POLICY RESEARCH WORKING PAPER 2403

Can the World Cut Poverty in Half?

How Policy Reform and Effective Aid Can Meet International Development Goals

Paul Collier
David Dollar

Poverty in the developing world will decline by roughly half by 2015 if current growth trends and policies persist. But a disproportionate share of poverty reduction will occur in East and South Asia, poverty will decline only slightly in Sub-Saharan Africa, and it will increase in Eastern Europe and Central Asia. What can be done to change this picture?

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Summary findings

More effective development aid could greatly improve poverty reduction in the areas where poverty reduction is expected to lag: Sub-Saharan Africa, Eastern Europe, and Central Asia.

Even more potent would be significant policy reform in the countries themselves.

Collier and Dollar develop a model of efficient aid in which the total volume of aid is endogenous. In particular, aid flows respond to policy improvements that create a better environment for poverty reduction and effective use of aid.

They use the model to investigate scenarios—of policy reform, of more efficient aid, and of greater volumes of aid—that point the way to how the world could cut poverty in half in every major region.

The fact that aid increases the benefits of reform suggests that a high level of aid to strong reformers may increase the likelihood of sustained good policy (an idea ratified in several recent case studies of low-income reformers).

Collier and Dollar find that the world is not operating on the efficiency frontier. With the same level of concern, much more poverty reduction could be achieved by allocating aid on the basis of how poor countries are as well as on the basis of the quality of their policies.

Global poverty reduction requires a partnership in which "third world" countries and governments improve economic policy while "first world" citizens and governments show concern about poverty and translate that concern into effective assistance.

This paper—a product of the Development Research Group—is part of a larger effort in the group to study aid effectiveness. Copies of the paper are available free from the World Bank, 1818 H Street, NW, Washington, DC 20433. Please contact Emily Khine, room MC3-347, telephone 202-473-7471, fax 202-522-3518, email address kkhine@worldbank.org. Policy Research Working Papers are also posted on the Web at www.worldbank.org/research/workingpapers. The authors may be contacted at pcollier@worldbank.org or ddollar@worldbank.org. July 2000. (50 pages)

Can the World Cut Poverty in Half?

How Policy Reform and Effective Aid Can Meet the International Development Goals

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1. Introduction

Ten percent of the world's population produces 70 percent of its goods and services and receives 70 percent of world income – an average of $30,000 per person. At the other extreme, half of the world's population lives on less than $2 per day. How do we understand this extreme global inequality? And, more importantly, what can we do about it?

To a large extent differences in productivity and income across countries can be explained by differences in economic institutions and policies. Some countries have a good environment for households and firms to save, invest, and increase productivity, while other countries have poor environments. Rapid poverty reduction in low-income countries depends primarily on these countries improving their own policies and institutions. However, foreign assistance is also important. In an earlier paper we introduced the concept of the 'poverty-efficiency' of foreign aid: a poverty-efficient aid program is one which reduces poverty by as much as possible. We showed that both governments and aid donors have considerable scope to increase the poverty-efficiency of the current volume of aid. Developing country governments can massively increase poverty-efficiency by improving the policy and institutional environment. As policies and institutions are improved, the cost of poverty reduction is lowered, so that for a given aid volume more people can be lifted out of poverty. Donors can almost double the poverty-efficiency of their aid through simple but radical changes in how they allocate their assistance. A poverty-efficient allocation of aid would equalize the marginal cost of reducing poverty across countries. As long as marginal costs differ, it is possible by reallocation to lift more people out of poverty with a given volume of aid. Compared

with the current allocation of aid, donors would need to target aid to poorer rather than less poor countries and to good rather than bad policy and institutional environments (Collier and Dollar 2000).

In this paper we apply our approach to the dynamic question of poverty reduction over the next fifteen years. The main organization of donors (Development Assistance Committee of the OECD, or DAC) – in consultation with developing country partners and international agencies– has set a specific poverty reduction goal for 2015, namely that the incidence of poverty should be halved. Whereas our previous work posed the question of how current aid programs could have a higher poverty impact and so could take the volume of aid as a given, our new work takes the international poverty reduction objective as given. Hence, in order to meet the international development goal of poverty reduction, the donor-government partnership has a third potential instrument, the volume of aid, in addition to reform and aid reallocation. With the volume of aid a choice variable, the notion of poverty-efficiency must be extended: each of three actors face decision problems. As in our previous work, we see it as the responsibility of developing country governments to reform policies and institutions in such a way as to reduce poverty. It is the responsibility of donor agencies to allocate aid among countries so as to equate the marginal cost of poverty reduction. However, additionally, it is the responsibility of western Ministries of Finance to adjust aid budgets so as to equate the marginal cost of poverty reduction with the marginal value which western electorates attach to global poverty reduction.

The first of these decision problems, policy and institutional reform for poverty reduction designed by the government, is obviously not new since some governments

have had this as a central policy objective for many years. However, most developing country policy and institutional environments are currently far from poverty-efficiency so that there is considerable scope for improvement. We show that whether the international poverty target is attainable by 2015 is critically dependent upon successful reform. We consider several policy scenarios. In our baseline scenario current policies persist. In our main variant, policy in the regions with the weakest policy, Africa, Eastern Europe and Central Asia, is assumed to improve to the level currently prevailing in South Asia.

The second of the decision problems, aid allocation on the criterion of poverty efficiency, is more radical. Until recently, the overall allocation of aid had little relationship to good economic policy, as required by poverty efficiency.[1] However, the concept of poverty-efficient aid allocation has now become considerably more widespread. Several of the bilateral donors have already changed their aid allocations so as to make them more poverty efficient and this trend seems likely to continue. By 1998, a clear relationship between the allocation of aid and the quality of policy had emerged (Dollar 2000). We will therefore look at scenarios in which donors allocate aid efficiently, subject to one important and evident political constraint, namely population bias. It has long been known that per capita aid receipts are systematically smaller for countries with large populations. In this paper we accept that bias as a fact of life. We estimate the quantitative magnitude of the population bias in current allocations and assume that it is a persistent feature of aid allocation rules.

The third of the decision problems, equating the benefits of aid expenditure with its costs, is the most standard of the three. After all, the core function of Ministries of Finance is to equate the marginal cost of taxation with the marginal benefits of the

various components of public expenditure as perceived by electorates. There is no particular reason to believe that Ministries have made any greater error with respect to expenditure on aid than any other component of their budgets. We therefore assume that the current volume of aid reflects competent ministerial budget allocation decisions. Hence, by computing the marginal cost of poverty reduction for the existing volume and allocation of aid we reveal the current marginal value of poverty reduction to western electorates.

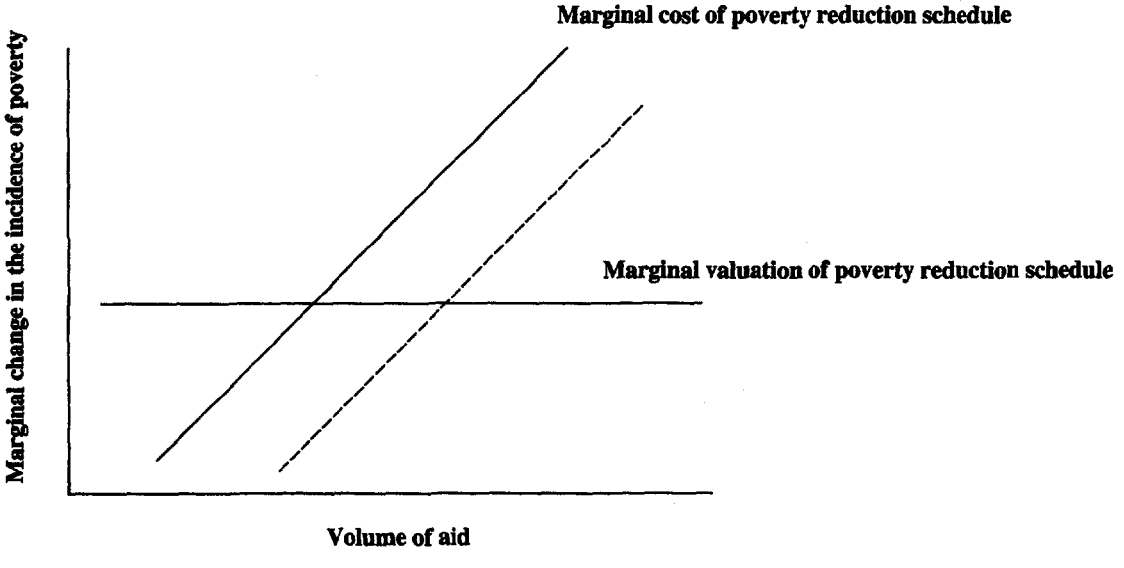
As reform and reallocation change the marginal cost of poverty reduction at a given volume of aid, the initial budgetary allocation is plunged into disequilibrium: the marginal cost of poverty reduction falls below the marginal benefit to the electorate. The actual volume of aid should therefore change endogenously. The extent of the change in the volume of aid depends upon the slopes of the marginal cost and benefit schedules. The slope of the marginal cost of poverty reduction is empirically determined, since as part of our analysis we estimate the extent of diminishing returns to aid: as the volume of aid is increased, the marginal cost of poverty reduction increases. The marginal benefit schedule is much more problematic. In effect, we are posing the question of how the concern of developed country electorates for additional global poverty reduction changes as the scale of global poverty decreases. For most components of budgetary expenditure it is evident that concern diminishes as the scale of the problem is reduced. If, for example, the electorate is concerned that there is not enough woodland, or too few teachers, then as trees are planted or teachers hired, presumably the marginal benefit from an additional tree or an additional teacher diminishes. However, in the case of global poverty reduction it is far from clear that there is such diminishing concern. Consider the

following thought experiment. Suppose that instead of there being over a billion people in absolute poverty, there were only ten million people. Would electorates attach more or less value per person lifted out of poverty? It is at least arguable that as the absolute poverty problem diminishes, electorates will come to attach more rather than less value to solving the problems of those few who remain poor.

In our analysis we will assume that the electorate's marginal valuation of poverty reduction is invariant with respect to the relatively small changes in the amount of poverty brought about by variations in the volume of aid budgets. The consequence of this assumption is that all of the adjustment back to equilibrium brought about by an increase in the poverty efficiency of aid is achieved through diminishing returns to aid in poverty reduction. In graphical terms, a fall in the marginal cost of poverty reduction schedule leads to an increase in the volume of aid sufficient to move up the new marginal cost of poverty reduction schedule to the point at which the marginal cost reverts to its initial level. There are two justifications for this assumption. As the above example shows, it is not even clear a priori whether the marginal valuation of poverty reduction is decreasing or increasing in poverty reduction. Further, it seems evident that even if the schedule is downward sloping, it is much less steep than the marginal cost of poverty reduction schedule. The latter is steeply sloped because there are evident limits to the absorptive capacity for aid. We find that once aid exceeds around 10% of GDP (measured at purchasing power parity) even in good policy environments the marginal cost of poverty reduction through further aid is prohibitively high. By contrast, changes in the volume of aid within the range in which it is productive (i.e. between zero and 10% of developing country GDP), in the short term have only a small impact on the global

poverty numbers. Thus, they are unlikely to have much impact upon the concern of electorates for further poverty reduction. Further, such changes in the volume of aid have only small overall implications for Finance Ministry budgets and so do not significantly change the marginal cost of taxation. In effect, the worthwhile range of changes in the volume of aid generate only `neighborhood' changes in electoral concern for global poverty reduction. Thus, all the action is reasonably focused upon adjustment through the diminishing returns to aid in achieving poverty reduction.

