Managing Commodity Booms: Lessons of International Experience

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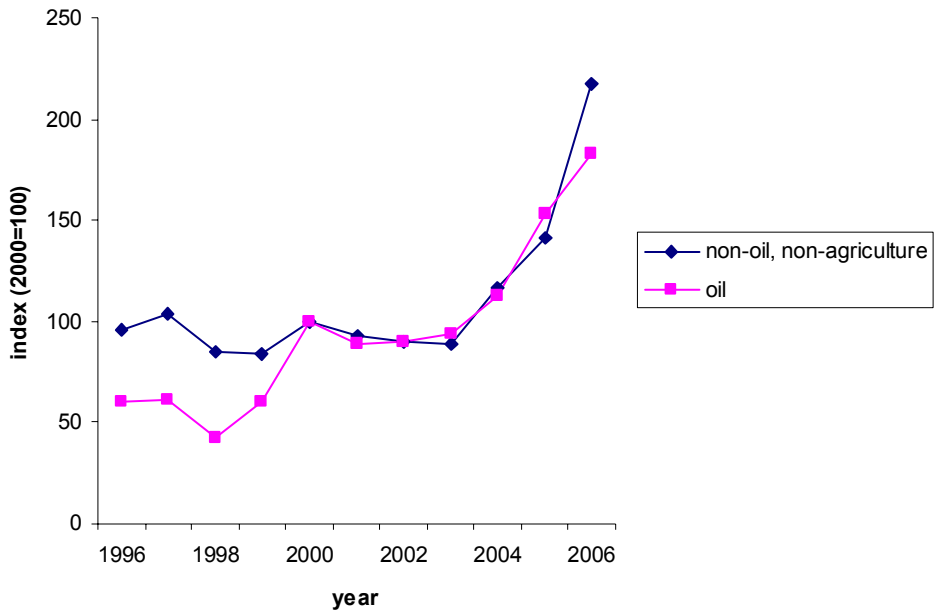
1. Introduction

Africa's exports have always been concentrated in primary commodities and recently, due to high prices and new discoveries, the importance of these exports has substantially increased. A distinctive characteristic of these commodities is that their world prices are volatile, with wide and unpredictable fluctuations. Evidently, these fluctuations have corresponding effects on export revenues. The price movements are not symmetrical hills and valleys. They are typically generated by shocks in supply or demand that result in temporary 'stockouts': periods in which global stocks of the commodity fall below some accepted threshold. During stockouts prices spike, followed by long periods of gentle decline. This produces a pattern of prices in which the normal state is for prices to be mildly depressed, interspersed by a few periods of exceptionally high prices. These periods of price spikes are, by their nature, major economic events that are exceptional and unpredictable. Africa is currently in the midst of one of these price upswings, as illustrated below. For both oil and the other non-agricultural commodities prices have approximately doubled.

Oil price index and non-agricultural, non-oil price index for commodity-exporting Sub-Saharan Africa



The management of these unpredictable price spikes raises vital issues of economic policy choices. Although these issues are at the core of managing the typical African economy, they do not arise in the OECD economies, China or India, which between them dominate textbook economic policy. Hence, African policy makers face a double challenge: coping with events that are intrinsically difficult, and doing so without the

normal guidance of learning from the 'core' economies. However, many of the smaller developing economies now have long experience with the management of commodity shocks and this forms the basis for learning.

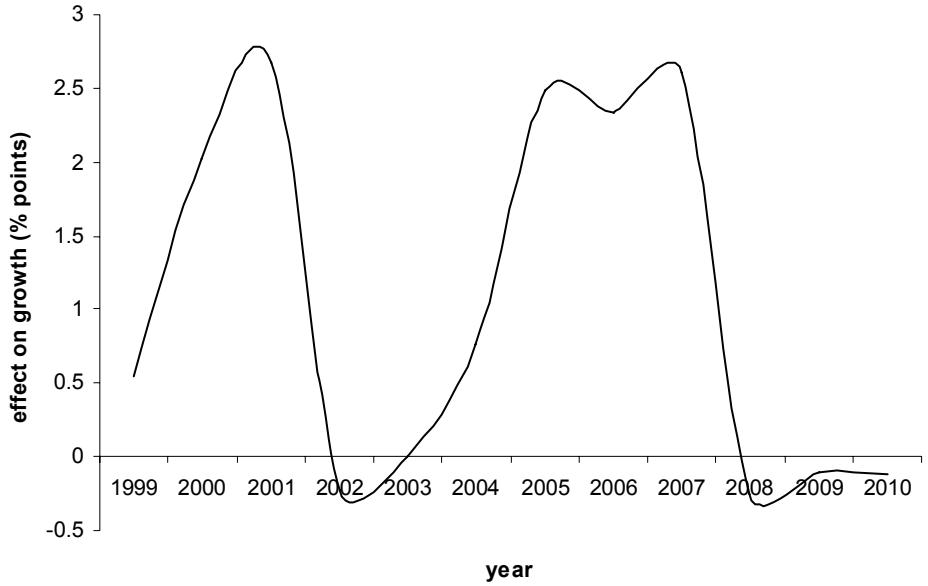
This paper sets out the key policy issues of economic management in African commodity exporting countries. Section 2 discusses recent research evidence on the short and long term consequences of commodity booms for growth. It turns out that booms have very different effects depending upon whether the commodity is agricultural or non-agricultural and so I consider each separately. Section 3 discusses policy for non-agricultural commodity booms, with Section 4 focusing on the agricultural export booms. Section 5 provides a brief summary and conclusion.

