Exogenous Inflows and Real Exchange Rates:

Theoretical Quirk or Empirical Reality?

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There are 'known knowns'. These are things we know that we know. There are 'known unknowns'. That is to say, there are things that we know we don't know. But there are also 'unknown unknowns'. These are things we don't know we don't know.

Donald Rumsfeld, US Secretary for Defence on the search for weapons of mass destruction in Iraq, February 2002.

1. Introduction

Concerns that large aid inflows will induce a sharp and sustained appreciation of the real exchange rate, discourage the expansion of exports (particularly non-traditional exports), and thereby damage growth prospects in the recipient economy are rarely far from the center of contemporary debates on the macroeconomics of aid to low-income countries. These concerns have recently come to the fore in a number of well-managed low-income countries that have already participated in the debt relief initiative for heavily indebted countries (HIPC Initiative)–and which are identified by the United Nations Millennium Project (2005) as potential "fast-track" candidates for rapid scaling-up of aid flows. These countries face the prospect of significantly higher aid flows in the near future (and, arguably, strong pressure from donor nations to see these resources absorbed rapidly). Thus, many question whether this increased aid can generate sufficient returns, in terms of sustained growth, to outweigh the costs of absorbing it, or whether it will contribute to the unraveling of hard-won economic gains secured in recent years.

In his overview for this seminar, Bevan (2005) summarizes the key elements underpinning this anxiety but argues that this conventional diagnosis may be unnecessarily pessimistic, even when aid levels are already high. While acknowledging the risks associated with rising aid inflows, he suggests that these can be managed.

Many economists would probably concur with this assessment but they would also recognize that effective management requires evidence on the impact of aid against which policy interventions can be calibrated. One problem currently facing policymakers, and the international community more generally, however, is that even though much research has been undertaken on the topic, the evidence on the short- and medium-run macroeconomic effects of aid–the "empirical reality" referred to in the subtitle of this paper–is still partial, often contradictory, and generally ambiguous. Moreover, since most of the evidence on the impact of aid is drawn from an era when the political and economic circumstances were far different from those today, much of it is of questionable relevance to the contemporary policy debate on aid management. This has quite serious implications, both when a view is required on by how much aid flows to low-income countries could sensibly be increased, and also in thinking about how the supporting macroeconomic policy environment should be structured. Taking too sanguine a view, either on the limits of absorption, the rate at which aid flows can be increased, or on the degree of macroeconomic intervention required to manage a scale-up effectively runs obvious risks. But too conservative a stance is also costly, condemning the recipient to a lower level of consumption and growth than could otherwise be achieved.

This paper is concerned mainly with forms of evidence and it has two objectives: The first is to review the theoretical arguments concerning the macroeconomic transmission from aid inflows to the real exchange rate and export performance and to summarize the macroeconomic evidence on this link. This constitutes the "known knowns" from the quotation at the beginning of the paper. The second objective is to discuss how simulation methods, based on a blend of theory and partial empirical evidence, may be used to highlight some critical but

typically hard-to-quantify factors that are likely to determine the macroeconomic response to increased aid flows. These, then, are the "known unknowns."

In Section 2 of this paper, I lay out the key theoretical arguments in the relationship between exogenous aid flows, the real exchange rate, and the structure of production in the recipient economy. In doing so, I address three specific issues: the role of dynamic growth effects from exporting; the problem of short-run real exchange rate overshooting; and the possibility that aid flows can generate a so-called "transfer paradox,"–where a gift (e.g., an unrequited transfer of aid resources) may leave the recipient worse off than before the transfer. I argue that while the transfer paradox is, in some respects, a "theoretical quirk" and unlikely to materialize in the aggregate, elements of the paradox are germane to understanding certain distributional consequences of aid inflows. In Section 3, I then review some of the empirical evidence and assess its relevance to the contemporary debate. Reflecting the rather pessimistic conclusions that emerge from this assessment, Section 4 then presents some simulation-based evidence on the aid and real exchange rate link. I argue that this link helps sharpen the focus on the key variables shaping the macroeconomic response to aid inflows. Finally, Section 5 concludes with brief remarks about implications for policy.

2. Aid Flows, the Real Exchange Rate, and Export Performance

The standard argument

The standard analysis of the macroeconomics of aid flows to small open economies posits that foreign aid flows augment domestic resources, leaving the economy as a whole better off; how much so depends on how these increased resources are used.

Two features of aid are important in considering the economy's response. The first is that aid accrues initially to the government. In this respect, it is similar to a resource windfall in state-owned natural resource sectors, as opposed to commodity price windfalls or remittance booms which tend to accrue in the first instance to the private sector. Consequently, parallels are often drawn between issues of aid management and the so-called "resource curse." The second feature is that while an aid inflow directly increases the economy's capacity to import (i.e., net imports must increase one-for-one with that part of the aid flow that is not saved), the expenditure supported by aid is often predominantly on domestic goods. The economic impact of aid flows therefore involves consideration of both the so-called transfer problem, that is, the process by which an inflow in the form of tradable goods is used to support increased consumption of non-tradable (domestic) goods and the balance between the public and private sectors. The critical decision is, thus, how the authorities choose to respond to the aid inflow. The choices are straightforward. It could be saved, by adding to official reserves, passed to the private sector, either through tax cuts or some direct transfer or by substituting for domestic deficit financing, or it could be used to augment public expenditure (or some combination of all of the above).

If it is entirely saved, either by the public or private sectors, the real exchange rate will be unaffected, at least initially. [1] Similarly there is no impact on the real exchange rate (or the composition of domestic production) if the ultimate recipient of the aid, either in the public or private sectors, spends the entire increase on imports. In this case, the increase in net imports is met entirely by an increase in gross imports. However, it is much more likely that the aid inflow will boost total demand for both imports and domestically produced (i.e., non-tradable) goods and services–including such public services as health and education. The real exchange rate response will

therefore depend on the relative pattern of demand between the public and private sectors. Typically it is assumed that the public sector has a higher propensity to consume domestically produced goods and services; this component of demand is thus likely to be stronger if aid is used to finance increased public expenditure than if it finances direct transfers to households or tax cuts, or is used to reduce domestic deficit financing. But in either case the mechanism is the same, so that differences in outcomes are a matter of degree. For small economies, while imports can be acquired directly from the world market at fixed world prices, non-tradables can, by definition, only be supplied by domestic producers. Unless there is considerable excess supply in the economy, this higher demand for domestic goods requires their prices to rise in order to induce the necessary supply response. In other words, the real exchange rate (i.e., the price of non-tradable relative to tradable goods) must appreciate to entice resources, including labor, to switch from the production of exportable and import-substituting goods to the production of non-tradable goods. In the process, then, as the real exchange rate appreciates, the tradable goods sector shrinks relative to the non-tradable sector. The increase in net imports in this case is brought about partly by an increase in imports and partly by a reduction in the production of tradables (exports and /or import substitutes). This decline in export production is referred to as the "Dutch disease."[2]

Dutch disease effects involve a change in the balance between the tradable and non-tradable sectors. Producers of tradables–both those currently in operation and potential producers–stand to lose: the purchasing power of export incomes declines and profit margins are squeezed as prices of domestic inputs, including labor, rise. On the other hand, producers of non-tradable goods stand to gain as their income now purchases more imports and domestic tradables (i.e., import-substituting goods) than

before. If the production of non-tradable goods and services is relatively labor-intensive–as is often the case–then in the aggregate wage earners will also gain, either as a result of higher labor demand or through higher wages if there is close to full employment.

