Aid, Policies and Growth

by

Craig Burnside and David Dollar

Macroeconomics and Growth Division

Policy Research Department, World Bank

 Helpful comments on this work have been provided by Alberto Alesina, Paul Collier, Bill Easterly, and Lant Pritchett. We would like to thank Charles Chang and Eliana La Ferrara for excellent research assistance. We gratefully acknowledge financial assistance from the World Bank Research Committee (RPO 681-70).

Abstract

This paper uses a new database on foreign aid to examine the relationships among foreign aid, economic policies, and growth of per capita GDP. In panel growth regressions for 56 developing countries and six four-year periods (1970-93) the policies that have a large effect on growth are fiscal surplus, inflation, and trade openness. We construct an index of these three policies, interact it with foreign aid, and instrument for both aid and aid interacted with policies. We find that aid has a positive impact on growth in developing countries with good fiscal, monetary, and trade policies. In the presence of poor policies, on the other hand, aid has no positive effect on growth. This result is robust in a variety of specifications that include or exclude middle-income countries, include or exclude outliers, and treat policies as exogenous or endogenous. We examine the determinants of policy and find no evidence that aid has systematically affected policies - either for good or for ill. We estimate an aid allocation equation and show that any tendency for aid to reward good policies has been overwhelmed by donors' pursuit of their own strategic interests. In a counterfactual we reallocate aid, reducing the role of donor interests and increasing the importance of policy: such a reallocation would have a large, positive effect on developing countries' growth rates.

The global economy governed by international financial institutions, the World Trade Organization, and Multinational Corporations proposes structural adjustment for countries in the South in the name of fiscal health. The result is increasing poverty, debt, and unemployment.

-- NGO declaration at the UN Conference on Women (Beijing)

Enormous and steady flows of concessional external finance from developed countries have permitted Third World governments to pursue "development" policies that have been wasteful, ill-conceived, unproductive -- or even positively destructive.

-- American Enterprise Institute testimony to the Senate Foreign Relations Committee

1. Introduction

Critics of both the right and the left have questioned the utility of foreign aid. The conservative critique holds that aid supports large and inefficient governments that create a bad environment for economic activity. On the other side, the left has argued that aid agencies have foisted structural adjustment policies on unwilling countries and that these policies have not delivered the promised benefits. Clearly these two critiques are inconsistent since at the heart of structural adjustment are fiscal discipline, trade liberalization, and other market friendly policies. Where the different critics of aid do agree, however, is that there are quite a few countries that have received large amounts of aid for long periods of time and have little to show for it in terms of growth or poverty reduction.

In this paper we revisit the question of the impact of foreign aid on growth. Recent work by Boone (1994, 1996) found that aid had no effect on investment or growth in a sample of developing countries. Our main innovation is to introduce economic policies into the equation. Does aid have a positive effect on growth in the presence of good economic policies? Have donors systematically allocated assistance in favor of

good policies? Has aid affected policies -- for good or for ill? These are the questions that we address.

A modified neoclassical growth model provides the analytical framework for this investigation. The neoclassical model suggests that poor countries should have a high return to capital and a fast growth rate in transition to the steady state; there are several factors that could interfere with this result, however. With a subsistence consumption constraint and imperfect international capital markets, poor countries will tend to grow slowly despite a high marginal return to investment. In this context foreign aid can accelerate growth rates in the transition to a steady state. Furthermore, various institutional and policy distortions can lower the return to capital and reduce transitional growth rates. We show that in such a model the impact of aid will be greater in a low distortion environment. In general, developing country growth rates will depend on initial income, institutional and policy distortions, aid, and aid interacted with distortions.

To investigate this model empirically we use a new data base on foreign aid developed by the World Bank. The grant components of concessional loans have been added to outright grants to yield a truer estimate of foreign aid. We draw on the recent empirical growth literature to develop a model with a range of institutional and policy distortions, and we estimate this equation in a panel with 56 countries and six four-year time periods from 1970-73 until 1990-93. Aside from institutional/political variables, the policies that have considerable weight in this equation are the budget surplus, inflation, and the openness dummy developed by Sachs and Warner (1995). We form an index of these three policies and interact it with foreign aid; initially we take policies to be exogenous. We instrument for aid with population and donor interest variables.

We find that foreign aid has a positive effect on growth in a good policy environment. The result is robust in a variety of specifications in which outliers are included or excluded, and middle-income countries are included or excluded. This finding is consistent with Boone's work in that the estimated impact of aid for an observation with average policy is zero. Countries with good policies and significant amounts of aid (3-7% of GDP), on the other hand, perform very well, better than can be explained by other variables in the growth regression.

