Resource revenue management:

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This paper gives an overview of the key policy choices that arise in effectively managing natural resource revenues. It is organised into the following 4 sections:

1) The long run: consumption, saving and investment
2) Transition to the long run: Dutch disease and effective spending
3) The short run: managing volatility
4) Fiscal instruments and spending channels.

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## 1. The long run: consumption, saving and investment

Natural resources provide an opportunity for transforming the economic progress of many developing and middle income economies. Scarcity of foreign exchange, of funds to finance investment, and of government revenues are constraints on many developing countries, and all these constraints can be relaxed by resource revenues. Yet the historical record of resource rich economies is poor, and this is attributable to many different factors. Some countries have failed to design the fiscal and contractual regimes to incentivise the discovery and development of their resource base, while others have put in place regimes that are too generous and so failed to capture the rents. In others rent-seeking behaviour, theft and conflict have dissipated rents and destabilised society. Even once revenue has got into the finance ministry, many countries have embarked on unsustainable increases in consumption, saving too little of the revenue and failing to transform sub-soil assets into the surface assets of human and physical capital that can generate sustained growth. This paper addresses the range of policy issues that arise at this stage of resource management, as countries seek to effectively manage the revenues that they receive.

The first issue we address is that of the medium- to long-run spending, saving, and investing of resource revenues. How much should be consumed now? How much transferred to future generations, and what assets should be acquired to make this transfer?[1] Figure 1 provides a framework for addressing these questions. Suppose that there is given a flow of resource revenue to government, illustrated by the solid line *RR* on figure 1 (with time on the horizontal axis and resource revenue and incremental spending flows on the vertical). Typically this flow would build up quite fast and then last for a finite period of time, as is the case for an exhaustible resource; we also assume (until section 3) that the flow is not particularly volatile and is known with a reasonable degree of certainty. The objective is to transform the flow of revenue into an ultimate flow of benefit (an increment to consumption) for present and future generations of society. Such a flow is illustrated by the line *CC* on the figure, and our first question is: what should the time profile of the increment to consumption – the shape of this line – be? The gap between *RR* and *CC* is saving from the resource revenue or, where negative, drawing interest income or dis-saving. The second question is; how should such saving be invested? We look, in

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[1] For formal analysis of this question see van der Ploeg and Venables (2011).

this section, at the broad division between investment in the domestic economy or the accumulation of foreign assets. The line *DD* is a possible division, with distance *DD - CC* being investment in the domestic economy, and *RR - DD* saving in foreign assets (or dissaving, if negative). This foreign saving might go into a *Sovereign Wealth Fund*, with the objective of long run savings or inter-generational transfers (sometimes referred to as a Future Generations Fund).
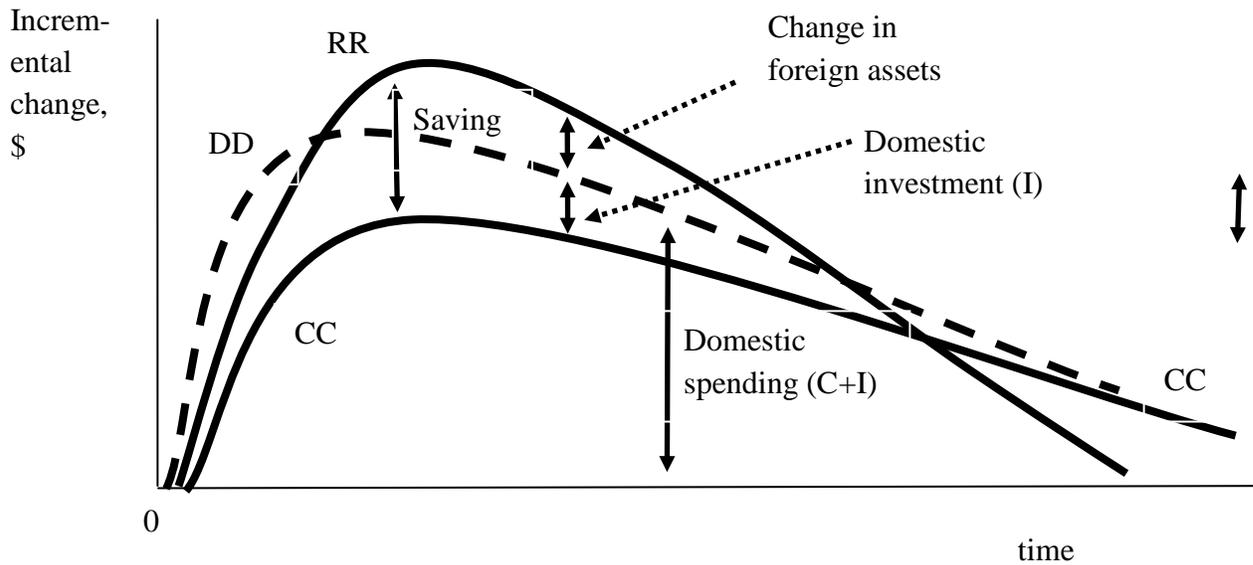
1. 1: Consumption and saving:

We look first at the time profile of incremental consumption (shape of *CC*) before turning to the form of saving (the position of *DD*). The point of departure for analysis of a transient income windfall is the permanent income hypothesis (PIH), under which consumption is perfectly smoothed. That is, *CC* is horizontal, and its height is equal to the annuity value of the windfall (the interest flow earned on the present value of *RR*). Notice that this might involve borrowing to finance consumption in early years, followed by a period of high saving and then consuming interest from accumulated saving in perpetuity. A more conservative variant of the hypothesis is the 'bird-in-hand' hypothesis (BIH), under which *all* resource revenue is saved, and consumption is equal to the interest income on the accumulated wealth. Under this strategy consumption

builds up slowly, reaching its maximum when the resource is exhausted, and then being maintained at this high level thereafter.

The PIH has analytical foundations in the theory of consumption smoothing. It gives the same increase in consumption at all dates and, therefore, to all generations. It is also attractive from the standpoint of custodianship. Underground resource wealth is converted into above ground assets of the same value, the income from which is consumed, while the asset value is preserved. However, it has several disadvantages, particularly from the standpoint of a developing country. A developing country is expected to be on a rising consumption path, along which the current generation is significantly poorer than future generations. It is then not appropriate to give the same resource based consumption *increment* at all dates; the current poorer generation should receive a larger share of the benefit than future and richer generations, since future generations' consumption will in any case be higher. The consumption increment should perhaps look similar to the line *CC* as shown on figure 1 which, after an initial period of build up, is tilted towards the present rather than being flat as it would be under the PIH.[2] Another way of making the same point is to say that the resource windfall should be used to accelerate development, bringing forwards a rising consumption path, rather than raising consumption for far future generations. While this argument is based on a utilitarian welfare maximisation calculus, it is reinforced by political economy considerations; citizens in a resource rich country need to become aware that they – not a political elite – are the ultimate beneficiaries of resource revenues, and an early consumption increment is probably the only way to achieve this.

In making these comments, it is worth re-emphasising the point that the historical record has been for countries to save too little and consume too much from resource windfalls. A substantial proportion should certainly be saved. However, while it may be appropriate for a high income country to follow the PIH (or BIH) strategies, this does not constitute optimal policy in a developing country. Poverty reduction priorities amongst the current relatively poor generation mean that transfers should not be made to generations far in the future, but that the consumption increment should be tilted towards the present poorer generation.

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[2] Consumption rises steadily, although the consumption increment financed by the resource falls back. For formal analysis of this see van der Ploeg and Venables (2011).

1. 2: Domestic and foreign assets:

A substantial part of resource revenues should be saved, this amount indicated by gap $RR - CC$ on figure 1. The question is then; what assets should be acquired with this saving? At the broadest level this is a choice between accumulation of foreign assets or investments in the domestic economy. In this section we continue to focus on long run aggregate decisions so foreign savings are designed as inter-generational transfers, and we will call such savings funds Sovereign Wealth Funds (SWF), referring later to Stabilization funds with shorter run objectives. We now look at this aggregate choice, turning to more short-run and micro-level investment decisions in later sections.

For a capital abundant country, it is probably appropriate to accumulate foreign assets. For such a country high return domestic investment opportunities have been exhausted and further investment would drive the domestic rate of return below that which can be achieved by placing the funds on international capital markets. Such countries have established funds such as Norway's Government Pension Fund or the UAE's Abu Dhabi Investment Authority.

For a capital scarce developing country the priority is investment in the domestic economy, building up domestic stocks of human and physical capital. Rates of return are potentially high, because of initial capital scarcity. This is particularly true for public capital. A developing country is likely to not only be capital scarce, but also short of public funds. Under-developed tax systems and low shares of government revenue in GDP are associated with a high 'shadow price' on government funds, and consequent low levels of public capital; the Spence Commission on Growth and Development emphasised that the share of public spending devoted to infrastructure by African governments is markedly too low (Growth Report, 2008).   Since resource revenues accrue to government they relax this constraint on public funds, as well as the constraint on the overall capital stock. This suggests the use of resource revenues for public investment such as infrastructure projects, and also education and health (technically counted as current expenditure, but nevertheless building the human capital stock of the country).

Investments in public capital have additional value as they are complementary with private sector investment. Complementarities run in both directions: infrastructure investment raises the return to private sector investments, and a larger private sector capital stock and

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associated demand for labour raises the return to investing in education and human capital. Private sector investment is the ultimate mechanism through which sustainable growth will be achieved, and public investments can be used to increase the productivity of private capital and thereby increase the level of private investment.   Used this way, resource revenues have the potential of increasing the rate of growth and bringing forward the development of the economy.