The magnitude of these short-run effects will depend on a number of things. As noted, they will be stronger the greater the share of non-tradable goods in consumption, which is likely to be closely related to the proportion of the aid inflow directly spent by the public sector. They will be weaker the greater the capacity of consumers–in either the public or private sectors–to substitute between domestic and imported goods in response to changes in relative prices. Dutch-disease effects will also be weaker if there is substantial spare capacity in the economy; the larger the pool of unemployed labor, the easier it is to increase the supply of labor-intensive domestic goods without driving up prices, including the price of labor. Nkusu (2004) suggests that a failure to account for idle capacity may create a systematic expectation that Dutch-disease risks are higher than they truly are. How much genuine spare capacity really exists, however, is often unclear. Unemployed capital and labor are only relevant as excess capacity if they can be brought into productive use in response to increased demand. Hence, if critical inputs in short supply, such as specialist labor, cannot be substituted by more abundant factors, regardless of how far their price falls, "full capacity" can coexist with generalized unemployment of factors.

In the short run, the impact of aid on the economy is felt predominantly on the demand side. Over the medium term, however, the evolution of the economy depends equally on the nature of the supply side response to the aid inflow, in other words how, if at all, the productive capacity of the economy is augmented by aid inflows. This in turn will be determined by how aid is used and how the supply side of the

economy responds to these different uses. As I will soon discuss, once appropriate consideration is taken of the supply side there is no presumption as to whether, over the medium term, aid inflows will be associated with an appreciation or depreciation of the real exchange rate, or, indeed, with an expansion or contraction in the tradable goods (exportables) sector of the economy. Before doing so, I consider three extensions to this basic argument.

The costs of temporary exclusion from world markets

Most economists believe that there are important growth-enhancing productivity gains to be obtained from producing for world markets. This belief appears to be borne out in empirical evidence, including for African manufacturing firms.[3] Hence, if the appreciation of the real exchange rate induces a protracted shift of resources away from the export sector and toward non-tradable production, where latent productivity effects are typically assumed to be lower, an important engine of growth for the economy is jeopardized.[4] Although the evidence on the scale of these growth effects is contested, this argument is a serious one, particularly since because of past policy errors the exportable sector in many low-income countries is already too small. The policy challenge is thus to ensure that poor management of aid inflows does not leave the exportable sector *permanently* smaller than its growth-maximizing level. If productivity gains from aid-financed public investment can be secured, so that the exportable sector's share of total output expands over the medium term, the issue is simply an intertemporal one, at least in the aggregate; the temporary growth-retarding effects of a short-run real exchange rate appreciation are compensated for by future growth in the export sector, allowing higher export-led productivity gains to be accessed in the future.

Permanent costs of temporary real exchange rate overshooting

The interaction of the demand- and supply-side effects of aid means that the real exchange rate may overshoot its long-run value and may, in fact, move in the opposite direction so that a short-run appreciation is followed by medium-term depreciation. Temporary movements of this kind are often much more costly than conventional models suggest, even if they are anticipated. These costs are likely to be especially high when firms face high adjustment costs and when the domestic financial sector is relatively underdeveloped. If firms falsely believe temporary real exchange rate movements to be permanent, they incur costs as they first move into (what they think is) the booming sector and then out again when the temporary effects pass. These are one-off costs. More problematic, however, is the case where real exchange movements are known to be temporary, so that firms are not induced to reallocate resources in response to short-run relative price movements. If they are unable to access sufficient credit from underdeveloped financial markets to finance the short-run losses triggered by unfavorable temporary real exchange rate movements, the firms may run down their capital; lay off skilled workers; or at worst close down completely, even though the long-run prospects for the tradable sector may be highly favorable. Short-run movements in real exchange rates thus may again have *permanent* effects on the structure of production and growth. Given their lesser ability to access credit from the formal financial sector, small firms are likely to be disproportionately vulnerable to this kind of market imperfection.

It is important to distinguish here between the volatility of aid flows and the volatility of the real exchange rate itself. It is the real exchange rate volatility that matters for intersectoral resource allocation decisions. Whether the volatility of aid

flows mitigates or worsens real exchange rate volatility depends on whether aid is pro- or countercyclical. Procyclical aid (i.e., flows that increase in "good" times as the real exchange rate is otherwise appreciating) may aggravate the problem, while countercyclical aid (which offsets other adverse shocks such as terms-of-trade shocks) may act to smooth both the current account and fiscal balances and the real exchange rate.

The transfer paradox

The original idea of a "transfer paradox" is that, as a result of distortions in the structure of trade, an aid transfer may move the terms of trade sufficiently far to its disadvantage that the recipient country is left worse off following the transfer. More recently, a number of economists have examined the possibility of a transfer paradox in the context of small-country aid recipients (where the terms of trade are independent of transfers), with attention switching to the role of the non-tradable goods sector.[5] In this case, the risk to the recipient emerges not from the conventional Dutch-disease diagnosis (which is concerned with the switching of resources away from the dynamic tradable goods sector) but rather from its reverse. Specifically, when the transfer induces an expansion of the supply of non-tradables that is strong enough relative to the growth in domestic demand, the relative price of non-tradable goods may fall sufficiently far that real income falls too. While the models employed are highly specific (some might suggest contrived) and the empirical evidence marshaled in their support relatively weak, this analysis does highlight an important aspect of aid transfers not normally addressed in conventional macroeconomic analyses, namely, that the effects of potentially large relative price changes induced by responses to aid flows may be highly concentrated and therefore

distributionally non-neutral. A particularly relevant example is in the market for basic food crops whose prices are determined by domestic market conditions. We frequently think of such goods as having a relatively low income elasticity of demand (i.e., above some subsistence level, the demand for food rises less than proportionally with income). In these circumstances shifts in supply arising, for example, from aid-funded public investment–and which are exogenous to the actions of producers themselves–can lead to a sharp fall in prices and hence a sharp decline in incomes for net sellers of basic foods, typically poor rural households. In reality, of course, households faced with this adverse movement in their terms of trade will tend to make some adjustment, either in, for example, their crop choice or their labor supply decision. The scope for adjustment may be very limited or take some time to take effect, however, so that the adverse distributional effects may be protracted.

