—for example, from manufactures to oil—may be inevitable regardless of macroeconomics. But the movement into nontraded goods is macroeconomic in origin.

What makes Dutch disease a “disease?” One interpretation, particularly relevant if the complete cycle is not adequately foreseen, is that the process is all painfully reversed when the world price of the export commodity goes back down. A second interpretation is that, even if the perceived longevity of the increase in world price turns out to be accurate, the crowding out of noncommodity exports is undesirable, perhaps because the manufacturing sector is the locus of learning by doing.<sup>88</sup> But the latter view is just another instance of the natural resource curse; it has nothing to do with cyclical fluctuations per se.

Dutch disease can arise from sources other than a rise in the commodity price. Other examples arise from commodity booms due to the discovery of new deposits or some other expansion in supply leading to a trade surplus via exports or to a capital account surplus via inward investment to develop the new resource. In addition, the term is also used by analogy for other sorts of inflows such as the receipt of transfers (foreign aid or remittances) or a stabilization-induced capital inflow. In all cases, the result is real appreciation and a shift into nontradeables and away from (nonbooming) tradeables. Again, the real appreciation takes the form of a nominal appreciation if the exchange rate is flexible or inflation if the exchange rate is fixed.

#### Procyclicality

Volatility in developing countries arises both from foreign shocks, such as the fluctuations in the price of the export commodity discussed above, and

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from domestic macroeconomic and political instability. Although most developing countries in the 1990s managed to control the chronic runaway budget deficits, money creation, and inflation that they had experienced in the preceding two decades, many are still subject to monetary and fiscal policy that is procyclical rather than countercyclical: they tend to be expansionary in booms and contractionary in recessions, thereby exacerbating the magnitudes of the swings. Ideally the aim should be to moderate them—to foster the countercyclical pattern, which the models and textbooks of the decades following the Great Depression originally hoped discretionary policy would accomplish. At a minimum, macroeconomic policy should not be procyclical. Often populist political economy underlies the observed procyclicality.

The fact that developing countries tend to experience larger cyclical fluctuations than industrialized countries do is only partly attributable to commodities. It is also in part due to the role of factors that “should” moderate the cycle but in practice seldom operate that way: procyclical capital flows, procyclical monetary and fiscal policy, and the related Dutch disease. If anything, they tend to exacerbate booms and busts instead of moderating them. The hope that improved policies or institutions might reduce this procyclicality makes this one of the most potentially fruitful avenues of research in emerging market macroeconomics.

#### The Procyclicality of Capital Flows to Developing Countries

According to the theory of intertemporal optimization, countries should borrow during temporary downturns to sustain consumption and investment and should repay or accumulate net foreign assets during temporary upturns. In practice, it does not always work this way. Capital flows are more often procyclical than countercyclical.<sup>89</sup> Most theories to explain this phenomenon involve imperfections in capital markets, such as asymmetric information or the need for collateral.

As developing countries evolve more market-oriented financial systems, the capital inflows during the boom phase show up increasingly in prices for land and buildings and in prices of financial assets. Prices of equities and bonds (or the reciprocal, the interest rate) reflect the extent of speculative enthusiasm, sometimes useful for predicting which countries are vulnerable to crises in the future.

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In the commodity and emerging market boom of 2003–2011, net capital flows typically went to countries with current account surpluses, especially Asian countries and commodity producers in the Middle East and Latin America, where they showed up in record accumulation of foreign exchange reserves. This was in contrast to the two previous cycles, 1975–81 and 1990–97, when the capital flows into developing countries largely went to finance current account deficits.

One interpretation of procyclical capital flows is that they result from procyclical fiscal policy: when governments increase spending in booms, some of the deficit is financed by borrowing from abroad. When these governments are forced to cut spending in downturns, it is to repay some of the excessive debt that they incurred during the upturn. Another interpretation of procyclical capital flows to developing countries is that they pertain especially to exporters of agricultural and mineral commodities. We will consider procyclical fiscal policy in the next subsection and return to the commodity cycle (Dutch disease) in the one after.

#### The Procyclicality of Fiscal Policy

Many authors have documented that fiscal policy tends to be procyclical in developing countries, especially in comparison with industrialized countries.<sup>90</sup> Most studies look at the procyclicality of government spending, because tax receipts are particularly endogenous with respect to the business cycle. An important cause of procyclical spending is precisely that government receipts from taxes or royalties rise in booms and the government cannot resist the temptation or political pressure to increase spending proportionately, or more than proportionately.