2. Commodity prices and growth

A new study investigates the global experience of primary commodity exporting countries over the period 1960-2004 (Collier and Goderis, 2007). It uses the statistical technique of co-integration to distinguish how changes in world prices affect both short run growth rates and, in the long run, the level of income. It finds that African countries have not differed significantly from the global pattern. However, there is a substantial difference between agricultural and non-agricultural commodities: price changes in agricultural commodities have very different long run effects from those of non-agricultural commodities.

The short run effects on growth rates are encouraging, both for agricultural and non-agricultural economies. Their magnitude obviously depends upon how important commodity exports are relative to GDP, but for the average African economy the short run effects of the present commodity boom are estimated to be as shown in the figure below. On this estimate, in both 2005 and 2006 the boom added nearly 2.5 percentage points to the growth of the typical African economy. This output effect is over-and-above the direct income effect consequent upon the improvement in the terms of trade: a given quantity of exports will now buy many more imports. A doubling of export prices raises income by approximately the initial share of exports in GDP. Since this happens over a brief period the short term consequences are spectacular: the economy lives through an unmistakable boom.

Figure 7 The aggregate short-run effects of the current commodity boom on GDP per capita growth in Africa's commodity exporting countries



However, from then on the experience of the agricultural exporters and the non-agricultural exporters diverges radically. I will begin with the non-agricultural commodity exports. Not only are these more important for Africa, they are the commodities that are currently booming.

Unfortunately, for the non-agricultural commodity exporters, the effects of higher world prices of exports on the long term level of output are unfavourable. The full long term effects take a long time to work their way through: the adjustment to the long run equilibrium is only at around 7% per year. However, after twenty-five years, the increase in export prices has actually reduced constant-price GDP relative to its counterfactual. The effect is substantial, with constant-price GDP lowered by 26%. The effect on income is much smaller because the decline in output is mitigated by the fact that the terms of trade improvement is still directly raising income. Hence, the net decline in income is more modest. The massive decline in output is, however, astonishing. The sustained windfall obviously creates the potential for radically higher investment. Cumulatively over twenty-five years the economy should have achieved enormous increases in output that dwarf the initial direct gain in income.

In the agricultural commodity exporters the long term effects are completely different. There, higher world prices have favourable effects not only in the short run but also in the long run. Why is there this massive difference between the consequences of higher export prices between agricultural and non-agricultural commodities, and in particular, what typically goes wrong and frustrates potential in the non-agricultural commodity exporters?

Potentially, three processes might be generating the adverse long term adverse effect. The first is Dutch disease, which tends to make non-resource exports uncompetitive. For example, in Nigeria oil exports led to the rapid collapse of agricultural exports. There is evidence that Dutch disease can indeed foreclose other export opportunities. In a study that focuses on growth rates industry-by-industry, Rajan and Subramanian (2005) show that exchange rate appreciation indeed reduces the growth rates of labour-intensive industries. However, Collier and Goderis control for Dutch disease and find that, although it has a statistically significant effect, it is only a very minor part of the overall explanation. Indeed, this is consistent with the divergent experience of agricultural and non-agricultural commodity exporters. An increase in commodity prices can be expected to generate the qualitatively the same adverse effects for other exports whether the commodity is agricultural or non-agricultural. Hence, Dutch disease cannot explain why the two have opposite long term effects.

A second potential process is the adverse consequences of volatility. Unless economic management is very good, the high volatility of commodity prices gets transmitted to the economy in the form of booms and busts. For example, as Addison (2007) shows, since the discovery of oil, Nigeria has been among the ten most volatile economies in the world. At higher prices the export sector will be more valuable and so a given amount of price volatility will transmit larger shocks to the rest of the economy. These boom-bust cycles can be highly damaging. Volatility can be detrimental to growth in several respects. One is that it makes private investment more risky and so tends to discourage it. Another is that the booms bequeath crises: public spending decisions become compromised, with extravagant commitments during booms that then force drastic cuts in vital expenditures during troughs. Collier and Goderis find some support for this. The commodity-exporting economies are more prone to booms and busts, with many more episodes of rapid economic decline than other economies. Indeed, their slower average growth than other economies is almost entirely accounted for by their higher incidence of economic crashes. Again, however, volatility is common to both agricultural and non-agricultural commodities, so that their adverse effects on agricultural commodity exporters must be insufficient to offset the favourable effects.

