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Managing Resource Revenues: lessons for low income countries

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Abstract

This paper explores the choices faced by developing country governments that have received substantial revenues from natural resources. The economic principles underlying the choices between consumption, domestic investment, and the accumulation of foreign assets are analysed. The priority should be to use revenues to promote growth and investment in the domestic economy and thereby put consumption on a rapid growth path, although absorptive capacity may constrain the scope for doing this in the short run. Foreign asset accumulation should be used primarily to smooth volatility, rather than to build up a long-term sovereign wealth fund. Trade-offs between private and public spending channels are examined from both an economic and political economy standpoint.

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1. Introduction.

This paper addresses two broad issues. What are the economic principles underlying efficient use of a flow of resource revenue? And how do these principles map into options that policy-makers face? The commodity boom that began in 2003 and is now faltering has already provided Africa with unprecedented resource revenues which account for substantial fractions of export earnings and government revenues. Well-used, these revenues are the best opportunity that the region has had for transformative development, but the experiences of many resource rich countries has been poor and the challenge for Africa is to make more of the present commodity windfall. The price declines during the third quarter of 2008 are a salutary reminder that commodity prices have a long history of volatility. Both this volatility and the stark fact that revenue is being generated by the depletion of an asset make the inter-temporal choices addressed in this paper critical.

The historical record has been extensively researched, and the emerging consensus is that while resource revenues have a positive effect on economic growth in countries with good governance, their effect in countries with poor governance has, on average, been negative. For example, new studies by Collier and Goderis (2007, 2008) ask the question whether a commodity boom helps an economy to produce more output. Using global data since 1960 they estimate the short and long run effects of an increase in the world price of a country's commodity exports on national output (a fixed price aggregate of resource and non-resource output). They find that for the first few years following an increase in the price of commodity exports output does indeed increase relative to what it would otherwise have been: people become more productive. However, usually this is not sustained. After two decades the typical resource-extracting economy is producing less than it would have done in the absence of the boom. Collier and Goderis simulate the current booms for the typical African commodity exporter and find that if global history repeats itself then after two decades output will be around 25 percent lower than it would have been without the booms. However, the key finding of Collier and Goderis is that although a decline in production is the norm, it is by no means inevitable. Some societies have succeeded in harnessing commodity booms for sustained increases in production, while others have not, with the quality of governance playing an important role. Resource-exporting countries with good governance grow more rapidly in the long run as well as in the

short run, Botswana being an African example. Unfortunately, during the period 1963-2003, the critical level of governance required to avoid the resource curse was above that prevalent in many African societies.

There is also evidence that democracy and resource rents interact badly (Collier and Hoeffler 2008). Whereas in the absence of resource rents democracies tend to grow more rapidly than autocracies, resource rich democracies grow more slowly. Two forces appear to be at work; the degree of electoral competition and the number of checks and balances. The degree of electoral competition determines the process by which a government acquires power, whereas the number of checks and balances determine the limits on how it can use power. Electoral competition is distinctively damaging, whereas checks and balances are distinctively beneficial. Furthermore, there is evidence that resource rents gradually weaken checks and balances. Once resource rents become substantial over the ensuing thirty years checks and balances are dismantled. Hence, on this evidence it might appear that the governance challenge for resource-rich Africa is to strengthen checks and balances in the face of pressures to weaken them.

Whilst this literature points to the importance of the institutions of governance, attention also needs to be paid to the actual content of the economic decisions that are taken. Resource rents give rise to distinctive decision problems and it is to the solution of these problems that we now turn. In the next two sections we lay out the analytical foundations of managing windfall revenue. Section 2 deals with the inter-temporal profile of consumption; what principles should govern the decisions to consume or invest the flow of resource revenues, and what are the implications for the time profile of consumption? The section looks at the permanent income hypothesis and the case of a developing country which has both high return investment opportunities and a need to raise the consumption of the current generation. Section 3 looks in more detail at the implications of domestic spending of resource revenues, focussing on the ability of the country to absorb an increase in spending. This covers government ability to assess and implement spending plans, and the ability of the economy to accommodate additional spending without damaging other sectors of the economy. Both these sections are analytical in focus, and provide the foundations for section 4. This looks at the range of spending and investment channels open to government, evaluates them in light of the discussions of the preceding sections, and discusses political economy aspects of these choices.

2. The time profile of saving and consumption:

2.1 Principles:

A country is endowed with a natural resource and policy makers know (let us assume for the moment with a high degree of certainty) the future flow of revenues from this resource. How should the country plan the time path of spending and saving from this windfall revenue flow? Devoting it all to current consumption is both wasteful and inequitable, but so too is postponing the consumption benefits into the far distant future. We take it that the ultimate objective is to bring about an increase in human well-being or, in short-hand, consumption. The optimal inter-temporal profile of this increase in consumption depends on views about the value of consumption accruing at different times and to different generations, and about the rate of return that can be obtained by postponing consumption and investing in assets of different types. In this section we explore the interaction between these elements – the consumption and investment sides of the equation.

On the consumption side, the social discount rate (*SDR*) measures the value of consumption one period in the future relative to consumption today, future consumption being discounted by factor $1/(1 + SDR)$. While consumption in the future is worth less than consumption today, this is offset by the fact that investment yields a positive return, and we denote by r^F and r^D the rate of return on foreign and domestic investments respectively. The choice of what to do with revenue today is informed by comparison of these rates, with efficiency requiring that it should be consumed today if *SDR* is greater than r^F and r^D, and otherwise invested in the highest return activity. The levels of consumption and investment undertaken will change these rates of return, so an efficient outcome might see them all equalised. This is the basic framework, and the next step is to look at each of these rates in turn.