3. The Absence of Reliable Macroeconometric Evidence

In principle, it should be a simple matter to answer the question of how aid flows affect the real exchange rate and the structure of domestic production, and how large these effects are. Attempts to measure this relationship date back to the early 1980s when parallels were first drawn with the natural resource curse and, hence, the possibility of Dutch-disease-like effects accompanying aid flows.[6] While a number of subsequent empirical studies have also found a tendency for aid inflows to be associated with an appreciation of the real exchange rate,[7] this evidence is not overwhelming. Econometric estimates of the impact of aid on the real exchange rate often show this effect to be small and statistically insignificant –what Bulíř and Lane (2002) refer to as "traces" of aid-induced real exchange rate appreciation. This tendency is echoed in more recent work by Prati, Sahay, and Tressel (2003). who, on

the basis of a rather more sophisticated dynamic panel data model, suggest that for countries with net official development assistance (ODA) flows in exceeding 2 percent of GDP a year a doubling of aid would only appreciate the real exchange rate by at most approximately 4 percent in the short run, rising to about 18 percent over a five-year period, and to 30 percent over the decade. Time-series models describing the evolution of the real exchange rate also tend to find that it responds much less to variations in aid flows than to other exogenous foreign exchange flows, most notably commodity prices or terms-of-trade variations.[8] Moreover, a number of studies on African economies find that aid inflows appear to be associated with a depreciation rather than an appreciation of the real exchange rate.[9]

One possible reason why large real exchange rate movements are not widely observed in response to aid flows is that the required quantity adjustments have actually occurred in conjunction with relatively weak real exchange rate effects.[10] A number of recent empirical studies from the IMF explore this more direct implication of the Dutch-disease argument and suggest that quantity adjustments to aid inflows have, in fact, been rather substantial. Bulíř and Lane (2002) present some striking evidence that suggests the tradable sector as a whole has declined by an average of 8 percent a year in a sample of aid-dependent economies. Arellano and others (2005), drawing on panel data regressions for 73 developing countries during 1981-2000, also find a strong and significant negative relationship between the level of aid a country receives and the share of manufactured exports in total exports. Their central estimates suggest that for the mean country in their sample, a rise in aid from 10 percent to 11 percent of GDP corresponds to an 8 percentage-point decline in the manufactured export share (from its mean of about 20 percent of total exports).[11] This effect is very large, but it is ultimately an association and does not control for the

endogeneity of aid and the possibility that causality runs in the opposite direction– namely, that aid-dependent economies may receive high aid flows precisely because the tradable sector is declining.

Rajan and Subramanian (2005) approach the same question from a slightly different perspective. By exploiting within-country variations in sectoral growth rates, they test the hypothesis that in the presence of high aid inflows, relatively labor-intensive industries grow more slowly than relatively capital-intensive ones. Arguing that in developing countries firms producing tradable goods tend to be more labor intensive than those producing non-tradables, the authors conclude that high inflows have systematic adverse effects on competitiveness.[12]

Other evidence is less compelling. Yano and Nugent (1999), in their paper on the transfer paradox, also find rather mixed econometric evidence on the relationship between aid flows, real exchange rates, and the structure of production among a set of 44 aid-dependent economies during 1970-90. Aid dependence here means that a country receives more than 5 percent annually in aid. In 21 of these 44 countries, aid was associated with an appreciation in the real exchange rate; in only 2 cases, however, was the effect statistically significant, while in 23 cases the relationship was reversed (and was significant in 4 countries). In only 6 countries (Burkina Faso, Congo, Lesotho, Liberia, Senegal, and Yemen) did the authors find a negative and significant relationship between aid flows and the symptoms of a transfer paradox (namely, an expansion of the non-tradable sector, contraction of the tradable sector, and a decline in real GDP); only in the case of Liberia was there any evidence that the decline in real income was statistically significant.

Where there is an arguably stronger empirical consensus is on the costs of short-run temporary movements in real exchange rates. The generalized costs of real

exchange rate volatility are extremely well documented, and an increasing body of firm-level evidence suggests that it is exactly this form of temporary misalignment–rather than anticipated medium-term movements in the equilibrium real exchange rate–that is particularly costly to sustained export growth in low-income countries.[13]

Making sense of the evidence

A first reading of this macroeconometric evidence would appear to suggest that while short-run real exchange rate volatility is costly, the case for strong Dutch-disease-like effects of aid is, at best, "not proven." At one level, this is consistent with the fact that it is impossible to think of any example in which surges in aid inflows have led to the kind of collapse in the tradable goods sector associated with conventional Dutch-disease episodes–such as, for example, the collapse of export agriculture in Nigeria following the oil shocks of the 1970s. But equally it does not imply that these effects could not materialize nor that aid inflows have not choked off an incipient export-led growth. Moreover the evidence sits uncomfortably with well-articulated concerns about aid-induced real exchange rate movements emerging from policymakers in a number of African countries in recent years.[14] The problem would appear to lie with the evidence, particularly the aggregate macroeconomic evidence. There are at least four reasons why we might be cautious about accepting this evidence at face value.

First, all empirical work in this area is plagued by severe measurement problems, both of the real exchange rate itself and across alternative concepts of tradable and non-tradable goods. Radelet (1996), for example, demonstrates that in Indonesia a conventional "IMF-style" real exchange rate measure of the kind used in most of the empirical work cited earlier (i.e., the ratio of consumer price indices expressed in a common currency) indicated a depreciation of the real exchange rate in

the early 1990s while every other measure of the real exchange rate suggested an appreciation, the latter being more consistent with export trends. Bevan and others (2003) identify a similar phenomenon in Uganda in the late 1990s.

It is equally difficult to derive accurate empirical proxies for tradable and non-tradable goods. Not only do official statistics indicate that most goods and services are traded internationally between at least some countries, but the degree of tradability of different goods is often endogenous to trade and other policy factors and hence is likely to change over time. But the alternative of arguing that the degree of tradability can be proxied by the labor intensity of production, as suggested by Rajan and Subramanian (2005), seems equally debatable.[15]

Second, much of the empirical evidence cited above draws on periods in the recent past when underlying macroeconomic circumstances, and particularly those relating to the management of foreign aid inflows, were radically different from those prevailing at present. In some cases, aid transfers were driven by, and responded to, non-economic factors (which might explain some of the high variation in the cross-country data such as that used by Yano and Nugent). In others, however, and especially throughout the 1980s and 1990s, aid was highly conditional on–or at least associated with–large macroeconomic reforms, particularly in the areas of exchange rate liberalization and unification and the removal of quantitative restrictions on trade. In these circumstances it becomes difficult to disentangle conventional aid and Dutch-disease effects–where aid inflows may be expected to appreciate the real exchange rate–from the associated (or at least contemporaneous) tendency for the real exchange rate to depreciate as a result of policy reforms aimed at removing macroeconomic distortions. Although considerable effort has been expended to address these issues,

conventionally estimated effects of aid on the real exchange rate are highly likely to be biased downward so that, at best, only weak Dutch-disease effects are identified.