The most plausible explanation for these adverse effects is that the large rents from non-agricultural commodity exporting that accrue as revenue to governments gradually erode economic governance. In turn, this deterioration in governance decisively reduces growth. This explanation is consistent with the radical difference between the exporters of agricultural and non-agricultural commodities. Rents are the surplus of export revenue over the costs of production including normal profit. Since the typical agricultural commodity can be produced in many different locations, production expands to the point at which during normal times there are no rents. Hence, export agriculture cannot normally be taxed on a sustainable basis any more heavily than other activities. The revenues from agricultural exports accrue to farmers, not to government. In contrast, non-agricultural commodities can only be produced where the resource is available to be extracted, so that location-specific rents are persistent. Since rents can be taxed without affecting production, the governments of countries with commodity exports which are

non-agricultural will have sustainable rent-based revenues. Thus, the bulk of the revenues from the export of non-agricultural commodities accrue to government, whereas those from agricultural commodities accrue to farmers. Because government is handling the former but not the latter, issues of economic governance are likely to be much more important. This is also consistent with differences in boom-bust cycles. The non-agricultural shocks are necessarily handled by government: an important aspect of economic governance is indeed the coherence of policies that ride the revenue cycle. In contrast, the agricultural shocks are primarily handled by farmers themselves, although, as I will discuss, government policy can either help or hinder farmers to manage shocks.

What typically goes wrong with economic governance in the resource-exporting economies and why does it happen? Because these societies inevitably have large government revenues from the taxation of rents, the centrepiece of governance is *how public money is spent*. Effective public spending is critical in these societies because of its scale. Continued improvements in public spending are also directly important for growth: since the public sector is a large part of the economy, its own productivity growth is a key component of overall growth.

Effective public spending depends upon how the government allocates resources and motivates public employees. The most pertinent approach for Africa is likely to be a system in which both the government and its service providing units are accountable to citizens. In turn, effective accountability is the result of a wide range of checks and balances through which citizens scrutinize how public money is used. Whether accountability is achieved depends partly upon institutional design and partly upon citizen engagement. Good institutional design provides plenty of checks and balances so that there are opportunities for scrutiny. Citizen engagement, which brings the institutions to life, depends upon overcoming the free-rider problem. Scrutiny of government is a public good and so no individual citizen has much incentive to devote effort to it. The standard historical process by which citizens have become engaged in scrutiny is that they are provoked into it by the burden of taxation, demanding oversight of how their money is used.

Despite having large public spending, resource-rich societies tend to have only weak systems of accountability. This is due to inadequacies of both checks and balances and of citizen engagement. Political scientists have measured the number of checks and balances, country-by-country and year-by-year (Beck *et al*. 2001). Using this measure, Collier and Hoeffler (2006) first investigate their interaction with resource rents. The find that in the resource-exporting economies checks and balances are distinctively effective in raising growth: a well-designed set of institutions for a resource-rich economy would thus include more checks and balances than in other societies. They then investigate how checks and balances actually evolve and find that precisely the opposite tends to happen. Over time, resource rents tend to erode the number of checks and balances in a society, so that although the resource-exporting societies need more checks and balances they actually have fewer of them.

One likely reason why the resource-exporting societies need more checks and balances is that citizen engagement is weaker. Because governments have large revenues from resource rents they do not need to raise much other tax revenue and so citizens are less provoked into scrutiny. Government in the typical resource-exporting economy is thus in charge of exceptionally large public revenues due to the receipt of resource rents, but subject to exceptionally little control from citizens over how this money is used. This is the core of the problem of economic governance.

Although the chickens of economic mis-governance come home to roost once the boom is over, the key decisions are taken during the booms themselves. If the boom is wasted, and commitments made to unproductive recurrent expenditures, the periods of low export prices will inevitably be difficult. The management of crisis, which was the dominant experience of African governments during the 1980s, is choice from a limited menu of painful options. Hence, there are two reasons for focusing on economic governance during periods of boom. The obvious one is that for the exporters of non-agricultural commodities, this is their current situation: they are in the midst of boom conditions. But the more critical reason is that this is the period during which all the key decisions get made. The past experience of managing crises is, in a sense, irrelevant. With good economic management of booms this experience will never be needed again. But knowledge of how to manage booms needs to be permanently internalized in these societies. They will need periodically to draw upon it. This knowledge, which as I have noted, is not needed in China, India or the OECD societies, is the subject of Section 3.

In the agricultural export economies governments do not have the same revenue opportunities because agriculture does not normally generate rents. In the 1970s and 1980s some African governments made the mistake of imposing heavy taxation on agricultural exports. They were able to get away with this for so long because the main capital stock in export agriculture, trees, is unusually long-lasting and costly to uproot. Hence, farmers who had already invested in tree planting could be locked into production despite heavy taxation. However, during the phase of high taxation farmers reduced planting and the result was a gradual but severe erosion of Africa's share of the global market. African governments have now largely reversed the policies of high taxation of export agriculture, so that large public revenues are again a distinctive characteristic of the resource-exporting economies. Nevertheless, the agricultural exporting societies need to internalize their own type of shock-specific knowledge of economic management. This is of how to enable farmers best to manage shocks in their export incomes. This is the subject of Section 4.