Turning to allocation issues, we estimate an equation to explain aid receipts (as a share of GDP). Donors direct their aid to low-income countries, but are also influenced by population (small countries get more) and by variables that reflect their own strategic interests. After controlling for these other influences, more aid goes to countries with good policies, as measured by our index. However, the donor interest variables seem to overwhelm the effort to reward good policy: if one looks simply at the partial correlation of aid and policy after controlling for income level and population, it is insignificant. We estimate separate aid allocation equations for bilateral and multilateral aid and find that it is the former that is influenced by the donor interest variables. Multilateral aid is largely a function of income level, population, and (good) policy.

We also estimate an equation for government consumption. We treat this separately from the other policies because it has no robust association with growth. We find that bilateral aid in particular has a strong positive impact on government consumption. This result is consistent with other evidence that aid is fungible and tends to increase government spending proportionately, not just in the sector that donors think they are financing. That aid tends to increase government consumption, which in turn has

no positive effect on growth, provides some insight into why aid is not promoting growth in the average recipient.

The final step in our work is to make policy endogenous and to estimate an equation for our policy index. We find no systematic relationship between the amount of aid that countries get and our index of fiscal, monetary, and trade policies. There are countries such as Ghana in which aid receipts and policy are highly and positively correlated, and one can argue that aid has supported policy reform. For each Ghana, however, there is a Zambia, in which policy deteriorated continuously from 1970 until 1993, while aid receipts rose continuously. The general result is no systematic effect of aid on policy. We go back to our growth regression and instrument for policy as well as for aid and find that our basic result is robust when we treat policies as endogenous.

This work has clear implications for how to make foreign aid more effective. It turns out that in the 1970-93 period both the right and the left were wrong: foreign aid had no systematic impact on the economic policies that affect growth. However, where aid happened to coincide with good policies, it had a strong positive effect on growth. Otherwise, it seems to have been dissipated in unproductive government consumption. In allocating assistance, donors have not sufficiently exploited the relationship between good policies and effective aid, probably because donors are pursuing a range of interests that are not necessarily consistent. If they want to have a large impact on growth and poverty reduction, then they should place greater weight on economic policies of recipients. In a counterfactual we reallocate 1970-93 aid by setting the coefficients on donor interest variables to zero and doubling the coefficient on policy: such a reallocation

increases the mean growth rate of our sample by 0.2-0.3 percentage points, a large increase relative to actual mean growth of 1.1% per capita per annum.

Our work also suggests that the climate for effective aid is improving. There has been a clear shift among developing countries in favor of better policies; in our sample the mean policy in 1990-93 was well above the 1982-85 mean. Quite a few recent reformers are very poor countries, such as Ethiopia, Uganda, Mali, and Vietnam. Ironically, while the climate for effective aid is getting better, the support for aid within rich countries is on the decline. Real levels of aid have decreased in recent years, and in 1994 OECD countries provided the smallest level of support, relative to their own GDP, in twenty years.

2. Methodological Approach

In this section we outline our methodological approach to measuring the impact of aid on growth and the interaction between economic policies and the effectiveness of aid. First, we provide some theoretical discussion of how aid might affect growth in the context of a neoclassical growth model. Second, we discuss the sensitivity of these effects to the introduction of strategic behavior on the part of policy-makers. Finally, we outline our empirical approach to measuring the effects of aid on growth and the interactions between aid and policy.

2.1 Aid in the Neoclassical Model

A series of interesting experiments can be performed in the context of a neoclassical model. Imagine a developing country in a world without private capital

mobility. Suppose that a social planner in this country maximizes the discounted stream of a representative consumer's utility given by

$$\sum_{t=0}^{\infty} \beta^t \frac{\left(C_t - \overline{C}\right)^{1-\gamma} - 1}{1-\gamma},$$

where C_t represents time-*t* per capita consumption, $0 < \beta < 1$ is the discount factor, $\gamma > 0$ is the coefficient of relative risk aversion and $\overline{C}$ is a subsistence level of consumption. As Christiano (1989) and Rebelo (1992) have argued, including a subsistence level of consumption in the specification of preferences within a neoclassical model is a useful way of explaining the positive empirical relationship between income levels and savings rates.

The planner maximizes subject to a resource constraint given by

$$C_t + I_t \leq AK_t^{\theta} + F_t,$$

where I_t is time-*t* investment, K_t is time-*t* capital, F_t is time-*t* foreign aid, $A > 0$ and $0 < \theta \leq 1$. Capital evolves according to

$$K_{t+1} = (1-\delta)K_t + I_t,$$

where $0 < \delta < 1$.