The classic utilitarian way to formulate a measure of aggregate social well-being through time is the present value of the utility of consumption, and this provides a basis for thinking about the *SDR*. According to this formulation the value of consumption at one date relative to another depends on two things, the rate of pure social time preference and the difference in per capita income (and hence the marginal utility of income) between dates. Many authors have argued that the rate of pure time

preference (ρ) should be very low since there is no ethical reason to attach less importance to future generations than the present; according to this view, the only reason for it to be positive at all is the probability of human extinction – that future generations will not exist. While this suggests a very low *SDR*, the second element captures the fact that we expect future generations to be richer than us. Equity then suggests that revenues should be used to increase consumption of the current, relatively poor, generation. This factors into the *SDR* by combining the expected rate of growth of consumption, $\dot{C}/C$, with society's attitude towards inequality as summarised by parameter σ (the elasticity of the marginal utility of consumption) which measures the value of marginal consumption to poor people relative to richer. Combining these terms, the social discount rate is $SDR = \rho + \dot{C}/\sigma C$. The parameter σ is often taken to be around unity (or perhaps somewhat less), so this social discount rate might range from around 10% in a fast growing economy to 2-3% in a mature or slow growing country.[1]

Turning to investment alternatives, the first distinction is between foreign and domestic investment. We denoted the rate of return on foreign investment by r^F, the value of which depends on whether a country is borrowing on lending on world markets. For a lending country – eg a country accumulating foreign exchange reserves or building up a sovereign wealth fund – this rate can be regarded as exogenous to the country, the world interest rate, r^*. But for a country that has existing foreign debt and which is considering using resource revenue to pay down this debt the value of r^F may be significantly higher, and endogenous to the country. There are numerous studies of the determinants of international interest rate spreads (for a good recent example see Akitoby and Stratmann 2006). These studies find that indebtedness raises the interest paid by countries, so the marginal value of paying down foreign debt may be large.

Most important, and most difficult to assess, is the return on domestic investment, r^D. Our starting point for thinking about this is that developing countries are capital scarce and likely to have a record of low saving and under-investment in both public and private assets. Lack of investment suggests that r^D should be high, but the argument is qualified by two points. One is that private returns may be

[1] These arguments have been re-evaluated in the context of climate change, see Stern (2006). An additional argument for using a low discount rate is that climate change creates a probability that future generations may be much *poorer* than us (Weitzman 2007).

reduced by lack of investment opportunity and lack of complementary public inputs. The other is that poor selection and implementation of investment projects might result in low returns. We devote section 3 to further discussion of these issues.

2.2: Applying the principles:

With this basic conceptual framework in place, we turn now to looking at alternative paths of consumption and saving out of resource revenues. We structure discussion around an example illustrated in Figures 1a and 1b, showing time profiles of incremental consumption and incremental national asset accumulation under different rules for consuming/ saving a given size resource revenue flow. For simplicity, the flow of resource revenues is assumed to be a step function, as illustrated by the 'revenue-flow' line in figure 1a; we assume that revenue flows for a 20 year period, anticipated to start in 10 years time and end in 30 years time. If society consumed the revenue as it came in – with no asset accumulation nor borrowing in advance of revenue flows – then the same curve would give the time profile of consumption. This would be a highly sub-optimal policy to follow, and we now discuss the alternative cases illustrated in the figures.

Figure 1a: Profiles of incremental consumption

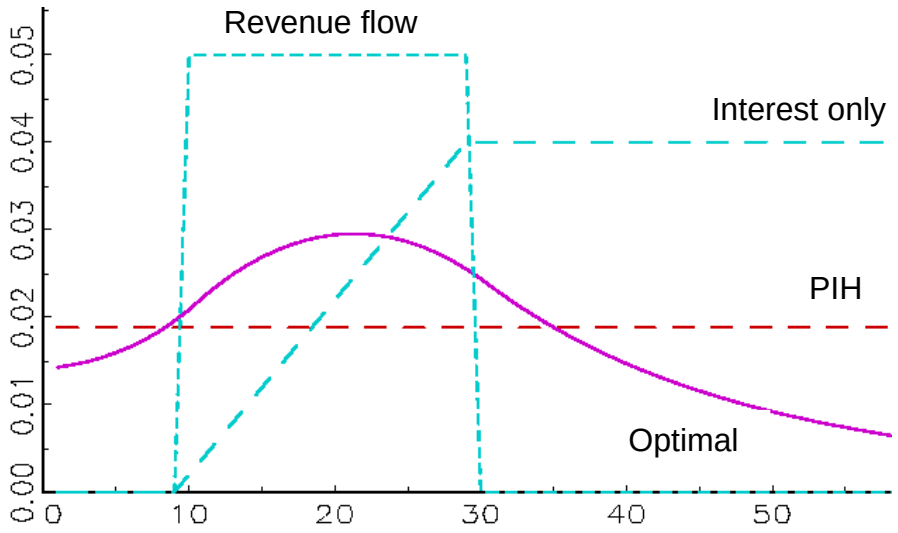
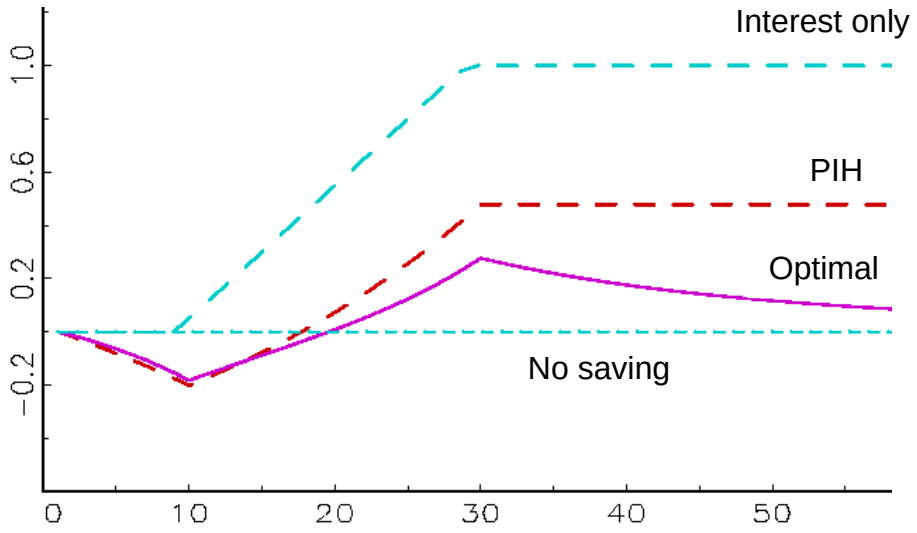


