

# **Key decisions for resource management; principles and practise**

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## 1. Introduction

The discovery and extraction of natural resources has the potential to finance rapid, sustained and broad-based development. However, harnessing this potential is difficult: the opportunity is often missed, and sometimes turns into a nightmare of corruption and violence. This study is based on the experience of eight countries which all had resource riches but were otherwise very different: Russia, Iran, Malaysia, Chile, Cameroon, Nigeria, Kazakhstan, and Zambia. In retrospect, two of these stand out as resounding successes, achieving rapid growth with social peace. But *ex ante* this could not have been predicted: they are Malaysia and Chile, countries utterly different from each other. One of the countries, Cameroon, has been an utter failure, the main legacy of oil revenues being a diversion of politics from the wellbeing of citizens. As the consequences of different choices cumulate, the divergence between success and failure becomes astonishingly wide: Malaysia reduced poverty from 50 percent of the population in 1970 to less than 4 percent by 2007, whereas in Cameroon all social indicators have deteriorated. The other five countries have had varying degrees of success and failure, although none has sustained rapid and widely diffused growth.

That six of these eight countries have failed to harness the full potential of natural resources illustrates that the process is difficult. For the depletion of natural assets to be converted into sustained development a series of decisions have to be got sufficiently right. It is useful to think of these decisions as forming a chain made up of four links. The analogy of a chain is helpful because all of these links need to hold in order to achieve sustained growth: growth through the depletion of natural assets poses a 'weakest link' problem. The first link in the chain is that natural resources must be discovered and developed. Discovery is the production of information, a public good typically not aligned with private incentives. Development requires a sufficiently secure institutional environment that investors are willing to make the capital investments required. The second link is that a substantial proportion of the value of resources extracted be captured by the government through taxation. This involves design and implementation of an appropriate contractual and fiscal system. It fails if revenue is siphoned off into corruption, if revenue is dissipated in rent-seeking behaviour, or, at worst, in violent conflict. Third, sufficient of this value should go into asset formation that the depletion of extractable assets is fully offset. Finally, the asset formation should be by means of domestic investment. This investment should diversify the economy, requiring that the investment process be sufficiently efficient to generate a return on investment at least as high as that available elsewhere in the world.

We now take each of these decisions in turn, drawing on the country evidence to illustrate the problems encountered.

## 1. Discovery and development of natural assets

The discovery of natural assets is about generating information through investment in prospecting. Economists now know that the market in information abounds in asymmetries, externalities and commitment problems. Resource extraction companies can be presumed to know more than governments about the chances of finding valuable resources: this is an information asymmetry. As a result, bilateral negotiations between a government and a prospecting company are liable to favour the company: competition between equally well-informed companies is the best way for the government to get value. Each discovery generates information on the chances of neighbouring discoveries: an externality. The preferred strategy for prospectors is to buy the rights to discoveries and then wait for others to make a strike: however, this privately optimal strategy is socially inefficient. Once a discovery has been made, the knowledge can potentially be expropriated by government: a commitment problem. This inability of many governments to make credible commitments not to expropriate discoveries reduces the incentive for companies to prospect.

The ideal sequence to address these problems would be to start with the government investing in as much public geological information as is practicable and then sharing this information with all potential companies. Directly, public information reduces the asymmetry of information between companies and government. But it also reduces the other two problems: there is less need to wait for others to prospect, and, by reducing the risk that prospecting will not find anything, the commitment problem is also reduced.

Information provision has to be accompanied by an investment environment in which there are incentives for prospecting and for development of discoveries. In the early 1970s the governments of both Nigeria and Chile confiscated natural assets from resource extraction companies. In Chile the Pinochet regime sought to live down this past government behaviour, introducing strong incentives for private investment and various arrangements purporting to guarantee investor rights. The government of Zambia had also nationalized the private copper company in the 1970s, albeit with compensation, and subsequently it also tried to live down this history by guaranteeing terms for private investors. However, in Chile, the changes introduced by the Pinochet regime generated little investor response until after the transition to democracy. Investors were waiting to see whether the new 'guarantees' would be robust to regime change. Only once the new democratic government decided not to change the terms did investors come in. In Zambia, where the government was already democratic, the investment response was more immediate. This suggests that the credibility of government is not just a matter of formal legislation, but of the wider context of governance in which it is set.

Having invested in public geological information, and created a sufficiently secure environment for investors, the government should *auction* off plots for prospecting *gradually*. The use of an auction further reduces the problem of asymmetric information as well-informed companies compete against each other and thereby inadvertently reveal the true value of the prospect. The

reason for selling auction rights gradually in geographic blocs, is that this enables the government to benefit from the externalities of prospecting in the first round of blocs before selling further contiguous blocs.

Finally, it is important to require prospectors to invest in search within a relatively brief time-period such as three years. Otherwise as noted, they have an incentive to wait for others to prospect. Yet such a requirement is only as effective as the ability to monitor performance on the ground and enforce adherence to the contract in the courts. Hence, the government needs to build both of these capacities.

None of our eight countries came close to this ideal approach. By design, all of them had some valuable resource discoveries. However, there is clear evidence that under-investment is a problem. In several countries the volume of resource extraction has trended down, despite reasonable expectations that more resources are available for discovery. In Nigeria and Cameroon oil production is lower now than it was thirty years ago, and in Zambia copper production declined to only 40 percent of its peak volume, until a change in incentives rapidly led to vast new deposits being discovered. At the opposite end of the spectrum, Chile has had a huge expansion in its copper output, driven by private investment, although as we discuss below, this was achieved at the cost of sub-optimal taxation. The difference between a path of volume expansion, such as that of Chile, and of volume contraction, in Zambia, Cameroon and Nigeria, has correspondingly large and important consequences for the path of revenues. While a lack of prospecting shifts resource discovery (and hence revenues) into the future, this may be disadvantageous. Partly, in a developing economy, the return on investment should be higher than that elsewhere in the world, so that it should pay to get resources out of the ground sooner rather than later. Further, it is much easier to manage a steadily rising revenue stream than one that rises rapidly for a few years because of an initial discovery but then gradually contracts because the incentives for further prospecting are inadequate.