Similarly, over much of the period spanned by the econometric evidence, and especially when foreign exchange regimes were highly controlled, aid flows played a crucial role in financing critical imported inputs. This had the effect of making short-run supply responses (across the economy as a whole) sufficiently strong and rapid to shift the balance in favor of a depreciation in the real exchange rate as otherwise idle capacity was brought into use.

A third problem with most analyses of real exchange rate responses to aid is that the results are dominated by the average, either over time or across countries. One consequence of this is that such models rarely allow for the possibility that real exchange rates may first appreciate and then depreciate in response to aid (and, equally, that the exportable sector may contract and then expand). In principle, time-series analyses can allow for these effects to some degree but given the previous observations about relying too heavily on historical data, it is questionable how much weight can be put on this evidence.

Finally, as emphasized earlier, aid flows do not occur in isolation. Their impact is intimately linked not just with the fiscal response to the aid (i.e., how revenue mobilization, public expenditure, and the overall fiscal stance respond to aid flows), but also with the monetary and exchange rate policy response. Although some attempts have been made to develop sophisticated econometric "fiscal response" models,[16] it is highly debatable whether such models can ever successfully identify the underlying structural linkages of interest, especially given the severe data limitations they face.

4. Using Simulation Approaches to Get Behind the Aggregate Data

In recent years, a second tradition has emerged to assess the quantitative significance of the macroeconomic effects of aid flows in circumstances where other direct forms of empirical evidence cannot be relied upon. This involves building simulation models that are informed by theory and calibrated by data and case study evidence where these exist, but which do not rely exclusively on actual history to provide quantitative insights on possible responses to aid. Simulation models differ greatly in terms of scale and structure, depending on the kinds of questions they seek to address.[17] Recently, however, a number of models have been constructed to focus specifically on the question of aid and public investment. These include work by the World Bank (2004), by researchers at the International Food Policy Research Institute (IFPRI), by Lofgren and Robinson (2004), and Adam and Bevan (2004). It is far beyond the scope of this paper to do justice to this research, but it is appropriate to illustrate how this approach can be used to understand the possible dynamic responses to aid inflows. Simulation models on their own are generally unable to "predict" the specific macroeconomic consequences of aid inflows. They can, however, in the spirit of the quotation at the beginning of this paper, focus attention on the key "known unknowns," those variables whose quantitative importance we need to know in order to gauge how a particular economy may respond to a scaling up of aid.

To give a sense of how this approach might contribute to the debate, this section reports on some simulations from a model built specifically to analyze possible short- and medium-term responses to alternative aid-financed public expenditure programs in low-income countries. The model, described in Adam and Bevan (2004), is designed to capture the salient features of a typical "post-stabilization" African country. Thus, it assumes that the economy produces basic

food crops, an export cash crop, manufactured goods (including non-traditional exports), and services. This particular model does not assume any significant natural resource dependency. It embodies a standard characterization of consumption and saving behavior for a range of representative household groups, including rural households whose livelihoods depend overwhelmingly on the production and sale of cash- and food-crops. The government in the model undertakes the standard array of functions, taxing households' income and consumption and providing conventional government services, but also providing public infrastructure that can boost productivity in the private sector. The recent work by the World Bank (2004) on Ethiopia follows a similar strategy, but places more emphasis on the potential for productivity gains from investment in human capital, specifically through public expenditure on health and education.

The simulations reported here are designed to examine the sensitivity of possible macroeconomic responses to aid-funded public expenditure programs to assumptions about: the productivity of different forms of public expenditure; how this affects the private sector (on average and, for example, whether different forms of public infrastructure favors the production of the export sector over the domestic non-tradable sector); how quickly public investment can be brought on line; the initial degree of capital scarcity in the economy; and the extent to which there are dynamic growth effects from non-traditional exporting. The simulations reported here represent only a fraction of the more extensive analysis carried out in Adam and Bevan (2004).

Figures 1 to 4 plot a set of simulated 10-year trajectories for the real exchange rate (Figure 1), export volumes (Figure 2), real GDP (Figure 3), and total income (Figure 4), in response to a scale-up of grant aid equivalent to slightly below 2 percent

of GDP in an economy that is already operating with a relatively high aid-to-GDP ratio of 11 percent.[18] Since the aim is to focus exclusively on alternative public expenditure packages, other external factors such as terms-of-trade changes and other aspects of the potential fiscal response are assumed to be constant, although there is no requirement that this be the case.[19] The plots, which give a sense of the potential range of responses, are generated for only a small subset of the possible trajectories generated by the model.

Experiment 1 provides a reference benchmark. In this case public investment has no effect on private sector productivity: the economy's total capital stock is expanded but the increased public capital does not sustain higher private output. This allows us to isolate the pure demand-side effects of the aid flow. Experiment 2 examines the case where aid-financed public investment does enhance private sector productivity, but disproportionately in the non-traditional export sector (for example, by improving international market access). Experiments 3 and 4 consider the case where the productivity gains accrue overwhelmingly to producers of domestic non-tradable goods (for example subsistence food). In Experiment 3, we assume this public investment has an immediate impact on productivity and occurs against a background or relative public- and private-capital scarcity so that the marginal returns to both kinds of capital are high. By contrast, Experiment 4 assumes a less favorable environment: the gestation lag for public investment is longer (it takes three years for investment to affect private productivity instead of one year, as assumed in Experiment 3); the economy is already working with somewhat higher levels of public and private capital (although the economy is still "capital scarce"); while the consequences of a temporary contraction of non-traditional export growth are more severe.

*** Figures 1 to 5 inserted from here ***

Experiment 1 highlights the classic Dutch-disease anxiety and reflects many of the features underpinning some of the econometric evidence discussed earlier. The aid flow obviously augments aggregate real income (Figure 4) but has little initial impact on GDP (Figure 3). The aid inflow does, however, lead to an appreciation of the export real exchange rate of about 3 percent, suggesting an elasticity somewhat larger than that estimated by Prati and others (2003), and a sizable contraction in exports (in favor of higher production of domestic goods). Moreover, the experiment suggests a progressive deterioration in overall economic performance that is, in fact, sufficiently large to reduce real disposable income below its initial level, despite the continued aid flow. This collapse reflects a decline in real private investment which, in turn, is underpinned by two features of the model. The first is the growth slowdown brought about by a squeeze on the non-traditional export sector. This is compounded, however, by the fact that the real exchange rate appreciation raises the cost of capital goods (since the model assumes, rather reasonably, that capital formation is intensive in non-tradable services). This means that although the real exchange rate appreciation moderates over time, the deterioration of the capital stock ensures that the decline in export performance does not reverse and, hence, the initial welfare gains weaken over time. Over the medium term, therefore, aid that delivers no supply-side benefit does indeed act as a brake on economic growth.[20]

By contrast, in Experiments 2, 3, and 4 public infrastructure investment is assumed to raise the productivity of private factors of production. In Experiment 2, the gains from this infrastructure are biased in favor of the non-traditional export

sector. In this case, once the effects of the public investment begin to be felt, the now higher returns to producing non-traditional exports draw resources away from other sectors, including the non-tradable sector, inducing a further appreciation of the real exchange rate (Figure 1). This real exchange rate appreciation has a deleterious effect on traditional exports (e.g., cash crops) in the short run. But as the supply-side effects feed in, non-traditional exports grow rapidly and this stimulates a fairly substantial cumulative growth in GDP and national income over the 10-year simulation horizon (Figures 3 and 4).