Procyclicality is especially pronounced in countries that possess natural resources and in which income from those resources tends to dominate the business cycle. Commodity booms are found to be correlated with spending booms.<sup>91</sup>

Two large budget items that account for much of the increased spending from oil booms are investment projects and government salaries. Regarding the first budget item, investment in infrastructure can have a large long-term payoff if it is well designed. In practice, however, it too often takes the form of white elephant projects, which are stranded without funds for completion or maintenance when the oil price goes back down.<sup>92</sup>

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Figure 1.2 Iran's government wage bill is influenced by oil prices during the preceding three years, 1974, 1977-1997.

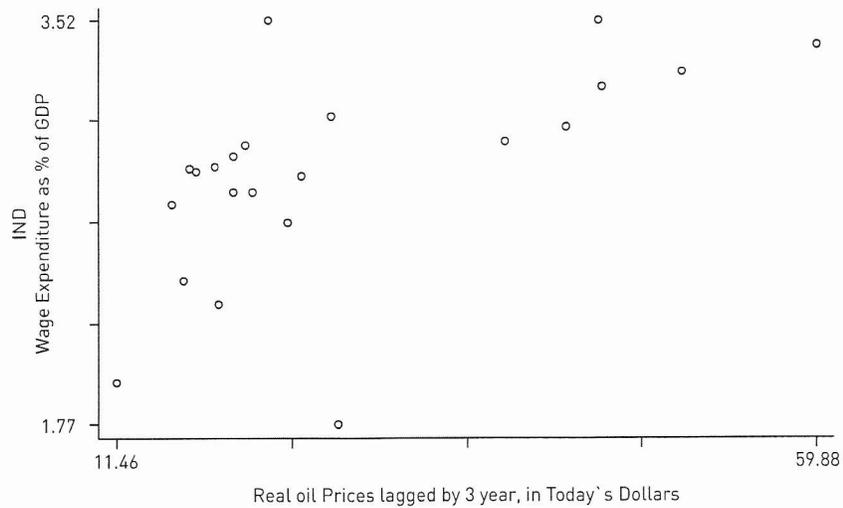


Figure 1.3 Indonesia's government wage bill is influenced by oil prices during the preceding three years, 1974, 1977-1997.

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Regarding the second budget item, Paolo Medas and Daria Zakharova point out that oil windfalls have often been spent on higher public sector wages.<sup>93</sup> They can also go to increasing the number of workers employed by the government. Either way, they raise the total public sector wage bill, which is hard to reverse when oil prices go back down. Figures 1.2 and 1.3 plot the public sector wage bill for two oil producers, Iran and Indonesia, against primary product prices over the preceding three years. There is a clear positive relationship. That the relationship is strong with a three-year lag illustrates the problem: oil prices may have fallen over three years, but it is not easy to cut public sector wages or lay off workers.<sup>94</sup>

### Institutions and Policies to Address the Natural Resource Curse

A variety of measures have been tried to cope with the commodity cycle.<sup>95</sup> Some work better than others.

#### Institutions That Were Supposed to Stabilize but Have Not

A number of institutions have been implemented in the name of reducing the impact of volatility in world commodity markets on producer countries. Most have failed to do so, and many have had detrimental effects.

#### MARKETING BOARDS

Examples of marketing boards (are the systems) implemented around the time of independence in some East and West African countries (that required all sales of cocoa and coffee to pass through a government agency. The original justification was to stabilize the price to domestic producers and symmetrically set a price above world prices when the latter were low and a domestic price below world prices when the latter were high. That in turn would have required symmetrically adding to government stockpiles when world prices were low and running them down when world prices were high.

In practice, the price paid to cocoa and coffee farmers, who were politically weak, was always below the world price in the early decades of the marketing boards. The rationale eventually shifted from stabilization to taxation of the agricultural sector (which was thought to be inelastic in its supply

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behavior) and subsidization of the industrial sector. But industrialization did not happen. Rather, the coffee and cocoa sectors shrank. Commodity marketing boards were a failure.