The phenomenon of under-investment in prospecting observed in several of the eight countries is more general. Among the poorest countries, the average square mile of their territory has only one quarter of the known sub-soil assets of the OECD countries. This is unlikely to be because they actually have fewer natural assets; rather it is that they have had weaker incentives for prospecting and so less investment in it.

## **2. The Taxation of Resource Extraction**

The design of a tax system for resource extraction is complicated and politically sensitive. At the technical level, the appropriate tax regime depends on the geology. For example, among our countries both Zambia and Chile are copper producers. However, thanks to favourable geology Chile is a low-cost producer, whereas Zambia is a high-cost producer. This implies that the rents on copper production in Zambia are smaller for any given world price, but also much more highly geared to the world price: the rents from a tonne of Zambian copper will be similar to

those in Chile when world prices are very high, but fall to zero at prices at which rents are still present in Chile. Hence, the Zambian tax regime should be much more strongly geared to the world price than that in Chile. Until the geology is known, such design issues cannot be ascertained. Once the tax regime is appropriate to the geology, there are advantages for the government if it can commit to it. However, as we will see from the history of commitments in Chile, in some political contexts credible commitment is not really feasible. Tax regimes for natural resources have often changed repeatedly, usually because the design has not adequately envisaged changing circumstances. The credibility of the tax regime is therefore more dependent upon its being designed to anticipate changes in circumstances than it is to the niceties of the legal process. A well-designed tax regime remains reasonable to both parties in response to changing circumstances such as new discoveries and changes in world prices. If the tax regime is badly designed and effective commitment technology might well be detrimental to government, locking it in to a design that becomes inappropriate.

Typically, there is considerable 'resource nationalism'. One way in which this is addressed is by taking national ownership through a national resource extraction company. This is potentially complementary with a well-designed tax system: the national company is subject to the same tax regime as private companies, but its existence builds national capacity and so enables the tax regime to be better designed. However, the experience with national companies has been very mixed. Malaysia used a national company as part of a much wider strategy of resource nationalism. As we will see, revenues from natural resources were in part used to buy-out the equity in foreign-owned resource extraction companies. Zambia also bought out the foreign copper company, but using borrowed money rather than revenues.

However, the key difference between the Malaysian and Zambian experience was in the performance of the nationally owned firms. In Malaysia the company was staffed with technocrats who were protected politically by the prime minister from populist pressures. Further, the staff appear to have internalized a mission to improve Bumiputra interests in the society rather than to use their positions to enrich themselves or their families. The company volunteered to retain a smaller share of profits for internal use than the world norm for oil companies. In contrast, the Zambian national company, ZCCM, gradually increased its internal retentions. Not only did it come to absorb all profits internally in the form of rising unit costs, but by the time it was dissolved it was running a loss equivalent to ten percent of GDP. Once privatized, unit costs rapidly and substantially fell, suggesting that what was happening was rent-seeking by public sector managers in various forms. In Chile, post-1990 the national company had to compete against several private companies that grew to account for around 80 percent of output. For most of this period the private companies paid virtually no tax whereas the public company paid dividends and tax to the government and so generated a disproportionate share of copper revenue.

A tax regime can be too favourable to private companies either because tax rates are too low, because they can be avoided by allowable deductions from profits, or because they are not

properly enforced. All three features were common in the eight countries. In Russia during the 1990s the federal government was weak and was out-bargained by the regions and the companies. The outcome was that both the companies and the regions were left with excessive shares of revenues. During the following decade, Putin strengthened the federal government and sharply increased federal revenue at the expense predominantly of the regions but also of the companies. Despite the low taxation there was little investment by companies because there was too much political uncertainty, analogous to Chile in the 1980s. Further, the regional governments, perhaps sensing that their advantage was likely to be temporary, sold off extraction rights by maximizing the initial payment at the expense of future revenues. In this condition of political flux companies were well-placed to play off the federal and regional governments against each other. In Chile, until 2006 the tax regime targeted profits but allowed many generous offsets for investment. The result was that despite booming output and a world copper boom tax receipts were negligible. In 2006 the government therefore switched the tax regime from a profits tax to a royalty system which did not permit offsets but paid a proportion of revenues per tonne, immediately generating large revenues. Nigeria illustrates the third form of problem: under-reporting by companies. For many years Nigeria lacked the capacity to audit the oil companies but did not bring in international audit companies: as a result, tax payments by the oil companies were, in effect, voluntary. Finally, in 2004 a new finance minister brought in international auditors who discovered that payments had been insufficient to the order of several hundred million dollars.

There are some periods which are too politically uncertain to attempt something as fundamental as a long-term tax regime for natural resources. In Russia, Zambia and Chile the initial attempt to attract private investors was in unpropitious circumstances: highly uncertain transition in Russia, a military regime that lacked long-term credibility in Chile, and a period of rock-bottom world prices in Zambia. In all three cases the result was that private companies captured an excessive share of the resource rents. It would have been more appropriate to wait until there was greater certainty before attempting to attract private capital. Zambia is somewhat distinctive in that there the uncertainty concerned the market rather than the political system. The government was not the only actor to be wrong-footed by the market: Anglo-American, a highly experienced resource extraction company, pulled out of Zambia at what was in retrospect precisely the wrong moment, foregoing the benefits of future price increases, and creating acute problems for the government.

The taxation of resource extraction evidently affects the incentives for investment in prospecting. Chile and Zambia have both succeeded in inducing foreign investment in prospecting by committing to long periods of tax exemption. Conversely, in Malaysia taxation achieved particularly high rates of rent capture and there is some evidence that this discouraged investment in prospecting. However, the appropriate trade-off between revenue and exploration is likely to be country-specific, and indeed to change over time. From the public perspective the objective is not to maximize discoveries or extraction. Malaysia had sufficient investment in prospecting that, given its tax regime, it was able to generate high and rising resource revenues.

Development expenditures were not generally constrained by a lack of finance nor was there a looming exhaustion of natural resources. Hence, there was no need to sacrifice revenues to induce further prospecting. Zambia is at the other extreme: development became acutely revenue-constrained, and by the late 1990s the exhaustion of known copper reserves was an imminent prospect. Hence, there was little option but to make a short-term sacrifice of revenues in order to induce further prospecting. The policy error was to have conceded too much potential revenue too far into the future.