3. Public Sector Commodity Booms

Economics provides a helpful and straightforward framework for thinking through the three critical public decisions which are fundamental to whether a volatile stream of public revenue is transformed into a sustained growth in living standards. These are the decision as to how much of the revenues should be saved, the decision as to how much of these savings should be invested domestically, and the decision as to how this investment should be divided between the public and private sectors. In the rare but fortunate

circumstances in which public revenues from resource extraction are very large relative to private incomes, there is also an issue of whether and how some of these revenues should be transferred directly to households. I now consider these decisions in turn.

The savings decision

I have emphasized that for those economies with large non-agricultural exports effective public spending is vitally important, and that public revenues are unusually volatile. These two problems are related: the volatility of revenues makes it more difficult to maintain good standards in public spending. It is when the government is known to be flush with revenue that it is most vulnerable to the erosion of standards. In tackling revenue volatility the key issue is the savings decision. If decisions to save out of these revenues are well-taken, then the defence of good spending is much more straightforward because total spending will be growing at a sustainable and orderly pace.

I will take the example of oil, but the same considerations apply to the other non-agricultural commodities such as copper. Oil in the ground is a valuable asset. As it is brought out of the ground, how much of the resulting revenue should be consumed and how much saved? The appropriate rate of savings out of oil revenue depends upon two distinct assessments about global oil prices: their long term trend, and whether they are currently above or below that trend.

Because oil is a depleting resource there is some expectation that over the long run it will gradually get more expensive. In the simplest framework, over the long term the world price should rise by around the world rate of interest. More sophisticated analyses must take into account extraction costs and tax incentives for oil companies. While these complicate the picture, what remains is a reasonable expectation that the world oil price will tend to rise in real terms albeit along a very volatile path. To see why this matters, suppose that on average it rises at the modest rate of one percent per year. This implies that even the oil in the ground is an asset that is yielding an income and this can finance consumption on a sustainable basis.

The share of the revenue from oil extraction that can be consumed on a sustainable basis depends upon the extraction rate. Specifically, it is the expected rate of increase in the world oil price, divided by the extraction rate. If, for purposes of illustration, the expected increase in the oil price is one percent, and the extraction rate is 3%, implying that there is sufficient oil to sustain around 33 years of extraction at the present rate, then one third of the revenue from oil extraction can be consumed. This can be thought of as *the long run savings rule*. If the remaining two thirds are saved in assets that yield more than the one percent that would have accrued had the oil been left in the ground, then as these savings build up, consumption can increase further.

The world oil price is extremely volatile. At any one time it is therefore likely to be either well above or well below the level implied by its long run path. Just as some judgment has to be made as to the rate at which oil prices can be expected to rise in the long term, so the savings decision has to be influenced by a judgment as to the current deviation in

the price from the long run path. Income generated by a price judged to be above the long run path needs to be saved. This can be thought of as *the medium run oil price smoothing rule*. Thus, if the current world price is $60 but the normal price is judged to be $35, then the above-normal $25 per barrel should be saved. Unlike the savings generated by the long run savings rule, these savings are intended to finance subsequent consumption during periods when the oil price is below its long run path. There is thus a strong case for holding these assets in liquid form, which implies the acquisition of financial assets abroad.

An important consequence of holding these temporary savings abroad and then bring them back at times of low prices is that this will dampen the volatility of the real exchange rate. Dramatic contrasting examples of the consequences of different savings strategies for the real exchange rate are Chile and Zambia during 2005, a period when the world price of their common commodity export, copper, was exceptionally high. The government of Chile followed a savings rule such that all the incremental revenue was saved, whereas the government of Zambia continued to run a fiscal deficit. During 2005 the real exchange rate mildly *de*preciated in Chile despite the boom, whereas in Zambia it *ap*preciated by around 80%, causing intense problems for non-copper exports.

Thus, the strategy has both a fiscal aspect and a foreign exchange market aspect – when times are good the government runs a fiscal surplus and the central bank accumulates foreign exchange reserves. The reduction in exchange rate volatility is directly beneficial to the private sector, from large businesses to small farmers. Hence, not only does it enable the government to smooth its own expenditures, with a payoff in terms of a higher quality of government spending, it also makes the environment for private activity less risky. The smoothing of government spending and the smoothing of the exchange rate are two sides of the same coin. It is not possible for the central bank to smooth the exchange rate unless the government is also smoothing its spending. Conversely, if the government tries to smooth its spending but the central bank fails to smooth the exchange rate the result will be to inflict massive volatility onto firms and households.