#### TAXATION OF COMMODITY PRODUCTION

Some developing countries subject their mineral sectors to high levels of taxation and regulation, particularly where foreign companies are involved, which can discourage output. Of course, some taxation and regulation may be appropriate on environmental or safety grounds. One can understand, moreover, the desire to avoid past experiences where multinational companies were able to walk away with the lion's share of the profits. But when Bolivia, Mexico, and Venezuela, motivated by populist nationalism, explicitly prohibit or discourage foreign involvement in the development of their mineral resources, the danger is that they end up "killing the goose that lays the golden egg."

#### PRODUCER SUBSIDIES

More often in rich countries, the primary producing sector has political power on its side. Then ~~the stockpiles are used as a subsidy rather than a tax.~~ An example is the Common Agricultural Policy in Europe. Subsidies also go to coal miners in Germany, oil companies with cheap leases on federal lands in the United States, and agricultural and energy sectors in many other countries.

#### GOVERNMENT STOCKPILES

Some governments maintain stockpiles under national security rationales, such as the U.S. Strategic Petroleum Reserve. One drawback is that decisions regarding the management of government stockpiles are made subject to political pressure, often failing to maximize the objective of insulating against the biggest shocks. Another drawback is that government stockpiles undermine the incentive for private citizens to hold inventories.

In some countries where the prices of fuel ~~to consumers~~ are a politically sensitive issue, the incentive for the private sector to maintain inventories is undercut in any case by the knowledge that in the event of a big increase in the price of the commodity, the inventory holder will probably not be allowed to reap the benefits. If this political economy structure is a given, then there is a valid argument for the government to do the stockpiling.

#### PRICE CONTROLS FOR CONSUMERS

In many developing countries, political forces seek to shield consumers from increases in basic food and energy prices through price controls. If the

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country is a producer of the crop or mineral in question, then the policy tool to insulate domestic consumers against increases in the world price may be export controls. (Examples include Argentina's wheat and India's rice in 2008.) If the country is an importer of the crop or mineral in question, then either the commodity is rationed to domestic households or the excess demand at the below-market domestic price is made up by imports. Capped exports from the exporting countries and price controls in the importing countries both work to exacerbate the magnitude of the upswing of the price for the (artificially reduced) quantity that is still internationally traded. If the producing and consuming countries in the rice market could cooperatively agree to *refrain* from government intervention, volatility could be lower, rather than higher, even though intervention is justified in the name of reducing price volatility.

, and Russia's wheat in 2010

rationalized

#### OPEC AND OTHER INTERNATIONAL CARTELS

In a world of multiple producers for a given commodity, efforts by producing countries to raise the price or reduce the volatility would logically require the cooperation of all or most of the producers. Each is strongly tempted to defect from the agreement and raise output to take advantage of the higher price. Most attempts at forming international cartels have failed within a few years.<sup>96</sup>

The institution that endures decade after decade is OPEC. It is not clear whether its attempts to raise the average price or reduce the variability of the international oil price have succeeded. Some of the most abrupt decreases and increases in the world oil price over the last half century have arguably been attributable to changes in OPEC's internal dynamics (increased collusion after the Arab Oil Embargo of 1973, followed by a breakdown in the 1980s when members stopped obeying their agreed-upon quotas). Meanwhile, many new oil producers have cropped up outside of OPEC, suggesting a diminution in its collective monopoly power even when the members act in unison.

#### DEVICES TO SHARE RISKS

It is probably best to accept that commodity prices will be volatile and to seek to establish institutions that will limit adverse effects that result from the volatility. In this section we will consider microeconomic policies to minimize exposure to risk, the sort of short-term volatility discussed earlier in the chapter. (We will shortly consider *macroeconomic* policies to

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minimize the costs of big medium-term swings of the sort associated with Dutch disease.)

Three devices for avoiding exposure to short-term volatility are promising. One is relevant for energy exporters who sign contracts with foreign companies, another is relevant for producers who do their own selling, and a third for governments dependent on energy revenues.

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#### PRICE SETTING IN CONTRACTS WITH FOREIGN COMPANIES

Price setting in contracts between energy producers and foreign companies is often plagued by a problem that is known to theorists as “dynamic inconsistency.”<sup>97</sup> The pattern has been repeated in many countries. A price is set by contract. Later the world price goes up, and then the government wants to renege. It does not want to give the company all the profits, and, in a sense, why should it? Certainly the political pressures are typically strong.

But this is a “repeated game.” The risk that the locals will renege makes foreign companies reluctant to do business in the first place. It limits the amount of capital available to the country and probably raises the price of that capital. The process of renegotiation can have large transactions costs, such as interruptions in the export flow.