### **3. Avoiding Political Violence**

Resource extraction can generate pressures for violence. However, it also generates revenues that can be used to address existing pressures for violence. Both of these effects are now reasonably well-established and both are evident from experience in the eight countries. Global statistical evidence finds that the risk of civil war (and other forms of internal violence) is reduced by economic growth and a higher level of income, but, controlling for the rate of growth, it is increased by revenues from resource extraction (Collier and Hoeffler, 2004; Miguel et al, 2004; Besley and Persson, 2009). Among the eight countries, Nigeria, Russia, Malaysia, Iran and Chile have all experienced political violence, some related to resource extraction, some unrelated.

The violence was most-clearly resource-related in Nigeria. In the late 1960s the oil-producing region violently seceded, leading to a three-year civil war. The predominant response to this was quasi-military. The three regions of Nigeria were gradually split up into a total of 36 small states, each incapable militarily of seceding from the other 35. While this avoided violence organized by state administrations, by the 1990s oil-related violence had re-emerged as an informal, quasi-criminal phenomenon targeting the local operations of the oil companies. It proved to be highly persistent and very costly. The informal violence was in part provoked by the combination of local environmental damage and manifest federal-level corruption, but was also increasingly opportunistic, kidnapping oil workers for ransom and stealing oil by tapping into pipelines. In response to the violence the oil-producing states were allocated disproportionate shares of national oil revenues, but this failed to redress the problem. The large revenues provided to these states were usually captured by local politicians (sometimes in collaboration with gangs), leaving the wellbeing of residents unaffected. The disproportionate allocations may even have compounded the problem: not only did they fuel local political corruption, but by conceding the principle that these localities were entitled more than other states they implicitly granted co-ownership of the natural resource to the local population.

In Russia following the break-up of the Soviet Union there was a credible fear that the resource-rich regions would secede. Various other regions of the USSR had seceded peacefully, and within Russia, Chechnia was attempting to secede violently. The response by the federal state was initially to accommodate economic demands by assigning revenue rights to the regions. In a confused legal situation, the principle of regional ownership of natural resources was largely

conceded. As in Nigeria, the resource-rich regions were a small minority of the country, and so this principle conflicted with the objective of using the resources for national development. Post-2000 the approach was reversed. Ownership by the regions was revoked and instead concentrated at the federal level. The change of ownership was supported by a display of military might: part of the rationale for the heavy government military response to the Cheknan secession may have been to discourage other such attempts. In effect, Russia had the same two approaches as Nigeria – inflicting military defeat on secessionists, and conceding regional ownership of resources, - but in Russia the accommodation strategy was replaced by military force, whereas in Nigeria the sequence was reversed. Both approaches proved to be very costly.

Iran had two phases of resource-related violence. During the 1970s the Shah's attempt to spend exploding resource revenues as rapidly as possible led to social disruption. He personally ordered an already ambitious five-year development plan to be quadrupled, overruling the advice of his technocrats. The resulting highly visible transformation of the society, with the rapid emergence of an affluent elite, presumably helped to provoke the religious fundamentalist backlash against modernization that toppled the regime. The second oil-related violence was during the 1990s when the oil revenues were used by a narrow, ideologically driven, elite to prolong an international war with Iraq. While Iran did not start the war, and it was ended by a settlement, it went on far longer than most international wars, for which the average is six months. Arguably, the narrow elite found the war a convenient justification for social control: the use of oil revenues for the war was thus a choice rather than an unavoidable necessity.

In these three countries resource extraction has thus contributed to secessionist violence, criminal violence and international war.

Two countries started from violence unrelated to resource extraction. In 1969 Malaysia experienced race riots, the ethnic majority objecting to the privileged economic position of the ethnic minority Chinese. While these were riots were not induced by natural resources, the subsequent concern of the government to defuse racial tensions undoubtedly influenced policies towards the management of resources. Whereas in Nigeria and Russia the responses were to accommodate by granting rights to revenues and to intimidate by military force, in Malaysia the responses were economic. The revenues from natural resources were entirely concentrated at federal level: no regional ownership rights were conceded. The revenues were then used to finance a gradual accumulation of assets in the hands of the ethnic majority, while maintaining a rate of growth that was sufficiently rapid that this redistribution of assets did not require absolute reductions in the incomes of the initially advantaged racial groups. Essentially, the Malaysian strategy was peace through redistributed economic growth. The strategy was explicit, high-profile and pursued relentlessly for decades: members of the disadvantaged majority could be in no doubt that through a variety of implementing approaches this was the government's overarching policy. Purely as a peace strategy this proved to be far more successful than either the Nigerian or the Russian approaches.

Somewhat analogous to Malaysia, Chile experienced a military coup followed by severe political violence in the early years of the Pinochet regime which was unrelated to resource extraction. However, there was subsequently a remarkably peaceful transition to social democracy in which the economic gains of the Pinochet era were preserved and extended. As in Malaysia, the politically disadvantaged appear to have drawn the conclusion from their experiences of a phase of social disturbance and phase of rapid growth that they could benefit more from continued growth than from a return to confrontation.

What are the lessons from these very different experiences? One is that resource extraction carries downside risks: both political groups and organized criminals can use local grievance to mount resource grabs; and national elites can become cavalier about international warfare. The other is that properly managed, the revenues from resource extraction can be a potent force for national social peace.

To reduce the risks of political secessionist and criminal responses and effective military deterrent may be necessary to face down opportunistic criminal predation, but it is unlikely to be sufficient. Local claims for disproportionate shares of revenues need to be made to look greedy. This depends upon the chosen national use transparently benefiting ordinary citizens equitably. Since for sustainability the depletion of natural assets should be offset by the accumulation of other assets, the national use must also benefit the future. One politically realistic way in which the imperative of transparent equitable benefits to citizens can be reconciled with accumulating assets is to target children as the primary beneficiaries of resource revenues. The government of Malaysia expanded education, and combined this with building long-term opportunities for employment, such as developing electronics in the impoverished district of Penang.