When the productivity gain is biased toward the production of domestic goods, however, as is shown in Experiments 3 and 4, outcomes are markedly different again. Here the productivity bias works to ease pressures in the non-tradable sector and, in this case, is sufficiently strong to rapidly reverse the initial demand-side effects of the increased aid flows. The real exchange rate reverts to its initial value quite rapidly, despite the continued higher aid inflows. Indeed, it shows a depreciation over the medium term, which, as we shall see shortly, has important distributional implications.

As shown in this set of simulations, the domestic-biased supply response in Experiment 3 (when the external environment is relatively benign and identical to that assumed in Experiment 2) has a stronger impact on overall export performance and output growth than when infrastructure is specifically export-biased. This occurs because of the beneficial effects of the weaker real exchange rate appreciation in the short run, which helps suppress the overall cost structure for the export sector. This relative ranking is not guaranteed, however. In the case shown as Experiment 4, where longer gestation lags are associated with public investment, and where

marginal returns to investment (both public and private) are somewhat lower, the export-biased case generates higher output growth over the medium term.

Finally, Figure 5 shows how aid inflows can worsen the income distribution, even when total national income is rising (as is shown in Figure 4 for Experiments 2 to 4). In this model, rural households are net producers of non-tradable food crops and urban households are net consumers. In cases where there is a strong export bias in the productivity gain induced by infrastructure spending, rural households enjoy a modest increase in real incomes (not shown here). This rise, however, is proportionally less than the rise in overall income, mainly because most of the positive demand-side effects of higher public investment expenditure are felt by the suppliers of goods and services to governments who tend to be found among urban households. The rural income share thus declines slightly. By contrast, when there is a strong domestic-goods bias in the supply response (which, as shown in Figures 3 and 4, generates higher aggregate income and output growth), this distributional effect is compounded by the fall in the relative price of food crops. This confers a direct benefit to net consumers of food (urban households) and a direct loss of real income to net producers. When the demand effects arising from the rise in overall national income are relatively weak (which may be the case if we consider basic foods), this disadvantageous shift in rural households' terms of trade may be sufficient to generate an absolute, as well as relative, loss of income and hence produce a variant of the "transfer paradox" noted above. This is the case here in Experiments 3 and 4.

5. Caveats, Summary, and Policy Implications

Although they only scratch the surface and are certainly not intended to be predictions for any specific country,[21] these simulations provide an interesting and informative

perspective on what may lie behind the econometric evidence on the effect of aid flows presented earlier. But simulations are only as good as the models generating them, and the model underpinning those presented in Figures 1 through 5 has many limitations. To name just a few: the initial calibration assumes no usable excess capacity in the economy; it assumes the evolution of the real exchange rate is not influenced by the nominal exchange rate regime (since domestic prices are assumed to be fully flexible) and there is no role for distortions arising from inflation. Moreover, the model does not allow for migration from rural to urban sectors in response to the shift in relative incomes nor provide for any form of human capital accumulation.

Listing the limitations is not really the point, though. The relevant issue here is that this analysis has moved beyond the econometric averages and has shifted attention onto some of the elements that determine the macroeconomic response to aid inflows and, in doing so, has helped identify some of the key "known unknowns."

For example, four central messages emerge from the simulations presented above:

1. When public infrastructure augments the productivity of private factors, and especially when there is an initial scarcity of public infrastructure, there are potentially large medium-term welfare gains from aid-funded increases in public investment. These occur despite the presence of some short-run Dutch-disease effects and are compatible with growth in the export sector of the economy.

2. When supply-side responses to aid are important, however, real exchange rate overshooting may be a central feature of the economy's response to aid inflows.

3. The actual evolution of the economy will depend crucially on the form of public investment, how powerfully (and how quickly) it feeds back onto private production capabilities, and the costs of any short-run contraction of the export sector.

Export promotion and growth, however, may be benefited as much, if not more, by public investment geared to improving the productivity of domestic non-tradable goods production rather than directly to improving productivity in the export sector itself.

4. If aid flows do stimulate significant shifts in non-tradable goods supply, this may aggravate underlying distributional tensions. In the case examined here, net suppliers of domestic goods will not share proportionately in the aggregate income gains to the economy, raising the possibility of a potential worsening in the income distribution.[22]

How does this discussion on forms of evidence contribute to the better management of aid?

I think two key implications emerge. The first is general, rather obvious, and does not necessarily imply specific macroeconomic policy actions. Just as the late Speaker of the U.S. House of Representatives, Tip O'Neil. famously claimed that all politics is local, any serious analysis of the impact of aid relies on the dictum that "all macroeconomics is micro." More precisely, which of the wide range of simulated macroeconomic trajectories is relevant for a particular country and setting, depends intimately on the microeconomics underpinning public expenditure and its impact including:

- the demand-side characteristics of different forms of public investment, particularly their call on the non-tradable goods sector, and the time taken for the effects of such investment to be realized;
- the extent of usable capacity and relevant unemployed (but employable) labor;

- the extent to which public expenditure alters private production capacities and how this varies across sectors; and
- how these constraints may vary with the rate at which public expenditure is scaled up.

An understanding of these microstructural features will clearly not emerge from macroeconomic data, but a burgeoning body of microeconomic and case-study evidence is increasingly able to provide some insight into the quantitative magnitudes of these features.

The second implication derives from the robust finding that there is a reasonable expectation that, in the short run, the real exchange rate will overshoot its medium-run value, particularly if aid inflows support productivity-enhancing public investment. This effect is likely to be larger and more protracted the more intensive is public investment in non-tradables, the more attenuated the public investment process, and the stronger the productivity bias in favor of the export sector.

Thus while the medium-term profile for the economy clearly depends on the aid being spent, there may be a case for aid inflows to be accompanied by measures geared to smoothing the path of the real exchange rate in the short run. How this might be most efficiently achieved–given that the management of aid flows is only one of the issues competing for policymakers' attention–has been a major concern to central banks in a number of low-income African countries confronting surges in aid flows. While firm conclusions have yet to emerge, this is now an area of active debate.[23]

FIGURES

SIMULATED RESPONSES TO AN AID-FINANCED INCREASE IN PUBLIC INVESTMENT EQUIVALENT TO 2 PERCENT OF INITIAL GDP.

Experiment 1: Baseline: "non-productive" public investment

Experiment 2: "Productive" public investment – export biased

Experiment 3: "Productive" public investment – domestic goods biased

Experiment 4: "Productive" public investment – domestic biased but low returns.