Figure 1 illustrates the implied relationship between the domestic savings rate and GDP in the absence of foreign aid. GDP is defined as $Y_t = AK_t^{\theta}$, while the savings rate is defined as $s_t = I_t / Y_t$. The figure is drawn for $\theta = 0.4$ and logarithmic utility, which together imply quite sharply diminishing returns to capital and relatively rapid convergence to a steady state income level even in the presence of subsistence consumption. Notice that the savings rate first rises and then falls with the income level.

The eventual decline is explained by the assumption of diminishing returns to capital while the initial increase is explained by the constraint put on savings behavior by subsistence needs.

In this setting it is not hard to see how aid might be an effective instrument for raising the income level and growth rate of a country. This is because the marginal propensity to save in the developing country is high, even though the average propensity to save is small. The difficulty the developing country faces is circular: because it is growing slowly it does not generate marginal income from which it can accumulate capital rapidly. A benevolent foreign donor providing a one-time donation representing roughly 15% of the developing country's GDP at time 0 would cut the half-life to steady state from 42 to 35 years and would raise the growth rate of GDP by about 1 percentage point from 0.35% to 1.35%. These effects would arise because the aid would cause a permanent upward shift in the developing country's GDP (by augmenting its capital stock), and there is a strong relationship between the income level and growth. This relationship is illustrated in Figure 2 (No Tax Case).

To examine the role of distortions, suppose now that in the same economy output is taxed at a rate of 40%, and the proceeds are distributed lump-sum to consumers. The growth performance of this economy is illustrated in Figure 2 (Tax Case). Starting at the same initial level of capital (and GDP) this economy will perform poorly relative to the no-tax case, and aid will be less effective. A 15% of GDP donation will reduce the half-life to the lower steady state from 50 to 40 years, but the increase in the growth rate of GDP will be only about 0.6 percentage point, from 0.2% to about 0.8%.

What does this neoclassical model imply about the relationships among aid, policy and growth? First, it suggests that one would find a positive relationship between aid and growth, as long as the recipient's GDP is below the level corresponding to its peak transitional growth rate. Second, it suggests that one would find a negative relationship between distortionary taxes and growth. However, aid and policy would not be sufficient to explain cross-sectional variation in growth even conditioning on initial income. Consider as a benchmark the distortionary economy without aid, where the growth rate is about 0.2%. The effect of better policy in this setting would be a rise in the growth rate to 0.35% or an increase of 0.15 percentage point. The effect of aid, in the absence of a policy improvement, would be a rise in the growth rate of 0.6 percentage point. However, aid combined with a policy improvement would raise the growth rate by more than the sum of these effects: the increase would be about 1.15 rather than 0.75 percentage point.

2.2. The Effects of Strategic Behavior

While we form some of our intuition for the relationships among policy, aid and growth using the neoclassical model, other factors can complicate the picture. First, the example we gave above ignores incentive issues by assuming that aid is provided in a lump-sum manner. Suppose, instead, that some component of aid were tied to the income level of the recipient, and that as that income level rose the quantity of aid would decrease. In this case, the donor's rule for providing aid would act as a tax on capital accumulation in the recipient country. Overall capital accumulation would rise as long as the direct impact of donated capital was greater than the indirect tax effect, but the impact of the aid would be less than in the lump-sum case.

Second, our example assumes either the existence of a benevolent social planner, perfect markets in the recipient country, or some other mechanism such that outcomes are consistent with a social optimum. There are many reasons why this may not be the case. In reality foreign aid is intermediated by governments, and these are not always best thought of as benevolent social planners. The incentives faced by political figures are not necessarily the same as those faced by a social planner. Given this it is possible that aid can have little or no impact on overall economic prosperity in the recipient country. Mosley and Hudson (1996) and Svensson (1996a, 1996b) have shown that when the donor-recipient relationship is modeled as a noncooperative game, moral hazard problems can lead to aid having little impact on the problems it is intended to alleviate. Aid may simply relax the budget constraint of the recipient government, without having much impact on the amount of that budget that ultimately is used to purchase capital. Furthermore, the donor government can also be part of this game for reasons other than benevolence. Donor interest may lead to the suboptimal use of aid and dampen any positive impact that it has.

While these factors and many others suggest that the positive impact of aid is likely to be smaller than what is predicted by the neoclassical model described above, our priors about the impact of aid are still driven by that example. Whatever marginal contribution aid makes to growth, we expect aid to be most effective in combination with good policy. Furthermore, we expect that the effects of good policy are enhanced by foreign aid.