While the primary arguments for investment in the domestic economy are to do with capital scarcity, the case is reinforced by several other considerations. Investment in the domestic economy will lead (directly and indirectly) to employment creation, unlike accumulation of off-shore funds in an SWF. If an economy has labour market imperfections, manifest as un- or under-employment of significant amounts of the labour force, then this is an additional argument for domestic investment; real income is raised by job creation. Putting this somewhat differently, the choice between investing in an SWF and investing domestically is (in part) a choice between having future income flows distributed as rent (i.e. foreign dividends that must then distributed in society) or distributed as wage income, earned by the effect of a higher domestic capital stock on employment and wages.

A further argument is to do with political economy. The current political leader knows that savings decisions taken now may be reversed by future political leaders. This reversal is particularly easy if the saving is held in form of financial assets, an SWF. Such funds can easily be looted by less benevolent future leaders, and there is no point in saving now to finance the profligacy of a future leader. An advantage of turning the saving into the physical assets in the domestic economy is that these investments are sunk; while there may be a risk of them being depreciated by low levels of future saving and lack of maintenance, human capital and roads and bridges cannot be directly looted and consumed by a future government. Essentially, investment in domestic capital is a commitment to a higher capital stock, whereas investments in an SWF do not have this commitment effect.

Summing up, the long-run balance of expenditures for a developing country should include some early increase in consumption, but priority to saving. For a developing country savings should go into investment in the domestic economy, rather than into foreign assets. However, this long run argument will need to be qualified in the light of the efficiency of domestic investment (section 2) and short run volatility (section 3).

2. Transition to the long run:

In the preceding section we argued that a developing or middle income country which is still in the process of building up human and physical capital should spend a significant fraction of resource revenues in the domestic economy. Some of this might be on 'consumption', to reduce current poverty levels, and most on investment, to build up capital stocks. Schematically in figure 1, this domestic spending is the height of the line *DD* and, as illustrated in this figure, ramps up quite fast. However, achieving this efficiently is likely to be difficult because resource revenues create political pressure for spending on pet projects, or in particular regions or constituencies. Furthermore, ramping up investment may encounter absorption problems; both government capacity and the ability of the economy to absorb a spending increase may reduce the efficiency of investment. We discuss each of these issues and policy responses to them.

2.1 Resisting spending pressure

A resource windfall will create both opportunities and demands for spending, even if it is low quality spending. On the supply side, the presence of resources provides collateral for borrowing; newly resource rich economies are likely to find that international capital markets are suddenly opened to them and credit constraints are removed. This has led to surges in international borrowing; the spending may be unproductive and low return, but the collateral provided by the resource means that lenders are nevertheless willing to lend.

On the demand side, increased availability of funds will typically increase demand for spending. The value of political incumbency increases, since the present leader anticipates the future revenue flow and the possibility that this will enable him to better meet political (or private) goals. Since the value of incumbency is increased, so too is the incentive to use public funds in pre-election spending booms.

A resource boom will increase pressure to spend not just by the incumbent leader, but also by others with claims on public funds. Spending ministries, regional governors, city mayors, members of parliament and private individuals are likely to step up bids for funds. This may be perfectly legitimate – spending ministries and regional governors are supposed to

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promote the interest of their department or region – but it creates a bias towards excess current expenditure from public funds. The tax based is shared, while benefits of these projects accrue just to members of a particular group. This common property feature of the shared tax base means that groups will over-bid for funds, even if they recognise that their own projects have low returns and displace higher return national projects. This is sometimes described as the 'voracity effect', and captured in economic models in which fiscal discipline is weak and groups are powerful enough to obtain public spending for their projects. A property of these models is that an increase in the shared tax base – such as that associated with natural resource revenue – will lead to an increase in spending by the groups and a possible decrease in funds left for national projects; the overall effect on economic performance can then be negative.

How can such spending pressures be countered? There are three standard answers. The first is to have high levels of transparency; the president's spending spree is thereby visible and he can be held accountable for inefficient spending; spending agencies are accountable to parliament and the public this, possibly, placing a check on grossly inefficient spending. The second is to ensure that political system has a centralised system of financial control and authority. The finance ministry is, in principle, the body that can trade-off the competing demands of spending ministries, regional authorities, or other lobby groups. It is best placed to internalise the free rider problem associated with a common pool of government revenues. However, to play this role effectively the finance ministry has to have control of incoming revenues, and the political power to be able to resist competing demands.