Source: Adam and Bevan (2004).

Figure 1. Trade Weighted Real Exchange Rate

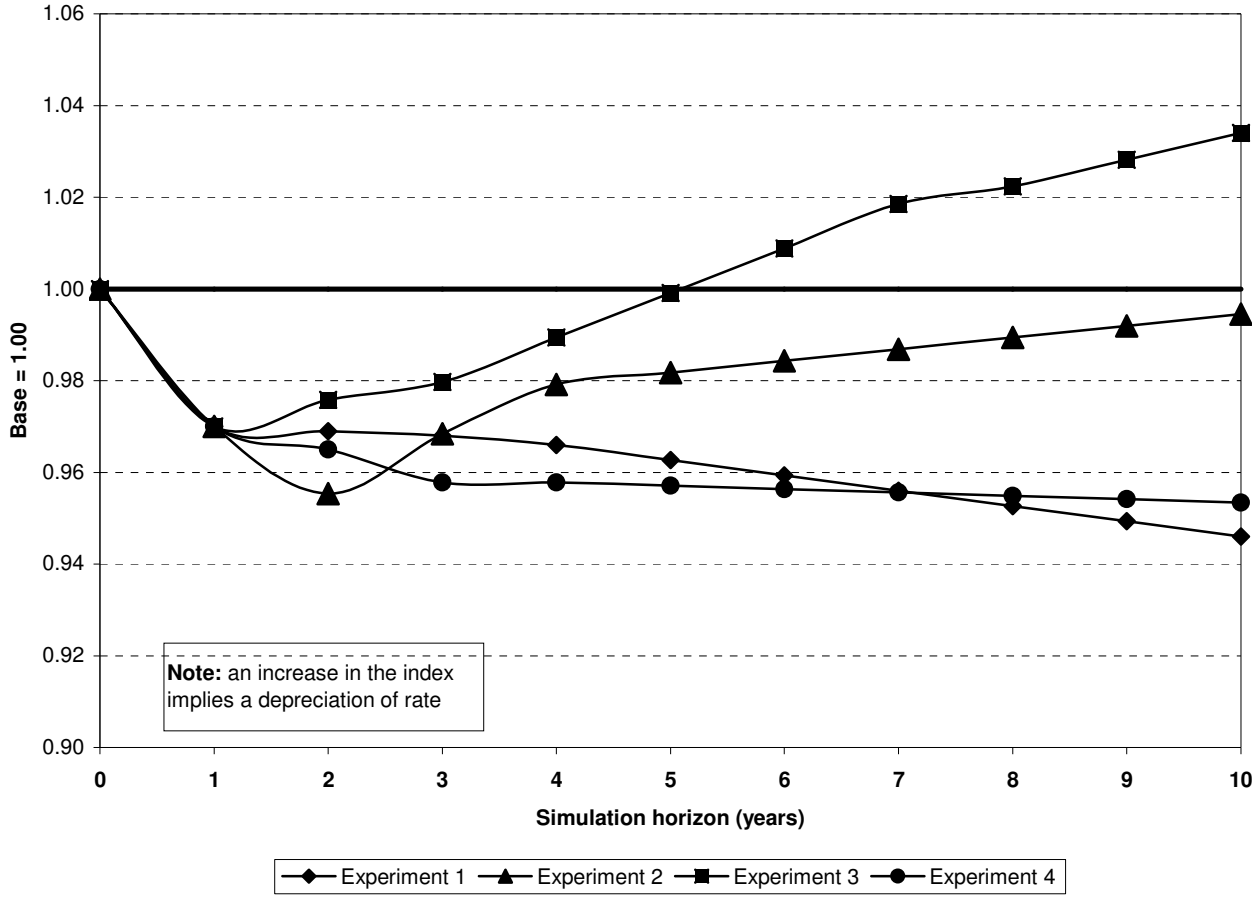


Figure 2. Total Exports

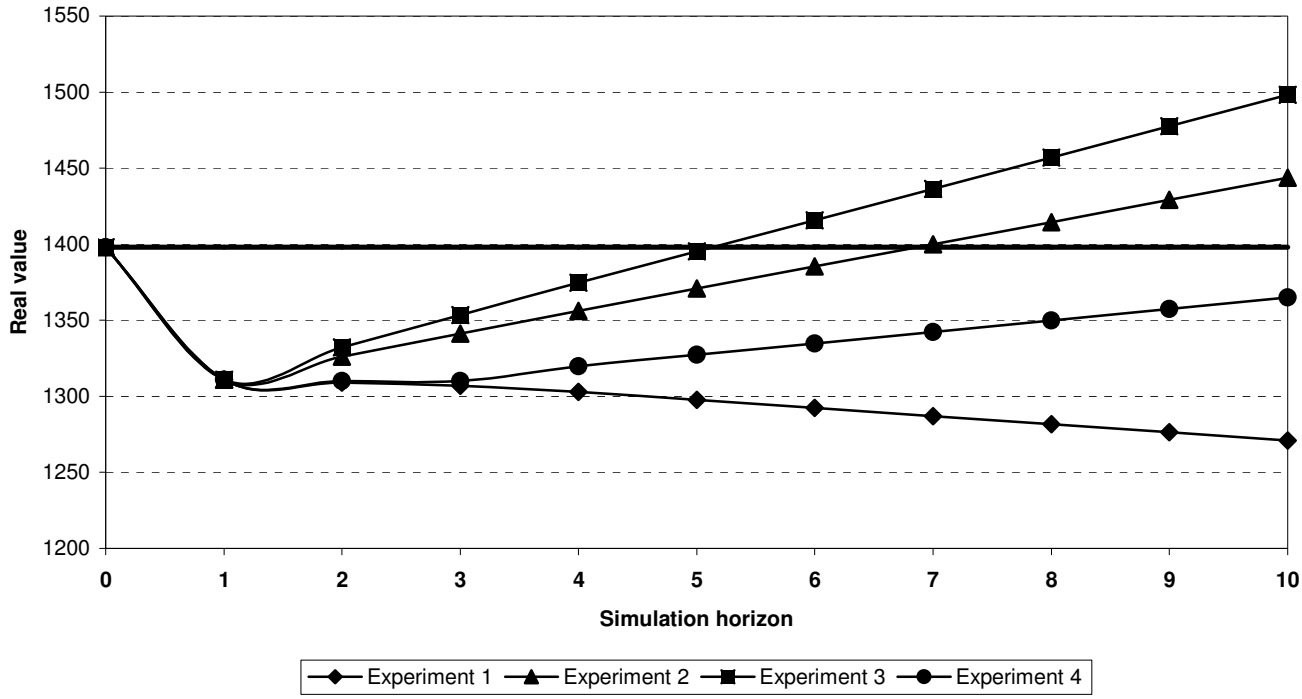