2.3 Our Empirical Approach

To determine empirically the relationships among aid, policies and growth we use a panel data set on 56 countries over six four-year time periods. Several papers have previously attempted to measure the impact of aid on savings, investment and growth in developing countries [Chenery and Syrquin (1975), Griffin (1970), Levy (1988), Weisskopf (1972)]. The conclusions reached by the authors of these papers have differed widely and they have faced numerous econometric difficulties. Recent papers by Mosley, Hudson and Horrell (1987) and Boone (1994, 1996) have concluded that aid has no significant positive impact on growth. Our approach is similar, in that our ultimate goal is to measure the impact of aid on growth using regression analysis. Our approach differs in that we explicitly model the simultaneous interactions among aid, policy and growth.

One of the main empirical difficulties we face is a fundamental identification problem. Does aid cause policy (say, owing to conditionality) or does policy cause aid (do donors reward exogenous policy changes), and how can we separate the effects of these variables on growth? Using two-stage least squares (2SLS) to estimate simultaneous equations for growth, aid and policy and by making identifying assumptions about the exogenous determinants of aid, policy and growth, we can determine the separate impacts of aid and policy on growth. Furthermore, we are able to test whether aid is affected by policy or vice versa. Of course, we cannot test our entire specification; only over-identifying assumptions are testable.

2.3.1 *The Structural Model*

Our model can be outlined as follows. Let g_{it} be the growth rate of real per capita GDP of country i during period *t*. Let y_{it} be the level of real per capita GDP in country i at the beginning of period *t*. Let a_{it} be the level of aid as a fraction of GDP received by

country i in period *t*. Let p_{it} be a $P \times 1$ vector of policy variables in country i at time *t*. Let x_{it} be a $K \times 1$ vector of exogenous variables. Suppose that initial income, aid, policy and some subset of the exogenous variables affect the growth rate of real GDP. This suggests a growth equation similar to those found in the determinants of growth literature (see Levine and Renelt, 1992 for a review):

$$g_{it} = \beta_{g0} + y_{it}\beta_{gy} + a_{it}\beta_{ga} + p'_{it}\beta_{gp} + a_{it}p'_{it}\beta_{gap} + x'_{it}\beta_{gx} + \varepsilon^{g}_{it}, \qquad (1)$$

where ε^{g}_{it} is some mean zero scalar, β_{g0}, β_{gy}, β_{ga} are scalars, β_{gp} and β_{gap} are $P \times 1$ vectors and β_{gx} is a $K \times 1$ vector. The interaction term $a_{it}p'_{it}\beta_{gap}$ allows us to capture effects of aid and policy suggested by the neoclassical model.

Aid and policy are also endogenous and depend on the independent variables in the system and on each other. Thus, we consider that aid may be a function of policy and/or that policy may be a function of aid:

$$a_{it} = \beta_{a0} + y_{it}\beta_{ay} + p'_{it}\beta_{ap} + x'_{it}\beta_{ax} + \varepsilon^{a}_{it} \qquad (2)$$

and

$$p'_{it} = \beta_{p0} + y_{it}\beta_{py} + a_{it}\beta_{pa} + x'_{it}B_{px} + \varepsilon^{p}{}'_{it}, \qquad (3)$$

where ε^{a}_{it} is a zero mean scalar, ε^{p}_{it} is a zero mean $P \times 1$ vector, β_{a0} and β_{ay} are scalars, β_{ap} is a $P \times 1$ vector, β_{ax} is a $K \times 1$ vector, β_{p0}, β_{py} and β_{pa} are $1 \times P$ vectors, and B_{px} is a $K \times P$ matrix.

We consider a number of different policy variables. For every additional policy variable there are two additional coefficients in the growth equation because of the interaction terms. In practice, it is difficult to estimate all of these coefficients with a

desirable amount of accuracy. For this reason, we construct a scalar policy index, $\tilde{p}_{it} = \alpha_0 + p'_{it}\alpha_1$, as a linear combination of a set of policy variables. The policy index is used to construct a single interaction term in the growth equation and is described in more detail below. Since we also find it difficult to assess the individual impact of each policy variable on aid, we use $\tilde{p}_{it}$ in place of p'_{it} in the aid equation.

It seems reasonable to assume that the error terms in the growth and aid allocation equations are correlated. For example, suppose that in a period a country is affected by a major shock, perhaps a drought, that is not captured by any of the *x* variables. If this has a negative impact on economic growth and a positive impact on the aid received by that country in period *t*, then the error terms in the aid and growth equations will be negatively correlated. But this will imply biased estimates of β_{ga} and β_{gap} if the growth equation, (1), is estimated by ordinary least squares. It is for this reason that we verify the robustness of our results using a 2SLS approach.[1] This involves creating an instrument for aid because it appears on the right hand side of the growth equation and is considered to be simultaneously determined with growth. It further requires the creation of an instrument for policy whenever policy is assumed to be a function of aid.[2]

2.3.2. *Identification of the Model*

With no further restrictions the system of equations (1)-(3) is underidentified. We consider two schemes for identifying the system of equations.