The oil price smoothing rule can only be introduced when the prevailing world price is above its expected path. This enables savings to build up which can then subsequently finance a period of dis-saving. If the rule were introduced at a time when the world price was judged to be below the world price there would be an initial period of borrowing, and such behaviour would be indistinguishable from straightforward fiscal irresponsibility. For credibility, a fiscal rule has to start with the politically more challenging decision of saving.

Now bring together *the long-run savings rule* and *the medium-run oil price smoothing rule*. I will continue to use the same numbers for illustration: the normal price is judged to be $35, the oil price is judged to be rising at 1% per year, and the depletion rate judged to be 3%. With these judgments, one-third of the $35 per barrel, namely $11.33 can safely be used to finance government consumption. The other two-thirds, namely $22.67, should be used for long term asset accumulation, so as to sustain consumption once oil revenues decline. But with the current price at $60, the remaining $25 per barrel should

be put into more liquid assets, namely financial assets abroad, so that they can be spent on sustaining both consumption and investment when the oil price is below trend. Thus, around 19% ($11.33/$60) of current oil revenues would be used to finance government consumption, around 38% ($22.67/$60) would be used for long term savings and investment, and around 42% ($25/$60) would be saved in liquid form. Note that this illustration is simplified to abstract from any production costs of the oil. In reality, of course, when the oil price is $35, the government does not get $35 of revenue per barrel since costs of production, including reasonable profits of oil producing companies, must be deducted. However, the core ideas remain unchanged by this additional complication: some of the oil revenue can be consumed, some should be invested, and some should be saved temporarily and therefore kept liquid. The division between these three components reflects judgments about oil prices and depletion.

These judgments are almost certainly going to be wrong. There is thus a need both to allow for the likelihood of error and to enable revision of judgments as information builds up. The consequences of errors are not symmetrical between excessive optimism and excessive pessimism. If the judgement of the path of the long term oil price is over-optimistic then the entire consumption strategy becomes unsustainable: the government runs out of money in circumstances of crisis. If the judgment is too pessimistic then all that happens is that assets accumulate more rapidly than would otherwise be the case. Hence, given the inevitability of error, it is wise to err on the side of caution, assuming a 'normal' path for the oil price that is probably lower than that which is likely. As assets accumulate faster than 'expected', the decision rules can gradually become a little less cautious.

The public portfolio choice: domestic or foreign assets?

I now focus on the second decision, where saving should be placed. In the case of depletable resources such as oil this decision only applies to that part of the revenues that need to be saved long-term. In the illustration above this is 38% of the oil revenues. The rest of the oil revenues are either consumed or saved in liquid form because they are only being saved temporarily.

The 38% that is going to be saved long-term could either be invested in the acquisition of foreign assets or in domestic capital formation. Note that if the money is used to acquire domestic financial assets the question must be pushed one stage further: what lies behind these financial assets? If the money that is put into domestic financial assets is used for consumption then it is not ultimately being saved. If it is put into foreign assets then that is its ultimate use, and if it is put into domestic capital formation then that is its ultimate use.

The decision as between foreign assets and domestic investment should hinge upon the rate of return. Since the rate of return on foreign assets is known and stable, the key issue is the rate of return on domestic investment. This depends upon four factors: the initial stock of capital; the investment climate for the economy; the magnitude of savings from oil revenues; and the decision procedures of the government.

In a capital-short economy in principle the rate of return on capital should be much higher than the world return. Thus, domestic investment should generate a higher sustainable income than the acquisition of foreign assets. However, one reason why the economy is short of capital might be that the investment climate is so poor that returns are very low. Even if the investment climate is satisfactory, if too much extra investment is attempted in a short period then the rate of return on domestic investment will be driven down. One reason for this is that during periods of boom the cost of those capital goods that can only be produced domestically gets driven up. This manifests itself as a construction boom, during which construction costs are unusually high. It therefore makes sense to defer some of investment expenditures until the construction boom has abated. By deferring these domestic investments the construction cycle is smoothed and public investment gets better value for money. Thus, at times when the overall savings from oil revenue are atypically high, a greater percentage of them should be temporarily saved abroad until construction costs have eased. These financial savings abroad can be thought of as *the short run construction price smoothing rule*. In effect, the expansion of the construction sector needs to be planned so that it is reasonably orderly, rather than boom-bust. The government of Botswana, which managed its resource revenues brilliantly, actually had a plan-within-a-plan specifically for the construction sector, ensuring that demand and supply were broadly matched. Public investment projects were deferred if there were signs of congestion, and the emerging bottlenecks in the construction sector such as skill shortages were identified by consulting the industry and tackled.

Although both the *construction price smoothing rule* and the *oil price smoothing rule* involve temporarily saving abroad in financial assets, the uses to which these savings are then put when they are run down are distinct. The savings accumulated under the *construction price smoothing rule* are used to finance domestic investment involving construction when conditions in the construction sector are calmer. The savings accumulated under the *oil price smoothing rule* are used to finance both investment and consumption to prevent them from being reduced when the oil price is below trend.