Figure 1b: Profiles of incremental asset holdings



Permanent income hypothesis:

The benchmark case is where the revenue is used to give all generations an equal increase in consumption. This has a superficial attraction of appearing equitable, and has a rationale from the well-known permanent income hypothesis, under which a windfall is perceived as an increment to wealth, and consumption from the wealth is smoothed through time. This hypothesis is familiar from the tax smoothing literature (Barro, 1979) or the optimal use of the current account (e.g., Sachs, 1981), and underlies much of the advice for the setting up of a Sovereign Wealth Fund (SWF) proffered by the International Monetary Fund (e.g., Davis, et al., 2002; Barnett and Ossowski, 2003; Olters, 2007; Basdevant, 2008).

The dashed line PIH illustrates this strategy for our hypothetical resource revenue flow. The increment to consumption is constant and given by the dashed line PIH in figure 1a. The magnitude of the increment is equal to the interest that would be earned at a fixed world interest rate, r^*, on the present value of the revenue evaluated at the initial date, $t = 0$. Notice that this strategy involves smoothing consumption from the date at which the resource windfall is 'discovered'. It therefore involves borrowing (i.e. dis-saving) during the period in which permanent income exceeds actual income, and saving and accumulating assets when actual income exceeds permanent income. Thus, in figure 1b the country borrows (has negative

incremental assets) for the first 10 years, then starts to pay back this debt when resource revenues come in, then building up a savings fund. The size of the savings fund and level of consumption increment at all dates are set so that interest payments on the fund (once resource revenue has come to an end) exactly finance the consumption increment. Since the level of consumption is determined in this way, the shares of revenue that are saved/ consumed at any date fluctuate with the magnitude of the current revenue flow.[2]

This benchmark case is optimal only under special circumstances that may apply to a high income country, but not to a developing economy. Essentially, it is applicable for an economy that is able to borrow and lend at the world rate of interest and has thereby aligned the rates of return on different activities, so $\rho + \dot{C} / \sigma C = r^D = r^F = r*$. The response to the windfall is therefore not to not to seek push consumption forwards or backwards in time (changing $\dot{C} / C$), but simply to have a one-off increase in the permanent level of consumption. Furthermore, the incremental assets should be held in foreign assets, because any further investment in the domestic economy would increase the capital-labour ratio, pushing the return in the domestic economy below that on world markets. The resource discovery therefore has no impact on domestic non-oil income, implying unchanged growth of consumption, $\dot{C} / C$.

While these conditions may be applicable to some high income countries, they are not applicable to a developing country implying that, should a developing country follow this rule, it would not be optimal.

'Bird-in-hand consumption'

The permanent income hypothesis makes the case for smoothing consumption through time, but has the implication that countries should borrow against future flows that enter permanent income. A much more conservative strategy is that countries should place resource revenues in a fund – possibly overseas – and only consume the interest on the fund. This yields constant consumption once revenue flows have ceased, but leads to a very slow build up of consumption. For our hypothetical economy this strategy is illustrated by the dashed line labelled 'interest

[2] Notice that the permanent income hypothesis holds true economic wealth constant at all dates from discovery onwards. Thus, borrowing in the early years equals the increase in the present value of resource revenue which is occurring as these revenues become less far distant.

only'. This strategy yields a large increment in the consumption of future generations, but the cost is that consumption benefits are pushed far into the future – eg overtaking PIH only in year 20.

This approach has been followed by some countries – for example Norway – but has no claim to being the socially optimal policy, even under special conditions, as was the permanent income hypothesis. Conceptually, the permanent income hypothesis says; consume the interest, but include the implicit interest on the resource in the ground as well as the actual interest on the resource once it has been converted into financial assets. This strategy says; for consumption purposes, ignore wealth until it has been extracted and converted into financial assets – hence the expression 'bird-in-hand' consumption (Bjerkholt 2002, Barnett and Ossowski 2003). There is no economic rationale for this rule, and it is a highly conservative strategy that allows consumption to reach its maximum only when the resource has been depleted.

Optimal policy for a developing country

A minimal representation of a developing country is that it is capital scarce, with interest rate above the world rate and access to world capital markets restricted, perhaps by the country's credit rating. Poor access to international finance is likely to be compounded by a history of undersupply of public infrastructure and an investment climate that has depressed private investment. From this starting point there is the potential of making high return investments and putting the economy on a growth path that involves capital deepening, with the rate of return converging to the world rate and, accompanying this, wages, consumption and income on an upwards trajectory. In such an environment, what is the optimal consumption profile, ie that which maximises the present value of the utility of consumption given available investment opportunities?

There are two forces at work. One is that consumption is currently low and is on a rising trajectory. This is a force for increasing consumption immediately – i.e. using some of the revenue for poverty alleviation. The other is that the rate of return in the economy is high – a force for investing, which in turn will grow the economy and lead to higher consumption in future. The efficiency condition (sometimes known as the Ramsey equation), $\rho + \dot{C} / \sigma C = r^D$, has high values on both sides of the equation. As we have noted above, ρ is commonly taken to be very small whereas σ is

commonly taken to be around unity, so that the efficiency condition approximately reduces to the rate of increase of per capita consumption being equal to the domestic real rate of return on investment. If we apply this to Africa over the past few decades it is apparent that this condition has seldom been met. In most countries the rate of growth of per capita consumption has been close to zero, whereas the return on domestic investment has been high since both public and private capital have been so scarce. An implication is that savings rates have been too low (an argument made by Spence in *The Growth Report* (World Bank, 2008). Windfall revenue is an opportunity to rectify this disequilibrium.