It has become such a familiar pattern that it seems more contracts ought to have been designed to be robust with respect to this inconsistency by making the terms explicitly dependent on future market conditions.<sup>98</sup> The simplest device would be indexed contracts in which the two parties agree ahead of time that “if the world price goes up 10 percent, then the gains are split between the company and the government” in some particular proportion. Indexation shares the risks of gains and losses, without the costs of renegotiation or the damage to a country’s reputation from renegeing on a contract.

#### HEDGING IN COMMODITY DERIVATIVES MARKETS

Producers, whether private or public, often sell their commodities on international spot markets. They are thus exposed to the risk that the dollar price of a given export quantity will rise or fall. In many cases, the producer can hedge the risk by selling that quantity on the forward or futures market.<sup>99</sup> As with indexation of the contract price, hedging means that there is no need for costly renegotiation in the event of large changes in the world price. The adjustment happens automatically. One possible drawback, especially if

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it is a government ministry doing the hedging, is that the minister typically receives little credit for having saved the country from disaster when the world price plummets but will be excoriated for having sold out the national patrimony when the world price rises. Mexico has the best solution to this problem, a marriage of finance theory and political economy: it hedges by means of the options markets. Options allow the buyer to hedge the downside but retain the upside. The country is protected if the world price of oil falls, yet the finance minister is not put in a difficult position if the price of oil rises.

#### DENOMINATION OF DEBT IN TERMS OF COMMODITY PRICES

An excellent idea that has never managed to catch on is for a mineral *commodity* producing company or government to index its debt to the price of the commodity. Debt service obligations automatically rise and fall with the commodity price. This would save developing countries from the kinds of crises that Latin American countries faced in 1982 and Asian countries in 1997, when the dollar prices of their exports fell at the same time that the dollar interest rate on their debts went up. The result for many countries was an abrupt deterioration of their debt service ratios and a balance of payments crisis. This would not have happened if their debts had been indexed to their commodity prices—the oil price in the case of such borrowers as Ecuador, Indonesia, Iran, Mexico, Nigeria, and Russia. As with contract indexation and hedging, the adjustment in the event of fluctuations in the world price is automatic.

When officials in commodity-producing countries are asked why they have not tried indexing their bonds (or loans) to the price of their export commodity, the usual answer is that they believe there would not be enough demand from the market (or enough interest from banks). It is true that a market needs a certain level of liquidity in order to thrive and that it can be hard for a new financial innovation to get over the volume threshold. But it used to be said that foreigners would not buy bonds denominated in the currencies of emerging market countries.<sup>100</sup> Yet in recent years, more and more developing countries have found that they could borrow in their own currency if they tried. Investor receptivity to oil-denominated bonds is potentially larger. There are obvious natural ultimate customers for oil-linked bonds: electric utilities, airlines, and the other companies in industrialized countries who are as adversely affected by an increase in the world price of

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oil as the oil exporters are by a decrease. This is a market waiting to be born.

### Monetary Policy

We will now move from ideas for institutions to address the risk created by high, short-term price volatility to ideas for macroeconomic management of medium-term swings. We will begin with monetary and exchange rate policy to manage Dutch disease.

#### FIXED VERSUS FLOATING EXCHANGE RATES

Fixed and floating exchange rates each have their advantages. The main advantages of a fixed exchange rate are, first, that it reduces the costs of international trade and, second, that it is a nominal anchor for monetary policy that helps the central bank achieve low-inflation credibility. The main advantage of floating, for a commodity producer, is that it often provides automatic accommodation of terms of trade shocks. During a commodity boom, the currency tends to appreciate, thereby moderating what would otherwise be a danger of excessive capital inflows and overheating of the economy, and the reverse occurs during a commodity bust.

A reasonable balancing of these pros and cons, appropriate for many middle-size middle-income countries, is an intermediate exchange rate regime such as "managed floating" or a "target zone" (a band). In the booming decade that began in 2001, many countries followed the intermediate regime, in between a few commodity producers in the floating corner (Chile and Mexico) and a few in the firmly fixed corner (Gulf oil producers and Ecuador). Although these intermediate countries officially declared themselves as "floating currency states" (often as part of inflation targeting), in practice they intervened heavily, taking perhaps half the increase in demand for their currency in the form of appreciation but half in the form of increased foreign exchange reserves. Examples among commodity-producers include Kazakhstan, Peru, South Africa, and Russia.<sup>101</sup>

Particularly at the early stages of a commodity boom, when there is little idea whether it is permanent, there is a good case for intervention in the foreign exchange market—adding to reserves (especially if the alternative is abandoning an established successful exchange rate target) and perhaps for awhile attempting to sterilize the inflow of foreign currency to prevent rapid

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expansion in the money supply. In subsequent years, if the increase in world commodity prices looks to be long-lived, there is a stronger case for accommodating it through nominal and real appreciation of the local currency.