Our analysis thus endogenizes aid volumes by making them a function of changes in the poverty-efficiency of aid. In our baseline analysis the electorate's marginal valuation of poverty reduction is assumed constant over the entire period 2000-2015 at its current (revealed) level. However, this is a very conservative assumption because the OECD economies are evidently going to enjoy substantial increases in per capita income. The desire of the electorate to finance global poverty reduction is likely to be a `normal' good with a positive income elasticity of demand. If the motivation behind poverty-



reducing aid is predominantly charitable then aid is likely to be highly income elastic. It may have other motivations such as the perception that the OECD societies are unlikely to be able to cocoon themselves from the social and environmental consequences of persistent absolute poverty, but again, such concerns may be income-elastic. Thus, in a variant we allow for the possibility that the marginal valuation of poverty reduction gradually increases from its current (revealed) level, by 3% per annum through to 2015.

In the next section we develop a baseline scenario, in which countries' growth rates are projected forward based on recent growth experience, initial conditions, and current economic policies. Using the average relationship between income growth and poverty reduction in a large number of empirical studies, we then project poverty rates in 2015. If current growth trends and policies persist, it turns out that the world has a pretty good chance of meeting the international targets even if we do nothing. However, a disproportionate share of the poverty reduction takes place in East and South Asia. In this baseline scenario, there is little poverty reduction in Africa, while poverty in the transition economies of Eastern Europe and Central Asia actually gets worse. By 2015, the latter economies would be poorer than South Asia.

In section 3 we extend our earlier model of efficient aid so as to explore the dynamic questions described above. We quantify the population bias in aid allocations and build this in as a persistent feature of future aid allocations even as other inefficiencies are gradually removed. We estimate the current revealed marginal valuation of poverty reduction to OECD electorates. Because, as in our earlier work, the effectiveness of aid in promoting poverty reduction depends on the policy and

institutional environment, an improvement in that environment induces an increase in aid volumes: more aid can now be used effectively.

In section 4 we investigate a number of counterfactual scenarios, focusing especially on Africa and ECA, which will be the lagging regions in terms of poverty reduction, according to the baseline projections. We investigate the efficacy of each of the three instruments for increased poverty efficiency: reform, aid reallocation, and increased volumes of aid, representing the decision problems of developing country governments, donor agencies, and OECD Ministries of Finance, respectively. Donor agencies are shown to have substantial scope for action. Efficient aid allocation alone could make a large difference in Africa, doubling the projected poverty reduction. Without action on the part of developing country governments, OECD Ministries of Finance are found to have relatively little scope for action. Even once donor agencies allocate aid to best effect, if current policies and institutions in Africa and ECA persist, there is little further gain from increasing aid volumes. The poor quality of policies and institutions limits the amount of additional aid that Africa and ECA can absorb effectively. Developing country governments can themselves do much to reduce poverty. If Africa could achieve the level of policies already in place in South Asia, that would have a large impact on poverty reduction. Further, it would create the opportunity for OECD Ministries of Finance to have a substantial impact. In our final scenario, with policy reform in Africa and more concern from the rich countries, the reduction in the poverty rate in Africa is nearly 50%. The same scenario for ECA also leads to a significant reduction in poverty relative to the baseline projection.

The specific numerical projections should not be taken too literally. However, the analysis of poverty efficient aid has four broad implications. First, the international poverty goal is attainable globally, but not in Africa and ECA unless there is major policy and institutional reform beyond the relatively modest level envisioned in this paper, whereby the two regions attain the level currently achieved by South Asia. Second, the analysis demonstrates the importance of partnership. We consider the scope for action of three entities: governments in developing countries, aid agencies and OECD Finance Ministries. As governments and aid agencies become more poverty-efficient, the scope for Finance Ministries to reduce poverty by expanding aid budgets increases. Reform, improved aid allocation, and expanded aid budgets are complements. Thirdly, if donor agencies are to fulfill their part in the attainment of poverty efficient aid then one of their key tasks is to allocate aid efficiently, that is, to countries that have high poverty and reasonably good policies. Note that these allocations do not stay frozen: as some countries rise out of poverty there will be a need for periodic reallocations. The high-aid countries by 2015 are very different from those in 2000. Fourthly, if aid agencies and OECD Finance Ministries become poverty-efficient in their respective aid decisions, then governments in developing countries will face differing trajectories of aid. Many are currently receiving inefficiently little aid. Such countries should go through a trajectory in which aid first rises, and then tapers out as poverty is reduced. Others will face precisely the opposite path of aid. Their policy and institutional environments are currently too poor for aid to be used efficiently, so that in the near future their aid receipts should be reduced. However, as other countries grow out of poverty, and as they belatedly improve their environments, aid should rebound. Hence, the common principle

of poverty efficiency in aid implies very different financing scenarios at the level of individual countries.

2. Baseline Scenario

What will global poverty look like in 2015 if current trends persist? To answer this question we need information on expected growth rates of per capita income and on the elasticity of poverty with respect to mean income. Specifically,

(1) $\hat{h} = -\alpha G$

where h is the headcount index of poverty, G is the growth rate of per capita income, ^ indicates relative rate of change, and α is the elasticity of poverty reduction with respect to mean income. (We prefer to define α as the elasticity of poverty *reduction* with respect to mean income so that α is positive.)

In general there is more information on determinants of countries' growth rates than on determinants of poverty elasticities. We are going to use for our baseline a set of growth projections prepared by Easterly (1999). He uses a regression of growth rates on past growth rates, initial conditions, and current economic policies to project the likely path of growth rates if policies remain the same. The measure of policies that he uses is the World Bank's Country Policy and Institutional Assessment (CPIA). Conceptually, this measure is trying to capture the extent to which a country has a good institutional and policy environment for long-term growth and poverty reduction. In practice it has 20 different components covering issues of macroeconomic, structural policies, public sector management, and social inclusion. Each of the twenty components is rated ordinally by country specialists, on a scale of 1-6, using standardized criteria. Considerable care is

taken to ensure that the ratings are comparable both within and between regions. While the scores include an irreducible element of judgement, they have a reasonable claim to being the best consistent and comprehensive policy data set. The CPIA has the advantage that it is available for all developing countries, and for our purposes it is important that all countries be included in the analysis.

Table 1 summarizes the baseline scenario by region. (These are population weighted averages for the countries in the regions. We project population by simply extrapolating the population growth trend of the past ten years.) In terms of the current CPIA measure of policy, Sub-Saharan Africa has the weakest policy, followed closely by the Europe and Central Asia region. At the other extreme, Latin America has the best policies, and, despite recent problems in some countries, East Asia fares almost as well. In our work, described in more detail below, we find that the derivative of growth with respect to the CPIA is about 1.0, so that the policy difference between Africa and Latin America explains about 1 percentage point of the difference in their growth rates. Clearly, other exogenous factors influence growth as well.

The table shows actual per capita growth, 1990-96, and the projection of the growth rate if policies remain the same. By construction, the projections are not going to be very different from recent performance. If current trends persist, Africa and ECA will grow slowly or not at all, while LAC and South and East Asia all do pretty well. The Middle East and North Africa region's performance is in between (projected per capita growth of 1.0 percent per annum).

How do we introduce poverty into this analysis? Ideally, we should have country-specific poverty elasticities. These, however, require detailed information on the

household distribution of income, and reliable such information is only available for about half of the countries in the developing world. In order to maintain comprehensive country coverage, we are going to rely on a simplifying assumption. In a large number of empirical cases, the median poverty elasticity was about 2 (Ravallion and Chen 1997). If we apply a constant elasticity of 2 to all of the countries in our sample, then we get the changes in poverty rates between now and 2015 indicated in Table 1. (These rates are headcount poverty based on a $2 per day poverty line.) Regions with good per capita income growth should register large declines in poverty (from 85% to 40% in South Asia, and from 57% to 10% in East Asia). Because these regions have such large populations, their performance is the key to a large change in the poverty rate for the whole developing world (from 61% to 31%). Thus, if the objective is to reduce the poverty rate by about half in the developing world, then based on current trends there is a pretty good chance that this goal will be met.

That global figure, however, disguises the fact that in this baseline scenario there is very little poverty reduction in Africa, and an increase in poverty in the transition economies of Eastern Europe and Central Asia. Note that by 2015, ECA would be poorer than South Asia. The remainder of the paper looks at how policy reform and more effective aid can lead to a better outcome, particularly in these regions.

Before moving on, however, it is necessary to say a few words about the simplifying assumption that the elasticity of poverty reduction with respect to mean income is constant over time and across countries. In practice, how would we expect this elasticity to vary? In particular, would we expect it to change in response to policy reforms that enhance growth? Dollar and Kraay (2000) show that the policies that

enhance growth (captured in the CPIA) have no systematic effect on distribution. (This means, incidentally, that the policies measured by the CPIA have the same affect on income of the poor as on average income.) Thus, as we examine scenarios of policy reform, it is reasonable to assume that the distribution of income does not change. With an unchanged distribution of income, the elasticity of headcount poverty with respect to growth of mean income will depend on the level of mean income and the shape of the Lorenz curve. Thus, in practice the estimate of 2 will be too low for some countries and too high for others. Certainly, in looking at individual countries it would be preferable to use the full information on the Lorenz curve where it is available. But, it is reasonable to expect these errors to roughly cancel out globally, so that our approach is appropriate for coming up with estimates for whole regions or for the whole world. The only alternative is to drop some significant countries from the analysis.

3. Allocating Aid for Poverty Reduction

In an earlier paper we showed how a more efficient allocation of foreign aid could increase the rate of poverty reduction in the developing world (Collier and Dollar 2000). Here we are going to build on that framework to develop a model in which changes in developing country policies and/or changes in underlying aid parameters will lead to changes in the rate of poverty reduction. We can then use the model to trace out different scenarios in order to understand better what changes are needed to bring about more rapid poverty reduction.

The projections that we began with in the previous section do not explicitly take account of aid; that is, they implicitly assume that the current volume and efficiency of

aid persist. And they explicitly assume that policies remain the same. So, we are going to add to the baseline projections estimates of the impact of policy change and more efficient aid.