The optimal response to our hypothetical resource revenue flow is illustrated by the curve labelled 'optimal' in figures 1a and 1b. The full analysis underlying this curve is contained in van der Ploeg and Venables (2008), in which investment can take place in three sorts of assets; foreign assets (or debt reduction); public infrastructure; and private capital stock.

The optimal consumption increment illustrates several points. There is a substantial jump in consumption at the date of discovery, although this is not as large as in the permanent income hypothesis, because of the presence of high return investment opportunities both in the domestic economy and in paying back foreign debt and thereby reducing r^F. Once resource revenue starts to flow there is a large increase in investment, this taking the form of both lower public debt and an increase in public infrastructure investment. Both of these factors make private investment more attractive, so there is an increase in the private capital stock and consequent increase in income and wages. This finances the rapid growth in the consumption increment that is illustrated in figure 1a, while enabling direct public transfers to consumption to fall sharply.

The balance between consumption and investment depends on the return that can be earned on investment of the resource revenue. If r^D is high then the initial jump in consumption is small; instead, resources are devoted to investment and the output which this generates puts consumption on a rapidly rising path, so the Ramsey equation, $\rho + \dot{C}/\sigma C = r^D$, is satisfied. Conversely, low r^D means that the initial jump in consumption should be relatively large; there are few good investment opportunities, so consumption jumps up but can then only grow slowly.[3] The

[3] And if $r^D = r^*$ we return to the world of the permanent income hypothesis.

important point is that it is the presence of high return investments that can put the economy on a path of growing income and wages and consumption that is the crucial to the consumption – investment decision.

Looking beyond the point at which the resource flow stops we see that the consumption increment and asset increment are both positive, but asymptoting to zero. The consumption decision therefore involves saving some of the benefits for distant generations, but does not involve establishing a savings fund to support a permanent increase in consumption.[4] Instead of building up an overseas fund, the resource wealth has been used to bring forward the development of the economy, this giving higher consumption at future dates, but with the increment steadily declining.

The asset story corresponding to this optimal case is in figure 1b. The curve is the increment to net national asset holdings[5]. Initial consumption is funded by borrowing (as in the PIH, but at a slightly lower level), which is then run down as assets are accumulated during the period of revenue flow. At the end of the period of revenue flow the incremental assets are gradually run down as the economy continues on its growth path.

The message from the socially optimal path is therefore an intuitive one, that smoothes the time path of consumption. Immediate consumption for the relatively poor current generation is optimal, but so is investment to put consumption on a steeply rising path. This higher level of investment ensures that benefits of the resource revenue continue to accrue once the resource has been depleted because the domestic capital stock is larger than it otherwise would have been.

2.3 Volatility and uncertainty.

The preceding arguments abstracted from many important features of revenue management, including issues to do with volatility and uncertainty of resource revenue flow.

Volatility of flows – given knowledge of their expected value – is easily dealt with. Suppose that the revenue flow illustrated on figure 1 instead of having a constant maximum was jagged. How would this change the consumption path?

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[4] Only if the resource discovery is very large will it also be optimal to build up a permanent savings fund, and this will still be smaller than under the permanent income hypothesis.

[5] But does not include private foreign investment in the economy.

Clearly if there was no saving or borrowing, consumption would become jagged too. At the other extreme, it would have no effect whatsoever under the permanent income hypothesis. Under the other hypotheses – consuming interest only and the optimal consumption path – the effect on consumption would be small. The point is that under each of these strategies consumption is smoothed in any case, and saving or borrowing on international capital markets provides the cushion.

If there were perfect symmetry in lending and borrowing, no separate stabilization fund would be needed to provide this cushion, but in practical terms, the economy's borrowing rate is likely to be above its lending rate. It is then efficient to hold a fund of liquid assets (a stabilization fund) to facilitate the separation of spending from revenue. This fund should be larger the greater the variance of the revenue flow, and the larger the difference between the marginal cost of borrowing and the marginal return to lending.[6]

What difference does it make to include uncertainty about the present value of the total of future resource flows? The answer is that if countries were risk neutral it would make no difference whatsoever. Risk neutrality means that the benefit of revenues being $1bn higher than expected are equal to the cost of revenues of being $1bn lower than expected. In practise risk neutrality is unlikely to hold, both because of diminishing marginal utility, which we used in the arguments above, and because of asymmetries in borrowing and lending opportunities. Uncertainty therefore has the effect of increasing these asymmetries so reinforcing the case for holding a stabilization fund to partially self-insure against the possibility of future losses.[7]

2.4. Efficiency in spending and the domestic rate of return

We have so far focussed on the timing of consumption (and the consequent savings decisions), taking as given that investment yields a rate of return and that consumption expenditure translates into individual well-being and aggregate social welfare. We now turn to the detail of implementing spending programmes, asking whether the country has capacity to absorb a flow of spending, be it consumption or investment. Is a given cash flow into saving or consumption used efficiently to

[6] Or more generally, the distribution of marginal utilities of the resource revenue.

[7] Of course, countries may be able to hedge against price uncertainty in futures markets, thereby reducing their exposure to risk.

generate a high social return or a high level of utility? Conceptually there are two main issues here. The first is to do with the selection, design and operation of projects. The other is to do with the general equilibrium effects of large volumes of spending in the economy – crowding out and the Dutch disease.