It is especially important in developing countries, where institutions tend to have lower credibility than in advanced countries, that the public's expectations of inflation be anchored by some nominal target by which the central bank asks to be judged. If the exchange rate is not to be that nominal target, then some other anchor variable should be chosen.

#### ALTERNATIVE NOMINAL ANCHORS

Three candidates for nominal anchor have had ardent supporters in the past but are no longer prominently in the running. They are: the price of gold, as under the nineteenth-century gold standard; the money supply (the choice of monetarists); and national income (the choice of many mainstream macroeconomists in the 1980s).

In recent years, central bankers and monetary economists alike have considered inflation targeting to be the preferred approach—or at least the preferred alternative to fixed exchange rates, which may be appropriate for very small, open countries. Although there are different interpretations of inflation targeting, some more flexible than others, they all tend to take the consumer price index (CPI) as the index to be targeted, and they tend to explicitly disavow the exchange rate ~~for~~ domestic commodity prices or asset prices ~~as~~ a target.<sup>102</sup>

Inflation targeting (IT) has a particular disadvantage for commodity producing countries: it is not robust with respect to changes in the terms of trade. Consider a fall in world market conditions for the export commodity, that is, a decrease in the dollar price. It has a negative impact on both the balance of payments and the level of economic activity. It would be desirable under these circumstances for monetary policy to loosen and the currency to depreciate to boost net foreign demand and thereby restore external and internal balance. But CPI targeting tells the central bank to keep monetary policy sufficiently tight so that the currency does not depreciate, because otherwise import prices will rise and push the CPI above its target. Conversely, if the world price for the export commodity goes *up*, a CPI target prevents a needed appreciation of the currency because it would lower import prices and push the CPI below its target.

I have in the past proposed for commodity producers a regime that I call “Peg the Export Price” (PEP). The proposal <sup>is</sup> that monetary policy be guided

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by the rule to keep the local currency price of the export commodity stable from day to day. For an oil exporter, every day that the dollar price of oil goes up 1 percent, monetary policy would allow the dollar price of the local currency to go up 1 percent, thereby keeping the local price of oil unchanged. The argument was that PEP combines the best of both worlds: it automatically accommodates terms of trade changes, as floating is supposed to do, while abiding by a preannounced nominal anchor, as IT is supposed to do.

Simulations show, for example, that if Indonesia and Russia had been on a PEP regime, they would have automatically experienced necessary depreciation in the late 1990s, when oil prices fell, without having to go through the painful currency crises that these two countries in fact experienced in 1998.<sup>103</sup> An additional selling point is that because PEP moderates swings in the real value of export revenue, expressed in terms of purchasing power over domestic goods and services, it would reduce the tendency for governments to increase spending excessively in boom times and symmetrically cut it in busts.

PEP in its pure form was a rather extreme proposal, which may account for the lack of guinea pigs willing to try it. If the noncommodity export sector is not small or if policy-makers want it to become larger, then PEP has the disadvantage of fully transferring the burden of exogenous fluctuations in world commodity prices to variability in domestic prices of noncommodity exports. It is not clear that this is an improvement over continuing to let the fluctuations show up as variability in domestic prices of the commodity export. A more practical version of the proposal would be to target a more comprehensive index of export prices rather than a single export price (Peg the Export Price Index).<sup>104</sup> Better still is the most recent version called PPT, for Product Price Targeting. It would target a comprehensive index of domestic production prices, including nontraded goods. Possibilities are the Producer Price Index, the GDP deflator, or a specially constructed index.<sup>105</sup> The important point is to include export commodities in the index and exclude import commodities, whereas the CPI does it the other way around.