The domestic investment choice: public or private?

The final decision concerns the balance within domestic investment between public investment and private investment. A core distinction in investment is between ‘structures’ and ‘equipment’. The two are complements: roads are an example of structures, and trucks are an example of equipment. Roads only have a good rate of return is there are trucks to drive on them; trucks only have a good rate of return if there are roads to drive on. Very obviously, the decisions to invest in roads and trucks are taken by different economic actors: investment in roads is undertaken by government, investment in trucks is undertaken by private firms.

Consider the problem facing the government of an oil economy. To make investment in structures productive requires that private firms also choose to invest. This does not happen automatically. How can the government increase the prospects that during the

current windfall private actors will match the government investment boom in structures with their own complementary investment boom in equipment? The government does not directly control private investment and so it can only work indirectly. The government does, however, control to an extent the assets that the private sector holds. In particular, currently the private sector holds substantial claims on the government in the form of public domestic debt. If, through the central bank, the government uses oil revenues to repurchase this domestic debt, then the private sector has to switch into other assets (Collier and Gunning, 2005). In aggregate, if public domestic debt is reduced, the only choices open to the private sector are to increase domestic investment, and to increase savings abroad. Since the private sector can be relied upon to do whichever of these choices is likely to be most profitable, it will indeed increase investment in the economy as long as the domestic investment climate is sufficiently good. Hence, a comprehensive investment policy out of oil revenue would be for the government to devote part of the savings to increased public investment, and part to the repurchase of its domestic debt, while simultaneously working to improve the investment climate. Potentially, beyond running down public debt, the government could also accumulate claims on the banking system, becoming a net depositor. The banking system can then on-lend this money to the private sector.

The domestic consumption choice: public or private?

In extreme cases the public revenues are so large that they should indeed not all be spent by the government even allowing for medium-term smoothing of booms. Even in the high-public spending societies of western Europe, public spending does not exceed 50% of GDP and this places a likely ceiling on the share of GDP accruing in resource rents that a government should seek to retain for its own uses. Beyond these levels, even if public money is well-spent, it produces an imbalance in which people are consuming too many public goods relative to their consumption of private goods. A few societies are fortunate enough to have resource rents well in excess of these levels. In sub-Saharan Africa this applies to Angola, Gabon and Sao Tome, Principe.

In such cases it is appropriate to complement the government's role as a custodian of savings with the redistribution of some of the resource revenues directly to citizens. The task is not to accumulate assets on behalf of citizens, but rather to empower citizens to raise their private consumption by transferring income to them. If the needed scale of income transfers is substantial it will be worth while incurring the administrative costs of registering the population so as to get a definitive list of eligibility: otherwise, since borders are porous, public provision of private unearned income will induce explosive immigration. In more modest cases of imbalance there are administratively simple means of transferring resource revenues to ordinary citizens. Probably the most credible mechanism by which low-income countries can redistribute income directly to households is through the schooling system: children could receive bursaries as is already done through the *Progresa* system in Mexico and Brazil. Studies in non-African situations have shown this to be highly effective both in increasing school attendance and in directly reducing poverty. A sensible approach would be to experiment through

properly evaluated pilot schemes to get an accurate assessment of their effects in particular African contexts.

Embedding policy rules in a fiscal constitution

The incentive to adhere to good policy rules on inter-temporal public spending is highly dependent upon what policy makers today expect to be the behaviour of their successors. In particular, if policy makers today believe that at some time in the relatively near future a successor is likely to cash in on their prudence to finance their own imprudent spending, then there is little point in making the savings effort in the first place. Thus, for example, in a country with a history of fiscal imprudence, even a reforming finance minister may reasonably decide that it is better to spend a windfall as best as possible rather than save it for a less careful successor. To overcome this problem what is required is to embed the policy rules in a constitution: in effect, the society needs a 'fiscal constitution'. No constitutional provision can irrevocably bind successor governments, nor is it meant to. Rather, the purpose is to ensure that any change in these rules is clearly signalled as important, and given due and lengthy consideration. Embedding fiscal rules into a constitution is therefore likely to be an effective guard against the most imprudent policy makers, since with their short horizon they would probably decide that the slow process of achieving a constitutional change was not worthwhile.

There is no issue of principle in embedding economic policy matters in a constitution. For example, many countries now provide constitutional independence to their central banks. However, for the exporters of non-agricultural commodities, the key economic issues are not monetary but fiscal and so the right part of economic policy to put into the constitution is the fiscal rules concerning public saving from commodity taxation.

4. Private Sector Booms due to Agricultural Commodities

Agricultural commodity exports are different because they can be produced in many different locations, so that in normal times there are few rents (supra-normal profits) from their production. As a result, in normal times there is little scope to tax them.