Our starting point is the finding that (1) the efficiency of aid in the growth process depends upon the policy environment (aid is more effective in raising growth the better is the policy environment) and (2) aid is subject to diminishing marginal returns (Burnside and Dollar, forthcoming). Thus, growth (G) is a function of exogenous conditions (X), the level of policy (P), the level of net receipts of aid relative to GDP (A), the level of aid squared, and the interaction of policy and aid:[2]

$$G = c + b_1.X + b_2.P + b_3.A + b_4.A^2 + b_5.A.P \qquad (2)$$

The coefficient on the interaction term, b_5, addresses that the hypothesis that the effectiveness of aid depends on the policy environment, while the coefficient on the quadratic, b_4, will pick up any diminishing returns to aid. The coefficient on aid, b_3, may be positive, negative or zero depending upon the importance of policy for growth. When it is zero it implies that in the best policy environments, scored as 6, the initial contribution of aid to growth is six times as large as in the worst policy environments, scored as 1. When it is positive it implies that the growth differential is less than six, and when it is negative it implies that the differential is greater than six. Thus, unlike the other variables, neither its sign nor its significance constitute tests of the hypotheses.

Table 2 column 1 presents the OLS results for the estimation of (2) in a large sample of countries. We have averaged growth and other variables over four-year

periods beginning with 1974-77 and ending with 1994-97; we have 349 observations. To capture initial conditions we have initial income, a measure of institutional quality from Knack and Keefer (1995), and regional dummies (not reported). There are also period dummies to account for the world business cycle. The most significant variable in the regression is the interaction of aid and policy, with a positive coefficient, significant at the 1 percent level. The CPIA measure of policy also enters directly with a positive coefficient, and marginal significance. Aid and aid squared both enter with negative coefficients and are jointly significant. However, the coefficient on aid itself, b_3, is not significantly different from zero, and since the variable is not intrinsic to the hypotheses it is dropped in the interest of parsimony. In this second regression, reported in column 2, the t-statistics on policy, the policy-aid interaction, and aid squared all increase, with the two latter being significant at 1%. Thus, the marginal impact of aid on growth depends positively on the policy environment and negatively on how much aid a country is getting (diminishing returns). Specifically, the marginal impact of aid on growth is estimated to be:

$$G_a = 0.185P - 0.072A \qquad (3)$$

The positive coefficient on the interactive term also means that the impact of policy change on growth depends on how much aid a country is getting; that is, the derivative of growth with respect to the CPIA measure of policy is

$$G_p = .64 + .18A \qquad (4).$$

At the average level of aid (2 percent of PPP GDP), this derivative is 1.0. At a higher level of aid (for example, 6 percent), the derivative would be larger: 1.7. The general

point is that the combination of good policy and high aid is conducive to growth and poverty reduction. One reason for this is that in a good policy environment, aid "crowds in" private investment, whereas in a poor policy environment aid crowds out private investment (Dollar and Easterly 1999).

Based on the regression in column (2), we can also calculate the discrete changes in the growth rate that would result from discrete changes in policy and/or aid.

The changes in aid that we want to consider are ones that arise from a more efficient management of aid. Specifically, how should the world allocate aid in order to have the maximum effect on poverty reduction? We set up this problem as

$$\text{Max Poverty Reduction} = \sum_i G^i \alpha^i h^i N^i N^{i-\beta}$$

$$\text{Subject to} \quad \sum_i A^i y^i N^i = \bar{A}, \quad A^i \geq 0 \qquad (5)$$

where

y is per capita income

Ā is the total amount of aid

h is the headcount index of poverty

α is the elasticity of poverty reduction with respect to income

N is population,

β indicates the degree of preference for small countries, and

the superscript "i" indexes countries. From above, we know that growth is a function of a country's policy and the amount of aid it receives.

Compared to our first paper, we have made one important change here, which is to add the term population raised to the negative β. If that term is omitted, then the maximization problem is to allocate aid in order to have the maximum effect on poverty

reduction, treating the poor everywhere the same. The result of that optimization is to allocate far more of the world's aid to very populous countries than is the current practice. In fact, India would receive two-thirds of all aid following that approach. We viewed that as politically unlikely, and then constrained India to its actual level of aid. The issue more generally, however, is that there is a bias in aid allocation in favor of small countries, and we have decided here to take that as an expression of donor preferences. Adding the term $N^{-\beta}$ to the optimization accepts this reality. Formally, it says that donors put more weight on a poor person in a small country than a poor person in a large country, and the parameter β captures the extent of this small country bias.

Considering for the moment only interior solutions (in which each country gets some aid), the first order conditions for a maximum are

$$G_a^i \alpha^i h^i N^i N^{i-\beta} = \lambda y^i N^i \qquad (6)$$

or

$$G_a^i \alpha^i (h^i / y^i) = \lambda N^{i\beta} \qquad (7)$$

Where λ is the shadow value of aid. If there is no population bias ($\beta = 0$) then λ has a simple interpretation: it is the marginal efficiency of aid, that is, the number of poor people lifted out of poverty through an additional million dollars of aid. Its inverse is the marginal cost of poverty reduction. Efficiency requires that the marginal cost be equated in all countries. With population bias the interpretation of λ is more complicated. Its inverse is the marginal cost of poverty reduction in a country with population of 10 million; efficiency now requires that that marginal cost be higher in countries with smaller populations (where the world values the poor more) and lower in countries with

larger populations (where the world values the poor less). What is equated across countries by the optimization is the marginal cost of poverty reduction adjusted for population preference.

Using the estimate of G_a from (3) above, we can solve explicitly for each country's aid receipts as a function of its policy, population, poverty level, per capita income, and elasticity of poverty with respect to income:

$$A^i = 2.6\, p^i - \frac{\lambda}{.07\alpha^i}\left(\frac{h^i}{y^i}\right)^{-1} N^{\beta} \qquad (8)$$

We have information on policy, poverty, and per capita income. To actually calculate the optimal aid allocation for each country we need estimates of α and β and to make an assumption about λ. As noted, we assume that the elasticity of poverty with respect to mean income, α, is constant and equal to 2.

Let us turn now to a plausible estimate of the population bias parameter, β. It is interesting (and convenient for us) that population is uncorrelated with policy and with poverty. Thus, if β is set equal to zero, there is no significant correlation between optimal aid to GDP and population. In practice, in 1996 the correlation of Aid/GDP and log population was -.38 (big countries got less aid). Through trial and error, we choose β to be .32, which yields an allocation of aid that is also correlated with log population, -.38; that is, we choose β to preserve the actual bias in aid allocations. (The fact that population is uncorrelated with poverty and policy is convenient, because setting $\beta = .32$ then preserves both the bivariate correlation between aid and log population and the partial correlation after controlling for poverty and policy.) To summarize on this issue of population bias: we are accepting as an expression of donor preferences the actual bias

in aid allocations against large countries. We are not in favor of it; it is something that we simply take as an aspect of reality. Our model then allocates aid as efficiently as possible, accepting this bias. We will show in a moment that the issue is only important for very small countries and for very large countries.

Now turn to the parameter, λ, the shadow value of aid. In our first paper, we took as given the actual volume of aid in the world, in which case λ is determined endogenously. But in projecting aid and its effect out fifteen years, we prefer to move away from an ad hoc assumption about the volume of aid. So we are going to think of the marginal cost of poverty reduction (the inverse of λ) as actually reflecting the marginal utility of poverty reduction to taxpayers in the wealthy countries that give aid. If first world governments are efficient, then they should give aid up to the point at which the marginal cost of poverty reduction equals its marginal utility to a representative taxpayer.

What is the marginal cost of poverty reduction (or its inverse, the marginal efficiency of aid), given the actual distribution of aid and current levels of poverty and policy? It can be calculated from our model. The marginal efficiency of aid is the left-hand side of equation (7). Table 3 lists virtually all of the countries in the developing world, their policy ranking, poverty rate, and estimated marginal efficiency of aid given actual aid allocations. Column 5 shows the estimated poverty impact of an additional million dollars of aid. In Column 6 this is adjusted for population preference. The current allocation of aid is inefficient from a poverty reduction point of view because these marginal efficiencies vary enormously. The marginal efficiency is high in Uganda, a country with high poverty, good policies, and only modest amounts of aid. The

marginal efficiency is much lower in Zambia, also a poor country, but one with weaker policies and far more aid than Uganda receives. So, there is no single answer to the question, what is the marginal cost of poverty reduction at present. However, an average answer can be found by taking the aid-dollar weighted average of the marginal costs across countries. Since we accept the actual bias against large countries as an expression of donor preferences, we use column 6 for this. We find that the typical aid dollar is associated with a marginal cost of poverty reduction of $6,293; that is, a one-time gift of $6,293 leads to one person permanently moving out of poverty. (Strictly speaking this is the marginal cost of lifting one person out of poverty in a country with 10 million people.)

We are going to take that average figure as an expression of the marginal utility of poverty reduction to first world taxpayers, and use its inverse as the estimate of λ in equation (8). We should be clear that we are thinking of this primarily as a *normative* model. If we approach poverty reduction efficiently, then we need some sense of its marginal value and we should allocate aid among countries to equalize the marginal cost of poverty reduction at a level equal to this marginal value. But this approach may also turn out to be a good *positive* model of aid-giving. It is suggestive that countries that have relatively poverty-efficient aid, such as the Netherlands or Sweden, tend to give a larger amount of aid relative to their income. An interesting idea to explore in future work is that in fact more efficient aid calls forth a higher volume of aid. For the moment we take that as given, based on the logic of our model.

This seemingly small change is an important deviation from our first paper. Notice what it means in the case in which a particular country improves its policies. Start

at an equilibrium in which equation (8) is satisfied for all aid receivers, and then imagine an improvement in policy in one country, j. This disturbs the equilibrium because the marginal efficiency of aid is now higher here than in other countries. If one takes the total volume of aid as fixed, then the only way to restore equilibrium is to take some aid away from all other countries and give more to country j. With total aid fixed, λ is endogenous and has to adjust upward to restore equilibrium. Alternatively, if the marginal cost of aid is taken as fixed, then the total volume of aid is endogenous. If country j reforms, more aid can be used productively there, and in our model it will be forthcoming.

There are two aspects of the allocation rule, equation (8), that donors may not like. From the point of view of donors, it takes both policy and the elasticity of poverty with respect to income as given. Thus, it gives donors what they might perceive to be a minor role in the development process: to identify good-policy environments and send checks. A lot of development assistance, in fact, is targeted to promoting policy reform or to providing specific services that benefit the poor. However, the research evidence is that donors have not had a lot of impact on policy (at least, not positive impact) and that their money is often fungible, that is, financing the whole public sector, not necessarily the project that they have associated themselves with.[3] A recent study of aid and reform in Africa, however, concludes that donors could have more systematic impact on policy if they followed the kind of allocation rule above: increasing aid as policies actually improve (Devarajan, Dollar, and Holmgren 1999). Furthermore, if the policies that are supported in this way include providing important public services that benefit the poor, then countries with good policy may have higher elasticities of poverty reduction with

respect to growth. *In either case, the poverty reduction benefit from moving to our allocation rule will be larger than what we project.* Thus, our estimates can be taken as conservative, and indicative of what aid is likely to achieve if donors have no influence over policy, including policies that increase the poverty elasticity. To the extent that supporting good, poverty-reducing policies solidifies those policies, the actual benefit of aid will be higher.