Our first scheme assumes that policy is weakly exogenous in the following sense. It assumes that policy is not contemporaneously affected by aid ($\beta_{pa} = 0$) although there is the possibility of lagged feedback through the coefficient on initial income, β_{py}. With

the further assumption that at least one of the *x* variables does not enter the aid equation, and that at least two of the *x* variables do not enter the growth equation, the entire system is identified. In practice, to lend greater precision to our estimates and raise the number of degrees of freedom, we impose more zero restrictions than necessary and thereby overidentify the system.

With this scheme, policy is assumed to be unaffected, contemporaneously, by aid or growth so that we do not bother to estimate the policy equation. The aid equation is given by

$$a_{it} = \beta_{a0} + y_{it}\beta_{ay} + \tilde{p}_{it}\beta_{a\tilde{p}} + x'_{it}\beta_{ax} + \varepsilon^{a}_{it} \tag{4}$$

while the growth equation is given by

$$g_{it} = \beta_{g0} + y_{it}\beta_{gy} + a_{it}\beta_{ga} + p'_{it}\beta_{gp} + a_{it}\tilde{p}_{it}\beta_{gap} + x'_{it}\beta_{gx} + \varepsilon^{g}_{it} \tag{5}$$

The effect of aid on growth is

$$\frac{\partial g_{it}}{\partial a_{it}} = \beta_{ga} + \tilde{p}_{it}\beta_{ga\tilde{p}},$$

which depends on the policy index.

Our second scheme, which we view as a robustness check, allows policy to be affected by aid. In this case, some zero restrictions are needed in the policy equation in order to achieve identification. In this scheme we also replace the individual policy variables in the growth equation by the policy index. This leaves us with the system

$$g_{it} = \beta_{g0} + y_{it}\beta_{gy} + a_{it}\beta_{ga} + \tilde{p}_{it}\beta_{g\tilde{p}} + a_{it}\tilde{p}_{it}\beta_{ga\tilde{p}} + x'_{it}\beta_{gx} + \varepsilon^{g}_{it}, \tag{6}$$

$$a_{it} = \beta_{a0} + y_{it}\beta_{ay} + \tilde{p}_{it}\beta_{a\tilde{p}} + x'_{it}\beta_{ax} + \varepsilon^{a}_{it} \tag{7}$$

and

$$\tilde{p}_{it} = \beta_{\tilde{p}0} + y_{it}\beta_{\tilde{p}y} + a_{it}\beta_{\tilde{p}a} + x'_{it}\beta_{\tilde{p}x} + \varepsilon^{\tilde{p}}_{it}. \quad (8)$$

In this case, the effects of shocks to aid are more complex. However, as will be shown in section 4, the estimate of the coefficient $\beta_{\tilde{p}a}$ is small and insignificantly different from zero. Therefore, it turns out that aid appears to have little impact on the policy index, and the effect of aid on growth is approximately

$$\frac{\partial g_{it}}{\partial a_{it}} \approx \beta_{ga} + \tilde{p}_{it}\beta_{ga\tilde{p}}.$$

In the next section we discuss our choices regarding the *x* variables under the first identification scheme. We also discuss which exclusion restrictions we use to achieve identification and why we think these are justified on a priori grounds. Then we present estimates of our system of equations and compute the effect of aid on growth.

In section 4 we return to the policy equation and show that aid has little impact on policy. We discuss the a priori restrictions that are necessary to identify the policy equation. Then we show that our results from section 3 are robust to allowing aid to affect policy as well as vice versa.

3. Aid and Growth

To examine the effect of foreign aid on growth we develop a base specification of the growth equation and introduce aid (properly instrumented) as well as aid interacted with policies. The recent empirical growth literature provides guidance concerning the institutional/political factors and economic policies that affect growth, and we follow this literature in building up the base specification. The general strategy is to account for a range of institutional and policy distortions that can help to explain the growth

performance of poor countries in order to ensure that any inferences about the relationship between aid and growth are robust. In this section we describe the base specification, the data (including a new data base on foreign aid), and an initial set of growth regressions.