Project selection and operation:

Countries often have difficulty in translating large expenditures into 'projects' that yield commensurate benefits. We use the term 'projects' generically, to cover investments and also initiatives to spend through current expenditures. Why are the benefits often low, and are there issues that are particular to resource revenues?

There are two standard arguments. One is limited information and technical capacity. 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, doing 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 more acute in most developing countries.

The other argument 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. Rent seeking occurs 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 in the economy. Another example of misaligned incentives comes simply from 'market failures'; if people are unable to transact at prices that are equal or close to social marginal valuations, then decisions will be suboptimal.

There are a couple of reasons to think that these issues are particularly severe in the context of resource windfalls. One is that large scale revenues come on stream abruptly and may be volatile. Administrative systems lack the information and capability to scale-up expenditures rapidly, and this leads to inefficient spending programmes. This argument obviously reinforces the case made in the preceding section for smoothing expenditure. It also suggests that any initial jump in spending should be small, waiting until capacity to spend efficiently is developed.

The other reason is that lack of transparency surrounding resource revenues relaxes the disincentives to misappropriate funds. The response is at several levels.

Increasing transparency and accountability limits the opportunities for theft of funds. Responsible governments may also be concerned that they will be followed by governments that are prepared to loot accumulated funds. It is therefore (second best) optimal for governments to use expenditures in ways that are hard to loot, such as immobile capital investments or distribution to citizens.

General equilibrium responses and crowding out.

Spending oil revenues in the domestic economy (either on consumption or investment) will shift upwards the demand curves for the goods and services being purchased. How does the economy respond to this increase in demand, and what policy issues does this raise?

One extreme case is that all supply curves in the economy are perfectly elastic. In that case the extra demand can be met without changing any relative prices in the economy, and without 'crowding out' alternative activities. The simplest model of this is the Keynesian model of undergraduate textbooks. There are unemployed resources in the economy, and an increase in demand draws these resources into use and raises income. Indeed, there are multiplier effects, so the final increase in income is larger than the increase in demand. Income will continue to rise until the increase in income (ΔY) equals the extra foreign exchange supplied by the windfall (ΔR) divided by the marginal propensity to import, $\Delta Y = \Delta R/m$.

Developing countries typically have un- (or under-) employed resources, so can they hope for real income growth several times larger than the resource revenue, in line with this model? In practise, supply curves are not horizontal, either at the aggregate or the sectoral level, so supply responses are dampened as other activities are crowded out by resource funded spending.

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.

Sectoral effects aggregate into economy wide changes in relative prices including higher wages and a higher price of domestic output as a whole, relative

foreign goods. This shows up as a real appreciation of the currency, and is the basis for the Dutch disease. This relative price change crowds out non-resource exports, which fall by amount ΔX, so the growth of income is just $\Delta Y = (\Delta R - \Delta X)/m$.

Are these effects a matter of concern for government and a basis for policy intervention? After all, a steep supply curve may just be a fact of economic life, and does not of itself constitute a market failure. To make a policy argument, we therefore have to dig a little deeper. There are three issues.

The first is to do with information. People making spending choices will typically not have information about the likely future prices of the goods and services they are purchasing. If they had this information their spending would be timed to not occur at a price peak, and this would in turn have the effect of dampening price booms. Without the information spending may occur at the wrong time, giving purchasers less value for money and creating overheating in the economy. This is an argument for smoothing of government expenditure from resource revenues, and more broadly, for macro-economic management. Importantly, supply curves are more elastic in the long run than in he short run, so it is an argument for a gradual build up of spending from resource revenue, in line with what the economy can absorb.

The second issue is to do with the nature of the activities crowded out. The Dutch disease argument is that private sector exports are crowded out by resource funded spending *and* that these activities are of particularly high marginal social value. The basis for this is often assumed to be the presence of external economies of scale in such activities. These may arise from learning by doing, or from the sorts of pecuniary externalities that support the development of fast growing clusters of activity.

The third point is to do with the factors that determine the shape of supply curves, sectorally and in aggregate. The fact is that supply curves are often steeper than they need be because of inefficiencies in the supplying sectors. What are the factors that hinder drawing new resources into a growing sector? They include regulatory or other barriers to setting up new firms. Delays and costs in importing equipment. Labour market regulations that make it difficult to hire labour. And the legacy of previous under-investment in, for example, labour skills. This is a standard list of factors that determine the investment climate, but their importance is amplified in the context of a coming spending boom.

2.5 Political Economy:

In the context of a resource windfall the key political decision concerns the savings rate. We have suggested that since Independence African governments have tended to save too little, resulting in low public and private capital stocks. The social sub-optimality of the savings rate evidently reflects a bias in the political process: for whatever reason, too little weight has been placed on future wellbeing. Yet the optimal savings rate out of the windfall is on average higher than that out of other government revenues. This raises the troubling prospect that whatever are the biases in the political process that have historically depressed savings, they might also impede high savings out of windfall revenues.

In our companion paper we have argued that in a democracy this outcome can only be grounded in citizen understanding of the issues. Yet even when citizens have understood the need for high savings they face an agency problem: the savings rate out of government revenues is determined by politicians whose interests may not be congruent with those of citizens. Further, the government itself faces an agency problem since it does not control the actions of future governments. We discuss these agency problems in turn.

The Signalling Problem

In modern economic formulations of democratic politics, voters face the decision problem of how to distinguish between well-motivated and ill-motivated politicians (Besley, 2006). Well-motivated politicians need to adopt observable actions which ill-motivated politicians find too costly to imitate, given their different preferences, and thereby signal their type to voters. Democracy only succeeds in disciplining politicians into good decisions if well-motivated politicians are able to find such observable actions which reveal their type.