The final step in this section is to calculate the country-by-country allocation of aid based on the rule in equation (8). Countries such as Uganda and Ethiopia could effectively use a lot more aid than they currently get (Table 3). Some poor countries, such as Angola, have extremely poor policies, and would receive less aid in our allocation than they actually get. Most of the truly poor countries receive significant allocations. Compared to the actual allocation of aid, our allocation (1) has the same relationship with population, (2) is more sharply targeted to poor countries, and (3) has a stronger relationship with policy. (In fact, the actual allocation of aid in 1996 had no positive relationship with policy.) The total volume of aid for the countries in our sample was $38 billion in 1996. It would take $56 billion allocated by our rule to achieve the same average efficiency.[4] Thus, one way to think about the static efficiency gain from our approach is that it would permit a 50% increase in aid absorption, without reducing the marginal efficiency of the typical aid dollar!

Finally, we want to say something about the sensitivity of the allocation to the choice of β, the population bias parameter. Table 4 focuses on several countries with different population sizes. It shows the allocation of aid for each country under three different choices for β: 0, .32., and .6. For Namibia (with 1.5 million people) and India

(with nearly a billion), the choice makes an enormous difference. For countries with populations between 5 million and 75 million (which is the vast majority of countries), on the other hand, the choice of β does not make a large difference.

4. Scenarios of Aid and Reform

The previous section provides a toolkit that we can use to assess the impact of altering key assumptions that underpin the baseline scenario of what poverty will look like in 2015. In particular, the four counterfactual scenarios that we will investigate are:

- *#1: Efficient aid:* hold policy constant and allocate aid efficiently year-by-year based on the algorithm in the previous section;
- *#2: Efficient and more generous aid:* hold policy at its current level, allocate aid efficiently, and allow the marginal utility of aid to rise over time (more concern from the first world);
- *#3: Efficient aid and policy reform:* assume that policy in Sub-Saharan Africa and ECA attains the average level in South Asia, and allocate aid efficiently as in secnario #1; and
- *#4: Policy reform plus efficient and more generous aid:* combines the policy reform of #3 above with the efficient and more generous aid of #2. (You could call this the "partnership approach": third world governments provide good policies while first world governments ensure adequate aid, efficiently managed.)

In each case the model works as follows: We start with current levels of poverty and per capita income. Given the assumptions about policy and λ, aid in the first year is allocated according to equation (8). The new aid allocation (and better policies, if that is part of the scenario) implies a change in the growth rate of per capita GDP and of

poverty, relative to the baseline. The new data on per capita GDP, poverty, and population are used to calculate the allocation of aid in the second year; and so on until 2015. Thus, for a country that is growing well, poverty will decline and its allocation of aid will decline over time.

The model generates several different types of results that are interesting. First, we will look at the overall impact of the different assumptions about aid and policy on poverty rates in 2015. Second, we will look at how the total volume of aid varies among the scenarios and over time. Third, we will pick out several different types of countries (reformers, laggards) to illustrate what the model means for aid flows to particular countries.

A. Impact on Poverty

Our greatest interest is in what happens to poverty rates under the different scenarios. Table 5 repeats the poverty rates for each region and what is projected to happen to the poverty rate under the baseline scenario and under each of the four counterfactual scenarios outlined above. The first counterfactual scenario tells us, given policy in the developing world and the level of concern in the developed world, how much mileage would we get from more efficient allocation of aid. More efficient aid has a large impact in Africa. Whereas the baseline projection is to go from a poverty rate of 72% today to 64% in 2015, the "efficient aid" projection doubles the decline in poverty, so that the rate would be 56% in 2015. The other region in which there is an impact is ECA: under the baseline scenario poverty is projected to increase from 28% to 43% of the population. With efficient aid, the increase is limited and poverty only reaches 41%. Note that for the developing world as a whole, efficient aid makes only a small difference

(poverty rate reaches 30% in 2015, compared to 31% in the baseline). The reason for this is that, even if allocated efficiently, aid plays a minor role in Latin America or East Asia (though of course there are individual countries in which aid is important). For the Middle East-North Africa region, efficient aid actually makes things worse, which may seem surprising. But in that region the main effect of efficient aid is to *reduce* the large volume of assistance to Egypt. Finally, there is only a modest increase in poverty reduction in South Asia as a result of efficient aid. By accepting the population bias that we find in actual aid allocations, we preclude giving a large amount of assistance to India, which has 75% of that region's population.

Thus, efficient aid makes a big difference for poverty reduction in Africa, and also reduces the increase in poverty in ECA. Keep in mind that, in the way in which we have defined efficient aid, the total volume of aid is endogenous. What is kept constant in the last scenario is the marginal cost of poverty reduction, which we take as an expression of the marginal utility of poverty reduction to first world taxpayers; in some sense, it measures the amount of concern about poverty in rich countries. The next scenario that we explore asks, what would happen if there were more concern. There are a number of ways that we could model this. We choose to let the marginal cost of poverty reduction increase at 3% per annum (from around $6,000 today to nearly $11,000 in 2015). The rich countries are going to be getting richer. If poverty reduction is a normal good, then the marginal utility of poverty reduction should be increasing with income.

In this second counterfactual scenario, the poverty rate in Africa is now projected to decline to 53%, compared to 46% in Scenario 1. It is interesting that efficient aid

makes a much larger difference than this degree of "greater concern." Our interpretation of this is that, once we move to efficient aid, there are not a lot of great additional opportunities to support poverty reduction, given the state of policies in the developing world. (The conclusion of course would change if the donors reduced their population bias and gave more assistance to populous countries.)

The third counterfactual scenario introduces policy reform but returns to the assumption of scenario 1 that the marginal cost of poverty reduction is constant. In terms of policy and poverty trends, the problem regions are Sub-Saharan Africa and ECA. So, we look at the following reform counterfactual: what if Africa and ECA attained the average policy level of South Asia? Since South Asia is today a poor region, this amount of policy reform seems like a reasonable aspiration.[5] The way our model works, better policy will lead to faster growth and poverty reduction directly, holding the amount of aid constant. It will also call forth a greater volume of aid, for a given level of "concern" of the rich countries. Intuitively, better policy increases the marginal impact of aid, and more aid would then be required to bring the marginal impact back in line with the constant marginal utility of poverty reduction.

In the better policy scenario, the poverty rate in Africa declines to 45%. This is best compared to scenario 1, which also has a constant λ. Thus, starting from today's poverty rate of 72%, efficient aid takes the region to 56% poverty, while efficient aid plus policy reform reduces that to 45%. Given efficient aid, the amount of policy reform in scenario 3 makes a much greater difference than the amount of "extra concern" built into scenario 2. For the ECA region as well, policy reform on top of efficient aid, makes a significant difference. By construction, this scenario cannot be different from scenario 1

for any of the other regions. If the total volume of aid were held constant, then policy reform in one region would require taking aid from other regions to maintain the efficiency conditions. However, by holding λ constant, the amount of aid to one country or region is delinked from the amount going anywhere else. Since in scenario 3 the policy of all regions other than SSA and ECA is unchanged from scenario 1, there can be no change in the projections for them.

Finally, we have what we call the "partnership" scenario in which the lagging regions ECA and SSA reform their policies as in the scenario immediately above, and donor "concern" grows over time as in scenario 2. In this case the poverty rate in Africa declines to 41% -- not quite a 50% decline from the current 72%, but pretty close. Note that the changes from scenario 1 to 2 and from scenario 3 to 4 both involve increasing donor concern while holding policies constant. There is a larger change in the 3-4 move than in the 1-2 move, because the better policies in the 3-4 scenarios provide a more fertile ground for effective aid. The general point of our whole model is that third world policies and first world concern interact in a positive way.

Obviously, these scenarios should be taken as illustrative, rather than literally. Nevertheless, the final scenario paints a pretty good picture of the world, compared either to reality today or to the baseline projection of poverty in 2015. In the "partnership" scenario, developing world poverty is reduced by more than 50%, and the distribution of poverty is far more regionally balanced than in the baseline. In particular, there is less concentration of poverty in Africa and ECA. While the specific numbers should not be taken too seriously, we believe the qualitative conclusion that this kind of outcome depends primarily on policy reform in Africa and ECA, maintaining (and ideally

improving) policies in other developing regions, efficient management of aid, and a high level of concern about poverty on the part of the wealthy countries.

B. Volume of Aid

There continues to be a lot of debate about how much aid the rich countries should provide. One of the features of our model is that it makes the total volume of aid endogenous, depending in particular on the amount of poverty in the world, the quality of policies in poor countries, and the level of concern in rich countries (marginal utility of poverty reduction to first world taxpayers). Figure 1 shows the total volume of aid in each of our four counterfactual scenarios.

Scenario 1 holds constant the marginal cost of poverty reduction. In this case the volume of aid declines over time. The reason is simple: poverty is actually being reduced in these scenarios, so that – everything else equal – the marginal cost of poverty reduction would rise, violating the equilibrium. Because of diminishing returns, the equilibrium is restored through smaller aid flows. Intuitively, if we require a constant marginal productivity of aid dollars, aid will have to decline as poverty is reduced; that is, as poverty is reduced, it will be harder and more costly to achieve further poverty reduction.

Scenario 2 holds policy constant, but adds the plausible assumption that, as developed countries become richer, they will be willing to pay more for a given amount of poverty reduction. Here the total volume of aid grows over time, because the growing marginal utility of poverty reduction more than offsets the tendency for poverty reduction to become more expensive as poverty is reduced. If one were to calculate aid dollars relative to the number of poor people in the world, it would be sharply rising in scenario 2 because the dollars rise while poverty declines quite significantly.

The only difference between scenario 1 and scenario 3 is that the latter assumes better policy in SSA and ECA. Note that this initially calls forth a significantly higher aid flow – about 20% higher. This feature of the model is one that we want to promote to donors: that the flow of assistance should be commensurate with opportunities for poverty reduction in the developing world. Policy reform creates a better environment for poverty reduction and for aid effectiveness, so more aid can be used at the same level of effectiveness. Note, however, that the decline in the aid volume over time in scenario 3 is quite sharp, and that by 2015 the volume of aid in scenarios 1 and 3 is about the same. What is happening here is that the combination of better policy and more aid in scenario 3 leads to faster poverty reduction than as in scenario 1. By the time we get to 2015, scenario 3 has better policy but less poverty, which together call forth about the same volume of aid as scenario 1. In scenario 4, the growing marginal utility of poverty reduction offsets the effect of reduced poverty, so that the level of aid rises.

C. Country Examples

A final insight into how the model works can be gained by pulling out some specific country examples. We are going to use Uganda as an example of a country that has good policy today and bright prospects for poverty reduction. Kenya has relatively poor policies as of 1999 and gets a small amount of aid in practice. We are going to look at what would happen in our model if Kenya had a serious reform program over the next five years. Finally, we are going to consider what will happen if Angola's extremely poor policies persist.