3.1. Base Specification of the Growth Equation

The equation that we want to estimate has growth depending on initial income (to capture convergence effects), institutional/political variables, economic policies, foreign aid, and aid interacted with policies. In the institutional/political category we use a measure of institutional quality that captures security of property rights and efficiency of the government bureaucracy (Knack and Keefer, 1995). This variable is not widely available before 1980; we use each country's 1980 figure throughout on the assumption that institutional factors change slowly over time. Another variable that does not change over time in our data set is the enthnolinguistic fractionalization variable used by Easterly and Levine (1996). The latter authors find that ethnic fractionalization is correlated with bad policies and with poor growth performance after controlling for policies. Thus the institutional quality and the ethnic fractionalization variables capture long-term characteristics of countries that affect both policies and growth.

We also include the assassinations variable used by several studies to capture civil unrest, and an interactive term between ethnic fractionalization and assassinations. The final institutional variable is the money supply (M2) over GDP, which proxies for distortions in the financial system (King and Levine, 1993). Because of concern over the endogeneity of the latter variable we lag it one period.

All of the above variables we take to be exogenous. We also include a number of policy variables in the growth regression. In this section we assume these to be exogenous. In the next section we relax that assumption and estimate a policy equation. For policies, we use the dummy variable for trade openness developed by Sachs and Warner (1995). Closed economies are ones that have average tariffs on machinery and materials above 40%, or a black market premium above 20%, or pervasive government control of key tradables. Following Fischer (1993), we take inflation as a measure of monetary policy. Finally, we have two fiscal variables suggested by Easterly and Rebelo (1993), the budget surplus and government consumption, both relative to GDP. The budget surplus variable has foreign grants included in revenue and aid-financed projects included in expenditures, so that there is no necessary relationship between aid and this measure of the budget surplus.

We considered some other variables that have been used in the literature, in particular the education variables developed by Barro and Lee (1993). We found that these variables had little explanatory power (*t*-statistics well below 1.0), but their inclusion significantly reduced the number of countries in the sample, so we did not include them.

The growth regression is estimated as a panel using six four-year periods from 1970-73 through 1990-93. Thus an observation is a country's performance averaged over a four-year period. Time dummies are included in order to account for the world business cycle.

3.2. Data Sources

Previous studies of foreign aid have used a measure of aid that lumps together grants and concessional loans. The World Bank has developed a new data base on foreign aid (Fernandez-Arias and Serven, 1997). The underlying source is the World Bank Debt Reporting System which contains, among other things, all of the official loans received by developing countries from multilateral or bilateral sources. The grant component of each concessional loan has been calculated and added to outright grants to provide a more accurate measure of foreign aid. These data are in current U.S. dollars. For our study we converted them into constant 1985 dollars using the unit-value of imports price index from the IFS. This provides a measure of aid that is constant in terms of its purchasing power over a representative bundle of world imports. Finally, we divided this aid figure by real GDP in constant 1985 prices from the Summers and Heston (Penn World Tables 5.6) data set.

The aid data cover a large number of countries. However, the institutional and policy variables are not available for many countries. We were able to collect the requisite information for 56 countries. Some countries are missing data in some time periods, so that we end up with a total of 272 observations. The countries covered are listed in Appendix Table 1. Twenty-one African countries are included, as well as major aid recipients in other regions. Clearly good coverage of poor countries is important if the results are to be robust. Note, however, that countries such as Argentina, Brazil, and Chile are also included. These are middle-income countries with good access to international capital markets. Not surprisingly they have been getting a tiny amount of aid throughout this period (an average of 0.02% of GDP for Brazil, for example). Thus, we have chosen to examine the relationship between aid and growth first using the

maximum number of observations available and then using a smaller data set in which middle-income countries are dropped. Appendix Table 1 indicates the countries that are dropped in the latter analysis.

The dependent variable in our study is the growth rate of real GDP per capita, from the World Bank data base. Table 1 provides summary statistics for a few key variables. The mean growth rate was 1.2% for the 272 observations in the full sample, and 1.1% for the low-income sample (189 observations). Because we have measured aid relative to real PPP-adjusted GDP we end up with smaller aid/GDP figures than reported in other studies. For the whole sample the mean value of aid/GDP was 1.6% (2.1% for the low-income sample). Nevertheless, there are some very large aid recipients, such as Zambia (11% of GDP in the 1990-93 period). The other explanatory variables in our growth regressions have been noted above.

3.3. OLS Growth Regressions

The OLS regression with our base specification -- but without aid -- is broadly consistent with the empirical growth literature (Table 2, Regression 1). The most robust variables are institutional quality, inflation, and trade openness. Other variables have the intuitive signs; however, with so many variables included it is not surprising that *t*-statistics on some variables are in the 1-2 range. Note that regional dummies for Sub-Saharan Africa and East Asia have moderate explanatory power, their significance being marginal, at least in regression (1), our base specification. In all of the growth regressions with aid included, this same set of variables will be retained, even if some *t*-statistics become very low. We choose this approach so that the reader does not wonder about the effect of including or excluding different variables.