Meanwhile, environmental damage should be kept to a reasonable minimum by forcing resource extraction companies to face the full social costs of damage. This requires either an effective legal system, or some government-provided substitute which assesses compensation for environmental damage. The resource extraction companies have learnt from the bitter experience of violence in the vicinity of their operations that there is good reason to avoid violence, but there is nevertheless a tension between their interest and the national interest. Resource extraction companies would prefer to buy peace by giving the local population a privileged share of revenues, but this would come at the expense of citizens elsewhere in the nation. Hence, there is a need for a government-generated approach based on compensating for actual environmental damage rather than the company-preferred one of entitlements to shares of revenues.

#### **4. Saving versus consuming revenues**

There are three distinct rationales for saving out of resource revenues. The predominant one is that they are generated by depleting an asset and so are unsustainable unless depletion is offset by accumulation. Most countries do not save enough out of natural resource revenues. Indeed, often they do not even know what the savings rate is because they no distinctive decision

procedure. While the appropriate rate of savings out of resource revenues is likely to be much higher than that out of other forms of tax revenue, it is usually likely to be considerably less than 100 percent. A savings rate in the range 30-70 percent might be appropriate depending upon both objective economic conditions and the ethical framework adopted. Most economists use the Utilitarian ethical framework of how to value the future relative to the present. On this framework, in an economy that is poor but converging on the OECD, the rationale for saving out of current revenues from depletion is not to raise the long-run level of consumption. The society is currently much poorer than it will be once it has converged on the OECD and so there is a good case for spending some of the revenues on consumption until convergence has been achieved (Collier, van der Ploeg, Spence and Venables, 2009). The case for saving is partly to accelerate progress to convergence, and partly, if resources are likely to be depleted before convergence is achieved, to stretch the additional consumption financed by natural resources beyond the time of their exhaustion or anticipated obsolescence. Even on the simpler ethical framework that natural assets belong to all future generations not just the present, there is a good case for consuming some of the revenues. If natural assets can be converted into other assets that are more productive, future generations can be fully compensated for the depletion of natural assets even if only a proportion of the revenues are invested. Potentially, in a capital-scarce economy, opportunities for high-return investment should abound.

The secondary reason for saving out of resource revenues is that they are highly volatile due to the vagaries of discoveries and price movements. Hence, a spend-as-you-go policy would imply fluctuations in public spending that would be disruptive. Whereas the former aims to accumulate long-term assets, the latter aims to build up sufficient liquidity to enable the society to stay on a path of spending that does not inflict accelerations and reductions that are inefficient. If the society were confident of its ability either to borrow through periods in which spending should exceed revenue, or to insure against revenue fluctuations, then it would not need to build up assets for this purpose. However, in practice as the 2008 global crisis demonstrated, many countries face borrowing constraints in world financial markets just when they most need finance, while insurance arrangements are often expensive and limited. Hence, building up liquidity is a sensible defensive strategy.

As we discuss below, only Chile and Kazakhstan have formally distinguished between the two rationales for saving out of resource revenues. Even this is relatively recent. Rates of asset accumulation have varied enormously between countries and between time periods. Malaysia has had an average savings rate of 37 percent, and Kazakhstan initially had a savings rate of 78 percent for over a decade, followed by one of 42 percent until the global crisis of 2008. In contrast, most countries have accumulated liquid assets for relatively short periods and drawn them down in order to sustain spending once revenues faltered. This does not, however, imply that spending has been stabilized. As we discuss, a more common pattern has been that spending reductions have merely been postponed.

Institutional designs for savings out of resource revenues have also varied enormously. The analytic ideal would involve both data presentation and decision processes. In resource-rich economies most tariff revenues are actually an indirect way of taxing natural resource extraction (Collier and Venables, 2010). Hence, they should be accounted as such in government budgets. Statements of revenue should be broken down so as to distinguish between those revenues which are sustainable, and that which derive directly or indirectly from resource depletion and so are unsustainable. The data on unsustainable revenues should then feed into a political decision process which sets the savings rate out of these unsustainable revenues. Further, since there are two distinct rationales for saving out of resource revenues, the combined savings rate should vary from year to year. The underlying rate of asset accumulation to offset depletion should be constant, but the rate appropriate for smoothing spending should swing from positive to negative depending upon judgments about market conditions.

Among the eight countries, the one which embarked on resource extraction with the most-praised savings strategy ultimately completely failed to harness its natural assets for development. This was Cameroon, where the president established a dedicated overseas fund into which most of the nation's oil revenues were paid. The size of the fund was kept secret from the population, and indeed from the government, being solely in the power of the president. At the time this design was praised by the World Bank as a prudent approach: saving abroad was considered the right approach to avoid Dutch disease, while the secrecy surrounding the fund was considered appropriate to avoid populist political pressure for domestic spending. In the event, the approach proved to be disastrous. The accumulation of liquid assets abroad enabled money to be brought back quickly following the revenue collapse of 1986. However, this merely deferred difficult spending choices: the repatriated money was largely dissipated in an ultimately unsustainable level of low-quality recurrent spending commitments built up during the boom years. Meanwhile, the secrecy surrounding the fund prevented any checks and balances on corruption. The money not repatriated is unaccounted for and presumed to be lost without trace. Cameroon has become, according to the various international ratings, the most corrupt country on earth.

Nevertheless, the need to accumulate assets abroad while providing political defences from populist pressure has been common to the two most successful countries, Malaysia and Chile. In Malaysia the accumulation of foreign assets was done through two distinct strategies. The first was to use revenues to buy-out the equity of foreign resource extraction companies operating in the country. This was managed by a committee and cleverly hitched the populist objective of resource nationalism to the prudent objective of asset accumulation. Initially, 67 percent of the equity of firms operating in Malaysia was foreign-owned. By 1990, despite a large increase in the overall value of firms, through buy-outs the foreign-owned proportion had been reduced to 25 percent. The second strategy for the accumulation of foreign assets was done through the national oil company which was encouraged by the prime minister to invest abroad, predominantly within the region of East Asia. The oil company reported directly to the prime

minister, not to parliament, so as to guard against populist pressure. The company was not highly transparent, but it was subject to commercial discipline.