#### Institutions to Make National Saving Procyclical

We have noted the Hartwick Rule, which says that rents from a depletable resource should be saved against the day when deposits run out. At the same

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time, traditional macroeconomics says that government budgets should be countercyclical: running surpluses in booms and spending in recessions. Commodity producers tend to fail in both these principles; they save too little on average and all the more so in booms. Thus some of the most important ways to cope with the commodity cycle are institutions to ensure that export earnings are put aside during the boom time into a commodity saving fund, perhaps with the aid of rules governing the cyclically adjusted budget surplus.<sup>106</sup> Jeffrey Davis and coauthors include under the rubric Special Financial Institutions three sorts of mechanisms: oil funds, fiscal rules and fiscal responsibility legislation, and budgetary oil prices.<sup>107</sup>

#### RULES FOR THE BUDGET DEFICIT: THE EXAMPLE OF CHILE

As of June 2008, the government of Chilean President Michele Bachelet had unusually low approval ratings. That it had resisted intense pressure to spend the soaring receipts from copper exports was widely resented. One year later, in the summer of 2009, Bachelet and her finance minister, Andres Velasco, had the *highest* approval ratings of any Chilean officials since the restoration of democracy. Why the change? In the meantime, the global recession had hit, and copper prices had fallen abruptly. But the government had increased spending sharply, using the assets that it had acquired during the copper boom, and thereby moderated the downturn. Saving for a rainy day made these officials heroes, now that the rainy day had come. Chile has achieved what few commodity-producing developing countries have achieved: a truly countercyclical fiscal policy. Some credit should go to previous governments, who initiated an innovative fiscal institution.<sup>108</sup> But much credit should go to the Bachelet government, which enshrined the general framework in law and abided by it when it was most difficult to do so politically.<sup>109</sup>

Chile's fiscal policy is governed by a set of rules. The first one is a target for the overall budget surplus—originally set at 1 percent of GDP, then lowered to 0.5 percent of GDP, and again to 0 percent in 2009. This may sound like the budget deficit ceilings that supposedly constrain members of Euro-land (deficits of 3 percent of GDP under the Stability and Growth Pact) or like the occasional U.S. proposals for a Balanced Budget Amendment (zero deficit). But those attempts have failed because they are too rigid to allow the need for deficits in recessions, counterbalanced by surpluses in good times. The alternative of letting politicians explain away any deficits by declaring

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them the result of slower growth than expected also does not work because it imposes no discipline.

Under the Chilean rules, the government can run a deficit larger than the target when: (1) output falls short of potential, in a recession or (2) the price of copper is below its medium-term (ten-year) equilibrium. The key institutional innovation is two panels of experts that each mid-year make the judgments, respectively: what is the output gap and what is the medium-term equilibrium price of copper (also the same for molybdenum). e trend

Thus in the copper boom of 2003–8 when, as usual, the political pressure was to declare the increase in the price of copper permanent and justify spending on par with export earnings, the expert panel ruled that most of the price increase was temporary so that most of the earnings had to be saved. As a result, Chile's fiscal surplus reached almost 9 percent when copper prices were high. The country paid down its debt to a mere 4 percent of GDP and saved about 12 percent of GDP in its the sovereign wealth fund. This allowed a substantial fiscal easing in the recession of 2009, when the stimulus was most sorely needed.

Any country, but especially commodity producers, could usefully apply variants of this Chilean fiscal device. Given that many developing countries are prone to weak institutions, a useful reinforcement of the Chilean idea would be to formalize the details of the procedure into law and give the expert panels legal independence. There could be a law protecting the members from being fired, as there are for governors of independent central banks. The principle of a separation of decision-making powers should be retained: the rules as interpreted by the panels determine the total amount of spending or budget deficits, and the elected political leaders determine how that total is allocated. e is  
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#### COMMODITY FUNDS OR SOVEREIGN WEALTH FUNDS

Many natural resource producers have commodity funds, often in global portfolios, to invest savings for future welfare. The oldest and biggest commodity funds are in the Persian Gulf and belong to Kuwait and the United Arab Emirates. Some highly successful noncommodity exporters in Asia have established such funds, too. When China joined the club in 2007, these funds received a new name—sovereign wealth funds—and a lot of new scrutiny.<sup>110</sup>

It has been pointed out that the mere creation of a commodity fund, in itself, does not necessarily do anything to ensure that politicians will not

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raid the fund when it is flush.<sup>111</sup> Two standard recommendations are that the funds be transparently and professionally run and that they be given clear instructions that politics should not interfere with their objective of maximizing the financial well-being of the country. The Norwegian State Petroleum Fund (now called the Norwegian Pension Fund) is often held up as a model.<sup>112</sup> But in fact Norway's legal system puts few restrictions on what policy makers can do, and the fund is managed with political objectives that sometimes go unnoticed when held up as an example for developing countries to emulate.<sup>113</sup> Botswana's Pula Fund is a more appropriate model.