Our model suggests that Uganda should be getting a lot more aid than it gets today. It is a country with good policies and a high degree of poverty. But while it

should get a lot of aid today, in scenario 1 its volume of aid drops pretty sharply and reaches zero by 2011 (Figure 2). The reason for this is that poverty declines rapidly in this scenario, so that by 2011 Uganda would not be an especially poor country in the developing world. In scenario 2, with growing marginal utility of poverty reduction, the decline is less steep, but still by 2015 aid to Uganda is finished. This highlights one important feature of our model, which is that successful countries should "graduate" out of the aid recipient status, over, say, a 15-year period. Note finally that while Aid/GDP declines monotonically, aid in dollars first increases (up to about 2005) and then declines. Thus, part of the decline in Aid/GDP arises from the rapid increase of Uganda's GDP that accompanies this scenario.

Figure 3 shows the trends in the poverty rate of Uganda under the baseline and scenarios 1 and 2. If Uganda continues to grow as it has, there will be rapid poverty reduction under any scenario. What is achieved by efficient aid is to accelerate this process. The observant reader will notice that the projected poverty rate in Uganda in 2015 is actually lower in the baseline scenario than in scenario 1. The baseline is holding constant the actual level of aid to GDP that the country received in 1996 (3.3% in the case of Uganda). That is probably not a realistic assumption if in fact Uganda does as well as projected, but the constant 3.3% per year in aid is a useful reference point. Relative to that, our efficient aid model would give more aid to Uganda today, but less aid in the future as poverty actually comes down. In the two cases, where Uganda ends up in 2015 is about the same, but the efficient aid scenario shifts some of the poverty reduction forward in time: peoples' lives are improved sooner rather than later.

Let us turn now to Kenya. What would the pattern of aid look like if that country – which has poor policies today -- reformed? Specifically, we consider the following counterfactual: suppose that over five years Kenya gradually achieved the level of policies that Uganda currently has. In our model, aid to Kenya would increase during the period in which policies were actually improving (Figure 4). If policies stabilized at a high level, the trend in aid would then look like Uganda's, because poverty would be declining over time. This pattern has important implications for donors and the Bretton Woods institutions. If donors follow our advice, they should be increasing aid to a country during the years of a successful reform program. To the extent that this aid is properly accounted for in the government budget (as it should be), there will an increase in the measure of the budget deficit that does not include aid grants as revenue. (There would be no change in the measure that does include grants as revenue.) Furthermore, there is likely to be a growing external deficit if the aid is financing productive investment that has a high import content. Thus, it is important that a "good policy package" not be defined as a narrowing of fiscal and external deficits. In our framework, good policies are ones that are conducive to long-term growth and poverty reduction. Low-income countries with such policies can absorb a high volume of assistance efficiently. If donors follow our advice and give small amounts of aid to countries with very poor policies, then reform programs should typically be accompanied by increasing fiscal and external deficits!

What about countries that persist with very poor policies? Frankly, our model has no easy answer for them. Certainly we hope that Angola finds it way to reform. But suppose its very poor policies persist. In our model Angola would get a modest amount

of aid today (about 1 percent of GDP), and this aid would increase modestly over time in scenario 1 (Figure 5). The aid dollars increase modestly over time because in this scenario Angola is becoming poorer every year. Aid to GDP increases even more because GDP is declining. The world being more concerned (scenario 2) only makes a small difference. In our model, the marginal impact of aid in Angola is small because of poor policies, so that, regardless of their level of concern, rational donors are not going to put a lot of money into that environment.

5. Conclusions

Poverty reduction – in the world or in a particular region or country – depends primarily on the quality of economic policy. Where we find in the developing world good environments for households and firms to save and invest, we generally observe poverty reduction. Foreign aid can accelerate the process. It can assist the government and the society to provide public services, including critical ones needed by poor households to participate in the market economy.

In this paper we developed a model of efficient aid in which policy and aid interact in several important ways:

- aid increases the benefits from good policy, while at the same time good policy increases the impact of aid; thus, the combination of good policy and aid produces especially good results in terms of growth and poverty reduction;
- by introducing the concept of the marginal utility of poverty reduction to first world taxpayers, we make the volume of aid endogenous; in particular, it increases when

policies are improved, because in the better policy environment more aid can be used effectively;

- we assume that policy is determined by developing country political processes and is independent of aid; however, the fact that aid increases the benefits of reform suggests that a high level of aid to strong reformers may increase the likelihood that good policy is sustained (an idea ratified in a number of recent case studies of low-income reformers); to the extent that this is the case, our estimates of the benefit of aid to good policy countries are too low.

The main conclusions of our work can be shown in a simple diagram, which could represent an individual country or a whole region such as Africa (Figure 6). On the vertical axis is a measure of developing country policy, and on the horizontal, a measure of first world "concern" (marginal utility of poverty reduction). The isoquant traces out combinations of policy and concern that would achieve a certain level of poverty reduction (for example, 50% by 2015). Our first finding is that we are not operating on this efficiency frontier. With the same level of concern, we could achieve much more poverty reduction by allocating aid on the basis of how poor countries are and the quality of their policies. That change alone would double the projected poverty reduction for Sub-Saharan Africa; it would put us at a point such as "A" on the poverty reduction = 30% by 2015 isoquant.

The curvature of the isoquant results from diminishing returns to aid. Given the current level of policies in Africa, simply increasing first world concern is not going to have much impact. Intuitively, once aid is allocated efficiently, there remain no great opportunities for effective aid, given the current state of policies. We argue that the best

hope for moving to the poverty reduction = 50% isoquant is the combination of policy reform in Africa and growing concern in rich countries. If Africa achieved the same level of policy as South Asia (which seems a realistic target) and first world concern grows at about the same rate as first world income (3% per year), we would just about make it to the international development goal for poverty reduction!

Please do not take the point estimates too seriously. But do take seriously the notion that global poverty reduction requires a partnership in which third world societies and governments improve economic policy, while first world citizens and governments show concern for poverty and translate that concern into effective assistance.

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Table 1
Growth and Poverty, by Region, Baseline Scenario

	CPIA	Poverty 1996[a]	GNP p.c. Growth 90-96	Proj. Growth	Poverty 2015
Sub-Saharan Africa	3.04	72%	-0.8	0.1	64%
East Asia and Pacific	3.78	57%	7.7	5.5	10%
Middle East/North Africa	3.58	34%	0.8	1.0	23%
Latin America/Caribbean	3.81	43%	1.0	2.0	26%
Eastern Europe/Central Asia	3.22	28%	-5.8	-1.2	43%
South Asia	3.63	85%	3.3	2.2	40%
Developing World	3.58	61%	3.2	2.7	31%

[a] Headcount poverty rate based on $2 per day poverty line.

Table 2
Dependent variable: Growth rate of per capita GNP

	(1)	(2)
Method	***OLS Panel***	***OLS Panel***
Time Periods (1974-97)		
Initial Income	0.67 (1.08)	0.85 (1.49)
Institutional Quality	0.28*** (1.67)	0.27 (1.61)
CPIA	0.46*** (1.65)	0.64** (2.26)
Aid/GDP	-0.54 (1.40)	--
(Aid/GDP) x CPIA	0.31* (2.94)	0.18* (3.06)
$(Aid/GDP)^2$	-.02 (1.60)	-.036* (3.07)
N	349	349
R^2	0.37	0.36

*Significant at the 1 percent level.
**Significant at the 5 percent level.
***Significant at the 10 percent level.

Note: t-statistics in parentheses. Regional and period dummies included.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country	Total Pop (10 mn)	1996 Aid GDP (%)	CPIA	Pop < $2 a day (%)	Marg eff (people /$mn)	Marg eff (adj for pop bias)	Pov efficient aid (%)
Angola	1.0	2.45		68%	69.1	68.8	0.6
Benin	0.5	4.15		80%	421.4	520.2	7.3
Botswana	0.1	0.71		61%	122.0	229.7	4.0
Burkina Faso	1.0	4.11		86%	520.0	523.0	6.9
Burundi	0.6	5.31		88%	129.2	152.5	5.3
Cameroon	1.3	1.57		58%	292.9	272.3	4.4
Cape Verde	0.0	15.49		57%	-224.7	-649.0	8.6
Cent. Afr. Rep.	0.3	3.41		70%	204.0	295.6	4.8
Chad	0.6	5.07		85%	348.2	407.1	6.7
Comoros	0.0	4.49		64%	91.2	243.0	5.1
Congo, Dem. Rep.	4.1	0.41		71%	424.5	269.8	2.0
Congo, Rep.	0.2	8.86		65%	-119.0	-185.6	4.6
Cote D'Ivoire	1.3	3.91		55%	244.3	223.6	5.5
Djibouti	0.1	..		..	..	..	..
Equatorial Guin.	0.0	2.39		78%	65.7	187.0	2.7
Eritrea	0.3	..		..	..	..	..
Ethiopia	5.5	2.90		89%	1,664.4	967.2	8.4
Gabon	0.1	1.51		54%	73.2	150.8	1.1
Gambia, The	0.1	..		74%	..	..	..
Ghana	1.6	2.04		68%	390.5	334.7	5.9
Guinea	0.6	2.45		50%	225.6	262.1	4.7
Guinea-Bissau	0.1	15.67		97%	-1,051.1	-2,178.6	7.1
Kenya	2.5	1.91		78%	542.3	402.6	5.3
Lesotho	0.2	3.09		74%	407.2	692.8	8.1
Liberia	0.3	..		..	..	..	..
Madagascar	1.3	2.84		93%	669.6	621.5	6.3
Malawi	0.9	7.09		96%	337.3	345.8	8.0
Mali	0.9	6.95		93%	330.7	339.6	7.9
Mauritania	0.2	6.15		68%	150.6	245.8	7.2
Mauritius	0.1	0.19		34%	56.2	114.1	0.0
Mozambique	1.6	9.21		100%	-147.5	-127.3	8.0
Namibia	0.1	2.27		50%	106.3	196.4	3.7
Niger	0.8	2.97		92%	663.2	699.5	6.6
Nigeria	10.5	0.19		60%	668.5	314.9	3.6
Rwanda	0.7	15.75		89%	-1,605.8	-1,807.7	7.0
Sao Tome And Pr.	0.0	..		..	..	..	..
Senegal	0.8	4.03		80%	349.4	376.6	7.0
Seychelles	0.0	..		..	..	..	..
Sierra Leone	0.4	8.11		77%	-276.0	-361.5	6.3
Somalia	0.9	..		..	..	..	..
South Africa	3.6	0.13		50%	98.5	65.5	0.0
Sudan	2.6	..		..	..	..	..
Swaziland	0.1	0.99		56%	169.8	374.0	5.0
Tanzania	2.8	4.46		46%	438.1	315.2	6.7
Togo	0.4	2.33		65%	321.0	434.8	6.0
Uganda	1.8	3.34		92%	903.7	748.3	8.9
Zambia	0.9	7.53		98%	245.5	258.6	8.1
Zimbabwe	1.1	1.45		68%	283.6	279.1	4.3
Cambodia	0.9	..		..	..	..	..
China	117.7	0.06		58%	247.5	53.8	0.0
Fiji	0.1	1.33		37%	80.1	181.9	2.1
Indonesia	18.8	0.16		59%	188.9	73.9	0.0
Kiribati	0.0	..		..	..	..	..
Korea, Rep.	4.4	-0.02		30%	33.9	21.1	0.0
Lao, Pdr	0.4	5.73		83%	203.1	264.7	6.6
Malaysia	1.9	-0.20		27%	37.2	30.2	0.0
Marshall Islands	0.0	..		..	..	..	..
Micronesia, Fs	0.0	..		..	..	..	..
Mongolia	0.2	4.34		57%	215.5	341.9	6.9
Papua New Guin.	0.4	2.87		58%	128.3	170.5	3.2
Philippines	6.7	0.36		65%	264.0	143.5	0.0
Samoa	0.0	..		..	..	..	..