Chile created two international funds, one for long term assets, and the other for stabilizing expenditure given likely fluctuations in revenue. Its approach to ring-fencing these foreign assets was quite different to Malaysia. The government set up an independent committee of experts to determine the long-term price of copper which should be used to determine revenues flowing against ministerial influence, the committee reported directly to parliament. Hence, in Chile parliament was seen as a safeguard against government abuse, whereas in Malaysia government (in the office of prime minister) was seen as the safeguard against abuse by parliament. Chile has achieved an impressive accumulation of foreign assets from this strategy, although much of the effect of seemingly highly sophisticated rules has in practice been to lag increases in spending one year behind increases in revenues. Further, the rules have been changed almost every year. The changes have been technocratic, but the fact that they can so readily be made suggests that the rule structure does not currently amount to an inviolable institution. Arguably what underpinned good fiscal choices in Chile was a deep popular understanding of these choices coming out of searing previous experience well-understood, rather than a set of technocratic constitutional rules. *The rules reflected previous social learning understanding rather than defending against popular misunderstanding.*

Nigeria first established a foreign savings fund in the early 1990s. However, it was essentially decorative: analogous to a national airline with no planes, it fulfilled form but not function. By the onset of the reform period, 2003-7, there was virtually no money in it. In 2003 the reformers established a rule a little like that of Chile but without the independent committee of experts and without a clear distinction between stabilization and long-term accumulation. Indeed, given the context – an initial fiscal deficit and an incipient oil boom – the urgent matter was to slow the increase in spending. The ‘long term price’ was set each year by the finance minister, with excess revenues going into a fund. As in Malaysia, the executive branch of government was seen as more prudent than the legislature. The vigorous opposition in Congress and the Senate to the Fiscal Responsibility Act tended to support this judgment. The fund was in part used to finance domestic investment, but also accumulated foreign financial assets. Since Nigeria started the oil boom with a debt overhang, a further use of revenues was to pay off debt. In Nigeria half of the oil revenues accrue directly to the states rather than to the federal government. A major constitutional battle developed as to whether the federal government even had the right to undertake the macroeconomic management of these state-owned revenues. Currently, only a few states have passed Fiscal Responsibility Acts.

Like Nigeria, following the financial crisis of 1998 Russia prioritized its oil revenues for paying down debt and accumulating foreign assets. Like Nigeria, by the end of the oil boom it had accumulated an impressive level of reserves. However, in both countries the reserves were quickly run down during the global crisis of 2008. Currently, it is too early to judge whether this use of accumulated funds was wise. In favour of the decision, clearly the global crisis of 2008

was a highly exceptional event which warranted exceptional responses. However, against the decision, the outcome may well have replicated the Cameroonian experience post-1986 of burning up hard-accumulated financial assets in sustaining low-priority recurrent spending decisions taken at the peak of the boom. By 2010 although Nigerian oil revenues had substantially recovered, they barely met public recurrent spending. The stabilization function may well have been given excessive priority relative to the function of accumulating assets for the long term.

Through a different route Kazakhstan experienced a similar outcome. The government appeared to be highly prudent, establishing an foreign asset fund into which all oil revenues were paid and virtually eliminating foreign indebtedness. High savings rates were institutionalized by rules governing maximum withdrawals from the fund. However, this apparent prudency proved to have two points of weakness. The main one was that the private sector, via the local banks, used this government accumulation as implicit collateral for foreign borrowing. The banks then on-lent this borrowed money for property investment. This resulted in an asset bubble which crashed at the time of the 2008 crisis. The government then had to repatriate a considerable part of its accumulated fund in order to bail out the banks. In effect, the apparently prudent behaviour by government permitted imprudent behaviour by the private sector and so was not, overall, as prudent as it looked. The second route for undermining the oil fund was that in response to the 2008 crisis the rules were changed to permit the fund to hold domestic assets. Very swiftly, one third of the entire fund was reallocated into salvaging the banks, acquiring low-quality assets in the process.

Post-revolutionary Iran also created a foreign savings fund for oil revenues. However, it was repeatedly raided and so, as a long-term accumulation strategy, was more form than substance.

Hence, in Cameroon, Nigeria, Russia, Kazakhstan and Iran for one reason or another foreign asset funds that were intended to be long-term were used to prop up what were probably rather low-quality forms of spending.

What are the lessons from this experience? Partly it shows that because foreign financial assets are liquid they are intrinsically a hostage to fortune. It appears to be politically much more difficult to maintain these assets in the face of downturns in revenue than to accumulate them in the first place. Essentially, recurrent expenditures are politically extremely difficult to cut, and the financial sector cannot be allowed to collapse. If these are the political realities, then three related approaches not followed by any of these countries may be helpful. First, buffers can be placed on the rate of increase of recurrent public spending. Rapid increases in recurrent spending are liable to lead to a reduction in standards of scrutiny, and so low-quality spending, which then becomes locked in, draining funds intended for asset accumulation. Because resource discoveries and price spikes both give rise to brief periods in which public revenues rise at extraordinary rates, it is important to detach the rate of increase of spending from them. Second, in view of the experience in Kazakhstan, buffers also need to be placed by government on the rate of increase

in private lending. The moral hazard associated with the accumulation of public foreign assets creates a bias towards risk in private lending which needs to be restrained. Third, withdrawals from a stabilization fund should not aspire to smooth the *level* of public spending, but rather its *rate of decrease*. The uncertainty around both depletion and commodity prices is such that stabilizing the level of spending is not feasible and attempts to do so risk merely postponing large and abrupt cuts in spending rather than avoiding them. Hence, an orderly rate of decrease should be determined in advance. It may also be more politically feasible to maintain this rule, which inflicts limited pain at the onset of downturns, than to aspire to prevent any withdrawals for purposes of stabilization.