For most countries, it would be best to have rules dictating the cap on spending from out of the fund. The commodity fund of São Tomé and Príncipe, established in 2004, includes extensive restrictions guiding how the oil revenues are to be saved, invested, or spent. Outflows legally cannot exceed the highest amount that could be sustained in perpetuity.

Macartan Humphreys and Martin Sandhu and Rolando Ossowski and co-authors sensibly recommend that commodity fund spending go through the regular budget so that these resources do not become any politicians' private "slush funds."<sup>114</sup> There can be advantages in earmarking the commodity funds for specific good causes such as education, health, or retirement support for a future generation (while seeking to avoid ad hoc extrabudgetary spending). If the political constituents know how the money is to be spent, they may be both more tolerant of the initiative to save it in the first place and more vigilant with respect to transgressions by politicians wishing to raid the kitty to spend on armies or palaces.

#### RESERVE ACCUMULATION BY CENTRAL BANKS

One way that countries save in the aggregate during booms, in order to be able to spend in busts, is for central banks to accumulate international reserves via foreign exchange intervention. Economists have regarded this as a suboptimal mechanism: if the goal is smoothing spending over time, as opposed to stabilization of the exchange rate, holding the assets in the form of foreign exchange reserves has disadvantages. First, the reserves (typically U.S. Treasury bills) do not earn a high return. Second, increases in reserves can lead to rapid monetary expansion (if not sterilized) and thereby to inflation. Thus a central bank that already has enough reserves, judged by precautionary and monetary criteria, should consider selling some of its foreign exchange reserves to the country's natural resource fund (NRF). But if the

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central bank has political independence and the NRF does not, that may be a reason to leave the reserves where they cannot be raided.

#### REDUCING NET PRIVATE CAPITAL INFLOWS DURING BOOMS

If foreign exchange reserves are piling up to excessive levels, there are other ways to reduce the balance of payments surplus and facilitate national saving. One is for the government to pay down debt deliberately, especially short-term debt. Another is to remove any remaining controls on the ability of domestic citizens to invest abroad. A third is to place controls on capital inflows, especially short-term inflows.

#### LUMP SUM DISTRIBUTION

The Alaska Permanent Fund saves earnings from the state's oil sector. Alaska state law says that the fund must distribute half of the investment earnings on an equal per capita basis. The theory is that the citizens know how to spend their money better than their government does. Certainly the system gives Alaskans a good reason to feel that they are full stakeholders in the fund. Xavier Sala-i-Martin and Arvind Subramanian suggest that Nigeria should similarly distribute its oil earnings on an equal per capita basis;<sup>115</sup> Nancy Birdsall and Subramanian make the same proposal for Iraq.<sup>116</sup>

#### Efforts to Impose External Checks

All these institutions can fail if, as in some countries, the executive simply ignores the law and spends what he wants. In 2000, the World Bank agreed to help Chad, a new oil producer, finance a new pipeline. The agreement stipulated that Chad would spend 72 percent of its oil export earnings on poverty reduction (particularly health, education, and road building) and put aside 10 percent in a "future generations fund." ExxonMobil was to deposit its oil revenues from Chad in an escrow account at Citibank, and the government was to spend them subject to oversight by an independent committee. But once the money started rolling in, the government (ranked by Transparency International as one of the two most corrupt in the world) reneged on the agreement.<sup>117</sup>

Evidently international financial institutions would have to go beyond the Chad model if local rulers are to be prevented from abusing natural resource funds. The Extractive Industries Transparency Initiative, launched in 2002, includes the principle "publish what you pay," under which interna-

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tional oil companies commit to make known how much they pay governments for oil so that the public at least has a way of knowing when large sums disappear. Legal mechanisms adopted by São Tomé and Príncipe void contracts if information relating to oil revenues is not made public. Further proposals would give extra powers, such as freezing accounts in the event of a coup, to a global clearing house or foreign bank where the natural resource fund is located.<sup>118</sup> Perhaps that principle could be generalized: it may be that well-intentioned politicians spend oil wealth quickly out of fear that their successors will misspend whatever is left, in which case the adoption of an external mechanism that constrains spending both in the present and in the future might not be an unacceptable violation of sovereignty.