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country	Total Pop (10 mn)	1998 Aid GDP (%)	CPIA	Pop < $2 a day (%)	Marg eff (people $/mn)	Marg eff (adj for pop bias)	Pov efficient aid (%)
Solomon Isl.	0.0	4.79		54%	53.9	156.8	4.8
Thailand	5.8	0.20		24%	46.7	26.6	0.0
Tonga	0.0	..		..	..	..	..
Vanuatu	0.0	6.36		52%	40.4	151.7	6.3
Vietnam	7.1	0.78		80%	517.1	276.3	4.0
Algeria	2.7	0.22		18%	41.6	30.3	0.0
Egypt	5.6	1.31		52%	207.7	119.8	0.0
Jordan	0.4	3.26		24%	59.0	80.2	0.0
Lebanon	0.4	0.96		..	..	..	..
Morocco	2.6	0.70		20%	72.8	53.9	0.0
Tunisia	0.9	0.29		23%	75.2	78.7	0.0
Yemen, Repub	1.4	1.84		..	..	..	..
Argentina	3.4	0.08		36%	58.8	39.8	0.0
Belize	0.0	1.87		45%	97.9	339.5	5.4
Bolivia	0.7	3.48		59%	..	..	..
Brazil	15.5	0.04		44%	94.9	39.5	0.0
Chile	1.4	0.12		39%	59.5	53.7	0.0
Colombia	3.6	0.10		22%	47.1	31.4	0.0
Costa Rica	0.3	-0.03		44%	101.4	145.6	0.0
Dominica	0.0	..		48%	..	..	..
Dominican Rep.	0.8	0.29		48%	127.9	140.0	0.0
Ecuador	1.1	0.44		66%	111.1	107.8	0.0
El Salvador	0.5	1.94		52%	230.2	280.4	5.7
Grenada	0.0	2.38		..	..	..	..
Guatemala	1.0	0.51		77%	245.3	244.9	3.5
Guyana	0.1	6.96		60%	103.4	230.7	7.9
Haiti	0.7	4.51		68%	227.7	256.7	5.5
Honduras	0.6	2.82		76%	328.2	395.3	6.7
Jamaica	0.2	0.66		25%	77.9	121.8	0.0
Mexico	8.8	0.04		40%	67.7	33.7	0.0
Nicaragua	0.4	10.21		75%	-68.6	-90.9	6.6
Panama	0.3	0.46		46%	96.9	150.3	0.0
Paraguay	0.5	0.56		41%	98.7	126.8	0.0
Peru	2.3	0.37		50%	159.7	122.6	0.0
St. Kitts & Nev	0.0	2.19		36%	53.2	308.0	6.1
St. Lucia	0.0	4.62		34%	54.1	206.2	6.0
St. Vincent	0.0	..		36%	..	..	..
Trinidad & Tob.	0.1	0.19		32%	72.4	140.2	0.0
Uruguay	0.3	0.20		34%	65.8	95.3	0.0
Venezuela	2.1	0.02		32%	44.9	35.5	0.0
Albania	0.3	..		..	..	..	..
Armenia	0.4	..		33%	..	..	..
Azerbaijan	0.7	0.93		36%	250.1	275.6	4.0
Belarus	1.0	0.16		6%	10.7	10.6	0.0
Bosnia & Herz.	0.4	..		..	..	..	..
Bulgaria	0.9	0.46		24%	50.1	52.8	0.0
Croatia	0.5	0.65		..	..	..	..
Czech Rep.	1.0	0.11		55%	76.9	76.1	0.0
Estonia	0.2	0.91		33%	105.6	192.8	2.8
Georgia	0.5	..		32%	..	..	..
Hungary	1.0	0.26		11%	25.6	25.3	0.0
Kazakhstan	1.7	0.23		12%	49.0	41.6	0.0
Kyrgyz Rep.	0.4	2.45		55%	306.3	395.9	7.2
Latvia	0.3	0.86		30%	117.6	181.3	2.1
Lithuania	0.4	0.54		19%	58.0	79.5	0.0
Macedonia, FYR	0.2	..		..	..	..	..
Moldova	0.4	0.59		31%	202.2	263.9	3.3
Poland	3.8	0.36		15%	41.1	26.7	0.0
Romania	2.3	0.21		71%	162.2	124.5	0.0
Russia	14.8	0.00		11%	27.3	11.5	0.0
Slovak Repub	0.5	0.35		85%	156.1	191.0	2.0
Slovenia	0.2	0.34		..	..	..	..

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Country	Total Pop (10 mn)	1998 Aid GDP (%)	CPIA	Pop < $2 a day (%)	Marg eff (people /$mn)	Marg eff (adj for pop bias)	Pov efficient aid (%)
Tajikistan	0.6	2.12		48%	343.5	412.6	4.9
Turkey	5.9	0.06		48%	109.6	61.9	0.0
Turkmenistan	0.4	0.26		26%	82.4	108.9	0.0
Ukraine	5.2	0.33		31%	120.8	71.4	0.0
Uzbekistan	2.2	0.15		43%	137.8	107.3	0.0
Bangladesh	11.6	1.02		88%	1,034.5	472.1	6.5
Bhutan	0.1	..		..	..	..	..
India	89.8	0.13		89%	740.5	175.6	1.0
Maldives	0.0	3.77		57%	162.5	539.4	8.6
Nepal	2.0	1.70		87%	601.0	478.8	5.2
Pakistan	12.3	0.41		57%	434.9	194.9	2.0
Sri Lanka	1.8	1.16		41%	214.4	178.7	2.1

Table 4

Poverty Efficient Aid Allocations with Different Degrees of Population Bias, Selected Countries

	Poverty Efficient Aid/GDP (%)		
	Population Bias Parameter (beta) equals		
	0	.32	.60
Namibia (1.5 m people)	0.0	3.7	7.4
Benin (5.2 m people)	5.8	7.3	7.9
Uganda (18 m people)	8.3	8.9	8.4
Tanzania (28 m people)	6.2	6.7	6.9
Vietnam (70.9 m people)	4.4	4.0	2.9
India (897.8 m people)	6.1	1.0	0.0

Table 5
Poverty Rates by Region, 1996 and 2015, Various Scenarios

	Poverty	Poverty 2015				
	1996[a]	Baseline	(1)	(2)	(3)	(4)
Sub-Saharan Africa	72%	64%	56%	53%	45%	41%
East Asia and Pacific	57%	10%	10%	10%	10%	10%
Middle East/North Africa	34%	23%	29%	29%	29%	29%
Latin America/Caribbean	43%	26%	26%	26%	26%	26%
Eastern Europe/Central Asia	28%	43%	41%	38%	37%	34%
South Asia	85%	40%	39%	37%	39%	37%
Developing World	61%	31%	30%	29%	28%	26%

[a] Headcount poverty rate based on $2 per day poverty line.