Once citizens appreciate the importance of windfall savings they face the problem of distinguishing well-motivated politicians, who wish to implement the socially optimal savings rate, from ill-motivated politicians who wish to use the windfall only for consumption. The problem arises because although on average the optimal savings rate is high, in the initial phase following a discovery it is negative: consumption should rise prior to the revenue inflow. This creates a signalling problem. In this initial phase the ideal savings choices of the well-motivated and the

ill-motivated politician will be coincident. A well-motivated politician who implements the socially optimal savings path cannot be distinguished by voters from an ill-motivated politician. This creates the danger than voters will inadvertently elect an ill-motivated politician who then mismanages the key later stage of the windfall.

Faced with this problem the well-motivated politician has two options by which to reveal his type to the electorate. One is to deviate from the socially optimal savings path. Since the well-motivated politician places more value on savings than his ill-motivated rival, above some critical rate of savings it is not worthwhile for the ill-motivated politician to imitate behaviour, so that voters can distinguish between types. The savings path which is socially optimal given the constraints implied by democracy may therefore diverge from that of a benign autocrat. In the limiting case this would be an economic rationale for the IMF prescription of only increasing consumption by the income from accumulated windfall savings.

The alternative is for the well-motivated politician to reveal type by some action other than the savings rate. Recall that the quantum increase in public spending provides the government with an opportunity to raise the quality of spending, reducing corruption and raising efficiency. Since the ill-motivated politician has a preference for low-quality spending, the well-motivated politician can reveal type through observable ways of raising quality. The examples of accountability set out in Table 2 (in section 3 of the paper) provide several such opportunities: competitive tendering can be introduced, as done by the Nigerian government in 2004, and spending can be subject to civil society scrutiny as in Chad in 2003. By revealing type through the quality of public spending the well-motivated politician can retain the scope to implement the unconstrained socially optimal savings path.

The Time-Consistency Problem

The rationale for implementing the socially optimal savings path is to raise consumption over the long term. However, in a democracy the current government does not control the savings rate beyond its electoral term. This creates the potential for a time-consistency problem. Even if the current government is well-motivated it might fear that a successor government will be ill-motivated. In this case, savings in the form of financial assets accumulated by the current government may merely transfer spending power to this ill-motivated government. In the worst case by saving the windfall not only does the current government fail to raise future consumption

sustainably, but it transfers public spending from a period when it is of high quality to one when it is low-quality. As a result, the constrained optimal decision even for the current well-motivated government may be to avoid saving the windfall in financial assets. Note that it is the future ill-motivated government that faces the time-consistency problem. Because it cannot pre-commit not to liquidate accumulated financial assets for consumption the current government does not save and so all future governments are worse off. The future ill-motivated government would be better off if it could pre-commit only to consume along the optimal path.

Evidently, future governments cannot themselves act in the present. However, the solution to the problem is to create a commitment technology which binds all future governments *and which they would themselves support* because they benefit. In OECD societies this form of problem has been recognized as most acute in respect of monetary policy. The solution that has evolved over the past thirty years, largely in response to developments in economic theory, has been for governments to grant independence to central banks. In Africa, while there is also a case for central bank independence, the more acute time-consistency problem concerns savings out of windfall resource revenues. This is a fiscal problem and so the equivalent to the OECD move to independent central banks is to develop institutional commitments on fiscal policy. Ngozi Nkonjo-Iweala, the former Finance Minister of Nigeria, pioneered the idea of a fiscal constitution for African natural resource revenues through the Fiscal Responsibility Bill which sought to pre-commit governments to savings.

2.6 Summing up; spending, saving, consuming.

Pulling this analysis together yields the following conclusions. Revenues should be used to bring consumption in both the short run and the long run; poverty reduction requires that benefits accrue to the current generation, but efficient use of the windfall requires that benefits also accrue well beyond the date at which revenues have stopped flowing. The best way to achieve this is by investment in the domestic economy which essentially brings forward the economy's growth trajectory, benefiting all generations. This is in contrast to accumulating revenues in a sovereign wealth fund, although some accumulation of foreign assets is desirable for smoothing volatility in revenue flows. The rate of return on domestic investment is the key variable. There is a need to develop capacity to spend revenues efficiently, and for the economy to

absorb this expenditure. This involves developing public expenditure management, project appraisal and procurement techniques. It also involves flattening supply curves – ie, moving promptly to anticipate bottlenecks and ensure that spending will result in an increase in quantities supplied by the economy, not just an increase in prices.

3. Alternative spending channels

Previous sections have outlined the economic fundamentals, and we now map these into the choices faced by government. In broad terms, there are four things the government can do with resource revenue:

i) Distribute to the private sector through citizen dividends or through the tax/ benefit system.
ii) Increase public spending, either on public consumption or the construction of public assets.
iii) Retain as a government financial asset, but lend on to the domestic private sector, either by government lending (eg development banks or mortgage lending) or by reducing existing public debt.
iv) Retain as a government financial asset and lend to foreigners, by foreign reserve accumulation or establishing a sovereign wealth fund.

3.1: Alternatives – accounting:

It is worth spending a moment classifying the *direct* impact of these alternatives, before assessing their wider economic costs and benefits. Table 1 illustrates who gets to spend, control, invest and own what under the alternative choices.

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
i) Tax cut/ transfer	1	c	0	1 - c	0	0	1 - c	0
ii) Public spending	1	0	g	0	1 - g	0	0	1 - g
iii) Domestic debt reduction	1	z	0	$\gamma(1-z)$	0	$(1-\gamma)(1-z)$	- z	1
iv) Foreign assets	1	0	0	0	0	1	0	1
Accounting identity	$R - C_p - C_g = I_p + I_g + I_F = A_p + A_g$							

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.
Sums across each row of the matrix satisfy the equation given in the bottom row.

Alternative (i) is distribution to the private sector, through lower taxes or social transfers of some form. Private individuals then get to choose how to spend the revenue, and each $1 of resource revenue will increase private consumption by amount c (the marginal propensity to consume). The remaining fraction $1 - c$ goes to investment which adds to the private capital stock, and which becomes a private sector asset.