The third mechanism is to legislate a 'fiscal constitution' that imposes ceilings (and perhaps also floors) on public spending from resource revenues (or public funds more generally). Many countries now have such rules, although few are effective. To be so, they have to robust to changing political and economic circumstances, while at the same time not being so rigid as to rule out extraordinary responses in extraordinary times. We return to a fuller discussion of these rules in the context of revenue volatility in section 3.

2.2 Effective government spending

Even if government can resist demands for excessive current spending, it still faces the problem of making sure that spending – current and capital – is efficient and secures value for money. This is a problem for many countries, but may be particularly acute for a country that is seeking to increase rapidly its spending on investment (and current) projects.

One problem arises due to limited technical capacity and information. Ideally, the government will have a stock of spending plans, each of them subject to rigorous ex-ante appraisal – a social cost-benefit analysis. However, assembling a set of prioritised spending plans and subjecting them to such analyses is hard in principle, requiring information and technical expertise that is lacking even in countries with a large government economic service. The problem is acute in most developing countries, although it is noteworthy that projects put forwards for Botswana's National Development Plans have to pass a strict social cost-benefit test.[3]

The other problem is to do with incentives. Even if the information and technical skills are present, misaligned incentives may cause decision takers to act in a manner that is socially sub-optimal. One extreme of this is corruption – incentives to steal or divert revenues. Another example is rent seeking, occurring when effort is devoted to activities that may be legal but are socially unproductive, involving a zero (or negative) sum game to capture rents created by artificial scarcities. These concerns can be crystallized into the need for projects to pass two distinct hurdles: honesty and efficiency. The tests can be imposed *ex ante*, and are about how decisions get authorised, and also *ex post* in the form of evaluation.

2.3 Absorption and the Dutch disease

Ramping up spending in an effective manner encounters not only political and administrative obstacles, but also economic ones. If supply curves are steep, then higher spending will increase prices and hence purchase relatively little extra quantity of goods or services. Other areas of

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[3] Botswana is heavily dependent on diamond revenues, and has been one of the fastest growing countries in the world over the last 50 years.

spending will be crowded out by these relative price changes, with possible adverse effects. The Dutch disease is the phenomenon whereby a resource windfall appreciates the exchange rate and so crowds out domestic production of tradable goods. There is likely to be both an increase in imports and a reduction in exports, with Harding and Venables (2011) suggesting that the former effect is about twice the size of the latter.

While the Dutch disease may have a long run dimension, much the most important aspect of these relative price changes are likely to be seen in the short and medium run as a resource rich economy tries to adjust to – and absorb – an increase in spending. The key issue here is the slope of supply curves for the goods and services that are demanded. For goods that are internationally traded supply curves will be close to flat: imports can be drawn in without significant increases in their prices (although they may hit other constraints, such as port capacity). Since these quantity changes are associated with relatively small price effects the concern that spending is eroding value for money is absent. The relative price effects will be more severe for goods and services that are non-traded. Often, the first sector in which supply problems show up is the construction sector. Resource funded infrastructure investment might coincide with private sector resource related investment (eg office construction) leading to a construction boom and a rapid increase in the price of non-tradeable inputs including some labour skills. As a consequence the purchasing power of public expenditure is reduced and this brake on infrastructure investment creates other bottlenecks in the economy – in road capacity and traffic congestion for example. The price effects are likely to be most acute where there are sector specific inputs that are hard to replicate, or that take a long time to produce. For example, production of a non-traded good might require capital goods that are non-traded and which themselves require non-traded capital, and so on; if it takes local teachers to produce teachers, then expansion in supply is inevitably slow and price effects will be large.[4]

These points suggest several recommendations for government to get value for money from an increase in spending. First, it is important that the economy is open to international trade; the windfall is incurred in foreign exchange, so drawing in extra imports directly is appropriate, and will mitigate price increases. Second, it is possible to anticipate many of the bottlenecks that will arise in trying to increase spending; ports and roads will become congested,

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[4] See van der Ploeg and Venables (2010) for analysis of 'Dutch disease dynamics'.

and there will be shortages of particular goods and especially of some labour skills. This is an argument for acting early to invest in those activities that are needed to support a wider increase in investment in the economy. Governments should 'invest in investing', to build up the capacity to be able to undertake effective investment. Third, the government needs to ensure that the business environment facilitates entry of new firms and an expansion of employment; restrictions to either of these will be particularly damaging during a resource boom, and while government is seeking to increase spending in the domestic economy.