Figure 1. Total Volume of Aid

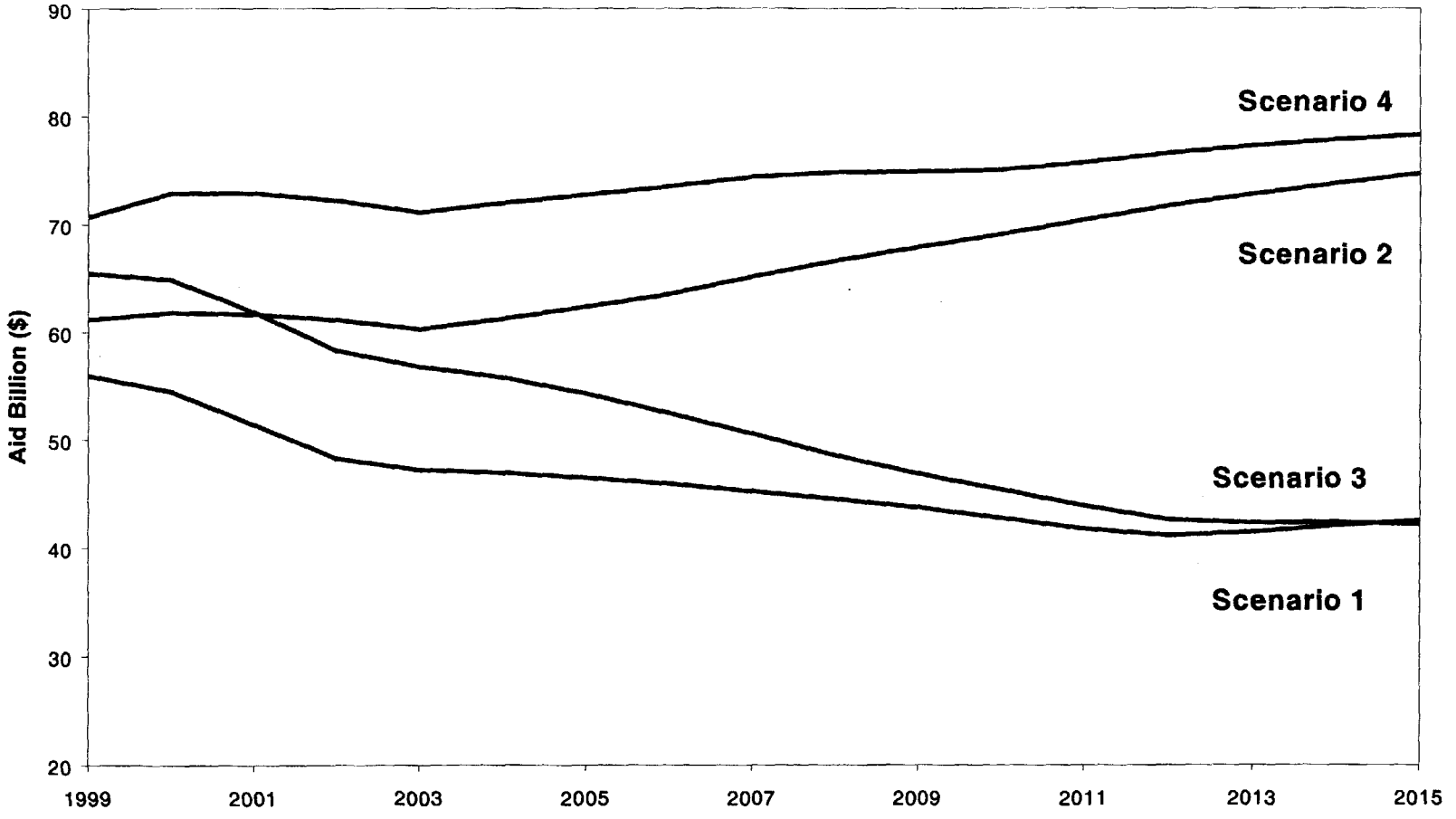


Figure 2. Aid Allocation to Uganda

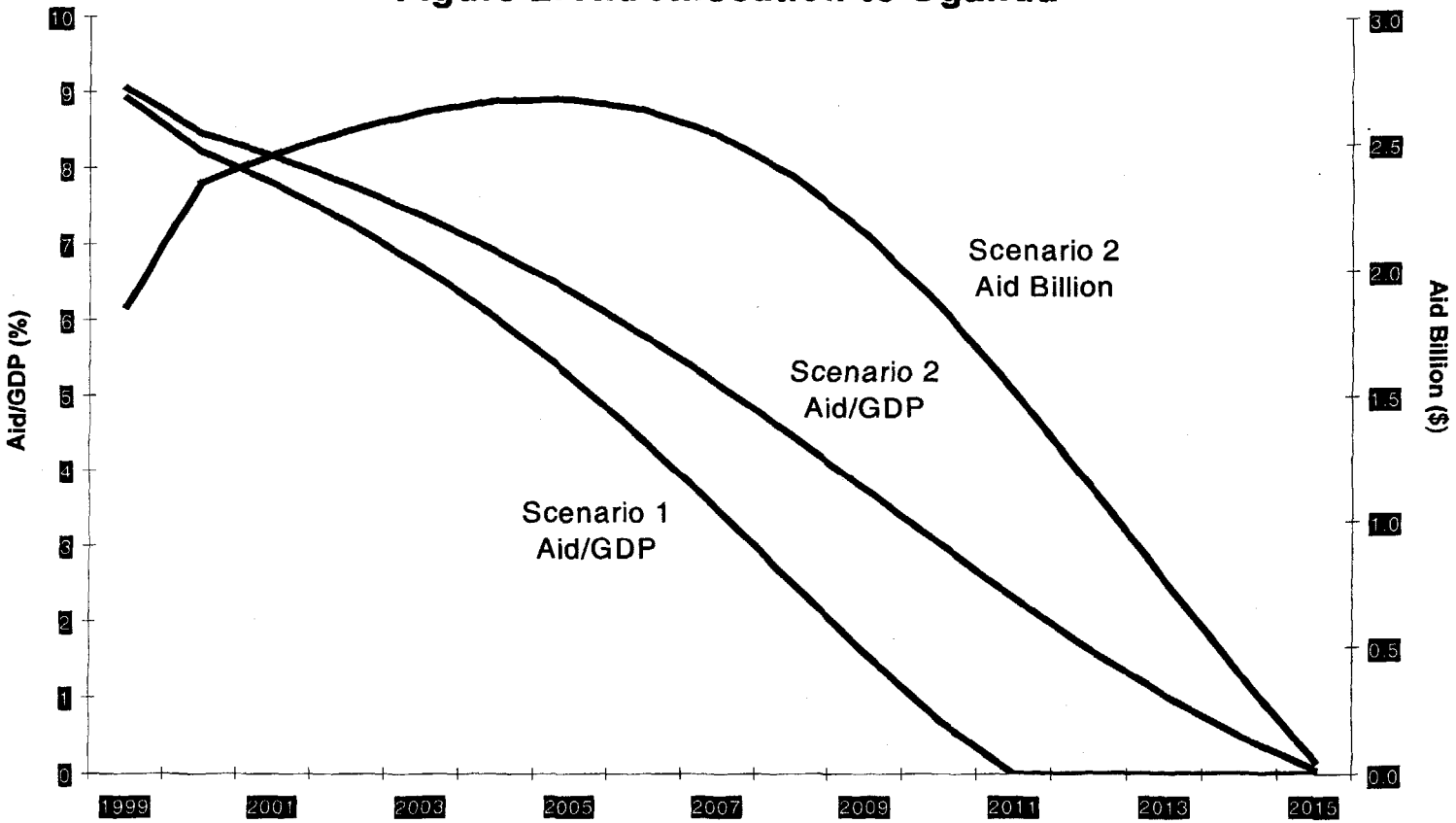


Figure 3. Uganda Poverty Rate

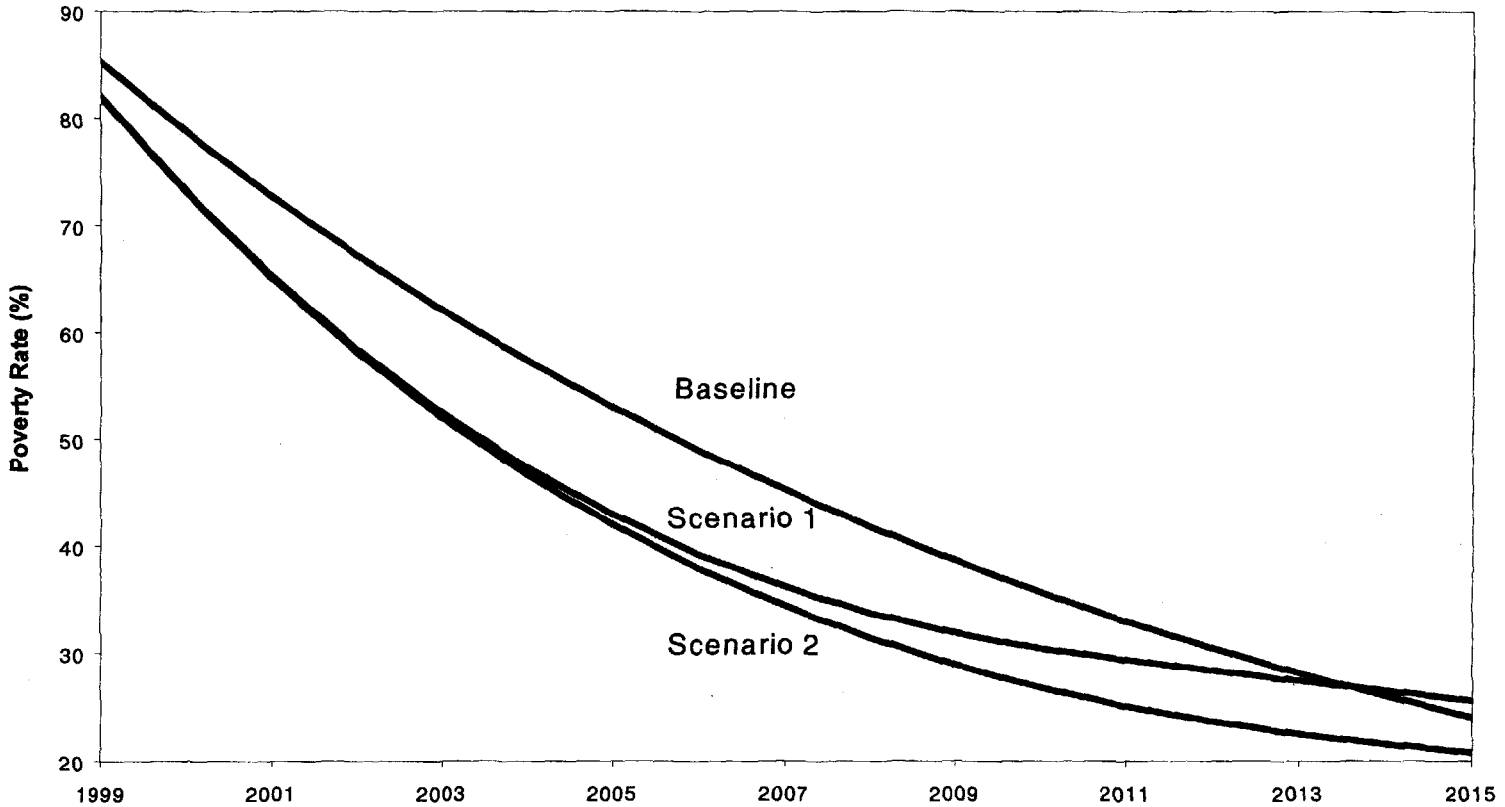


Figure 4. Kenya (Reform Scenario)

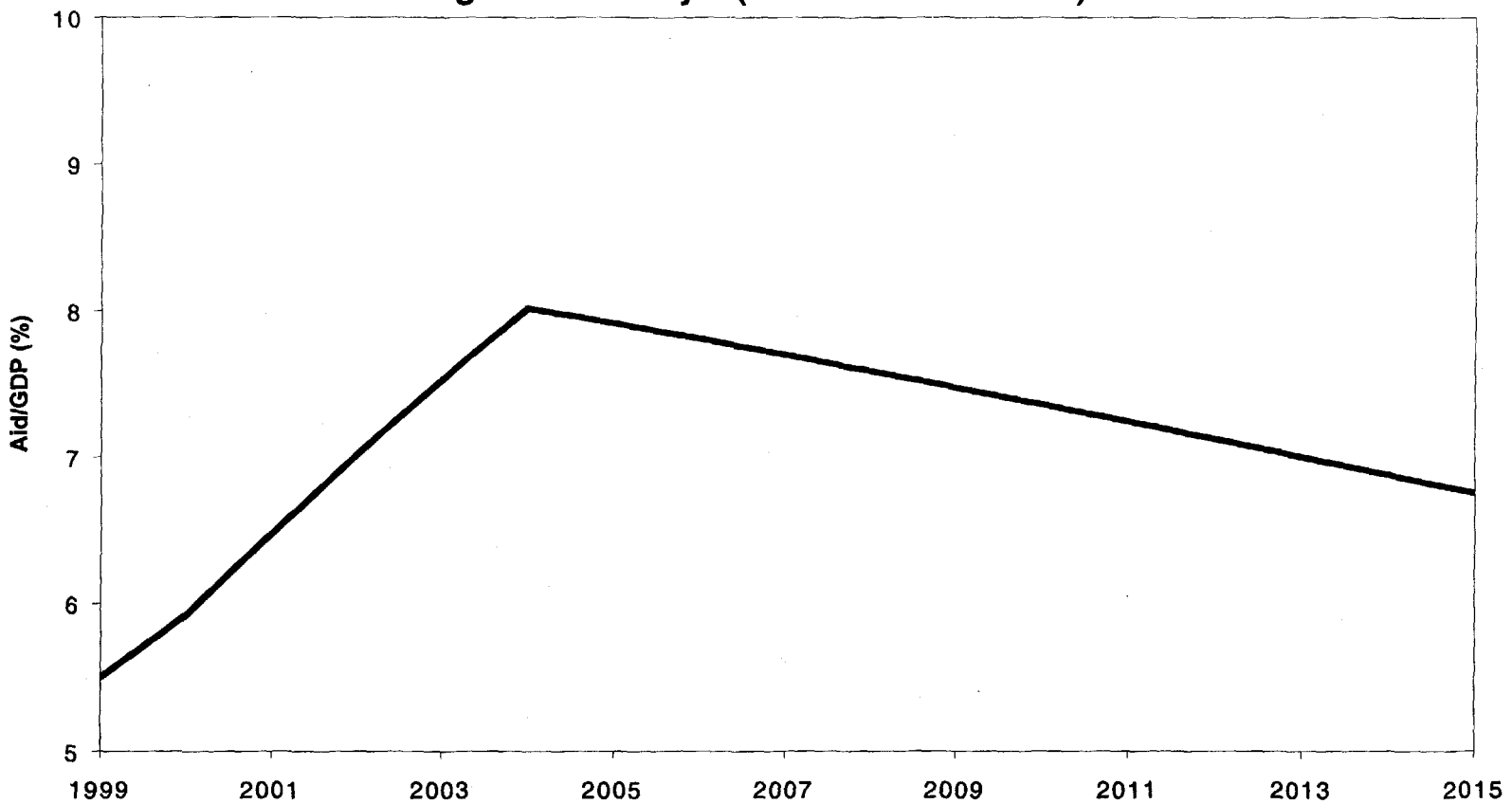


Figure 5. Angola (No Reform Scenario)