Public spending, alternative (ii) will typically be some mixture of current (fraction g) and capital, the latter part adding to the public capital stock (eg infrastructure) and becoming a government asset.[8]

The third alternative is for the government to retain the revenue as an asset, but to lend it on to the private sector to spend or invest. This could be new lending – eg 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 (i)) 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 (iii) the government's

[8] Possibly also a private asset – eg health or education expenditure that builds human capital.

balance sheet has improved, either by paying down domestic debt or through its financial claim on new lending. To the extent that the private sector has increased its consumption, its asset position has deteriorated.

Finally, in case (iv) government may simply acquire foreign assets (or pay down foreign debt), this having no direct impact on the private sector, and including the case of investment in an overseas fund or sovereign wealth fund.

This taxonomy is useful in part because it 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 (i) and (ii) are 100% absorbed, case (iii) $1 - (1-\gamma)(1 - z)$ absorbed, and case (iv) zero% absorbed. A windfall is 100% 'spent' if it is matched one-for-one with the non-windfall fiscal deficit. Thus, alternatives (i) and (ii) are 100% spent, while alternatives (iii) and (iv) are 0% 'spent'.

3.2: Alternatives – economic analysis:

Each of these alternatives has wider implications for the economy as a whole, and we now turn to using the economic analysis of the early part of the paper to evaluate these implications.

i) Transfer to the private sector:

One view of the optimal way to handle resource revenue is that it should be handed entirely 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. Some areas have limited citizen dividend schemes (such as Alaska and Alberta) and in all resource rich regions it can be conjectured that taxes are somewhat lower than they otherwise would have been. What are the pros and cons of transferring the proceeds directly to private individuals?

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 (see Subramanian and Sala-i-Martin 2003 for a statement of this case for Nigeria). 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 issues 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 is to do with the micro-economic detail of spending, and our earlier discussion of information and incentives. 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 increased investment in their small-holdings.

A number of arguments are ranged on the other side. 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 2? Individuals currently alive may give too little weight to future generations, and therefore invest too little (c is too high in table 1). Put differently, the social discount rate that society uses should be less than market rates of return, and less than that suggested by studies of individual behaviour. This may be exacerbated if people overestimate the size and duration of the revenues. Society therefore has an obligation to increase savings rates by direct government action, and should not accept the pure outcome of individual choice. 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 – the general equilibrium effects of section 2.6.

Even if individuals wanted to save at a sufficiently high level, 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, any transfer to the private sector is likely to take place through adjustment of tax, subsidy or social protection schemes, and each of these has to be evaluated on its own merit. Bornhorst et al (2008) find that for each $1 hydro-carbon resource revenue accruing to government, domestic tax revenue is reduced by around 20 cents. Resource revenues provide an opportunity for reducing distortionary taxation that may have a negative impact on economic activity, but it also provides the opportunity for maintaining highly inefficient subsidy programmes. For example, fuel subsidies may look politically attractive in an oil rich country, but are no less distortionary simply because the country is oil rich. Social protection schemes have many advantages, particularly in so far as they are associated with private sector accumulation in either human capital (eg transfer programmes conditional on school attendance) or physical capital (eg by allowing farm assets to be retained during an economic downturn or drought).

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 get into citizens hands quite early on. As we argued in section 2, it is important to raise consumption, and it is also likely that these flows would finance some very high return investments. Risk of large scale theft of revenues is diminished and, perhaps most importantly, it establishes the clear 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, it is not an argument for the transfer of all of it. 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.

ii) Public spending:

Growing economies face high demands for public spending on human development and on infrastructure. The Spence Commission on Growth and Development has recently suggested that the share of public spending devoted to infrastructure by African governments is markedly too low. Infrastructure is complementary to private sector investment, so benefits accrue directly and also indirectly via increased private sector activity.

A quantum increase in public spending is likely to change both the composition of public spending and the process by which it is undertaken, each of which are manifestly political issues. Two important political pressures are the bureaucratic tendency to defend existing budgets and lobbying from special interests. If aggregate spending has only been increasing slowly, the composition of budgets is likely to be inert due to bureaucratic defence so, as needs change, the frozen composition may gradually drift further from the ideal. However, one consequence of a frozen composition of spending is that the returns to lobbying are low and so there is little lobbying pressure. The net effect of budget inertia and weak lobbying is likely to be that although incremental money is scarce it can be well-used.

Both a sharp increase in the world price of commodity exports and the discovery of natural resources are high-profile public events so that the quantum increase in public spending is fully anticipated by political actors. There is now plenty of incremental money free from the bureaucratic necessity of maintaining existing budgets and so the return to political lobbying sharply increases. Once lobbies have won spending increases, these tend to be locked in by bureaucratic defences against change. Realizing this, lobbies have an incentive to devote resources even in excess of the current increase in revenues. This generates the lobbying equivalent of the economics of a gold rush: lobbies rush to stake claims to future income streams from the assignment of rents.

Lobbying is subject to free-riding and so favours those components of public spending that confer large benefits on small groups. It can take a variety of dysfunctional forms, from financing election campaigns that create political obligations, through strike threats by public sector unions, to bribery of decision takers. In general, such an increase in political pressure squeezes the use of public money for those purposes which benefit everyone. The most generalized benefit is

clearly to save the windfall in financial assets and so this will attract the least political support, but more generally lobbying will tend to reduce the return on incremental spending.

If citizens come to believe that the windfall will be captured by such special interests, they might themselves pressure for second-best alternatives that at least provide some benefits that are more widely distributed and highly observable. Again, savings will not be favoured since it is not observable. However, some observable and widely diffused benefits might be poor uses of the windfall, such as subsidized petrol or an increase in the national minimum wage.