A final point about the base regression is that government consumption has only a very weak negative relationship with growth. If government consumption is dropped, the coefficients on the other variables remain about the same [regression (2)]. We choose to retain government consumption for reasons that will become clear later. Excluding it does not affect any results.

We use regression (2) to form a policy index comprised of the budget surplus, inflation, and trade openness. We are interested in the interaction of aid and policies, and frankly we do not think that we have enough information to simultaneously interact aid with several policies. If we interact aid with only one policy there is always the danger that the interaction is proxying for interaction with a different policy; not surprisingly the policy measures are positively correlated. The policy index is formed by using the regression coefficients from regression (2):

Policy = 1.3 +5.4 x Budget surplus - 1.4 x Inflation + 2.1 x Openness.

Thus we let the growth regression determine the relative importance of the different policies.[3] The constant, 1.3, is the impact of all of the other variables in the regression (excluding the time dummies) evaluated at each variable's mean. The index can be interpreted as a country's predicted growth rate, given its budget, inflation, and trade policies, assuming that it had the mean values of other characteristics. Since the time dummies have been excluded it is the predicted growth rate in the world economic conditions of 1990-93 (the benchmark period).

Consistent with its large coefficient in the growth regression, the openness dummy has a large impact on the policy index. Note that the index can be negative if inflation is high or if the budget deficit is very large. The data set contains a number of

observations with a negative value for the policy index. For both the whole data set and for the low-income countries alone the mean of the index is 1.3 with a standard deviation of 1.2 (Table 1). To examine interactive effects, we form a variable, Aid/GDP times Policy, and a quadratic term, $(\text{Aid/GDP})^2$ times Policy.[4]

Before instrumenting for aid it is interesting to look first at the OLS regression with aid included (Table 2, Regression 3). When Aid/GDP alone is introduced into the growth regression it has an insignificant positive coefficient. An interesting story emerges, however, when Aid/GDP x Policy and $(\text{Aid/GDP})^2$ x Policy are added (Regression 4). Aid still has a zero coefficient, but aid interacted with policy is significantly positive, while the quadratic term is significantly negative. These results imply that the impact of aid on growth is a function both of the level of policy and of the level of aid. It turns out that the quadratic term depends on five big outliers that we will discuss in more detail below. If these outliers are dropped, the quadratic term becomes insignificant and the *t*-statistic on Aid/GDP x Policy is much larger (Regression 5).

This regression indicates that the derivative of growth with respect to aid is an increasing and linear function of policy, as graphed in Figure 3. When the quadratic term is significant, this relationship is still linear, but the slope depends on the level of aid. At the mean level of aid regression (4) generates a line virtually identical to regression (5). As aid increases (decreases) the line sweeps downward (upward) with the same y-intercept. In other words, there are diminishing marginal returns to aid.

There are two aspects of the derivative of growth with respect to aid with which we are concerned. First, is the slope in the policy dimension significantly positive, which tells us whether aid is more effective in a good policy environment? Second, is the

derivative positive when evaluated at a "good" level of policy, for example, at policy = 2.5 (one standard deviation above the policy mean)? For regression (5), the answer to both questions is "yes," at a .01 confidence level. The question that we turn to next is how robust those results are.

3.4. Two-Stage Least Squares Growth Regressions

There are several reasons to be skeptical about the OLS results presented above. First, we did not take account of the likely endogeneity of aid. Second, the data set combines low-income and middle-income countries, which may not be appropriate. Third, we have not checked for the importance of outliers. In this section we address all three issues.

Boone (1994, 1996) has shown that there are good instruments for aid that can be used to address endogeneity problems. Aid/GDP is a function of a number of variables that do not belong in the growth regression, notably population, infant mortality rate, and proxies for donors' strategic interests. We use these as instruments in a two-stage least squares regression. This procedure purges the correlation of Aid/GDP with the error term in the growth regression, and ensures that we capture some portion of Aid/GDP not explained by the other variables in the growth regression. Thus, the fact that aid goes primarily to poor countries with weak institutions and growth-inducing characteristics is controlled for, as is the possibility that emergency aid responds to negative shocks to growth. The specific donor interest variables that we use as instruments are dummies for the Franc zone in Africa, Central American countries (which are in the U.S. sphere of influence), and Egypt, and a measure of arms imports as a share of total imports (lagged one period to address potential endogeneity).