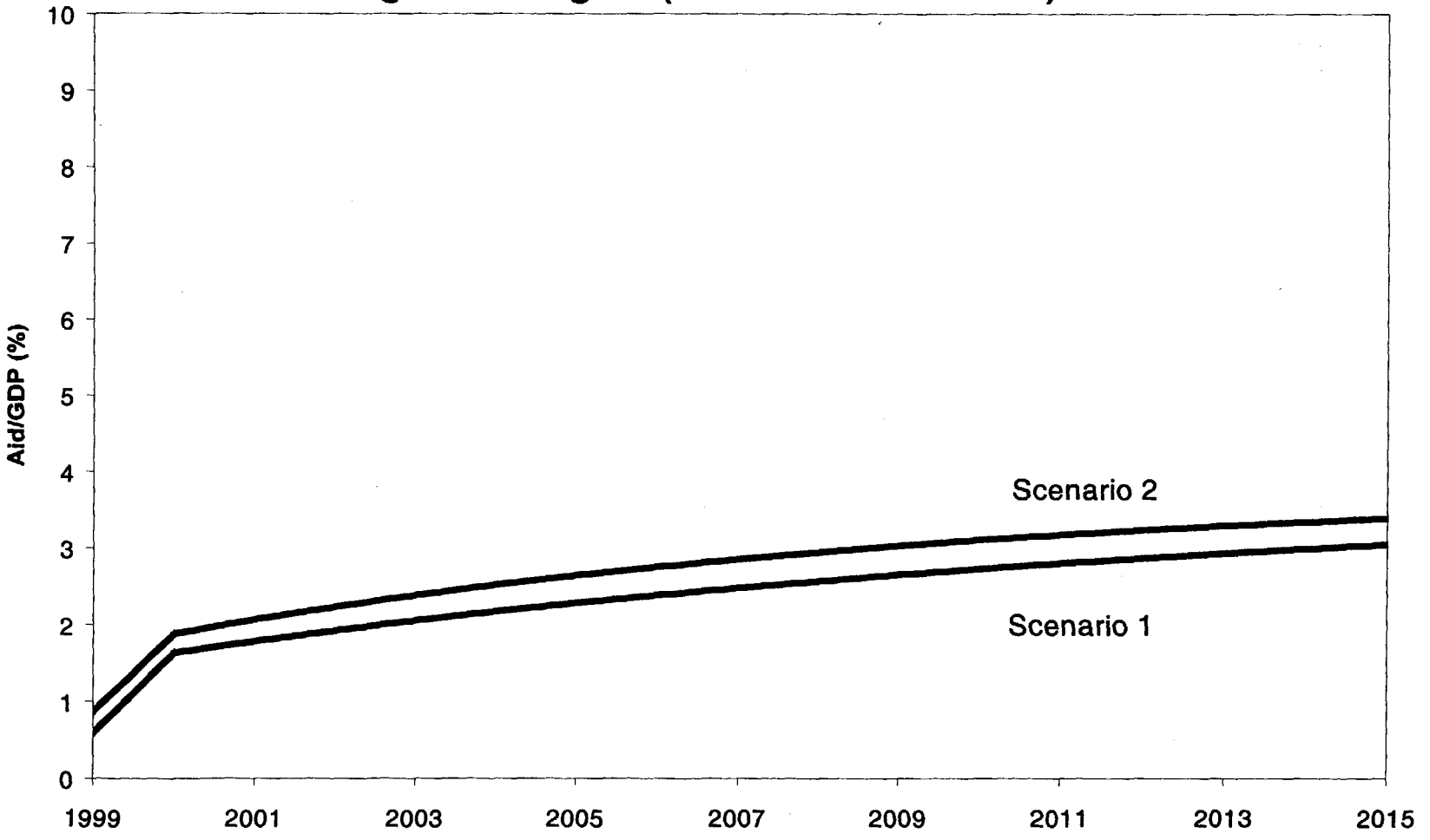
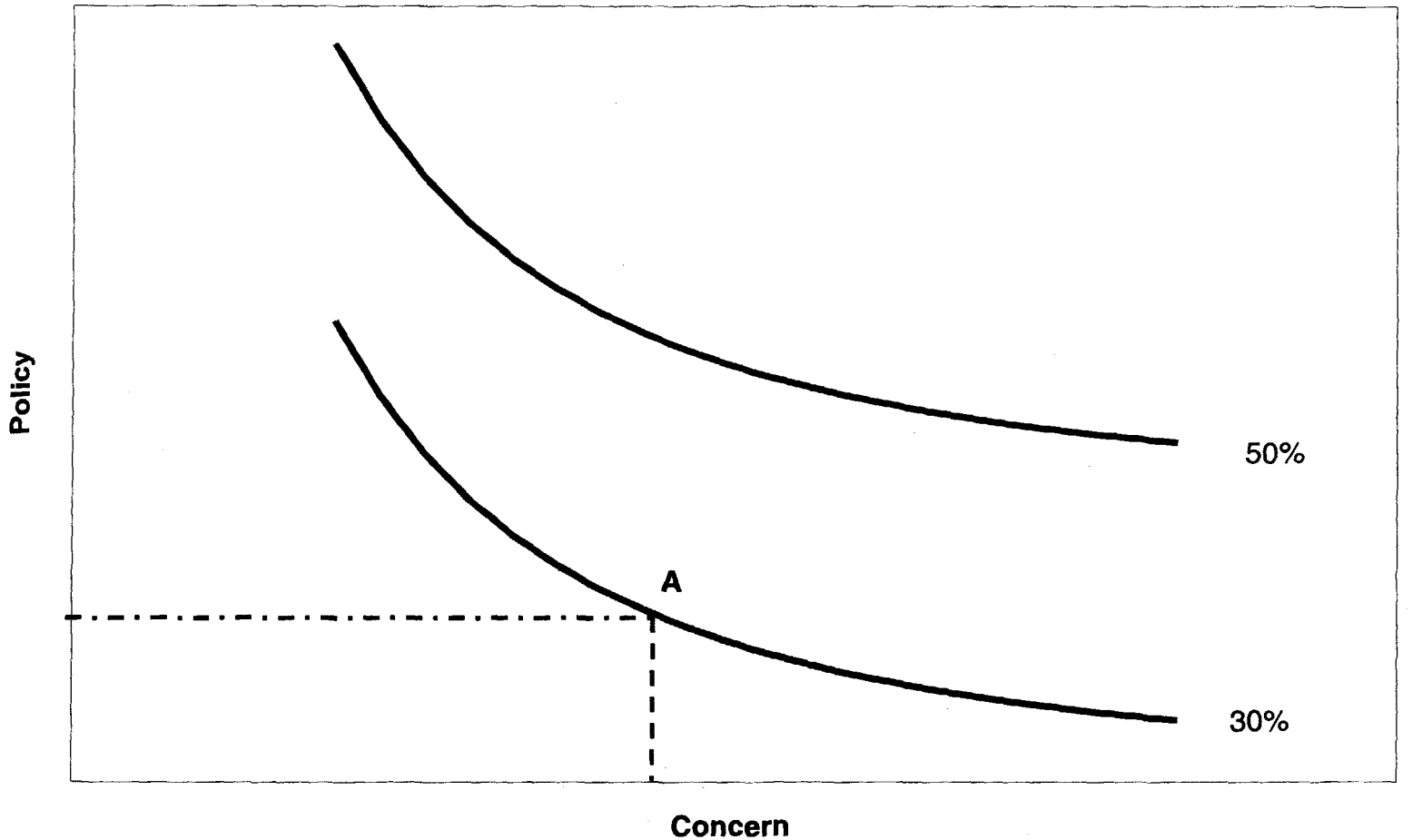


Figure 6. Poverty Reduction Isoquants



End Notes

1. [1] Alesina and Dollar (forthcoming) show that the allocation of bilateral aid up to the mid-1990s could be explained to a large extent by strategic variables including former colonial status and voting patterns in the UN. Beyond this, there was little consistent relationship between the allocation of aid and the quality of economic policy.

2. In this formulation we make use of two other results from Burnside and Dollar. First, they consider the possibility that policy is endogenous and in particular is influenced by the level of aid, but they find no significant effect of the amount of aid on policy. Our specification for growth makes use of this information, that the policy measure is not affected by the level of aid and can be taken as independent of it. Second, Burnside and Dollar consider the possibility that aid is correlated with the error term in the growth regression and instrument for it. Their OLS and 2SLS regressions are essentially the same, indicating that there is no significant correlation between aid and the error term. In light of this, we use OLS to estimate the growth equation.

3. On the impact of aid on policy, see Collier (1997), Killick (1991), Rodrick (1996), and Williamson (1994), and Dollar and Svensson (forthcoming). For empirical evidence on the fungibility of aid, see Feyzioglu, Swaroop, and Zhu (1998) and Pack and Pack (1993).

4. We have left India out of this calculation of actual aid and of the total aid in our optimal allocation. India is so large that small changes in parameters make large differences in the absolute volume of aid to the country in our model. To make this comparison of total aid in reality and total aid in our model fairly robust, it is necessary to exclude India. For the same reason we exclude it in the comparison of volumes of aid under different scenarios in Figure 1.

5. The way that we distributed the policy reform around Africa and ECA is as follows: Referring to Table 1, the ratio of policy in South Asia to SSA (ECA) is 3.63/3.014 = 1.19 (3.63/3.22 = 1.13). We scaled up policy in SSA (ECA) by the factor 1.19 (1.13), so that the population-weighted average of policy in each region would now be 3.63. This method means that the absolute change in policy is larger in countries that already have better policy. In general, the effect of policy reform on poverty reduction would be greater if the reform were concentrated in countries with very bad policy. A counterfactual scenario that put more of the policy reform in the countries with very poor policy would generate a higher impact of policy reform on poverty reduction.

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