2.3 Transition: conclusions

We have argued for spending a substantial part of resource revenues in the domestic economy, particularly in building up domestic capital stock. However, this spending needs to be effective. This requires that it is robust to political pressures, that administrative capacity is able to select, design and administer good projects, and that the economy's supply response can accommodate it. Failing this, the rate of increase should be slowed down. While an investment plan might track revenues averaged over a 5-year or 10-year, period, there is no reason to think that it should track it on an annual basis. It is important therefore that the year on year path of spending is decoupled from that of revenue, and that consequent savings (the temporary gap between revenues and spending) are 'parked' abroad, i.e. accumulated in foreign assets on a temporary basis in a '*Parking Fund*' until absorption problems in the domestic economy have been addressed. The extent and duration of such 'parking' will of course depend on the size of the windfall relative to the economy as a whole. Botswana and Timor Leste are not yet high income and are capital scarce, but for countries with such large resource revenues per capita, absorption problems would be acute and the accumulation of foreign assets (Botswana's Pula Fund, amounting to 40% of GDP and Timor Leste's Petroleum Fund, at more than twice GDP) is appropriate.

3. The short run: managing volatility

Resource revenue is often highly uncertain and volatile. Not only is there the 'low frequency' peak due to the cycle of exploration and depletion (as illustrated on figure 1) but also a higher frequency volatility due to price movements. There is a considerable amount of evidence that this volatility is one of the most damaging aspects of resource dependence. For example, the econometric study by van der Ploeg and Poelhekke (2009) suggests that the negative effect of resources on economic growth is entirely due to volatility, and that if Africa's export volatility could be move down to the level of Asia's it would see a 2% pa growth increment. There are several alternative strategies for coping with this volatility.

3.1 Hedging

One way to handle commodity price uncertainty is to sell the resource forward and/ or purchase options or other derivatives. The most celebrated example of this strategy is Mexico's purchase in early 2008 (when oil was $120 per barrel) of an option to sell oil at $70 per barrel. The option cost $1.5 bn and, when it was exercised in 2009 (when the price had fallen to $40), earned Mexico some $8bn. Impressive though this performance was, it seems unlikely that it can become a widespread way for countries to handle price uncertainty. Politically, it is difficult for a government to repeatedly spend billions of dollars on options that will, usually, not be exercised. And if such strategies were to become widespread then market failures would become apparent. Major commodity producers might be large enough to exercise market power, and moral hazard issues would surely arise if larger producers were able to use financial instruments to bet on price movements.

3.2 Fiscal rules and stabilization funds

If revenue flow cannot be stabilised by hedging, then its impact on the domestic economy can be managed by use of a *Stabilization Fund*. When prices (or total revenue flow) are high then revenues (above some 'normal') level are paid into the fund and held in foreign assets; when

prices are low withdrawals from the fund are made. A number of issues surround the design of such funds.

First, the criteria for depositing or withdrawing revenue from the fund. These could in principle be linked to resource prices, total revenues, or to other macro-economic considerations that reflect the economic cycle or the state of public finances. For example, in 2001 Chile instituted a fiscal rule whereby government expenditure is a function of structural revenues, and is set to achieve a target structural fiscal balance, originally set at surplus of 1% of GDP. Structural revenues are computed on the basis of resource prices (copper and molybdenum) being at long run equilibrium and GDP being at long-term trend level; judgements on both these variables are made by an independent committee. Differences between actual revenues and those needed to attain the target structural balance are paid into the Fund for Social and Economic Stabilization (now supplemented also by the Pension Reserve Fund). The policy has been highly successful, with the funds attaining a value of nearly $20 bn in late 2008, and then being run down following the collapse of the copper price and the financial crisis.

The second issue concerns the optimal size of the Stabilization Fund. While the size will vary over the economic cycle, there needs to be some target for the size of the fund if it is to be able to smooth a downturn. The economic determinants of this are, in principle, the stochastic process driving the resource price, the marginal benefits and costs of increasing or decreasing spending in different phases of the cycle, and the marginal returns to lending vs the marginal cost of borrowing in a downturn. These are unknown parameters, so a judgement will inevitably be formed on some ad hoc basis.   There is a delicate trade-off, in that making the fund too large means that citizens will not see the benefits of resource revenues in boom times, and the Stabilisation Fund will have become like a long run Sovereign Wealth Fund. Having it too small will leave the economy exposed to downturns.

The third issue is to do with the legal status of the fund and the balance between rules and discretion.   At one extreme are discretionary practises; virtually all resource rich countries have Central Bank monetary operations which use foreign exchange reserves as a stabilization mechanism. At the other extreme are the formal rules, perhaps best exemplified by Chile. Formal rules have a number of advantages. Their credibility means that they stabilise private sector economic expectations, so facilitating economic management.   Since they are binding on

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politicians, they constrain discretionary spending in the medium run (see discussion in section 2) as well as in the short run. Importantly, they help solve time-consistency problems, since the legal structure will be inherited by future politicians.