The absence of rents in normal times makes agricultural commodity booms decisively different from non-agricultural booms in two respects. First, the revenues automatically accrue to farmers rather than the government, unless special windfall taxation is introduced. Thus, these are essentially private sector booms rather than public sector booms. Secondly, these periods of peak prices are the only times at which the agricultural export economies receive significant rents, and so savings are even more heavily concentrated into these boom periods than is the case for the economies rich in non-agricultural commodity exports.

Thirty years ago it used to be believed that farmers would not save out of temporary windfalls so that the government should override their decisions by custodial taxation. Thus, for example, during the coffee boom of 1976-79 almost all governments introduced windfall taxation. There is now good evidence that farmers are well capable of taking

sensible savings decisions, whereas governments face far greater difficulties in handling windfalls than was previously imagined (Collier and Gunning, 1999). However, for farmers to save out of a windfall they need to have good information as to its cause. For example, during the coffee boom of the 1970s the government of Kenya, which was one of the few not to impose custodial taxation, explained to farmers that prices were high due to a frost which had damaged the Brazilian crop, but that since the trees would recover this would not be a long-lasting phenomenon. With this information Kenyan coffee farmers drew the correct inference that their windfall from high prices was merely temporary and should therefore be saved: they had a savings rate out of windfall income of around 60% (Bevan *et al*, 1987, 1989). Hence, it is not necessary for the government to have a custodial role since it can readily share any initial informational advantage.

Nevertheless, agricultural commodity booms place considerable demands upon the economic management skills of governments. Whereas with non-agricultural commodity booms the key decisions are fiscal, with agricultural commodity booms the key decisions are monetary. This is because the central bank is called upon to facilitate the asset accumulation strategy of farmers as it gets implemented over the course of the commodity cycle.

To understand what the central bank needs to do, the starting point is to understand what a sensible farmer is going to do, faced with the information that his income will temporarily be at boom levels. The farmer will wish to transform this temporary windfall into sustained or 'permanent' income through saving the transient part of it and accumulating assets. Now consider what assets the farmer will wish to accumulate. There is very likely to be a difference between the assets he chooses to accumulate in the short term and those he accumulates in the long term. First, consider the long term. He may decide to use part of his asset accumulation to improve his living conditions through building a new house, and part of it on investments that raise his farm income such as farm equipment. However, these prior to these investments there will be a phase during which he chooses gradually to accumulate his windfall savings as liquid financial assets. There are various reasons why in the short run his savings will be in this form. He is likely to take time to decide how best to use the windfall and so save while he makes his mind up. He may also wish to keep his options open until he discovers its magnitude. For example, it makes no sense to spend money re-roofing his old house if the windfall might continue for sufficiently long to enable him to afford to build a new house. This is known as the 'option value' of liquidity. Further, some good investments are lumpy and so can only be done once a certain amount of money has been accumulated. Finally, there is likely to be an implementation lag between the decision to invest and its execution. For example, some farm improvements can only be done at certain times of year, and house construction may be delayed because of shortages of inputs or bottlenecks in skills. Taking a typical coffee boom with a price spike lasting three years, for the first two years of the windfall farmers may do little real investment, despite high savings. They may wish to implement their investment phase out of the windfall between three and five years after the start of the boom, most of it occurring after the boom itself is over. More generally, the investment boom is likely to be heavily lagged behind the income boom, and there are sound reasons of investment efficiency that make this an efficient strategy.

Now draw the implications for the central bank. The key point is that because many farmers are facing the same income shock their asset decisions will be synchronized and so aggregate up into a powerful cycle in the demand for financial assets. Essentially, during the first phase of the boom a substantial part of private windfall income will be directed into the demand for financial assets, while during the second phase these financial assets will be depleted as they are converted into real investments. In Africa the key financial asset available to farmers in money, the supply of which is determined by the central bank. Hence, the central bank must accommodate this large swing in money demand without disturbing financial conditions more generally.

Consider what would happen if the central bank simply ignored the changing asset demands of farmers and stuck to a predetermined growth of the money supply rule that did not take into account the boom. The increase in the demand for money during the first phase of the boom would therefore not be accommodated by an increase in the nominal supply. However, while the central bank determines the nominal supply of money, the private sector determines the supply in real terms, that is, the nominal money stock corrected for changes in the price level. If the central bank fails to increase the nominal money supply the increased private demand for real money balances would therefore drive the price level down relative to counterfactual, producing an acute disinflation. For example, in the first few months of the 1994 coffee boom in Uganda, the price level fell in absolute terms by 7%. However, this way of increasing real money balances does not in aggregate enable farmers to shift the investment boom, which is what they are individually trying to achieve. When they all come to spend their extra money holdings they merely drive the price level back up again: their windfall savings evaporate in additional inflation and so cannot be converted into real assets. The problem arises because in this example the central bank failed to match the temporary increase in real money balances with a balancing increase in foreign exchange reserves, so that when farmers attempted to run the money balances down again the central bank could not move in to purchase them in exchange for foreign currency. How should the central bank have reacted to the windfall?