Hence, the quantum increase is both an opportunity for increasing the return on public spending, since it relaxes the bureaucratic constraint, and a problem, since it generates a surge in lobbying which is likely to reduce the quality of spending. The challenge for the government is publicly to face down the lobbying surge. One approach is to establish explicit and transparent new decision processes for natural resource revenues linked to a clear vision of long-term development. While this runs counter to the ideal fiscal principle of a fully integrated budget in which all revenues are pooled, it might have superior informational properties. By spotlighting the new spending, it makes scrutiny easier and signals to citizens that the windfall will not be captured by special interests.

Linking windfall expenditures to development has both macroeconomic and microeconomic components. The macroeconomics of public spending concerns the capacity to manage change, the balance between public consumption and investment, combating Dutch disease, and linking spending to a strategic vision. Change is demanding and so if spending rises too fast the processes of decision and implementation will inevitably deteriorate. Hence, a wise macroeconomic strategy is to impose a ceiling on the permitted rate of increase in spending. As to the balance between consumption and investment, as discussed above it is desirable to stretch extra consumption beyond the date at which extractable assets have been depleted. This implies both a higher rate of saving out of resource revenues than other taxation and, since the rate of return on domestic investment is higher than foreign savings, that much of this saving should take the form of domestic investment. Dutch disease can be combated both by skewing public spending towards imports, and by privileging those expenditures which lower the costs of producing exports and import substitutes. Finally, incremental public spending needs to be linked to a strategic

vision of the realistic opportunities facing the economy. Whether the economy is expected to growth predominantly through e-services, agriculture, resource extraction, or manufactures will imply different needs for public spending.

The microeconomics of public spending concerns two distinct hurdles: honesty and efficiency. In a well-functioning system honesty and efficiency are enforced in multiple ways. Some work *ex ante* and are about how decisions get authorized, while others work *ex post* and are about evaluation. Enforcement is partly through top-down authority, partly through bottom-up pressure from citizens and their representatives, partly through peer groups, and partly through norms internalized by the public sector workforce. Table 2 presents a simple classification, giving examples of each of the sixteen resulting mechanisms. The quality of public spending depends jointly on all of these mechanisms, the balance between them varying according to the needs and opportunities of each situation. A key political challenge posed by a quantum increase in resource revenues is to upgrade these mechanisms as rapidly and as visibly as possible

Table 2: A Classification of Accountability in Public Spending

Purpose and Timing of scrutiny	Top-down	Bottom-up	Peer Group	Internalized by Workforce
Honesty: ex ante	International competitive tendering required for public investment projects	Civil society scrutiny of public spending in Chad through the *College*	Ethical norms set by an association of doctors	Opportunities for corruption resisted due to integrity
Honesty: ex post	Audit by Auditor General	Exposure of public corruption in the media	Peer group disciplinary processes in professions	Guilt and regret induce confession and restitution
Efficiency: ex ante	Cost-benefit analysis of proposed projects	Parliamentary approval of budget, and PRSP consultations	Presentation of spending plans by ministers in cabinet	Pride in skill induces high effort
Efficiency: Ex post	Evaluation of completed projects	Comparison of benchmarked performance of service delivery in media	Comparison of examination results among headmasters	Failure induces an effort to learn from mistakes

iii) Public lending/ debt reduction:

Public lending 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 be new government lending or the reduction of domestic debt.

Levels of government debt held domestically in African countries are generally quite low relative to GDP, but large relative to the banking sector, amounting to an average of 25% of total commercial bank deposits. What then is the effect of reducing the availability of government bonds? It 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 depends on investment opportunities in the domestic economy. 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.

What is the empirical evidence on the relationship between government debt and lending to the private sector? Evidence suggests that the response of private sector investment might be quite low, with one study finding that each $1 decrease in domestic debt was associated with a $0.15 increase in lending to the private sector.

The other side of debt reduction is new government lending, through institutions such as development banks. Of course, the historical record of such banks has been extremely poor, but for resource rich countries it may be appropriate to revisit and rethink this option. One suggestion is for lending for residential construction.

iv) Foreign assets:

We have argued throughout that accumulation of foreign assets should not be a primary objective of policy. The priority should be to raise consumption and investment in the domestic economy, and accumulate foreign assets in three specific contexts; (a) to smooth volatility (b) to insure against unanticipated reductions in the flow of revenue and (c) to park funds that cannot yet be used effectively in the domestic economy because absorptive capacity is still being developed.

4. Pulling it together

The arguments discussed through the paper provide the basis for the following conclusions.

Consumption of resource revenues should be smoothed, beginning early (perhaps before revenue flows) and certainly extending well beyond the period of peak resource revenues. The mechanisms through which this extra consumption is delivered are likely to be a combination of lower taxation, social protection schemes, and above all higher income coming from growth of the domestic economy.

The critical issue is therefore whether resource revenues can be harnessed for faster growth. Potentially, the extra revenues enable faster growth of the domestic economy both by increased supply of capital to the private sector, and by public sector investments that raise the productivity of private capital. Increased supply of capital

to the private sector comes from a range of sources. The very micro, as households save some of the proceeds of lower taxes or social protection schemes. Through asset substitution as reduced supply of government debt induces people – and more importantly the commercial banks – to seek out alternative investments. And possibly also through direct government lending if appropriate institutions can be developed that are able to lend funds in an honest, efficient and accountable manner.

Probably the more important source of increased growth and private sector investment is the use of resource revenues to raise the marginal product of capital, both public and private. Although a quantum increase in public capital formation might normally be expected to lower its productivity, in conditions where the existing public sector performance is unsatisfactory, a quantum increase can be an opportunity for procedural change. The productivity of private capital can be enhanced by the enhanced provision of public capital because the two are, – or can be designed to be -- complementary. Public infrastructure can deliver lower cost and better quality supplies of transport, communications, power and human capital. While there are dangers of crowding out and Dutch disease effects, these can be offset by public spending designed to increase the competitiveness of private sector investments.

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