Figure 3. Real GDP

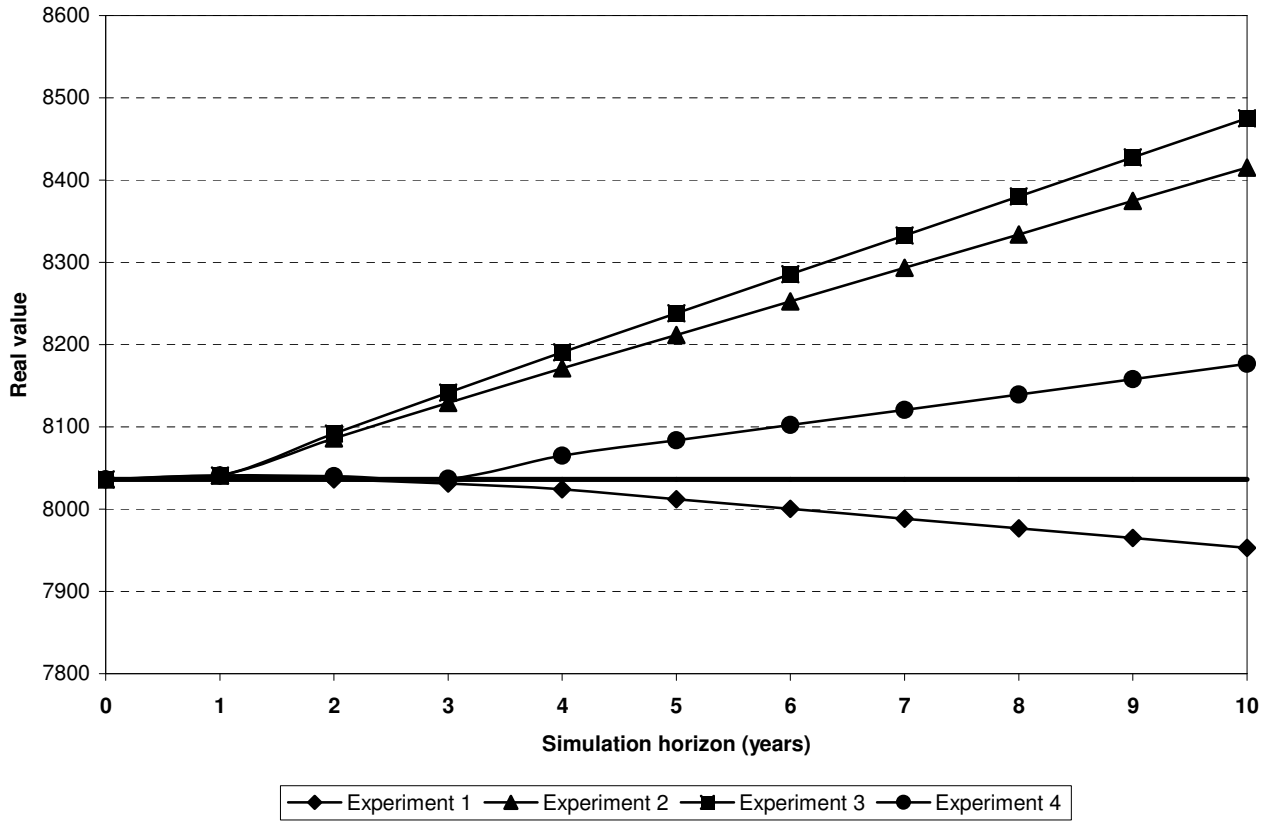


Figure 4. Total Real Disposable Income

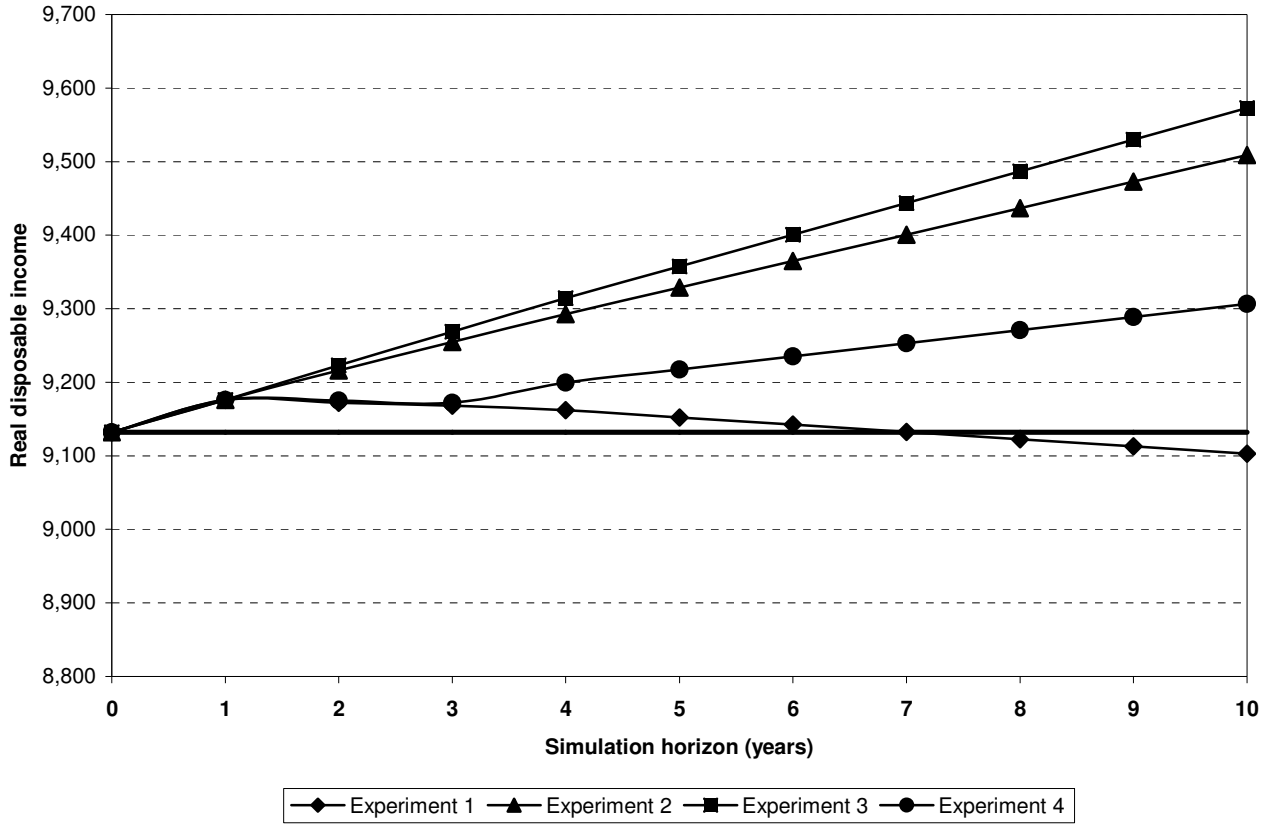
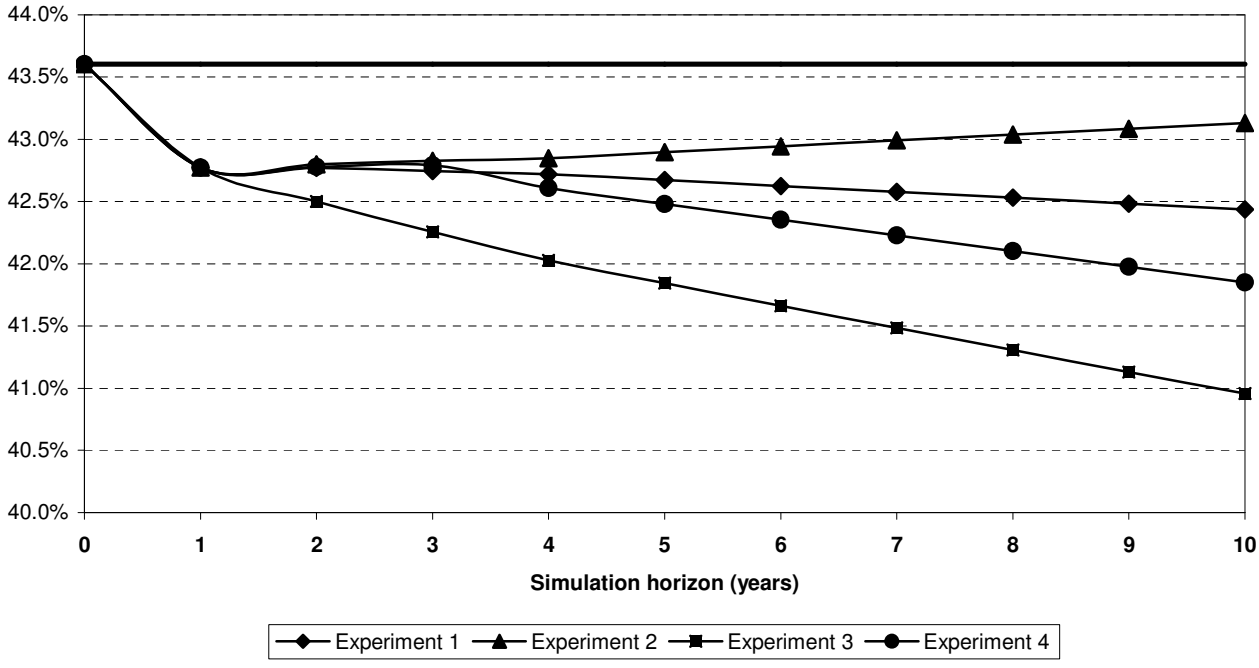