A second lesson is that rules may be less important than social understanding. The Chilean rule structure of a stabilization fund and a long-term asset fund correctly identify the two core functions of foreign asset accumulation, but most elsewhere foreign asset funds are not sufficiently elaborate to make this distinction. Simple rules are thus liable to be inadequate in serving one of other of these functions, while elaborate rules that are not being understood may not be robust. Related to the need for social understanding, potentially the president, government ministers, parliament, and the popular media can each constitute ‘the problem’ against which rules try to guard. Perhaps, upon the discovery of valuable natural resources, a judgment needs to be made as to where the best defences lie, and initial institutional rules designed around this judgment: as a result such initial institutions may look very different society by society. Yet over time regardless of this initial judgment the right approach may be to build a common understanding across society. As this happens, the initial design becomes increasingly redundant and may indeed become dysfunctional. The example of diamonds in Botswana illustrates this evolution. Although Botswana has always been a functioning democracy, when the government first received diamonds revenues it decided that its decision to save much of these revenues would virtually be hidden from public scrutiny. Savings were merely reported as a single line item buried in the budget. Yet the government followed this up with a sustained education campaign to inculcate prudence into the population. Successive governments have been able to preserve highly prudent behaviour for several decades, accumulating massive foreign exchange reserves, without either dedicated foreign funds or complex rule structures. Public prudence has been underpinned by popular understanding. Even in Botswana the accumulation of liquidity may, however, have eventually given rise to the problem of excessive protection of public spending during downturns. In 2009 a severe downturn in the global diamonds market coincided with a new president with ambitious spending plans facing an election: as a result the fiscal deficit rose to 15 percent of GDP.

In the absence of a critical mass of informed citizens, rule structures can easily become a sham, defusing pressure for change without altering real decisions. Cameroon is the clearest instance of rules as a smokescreen for inaction. The government has repeatedly created institutions which are superficially appropriate for the management of resource revenues, but for many years none of them has proved effective.

A third lesson is that the liquidity of foreign financial assets may make them unsuited for the task of long term asset accumulation. Debt reduction, as in Nigeria, or public investment abroad, as in Malaysia through its national oil company, may be better suited because they are much less reversible. However, the accumulation of real domestic assets may be the best-defended form of accumulation. It is to this that we now turn.

## **5. Domestic Investment**

Domestic investment out of the savings from resource revenues is desirable for three distinct reasons, but there are potentially two important offsetting arguments for the accumulation of foreign assets.

### ***Domestic versus foreign asset accumulation***

The first reason for domestic investment, noted above, is that being illiquid, such assets are less prone to being dissipated in misguided attempts to sustain recurrent spending at excessive levels. The second reason, also noted above, is that in a capital-scarce economy, returns should be higher than on foreign financial assets. The third is that properly chosen, domestic investment can transform the economy away from resource-dependence, to a structure in which it is easier for ordinary citizens to generate productive livelihoods.

One potentially offsetting reason for the accumulation of foreign assets is indeed their liquidity. If the society can ensure that the depletion of foreign assets is never excessive, their greater liquidity is an advantage. For example, the Russian government may indeed be thankful that during the period 2000-2008 it accumulated foreign assets so that it could cushion the global crisis without resort to international borrowing.

The other potentially offsetting reason for accumulating foreign assets is the avoidance of Dutch disease. Foreign asset accumulation reduces pressures for the appreciation of the exchange rate. While this is one way of helping non-resource exports, other ways which are less costly in terms of domestic investment forgone are likely to be more effective. Malaysia had long experience of export diversification, initially mounting a highly successful diversification from rubber to oil palm through public investment in new varieties, extension, and subsidized smallholder replanting programs through FELDA. Throughout, more than half of public investment was targeted on agriculture, on which the majority of the indigenous population were initially dependent, but increasingly, the government also promoted export diversification into manufacturing through targeted economic and social infrastructure. By 1987 manufactured exports overtook natural resource exports and are now many times larger. From the 1990s an increasing proportion of public investment was for social infrastructure. Thus, over the decades the composition of public investment changed, the sequence being first agriculture, then industry, and finally the social sectors. In the process, absolute poverty came down from 50 percent of the population in 1970 to under 4 percent by 2007.

Whereas attempts to change the real exchange rate over the long term are likely to be costly, there may be more scope for exchange rate management to assist diversification by avoiding temporary surges during commodity booms. In Zambia an unfortunate conjunction of a copper boom, debt relief, and monetary targeting led to a sudden real appreciation of around 80 percent, which inevitably damaged non-resource exports. In contrast, Chile was able to go through the copper boom without any exchange rate appreciation thanks to its policy of using the boom to accumulate foreign assets. Although the Zambian authorities mismanaged the exchange rate, wrong-footing exporters, survey evidence on Zambian exporters finds that they are usually far more concerned about inadequate infrastructure than about the exchange rate. Resource revenues spent effectively on improving the infrastructure for the export sector are likely to improve the competitiveness of exports more than were the same revenues accumulated abroad.

### *Managing domestic investment*

If asset accumulation from resource revenues is to be domestic, the next question is whether this should be managed by the public or private sectors. Nigeria and Iran on the one hand, and Kazakhstan on the other, offer contrasting stories of investment disasters, one by the public sector, the other by the private sector. During the oil boom of the 1970s the government of Nigeria determined to use much of the revenues to accumulate public infrastructure, which was indeed badly needed. Unfortunately, the management of this process went disastrously wrong. An uncoordinated program of purchasing cement abroad in order to break a potential bottleneck in cement supplies led to the infamous ‘cement Armada’ in which massively excessive purchases clogged up Lagos harbour incurring demurrage. Rampant corruption in construction projects generated ‘ghost’ construction firms which entered into contracts without either the capacity or the intention of delivering on them. One estimate suggests that 80 percent of construction spending during this period was wasted. There was also a sharp increase in the unit cost of construction, so that much of the extra expenditure on public investment was dissipated. Meanwhile, private investment in Nigeria actually declined as private wealth was sent abroad, partly to benefit from an overvalued exchange rate, and partly because much of it was corruptly generated and so was more safely held in overseas banks. In Iran the same oil boom was seized on by the Shah as an opportunity for accelerating an economic transformation that was already astonishingly rapid. Prior to the boom oil revenues had been well-used to finance a land reform, expand education, and industrialized. However, the boom fed the Shah’s delusions of grandeur. His insistence on quadrupling the development plan overnight was analogous to the grandiose plans of the Nigerian government. The implied annual growth rates for public investment expenditure were simply unmanageable, reducing established procedures to chaos and thereby enabling corrupt practices to thrive. Post-revolutionary Iran also adopted high rates of domestic investment, but for different reasons failed to get good returns on it. Management of the investment process was largely delegated to quasi-charitable organizations which lacked both scrutiny and expertise, resulting in poor selection and implementation of projects.