Setting up a Stabilization Fund which is credible and politically robust requires considerable political will. It is noteworthy that Chile, a country that has done this successfully, is also a country with fairly recent experience of reckless economic management and of hyper-inflation which has created quite widespread support for fiscal discipline. However, although fiscal rules have legal force, they can of course be changed. In a democracy, it is appropriate that an elected government has some control; in Chile, the size of the target structural balance is set by the current government. And of course, governments can repeal legislation. A Stabilisation Fund which is not sustained through time is perhaps worse than no fund at all. Nigeria's experience with the Excess Crude Account saw a stabilisation fund rise to $30 bn during the period 2008 only to fall to zero by 2011. Part of the fall was due to lower oil prices, but most was due to poorly controlled withdrawals from the Account. Essentially, this was a transfer from the well-intentioned politicians who set up the fund to the less well-intentioned who ran it down.

3.3 Managing residual instability

Most countries will have neither hedging strategies nor Stabilization Funds that will completely insulate the domestic economy from commodity price movements. Furthermore, the direct revenue flows to government are not the only source of commodity induced instability. There are large private sector responses and international capital flows. The capital flows might be associated with investment in the oil sector (in Azerbaijan foreign direct investment peaked at 30% of GDP in 2003) or with short run speculative flows, such as the purchases of Zambian government domestic debt at the height of the copper boom in 2006, which led to a near doubling in value of the currency. How should these sources of instability be managed?

First, active monetary management may be needed. Since these are foreign exchange flows – public or private – foreign exchange intervention will be needed to maintain stability of the exchange rate. Associated with this there will be a need to sterilize the monetary

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implications of flows. Second, it is particularly important that economies subject to these sources of volatility are flexible – with flexible labour markets and a minimum of other nominal or real rigidities. Third, in so far as some of fluctuations are coming through public spending, government should form a view about what sorts of expenditure can be varied (increased and decreased) through time at little cost, and what are hard to reverse. For example, increases in the pay of government employees, given during a time of boom, are almost impossible to reverse. The over-generous Dutch benefit system installed during the natural gas boom of the 1970s took a generation to unwind. More generally, spending that leads to increases in consumption are hard to reverse, because habits are formed and political resistance will be high. By contrast, fluctuations in levels of investment are easier to manage; it is a characteristic of all economies that investment is less stable than consumption. Consequently, if variations in government spending cannot be completely separated from variations in resource revenues, it is probably better to have such variation impact on public investment rather than private consumption; too rapid increases are then more easily reversed.

4. Fiscal instruments and spending channels.

Preceding sections have concentrated on the macro-aggregates – resource revenues, total consumption, investment, and spending in the domestic economy. While resource revenues accrue to government, most consumption and investment are ultimately taken by the private sector. These are not controlled directly by government, but only indirectly through a set of policy instruments and spending channels. In this section we see how alternative ways in which the government may allocate funds map into the spending outcomes outlined in previous sections.

Broadly speaking, there are three channels through which the government can allocate resource revenues. They can be given to the private sector in the form of citizen dividends or through the tax/ benefit system. They can be spent directly by government, either on public consumption or the construction of public assets. Or they can be lent by government to the private sector. This could be foreign lending (as in the Wealth, Parking and Stabilization Funds already discussed) or could be domestic lending, either by direct lending activities (eg Development Banks) or by lower levels of public borrowing. These alternatives vary in three fundamental ways. Who gets ultimate ownership of the resource revenue. Who gets control of the micro level spending detail – the choice of project. And how they map into the macro-aggregates of consumption, domestic investment, and foreign assets that we have been looking at up to now.

Table 1 outlines these alternatives and some of their direct implications. Alternative 1 is distribution to the private sector, through lower taxes or social transfers. In this case, the government retains no ownership of the resource wealth and consequently has no macro-economic control over spending once the transfer is made. This alternative also decentralises the micro-economic detail of spending to private citizens, rather than implemening projects through government ministries. Transfers will typically induce both private consumption and investment, and we denote the increase private consumption c (the marginal propensity to consume). The remaining fraction $1 - c$ goes to investment which adds to the private capital stock and becomes a private sector asset.

Public spending, alternative 2, centralises control both at the macro level and the micro level of project design and implementation. This too will typically be some mixture of current (fraction g) and capital spending, the latter part adding to the public capital stock and becoming a government asset or possibly adding to the human capital stock when it is spending on education or health care.

Table 1: Government choices – impact per $1 revenue

	Res-ource revenue	Consumption		Investment			Balance sheet	
		Private consum-ption	Govt. consum-ption	Private capital stock	Public capital stock	Foreign assets	Private assets	Govt. assets
1. Tax cut/ transfer	1	c	0	$1 - c$	0	0	$1 - c$	0
2. Public spending	1	0	g	0	$1 - g$	0	0	$1 - g$
3. Domestic lending/ debt reduction	1	z	0	$\gamma(1 - z)$	0	$(1-\gamma)(1-z)$	$- z$	1
4. Foreign assets/ SWF	1	0	0	0	0	1	0	1
Accounting identity	R -	C_p -	C_g =	I_p +	I_g +	I_F =	A_p +	A_g

Note: c – share of consumption from tax cut.
g – share of consumption in government spending.
z – share of consumption in private response to government debt reduction/ lending.
C – consumption, I – investment, A – change in assets.
Subscript p – private, g – government, F – foreign.
Sums across each row of the matrix satisfy the equation given in the bottom row.