Figure 5. Rural Share of Total Income



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NOTES

[1] Even if donors were comfortable with the idea, this option is unlikely to be optimal for the recipient, particularly if the aid increase is permanent, or at least not expected to be reversed in the near future. Some reserve accumulation might be optimal if reserves are sufficiently far below the level required for sound macroeconomic management. In this case, however, the accumulation of reserves is best thought of as a temporary rather than permanent response.

[2] The term "Dutch disease" was first coined to describe the adverse effects on the Dutch manufacturing sector following the sharp appreciation in the real exchange rate induced by the discovery of natural gas off the coast of Holland in the 1960s. The Dutch disease framework has also been used to analyze the impact of gold inflows from the Americas to sixteenth century Spain and to the discovery of gold and other minerals in Australia in the 1850s. An early application of the framework to aid inflows is found in van Wijnbergen (1985).

[3] For example, see Ghei and Pritchett (1999) for a general discussion on this topic, Westphal (1990) and Kraay (1999) on evidence for East Asia and China, and Gautier (2002) and Bigsten and others (2004) for African exporting firms.

[4] See, for example, Adam and O'Connell (2004).

[5] The small country "aid transfer paradox" problem was first introduced by Chichilinsky (1980) but the idea has recently been revived by Yano and Nugent (1999).

[6] For example, van Wijnbergen (1985).

[7] These include country-specific studies, for example, by Younger (1992) for Ghana, Atingi-Ego and Sebudde (2001) for Uganda, as well as cross-country analysis by Adenauer and Vagassky (1998) for a number of franc zone countries, and Prati and others (2003) for a range of low-income, aid-dependent economies.

[8] For example, Elbadawi (1994) for Ghana; Baffes and others (1999) for Côte d'Ivoire and Burkina Faso; Atingi-Ego and Sebudde (2001) for Uganda; and Cashin and others (2002).

[9] For example, Nyoni (1998), and Adam, Bevan, and Chambas (2001).

[10] In other words, the intersectoral elasticity of substitution is relatively large, so that while incipient real exchange rate pressures may be strong, actual real exchange rate movements are more modest.

[11] Arellano and others (2005), Tables 4 and 7.

[12] Rajan and Subramanian (2005) also examine the relationship between aid flows and the growth of the manufacturing sector, finding results consistent with those of Arellano and others (2005).

[13] See, for example, Servin (2003) and Bleaney and Greenaway (2001) on the general evidence, Elbadawi (1999) on country-level evidence for sub-Saharan Africa, and Bigsten and others (1999) and Sekkat and Vavoudakis (2000) on firm-level evidence.

[14] For example, the discussion in Buffie and others (2004).

[15] For example, while it is probably correct that tradable goods are produced in developing countries at a lower capital-labor ratio that they would be in industrial countries, it does not follow that their production is more labor-intensive than non-tradables *in their own country.*

[16] For example, Mavrotas (2002).

[17] For example, there is a long tradition of using simulation models to analyze the likely impact of trade policy reforms. More recently these models have been promoted as a means of analyzing possible distributional effects of policy reforms.

[18] This is similar to the top end of the scale of HIPC debt relief but somewhat smaller than some of the aid flows anticipated under the UNMP.

[19] In practice, of course, the government may decide to take all the adjustment on the side of expenditure, by increasing current expenditure or infrastructure investment, or to offset part of it by altering the rate of revenue mobilization. Some combination of both is likely to be optimal in many circumstances, especially if current tax structures are highly distortionary at the margin and the public sector's absorptive capacity is limited.

[20] These simulations are reported as deviations from a static baseline, represented by the horizontal line in each figure. In reality, of course, the no-aid increase baseline may reasonably exhibit some growth so that the contraction illustrated here represents a slowdown in the growth of output rather than an outright contraction.

[21] Simulation models certainly can be used for country-specific predictions but to be effective in this role, much closer attention would need to be paid to the calibration of exogenous developments (and not just the aid shock) and the characterization of anticipated policy reactions to such changes.

[22] How this effect is likely to translate into overall income distribution and poverty incidence will depend on the detailed structure of household activities (e.g., whether households are able to switch their production between subsistence and cash-crop production), patterns of off-farm employment, migration, and remittances, etc.

[23] See, for example, Buffie and others (2004) for a discussion of alternative monetary and exchange rate rules in the face of persistent aid shocks (e.g., arising from debt relief).