While in Nigeria and Iran it was public investment which went wrong, in Kazakhstan it was private investment. As discussed above, the government saved abroad but this provided collateral for local banks to borrow and lend for domestic private investment. Being landlocked, Kazakhstan has relatively few opportunities for export diversification. The main investment opportunities to which the private sector was attracted were property. The resulting boom in property prices induced expansion in the construction sector which consequently became the fastest-growing sector of the economy. In 2008 the property bubble burst, leading to a banking crisis.

Neither of these strategies delivered appropriate domestic investment. Public and private investments are naturally complements, an example being roads and trucks: the return on each depends upon investment in the other. In Nigeria public spending did not result in decent infrastructure, whereas in Kazakhstan the government forewent needed investment in infrastructure in a misguided prudence, leading to wasteful private investment in residential and commercial property. The government cannot abrogate its role in providing infrastructure: resource revenues are an opportunity to finance this investment, but, as Nigeria demonstrated, the government also needs to build the capacity to manage the process efficiently. Until 2004 Nigeria lacked basic procedures necessary for public investment, such as competitive and transparent tendering: once these were belatedly introduced the unit cost of projects fell by an estimated 40 percent.

The government's role in stimulating complementary private investment need not be primarily via the provision of finance. Increasingly, where private returns are high, finance can be attracted, whether through raising the private domestic savings rate or through foreign borrowing and FDI. For example, Malaysia has been able to attract more FDI per capita than any other developing country. In part, by providing good infrastructure the government will automatically be raising the return on private investment. However, it can supplement this effect by reforming regulatory practices so as to improve the private investment climate. There are now several global investment ratings, such as the World Bank's *Doing Business* annual assessments. Resource-rich countries tend to do atypically badly on these ratings. This may be systematic: resource revenues may reduce the need for the government to promote private investment. Iran is an extreme case in which following the overthrow of the Shah, policy changes affordable because of the continuing oil boom sharply reduced private investment. Russia post-2000 is somewhat similar. Changes in government policies led private investors came to fear for the security of their assets, inducing massive private capital flight, estimated at up to \$300bn. In contrast, by implementing credible policy reforms, Chile post-1990 was able to attract considerable private investment without specific mechanisms for lending resource revenues to the private sector. Similarly, Zambia achieved a high investment rate out of the recent copper boom, of around 60 percent, entirely through inducing private investment in the copper sector by tax concessions: in effect, foreign copper companies captured boom rents but then invested much of them. Potentially, this is a good use of the boom rents as long as the government is able to

capture the rents from the extraction generated by this investment. Overall however, the poor performance of most resource-rich countries on the investment ratings suggests that there is considerable scope for relatively straightforward improvement.

Building the capacity for public investment, and improving the environment for private investment are two pillars of the strategy of ‘investing-in-investing’ which is a critical policy response for the successful harnessing of natural resources. The remaining pillar is to lower the unit costs of construction. All fixed investment can be decomposed into equipment and structures. Equipment can be imported at world prices, but structures have to be produced domestically by the construction sector. As Nigerian experience illustrates, rising unit costs of construction can dissipate increased investment spending, and this problem of high costs is common to both the public and private sectors. Yet there is considerable scope for public policy to address this problem, depending upon where the bottleneck is in the construction process. For example, in Nigeria the bottleneck has long been cement: the richest Nigerian billionaire is a cement producer. Continuing deficiencies in port infrastructure have permitted the domestic price of cement to be far above world levels. In Zambia a lack of basic construction skills contributes to high costs: the government had to recruit welders from East Asia, whereas prior investment in training facilities could have generated skilled local workers more cheaply.

## **6. Coping with adverse shocks**

Most of the eight countries have been shock-prone. Sometimes these shocks have been generated by natural resource extraction, sometimes the causes have been unrelated but they have made the management of resource extraction more difficult.

### ***Resource-generated adverse shocks***

Revenues from resource extraction change abruptly, due either to step-increases or volatility. A common policy error is to build systems of social protection during periods of peak revenue that then become unsustainable during downturns, as declining revenues collide with escalating needs. Zambia during the 1970s is a classic instance of this error: by the peak of the copper boom the government had constructed an extensive welfare state, with guaranteed pan-territorial purchase prices for crops regardless of transport costs, and pan-territorial subsidies on food consumption. As world copper prices went into prolonged decline this system initially continued to be financed by slashing investment spending, and finally had to be dismantled.

During a downturn the primary shock to revenue reduces aggregate demand and thereby reduces output in various sectors of the economy. This transmission from resource revenues onto the contraction of aggregate output amplifies the shock. However, the extent to which output contracts varies considerably depending upon the policy response. In Zambia the shock to output was large, given the contraction in revenue, because of the maintenance of a fixed exchange rate and price controls. Both policies limited the extent to which factors of production were given incentives to move between sectors. A contrasting experience is the massive collapse in revenues

from oil in Nigeria in 1986. Indeed, the loss of revenue was compounded by a sudden switch from foreign borrowing to debt repayment. During the boom the government had geared up oil revenues by large foreign borrowing. The crash in the oil price induced international banks to downgrade Nigeria's creditworthiness so that it was not able to borrow further but still needed to service its accumulated debt. Yet despite this combined massive adverse shock, the policy response of a large devaluation enabled the economy to avoid output contraction. Indeed, aggregate output grew more rapidly in the 1986-89 period than it had during the boom years. The growth of output was, however, nowhere near sufficient to offset the decline in aggregate expenditure and so living standards collapsed. The reduction in living standards would, however, have been even more severe without the devaluation and accompanying reallocation of production. This pattern appears to be general: exchange rate flexibility, and policies that enable firms to expand and contract rapidly, both reduce the shock to output from any given decline in resource revenues (Collier and Goderis, 2009).