The third alternative is for the government to retain the revenue as an asset, but to lend it on to the domestic private sector to spend or invest. In this way the government retains control of the macro-aggregate, but decentralises the micro-economic detail to the private sector. This could be new lending – e.g. through a development bank – or the reduction of existing domestic government debt. The private sector response will be to consume fraction z and invest $1 - z$. It

is possible (in this and also in case 1) that some of the private investment takes the form of acquisition of foreign assets, so only fraction γ goes into the domestic capital stock, the rest being invested abroad. Notice that in case 3 the government's balance sheet has improved, either by paying down domestic debt or through its claim on new lending. To the extent that the private sector increases its consumption, its asset position will deteriorate. Finally, in case 4 government lending is to foreigners, through the acquisition of foreign assets (or paying down of foreign debt), this having no direct impact on the domestic private sector.[5] We now discuss the first and third of these channels, and then relate this to our earlier discussions of public spending and foreign asset accumulation.

4.1 Distribution to the private sector

One view of the optimal way to handle resource revenues is that they should be handed to private individuals through citizen dividends and, if government needs to raise funds for public expenditure, it should do so by taxing back some of the dividend (i.e. government should put 100% of funds through route 1 of table 1). Some limited citizen dividend schemes are in operation (in Alaska and Alberta) and it is generally the case that taxes in resource-rich regions are somewhat lower than they otherwise would have been. What are the pros and cons of transferring the proceeds directly to private individuals in this way?

The main advantage is that, in countries with bad governance, it is important to get funds out of the reach of government as rapidly as possible, as has been argued for the case of Nigeria (Sala-i-Martin and Subramanian, 2003). This argument, though correct, is of doubtful relevance, since the countries with the worst governance are unlikely to implement such a scheme, and those most likely to implement it have least need of it. The scheme could however be a commitment mechanism; a well-intentioned government might introduce the scheme, knowing

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[5] Note that the taxonomy links the discussion of resource revenue to that on scaling up aid (Gupta, et al., 2006). In IMF terminology a foreign exchange windfall is 100% 'absorbed' if it is matched one-for-one by an increase in the non-windfall current account deficit. Thus, cases 1 and 2 are 100% absorbed, case (iii) $1 - (1-\gamma)(1-z)$ absorbed, and case 4 zero% absorbed. A windfall is 100% 'spent' if it is matched one-for-one with the non-windfall fiscal deficit. Thus, alternatives 1 and 2 are 100% spent, while alternatives 3 and 4 are 0% 'spent'. Each of these alternatives has wider implications for the economy as a whole.

that it could be difficult for succeeding governments to reverse. The governance issue can be set in somewhat wider terms, via the argument that building state accountability requires taxation. Some authors argue that bargaining over tax is the basis of the social contract between the state and its citizens and a key building block in the development of democracy (Brautigam et al., 2008). According to this argument, government should only be able to spend the funds itself if it has taxed them back from the private individuals to whom the revenue has already been given. Of course, this has a disadvantage of administrative complexity as there are two layers of government process, initial distribution and then taxation.

The second advantage of direct distribution to citizens is to do with the micro-economic detail of spending. Private individuals are much better at identifying investment projects than are government officials, and have sharper incentives to implement them well and make sure they succeed. Underdeveloped credit markets mean that many high-return investments do not get undertaken, and putting cash in the hands of individuals may remove credit constraints and cause such investments to be made. This argument is supported by the evidence that agricultural based resource booms have had much more positive effects than booms in 'point resources' such as minerals or oil, in part because individual farmers have used additional income to increase investment in their small-holdings.

There are some counter-arguments. The first is to do with the fundamental problem of the inter-generational distribution of the benefits. Will private choices lead to the optimal time profile of consumption versus investment that we discussed in section 1? Individuals currently alive may give too little weight to future generations and therefore invest too little (c is too high in Table 1). This spending bias may be exacerbated if people overestimate the size and duration of the revenues. The argument has particular force for the proceeds of a resource windfall, which the current generation has no particular claim to 'own' any more than does any other generation. Furthermore, the timing of individual spending decisions might contribute to short-run booms and loss of macro-economic stability, since private individuals do not internalise the effects of their decisions on prices and the level of activity.

Even if individuals wanted to save a sufficiently large proportion of the windfall, they would not necessarily do so by undertaking their own investment projects. Efficiency therefore requires an effective system of financial intermediation which both rewards depositors and

identifies investors who can best use the funds. Without such a system, the argument that the private sector has better information and incentives than the public sector is eroded. Of course, cutting in the other direction, substantial cash transfers to citizens would be a powerful force to promote development of a wider and deeper financial system.