Ideally, it should have met the temporary increase in the demand for real money balances with an increase in the nominal supply of money. Such as increase need not in these circumstances be inflationary because farmers want to hold these extra balances as savings rather than spend them. The velocity of circulation temporarily declines because it is the asset demand for money that has increased. The counterpart to the central bank increasing the supply of money is that it should accumulate additional foreign exchange reserves. In effect, the central bank is holding foreign exchange on behalf of farmers as the liquid asset they need. Then, when farmers start to switch from their temporary financial asset into longer term real investment – running down their money balances to buy housing and equipment – the central bank should run down its foreign exchange reserves so that the decline in the demand for money does not drive up the price level.

An implication is that during and after an agricultural commodity boom the demand for money is quite volatile, first rising and then declining. Monetary targeting in such

circumstances would produce highly unsatisfactory results. Instead, the central bank needs directly to target the price level. In the first phase of the boom it will find that it can increase the nominal money supply substantially without increasing the rate of inflation, while in the second phase it will find that in order to prevent inflation from accelerating it must aggressively reduce the money supply by selling foreign currency.

This is not, however, the end of the monetary story. The money supply is composed partly of base money and partly of 'inside' money generated by the pyramid of credit. If there were no inside money then the central bank response would be straightforward, as set out above: farmers would hold claims on the central bank, which would back these claims with holdings of foreign currency. However, if the extra base money is allowed to generate additional credit, then the result is an inflationary increase in the overall money supply in excess of the extra asset demand of farmers. The sequence is that farmers sell their coffee in return for dollars. They cash these dollars with the central bank in return for local currency. They then decide that rather than spending this currency they will deposit it in the commercial banks. The commercial banks can then on-lend most of this increase in deposits, retaining only enough to meet their required cash ratio. Since the money they lend is redeposited into the banking system, the increase in credit is a multiple of the increase in base money, the multiple being the reciprocal of the cash ratio.

Thus, to avoid increasing inflation the central bank must prevent inside money increasing despite increasing the supply of base money. In effect, it needs to temporarily reduce the ratio of inside to outside money. In some situations this will happen automatically: the banks may simply not be able to increase lending because they cannot find additional creditworthy borrowers. It has been quite common in Africa for commercial banks to be extremely liquid. However, where the commercial banks are able to on-lend, the central bank will need to raise the cash ratio to prevent them. It will need to do this carefully, because some banks will be receiving proportionately larger increases in deposits than others, and the increase in the cash ratio may push some into difficulties while leaving others still able to increase lending.

As with the fiscal response to an oil windfall, this monetary response to an agricultural shock has no counterpart in central banking experience in the OECD societies. The skills involved simply do not need to be part of their repertoire. Africa is the main region in which agricultural shocks remain sufficiently important to have substantial macroeconomic consequences. However, the difference between good and bad monetary management of windfalls matters for the African agricultural export economies. If the windfall is well-managed substantial additional private investment is packed into these brief booms. Since private investment, and especially private investment in agriculture, is acutely scarce in Africa, it is important to facilitate it.

Thirty years ago, most agricultural commodity booms were heavily taxed by governments. While, as I have argued, there is no valid 'custodial role' for such taxation, should the government nevertheless aim to tax part of the windfall so that it can match the boom in private investment with a boom in public investment? The likely answer is that the government already has in place a tax system that will capture part of the

windfall through indirect taxation, and that this will be sufficient for complementary public investment. Direct taxation of agricultural windfall income is costly. If farmers conclude that their periodic windfalls will be taxed away, this will discourage investment in export agriculture. More importantly, because windfall agricultural incomes appear to be particularly well used to finance private investment, windfall taxation comes disproportionately at its expense. A transfer from private investment to public investment is not generally desirable in the African context because the ratio of the public capital stock to the private capital stock is already very high.

5. Conclusion

African economies are much more prone to commodity booms that are the OECD economies. Such booms have in the past usually not been handled well. The booms in non-agricultural commodities were badly handled globally, to such an extent that in the longer term they proved to be a curse rather than the blessing that is their potential. The booms in agricultural commodities tended to be badly handled in Africa because of excessive taxation.

To handle commodity booms well requires distinctive strategies. These strategies are not to be found in the OECD economies for the evident reason that they are not needed. Indeed, even within Africa they will need to be sharply differentiated, with non-agricultural commodity booms being met by public savings strategies embedded in a fiscal constitution, while agricultural commodity booms are met by astute central banking. One corollary is that African policy makers need a range of economic skills that others do not have. Another corollary is that African constitutions may need to look distinctive. Nowadays it is common to embed some fundamental aspects of economic policy in the constitution. In the OECD the most common provision concerns the independence of central banks. For commodity-exporting African economies the key economic issues are different. In particular, for the exporters of non-agricultural commodities the dependence of current savings decisions on future decisions makes a fiscal constitution appropriate.

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