The appropriate management of revenue volatility is predicated on the larger issue of how revenues from resource extraction should be used overall. We have noted above a tendency for excessive protection of public consumption during downturns by repatriating foreign financial assets. However, where a government is already saving and investing a substantial proportion of resource revenues domestically, the task of smoothing consumption in the face of a decline in revenue is less daunting. In resource-rich countries with high gross investment it is easier to cope with revenue volatility while protecting both the level of consumption and the rate of return on investment. Volatility in revenues can be absorbed by changing investment because the implied swings in investment are proportionately smaller and so more manageable. A well-run resource-rich country would thus have a high average level of investment, but considerable investment volatility around this high average.

The cost of protecting consumption (both public and private) in this way – and hence, the extent to which it is appropriate – depends upon the degree to which volatility in investment reduces the average return on investment. Hence, policies which reduce the cost of investment volatility permit enhanced social protection. What policies are appropriate?

One policy is the preparation of projects. In the public sector periods of low investment would be used to prepare a stock of ready-to-implement projects that met agreed criteria. In periods of high investment these projects, rather than momentary political priorities, would be implemented. Private sector investment in resource-rich countries seems to be particularly prone to property bubbles, a recent example being that in Kazakhstan. Social protection during periods of low commodity prices is in part dependent upon caution during periods of boom.

A second set of policies would aim to flatten the supply curve in the construction sector, so that periods of boom and bust did not map into large changes in unit costs. However, stabilizing aggregate consumption by learning to live with volatility in investment inflicts volatility on one relatively small sector of the economy, namely the construction sector. In turn, volatility in this

sector creates social distress in those households dependent upon workers in the sector. Hence, addressing this problem could be a distinctive feature of targeted social programmes in resource-rich economies. The key transmission onto the incomes of ordinary households is via fluctuations in employment in construction so that ideal social protection would provide counter-cyclical employment in the sector. If investment is to be volatile, the remaining degree of freedom in the system is the labour-intensity of investment projects. During revenue booms what is abundant is foreign exchange, and so the ideal projects are intensive in imported capital goods. Conversely, during revenue slumps, employment can be cushioned relative to the overall decline in investment if labour-intensive projects are prioritized.

This suggests that an important criterion for project preparation and selection should be the ratio of imported capital to employment. In effect, trucks should be imported during booms and roads built during slumps. Because neither the exchange rate nor the wage rate are fully flexible markets, price signals alone cannot be relied upon to effect these changes in composition. There is little else that can be used to affect private investment, but public investment, while notoriously unresponsive to price signals, can navigate by decision rules which exaggerate the swing between the two types of project and so compensate for the inadequate swing in the composition of private investment. In the countries we have studied, public investment projects are prepared by each ministry without consideration to the overall macroeconomic context. Ministries of finance ration the number of projects so as to fit available revenues, but the actual composition of projects is not done with reference to the macroeconomic cycle. Schemes such as food-for-work are *ad hoc* responses triggered by social need. In technical terms, the ideal would be for public projects to be prepared using two sets of shadow prices, one for boom conditions and one for slumps. Hence, the ranking of available projects would change over the course of the cycle. This was not the practice in any of the countries in our sample, but it suggests that even 'best practice' may fall considerably short of policies that would be most effective.

### ***Shocks due to other causes that influenced resource management***

Russia following the fall of the Soviet Union is a classic instance of a shock the cause of which was unrelated to resource extraction but which was critical in shaping its management. As the Soviet Union disintegrated, ownership of its hugely valuable natural resources became the focus of power struggles between the regions and the federal government, and the object of opportunistic plunder by officials in strategic positions. By 1998 the legacy of these two phenomena was a seriously weakened central government, humiliated by the financial crisis in emerging markets, and new billionaires who were acquiring political power. The overarching objective of the policies instigated by the new leader, Putin, was to restore the power of the centre by confronting the regions and the oligarchs and, by using the revenues diverted from these initial beneficiaries to repay debt and accumulate foreign exchange reserves, also to escape dependence on the international community. By 2008 Putin had succeeded in these objectives, choosing very high rates of saving from oil revenues. However, the motivation for high savings was probably not so much a custodial approach to the value generated by natural resources for

future generations, as a concern to regain full de facto sovereignty as quickly as possible. When the global financial crisis plunged Russia into a new economic crisis the accumulated reserves were rapidly drawn down to avoid politically more difficult adjustments. Unsurprisingly, in the context of this political earthquake the key economic decisions concerning resource extraction were not significantly influenced by considerations of long term economic advantage. There was not sufficient political stability to build credible institutions that could administer a set of rules. Nor, given the fundamental economic disputes raging in the society, could a critical mass of informed opinion be built that could agree on an appropriate set of rules for resource management. These key tasks remain for Russian society once conditions are sufficiently stable to permit them.

Iran following the fall of the Shah was a somewhat analogous situation of political earthquake. Although mismanagement of the resource boom triggered the Shah's downfall, the incoming regime was not primarily concerned with resource management. On the contrary, continuing revenues from the oil boom merely enabled it to pursue an economic strategy that would otherwise have quickly been ruinous, as happened in many other societies. The closest analogy is, perhaps, current governance in oil-rich Venezuela.

Chile following the coup against the socialist regime of President Allende is another example of a political earthquake essentially unrelated to resource extraction. Searching for vestiges of legitimacy, the Pinochet regime adopted pro-market economic policies that proved highly successful overall, but the specific policies concerning resource extraction were to an extent stymied by the lack of long-term credibility of the regime. In retrospect, the two great successes of the Pinochet regime were to demonstrate to a majority of the population that pro-market economic policies were more beneficial to them than socialism, and to design a successful transition back to democracy. The democratic government came to power free of either political or economic crisis and hence had the space to design good institutions for resource management. It used this space very well, presumably underpinned by popular understanding of the issues. It created or took over institutions which (in our judgment) are much closer to what would be ideal given the economic circumstances of the country than the other societies we have discussed.

## **6. Conclusions**

The preceding remarks preview some of what has been got right, and some of what has gone wrong. Evidently, the story is much richer than can be identified by broad-brush statistical analysis, and the following chapters fill in more of the detail.