The arguments above were couched in terms of a 'citizen dividend' or pure transfer. In practise, transfers to the private sector are likely to take place through adjustment of taxes, subsidies, or social protection schemes, each of which has to be evaluated on its own merit. Recent empirical evidence suggests that for each $1 hydro-carbon resource revenue accruing to government, domestic tax revenue is reduced by around 20 cents (Bornhorst, et al. 2008). These distribution channels will have their own incentive effects, which may be adverse or beneficial. Fuel subsidies are one way to make the transfer, and they have a superficial political attraction in an oil rich country; they are, of course, hugely inefficient and wasteful. Beneficial incentive effects can be generated if the transfers take the form of reductions in other distortionary taxes and charges, or if they are linked to some 'merit' activity. Conditional cash transfers (e.g. transfer programmes conditional on school or clinic attendance) have well documented benefits.

The balance of these arguments is country and expenditure channel specific, but some broad conclusions can be drawn. It is important that some fraction of revenues gets into citizens hands quite early on. As we argued in section 1, it is important to raise consumption, and it is also likely that these flows will finance some high-return private investments. Risk of large scale theft of revenues is diminished and, perhaps most importantly, it establishes the principle that the resource belongs to citizens, and is being used for the benefit of citizens as a whole, rather than for a small elite. But while these are arguments for the transfer of some fraction of revenue to individuals, they do not imply that all should be transferred this way. Private individuals' choices alone will not lead to an efficient profile of consumption or spending, and there are pressing needs for direct investment in public, or publically funded, assets.

4.2 Domestic lending and debt reduction.

Public lending (table 1 alternative 3) is an instrument that puts the micro-management of projects into the hands of the private sector, while retaining control of the macro-aggregates at the central level. This could take the form of new government lending or the reduction of domestic debt. Government lending would need to go through institutions such as Development Banks. In many countries the historical record of such banks has been extremely poor, and has certainly not operated to allocate funds in an efficient way. It may be worthwhile for resource rich countries to revisit and rethink domestic lending options, either through reformed Development Banks, or perhaps through institutions that target particular needs, such as lending for residential construction.

Domestic government debt reduction is, at the aggregate level, equivalent to new government lending. Using resource revenues to buy back government bonds should reduce domestic interest rates and induce asset holders to acquire other assets. Ideally this would be domestic assets, although the extent to which this occurs depends on investment opportunities in the domestic economy and abroad. One important mechanism may be that a reduction in government debt deprives commercial banks of the easy option of simply lending to government, and thereby induces them to be more pro-active in seeking out other lending opportunities. However, there is little evidence on the relationship between changes in government debt and lending to the private sector, and a commonly held view that the response of private sector investment might be quite low.

4.3 Expectations and public-private interaction.

An important final point is that private sector behaviour is influenced not just by current government actions, but also by expectations of future actions. This applies to consumers, who may adjust current consumption in expectation of future benefits. For example, government may behave prudently, saving resource revenues, but if consumers then anticipate higher future benefits (e.g. pensions) then they might save less, so public prudence is cancelled out by private spending. The role of expectations is likely to be strongest in liberalised foreign exchange

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markets, where exchange appreciation and Dutch disease effects may occur in anticipation of future resource revenues and spending.

4.4 . Spending channels and economic outcomes: conclusions

Appropriate revenue management is highly country specific, but we nevertheless offer some general points about best practise for developing and middle income countries.

It is important to get some share of revenue to citizens quite early, and not to bank too high a proportion for future generation. The current generation is relatively poor, needs to see its 'ownership' of the resource, and transfers can be made in a way that incentivises socially valuable behaviour, e.g. through conditional cash transfers.

While some transfers and incremental consumption is desirable, the historical record is that too little has been saved, and sub-soil assets have not been turned into economically productive human and physical capital. The savings rate should be high, and savings should go primarily into domestic assets. This may require formal fiscal rules to constrain competing demands, and will require preparatory work to ensure that the economy can absorb spending from the resource revenue. The main benefit of such public investment should be through raising the return to, and hence the quantity of, private investment in the economy.

For a capital scarce economy, accumulation of foreign assets in a long run Sovereign Wealth Fund is not appropriate. However, accumulation of foreign assets on a temporary basis (in a Parking Fund and a Stabilization Fund) plays two extremely important roles. One is to allow the path of spending to be decoupled from the path of revenues; an efficient spending path will not, in general, exactly track revenues, so the difference should be 'parked' abroad. The second is to smooth price volatility, a major source of the resource curse. However, to be useful the Stabilization Fund has to be robust store of value which is not susceptible to looting by future governments.

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