Resource

### Summary

Much theoretical reasoning and statistical evidence suggest that possession of natural resources, such as hydrocarbons, minerals, and perhaps agricultural endowments, can confer negative effects on a country along with the benefits. This chapter has considered seven channels whereby natural resources might possibly have negative effects on economic performance. The first—the Prebisch-Singer hypothesis of a negative long-term trend in commodity prices—is counteracted by theoretical arguments for a positive trend and empirical findings that there is no consistent trend either way.

But the other six channels each have at least some truth to them.

(1) Commodity price volatility is high, which imposes risk and transactions costs. (2) Specialization in natural resources can be detrimental to growth if it crowds out the manufacturing sector and the latter is the locus of positive externalities. (3) Mineral riches can lead to civil war, an obstacle to development. (4) Endowments of “point-source” commodities (oil, minerals, and some crops) can lead to weak institutions, including corruption, inequality, class structure, chronic power struggles, and absence of the rule of law and property rights. Natural resource wealth can also inhibit the development of democracy though there is not good evidence that democracy per se (as opposed to openness, economic freedom, decentralization of decision making, and political stability) leads to economic growth. (5) Dutch disease, resulting from a commodity boom, entails real appreciation of the currency and increased government spending, both of which expand non-traded goods and service sectors such as housing and render uncompetitive

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noncommodity export sectors such as manufactures uncompetitive. If and when world commodity prices go back down, adjustment is difficult due to the legacy of bloated government spending, debt, and a shrunken manufacturing sector.

In recent years, revisionists have questioned each of these channels and the bottom line that natural resource wealth is detrimental for economic growth. Some differences in econometric findings are attributable to whether economic performance is measured as the level of income or the rate of growth of income during the sample period. Others are due to whether the equation conditions on related variables when it tests the influence of the channel in question. The revisionists often emphasize that resource extraction is endogenous and that it is wrong to treat data on mineral exports—the usual measure of “resource dependence”—as if they represent geographic endowments.

From a policy viewpoint, we do not necessarily need to settle these questions. It is clear that some resource-rich countries do surprisingly poorly economically while others do well. We have noted examples of both sorts: Norway, Botswana, and Chile, which have done very well with their endowments (oil, diamonds, and copper, respectively), versus Sudan, Bolivia, and the Congo, which have done much less well. The natural resource curse should not be interpreted as a rule that all resource-rich countries are doomed to failure. The question is which policies to adopt to increase the chances of prospering. It is safe to say that destruction or renunciation of resource endowments, to avoid dangers such as the corruption of leaders, will not be one of these policies. Even if such a drastic action would on average leave the country better off, which seems unlikely, who would be the policy maker to whom one would deliver such advice?

This chapter concludes with a list of ideas for institutions designed to address aspects of the resource curse and thereby increase countries’ chances of economic success. Some of the ideas that most merit consideration by countries rich in oil or other natural resources are as follows.

1. In contracts with foreign purchasers, include clauses for automatic adjustment in the commodity price if world market conditions change.
2. Hedge export proceeds in commodity futures markets or, more pragmatically, options markets.
3. Denominate debt in terms of commodity prices.

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4. Allow some nominal currency appreciation in response to an increase in world prices of the commodity, but also add to foreign exchange reserves under these circumstances, especially at the early stages of the boom when it may prove temporary.
5. If a country chooses inflation targeting as the monetary regime, consider using a price measure that puts greater weight on the ~~most~~ <sup>ties</sup> important export commodities, such as an index of export prices or producer prices, as the target in place of the standard CPI,
6. Emulate Chile: avoid excessive spending in boom times and allow deviations from a target surplus only in response to output gaps and long-lasting commodity price increases, as judged by independent panels of experts rather than politicians.
7. Run commodity funds transparently and professionally, with rules to govern the payout rate and with insulation for the managers from political pressure in their pursuit of the financial well-being of the country.
8. When spending oil wealth, consider lump-sum distribution on an equal per capita basis, as occurs in Alaska.
9. Mandate an external agent, for example a financial institution that houses a commodity fund, to provide transparency and to freeze accounts in the event of a coup.

Needless to say, policies and institutions have to be tailored to local circumstances, country by country. But with good intentions and innovative thinking, there is no reason why resource-rich countries need fall prey to the curse.

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