We are also instrumenting for the interactive term, Aid/GDP x Policy, and the quadratic term, $(\text{Aid/GDP})^2$ x Policy. Thus we include some nonlinear instruments such as Population x Policy and Infant mortality x Policy.

The TSLS regression with aid but not the interactive term confirms the OLS result: a coefficient on Aid/GDP not different from zero (Table 3, Regression 6). The TSLS regression with the interactive and quadratic terms is also consistent with the OLS result in that the coefficient on Aid/GDP x Policy is positive, while the coefficient on $(\text{Aid/GDP})^2$ x Policy is negative. The *t*-statistics are not very large; however, what we are interested in are linear combinations of these coefficients, not the coefficients themselves. The derivative of growth with respect to aid, calculated from regression (7), is plotted in Figure 3. It is a function of the level of aid, and here it is plotted for Aid/GDP = 3.7% of GDP, one standard deviation above the aid mean. It can be seen that this line is similar to the OLS regression except that it has shifted down. The slope of this line is significantly different from zero at a .10 level of confidence. If this relationship is evaluated at the mean of aid (1.6), the line is steeper, but we have less statistical confidence that the slope is different from zero.

If the five outliers are dropped, we get regression (8). It can be seen in Figure 3 that this result is virtually identical to regression (7) when the latter is evaluated at Aid/GDP = 3.7. For both regressions (7) and (8) the point estimates on the derivative of growth with respect to aid are positive at Policy = 2.5. However, we do not have a high degree of confidence that these estimates are different from zero. Because the slope of the relationship is significantly positive, however, our confidence that aid has a positive impact increases as we move further out in the policy dimension.

The next step in our analysis was to drop middle-income countries; these countries have good access to international capital markets and there is no compelling reason to think that their growth rates would be affected by aid. We arbitrarily defined middle-income as countries with real per capita GDP above $1900 both at the beginning (1970-73) and end (1990-93) of the time period. This eliminated 16 countries (listed in Appendix Table 1) and left 40 countries and 189 observations.

The TSLS regression for the restricted data set has stronger results in the sense of coefficients and *t*-statistics larger in absolute value (Table 4). In can be seen in Figure 3 that the impact of policy on the effectiveness of aid is much sharper in regression (9) than in regression (7). One thing that has happened is that the coefficient on openness is no longer significantly positive, and the regression is putting a large weight on the interactive term, Aid/GDP x Policy. This result conveys the important information that among low-income countries all of the good policy observations are either large aid recipients or in East Asia (note that the coefficient on the dummy is now larger). When the Chile's and Mexico's are included in the data set, the coefficient on openness is larger and the coefficient on Aid/GDP x Policy is positive but smaller than in regression (9). Thus, if you think that the experience of Chile or Mexico conveys useful information about what would happen to a low-income reformer without aid, you should prefer the estimate of regression (7). If you are skeptical that reformers such as Mali and Ghana will obtain the same impact from reform as Chile and Mexico than you should prefer the results from the data set that excludes the middle-income countries. Fortunately, at dispute here is only the quantitative estimate of the impact of policy on aid effectiveness. The qualitative results so far are quite robust.

We turn next to the issue of outliers. To get an insight into their role, we dropped the quadratic term from regression (9) but left the outliers in the data set, yielding regression (10). In Figure 4 we have plotted the part of growth not explained by the variables in regression (10) other than Aid/GDP x Policy against Aid/GDP x Policy. This figure reveals that there are two big negative outliers and three big positive outliers in the Aid/GDP x Policy dimension.[5] These observations are more than five standard deviations from the mean of the data set that remains when they are dropped. The model with the quadratic term fits these data nicely [as evidenced by the 1.78 *t*-statistic on the quadratic term in regression (9)]. However, their inclusion greatly increases the slope of the growth-(Aid/GDP x Policy) relationship in the area near the mean of the data set. We want to emphasize that including the outliers strengthens our basic story; but we think that they lead to an overestimate of the impact of Aid/GDP x Policy on growth in the range where most of the observations are located.

As we expect, dropping the outliers reduces the coefficient on Aid/GDP x Policy from 1.53 in regression (9) to .68 in regression (11). The *t*-statistic is much larger, at 3.18, and the *t*-statistic on the Aid/GDP coefficient is also large (2.15). Without the outliers the quadratic term is insignificant. The plot of regression (11) in Figure 3 is about the same as that of regression (9), when the latter is evaluated at Aid/GDP = 3.7. The problem with the regressions that include the outliers is that the slope of this line is implausibly large when evaluated at low levels of aid.

In the last regression in this section we replace the actual policies -- budget surplus, inflation, and openness -- with the index of these policies [regression (12)]. The results for Aid/GDP and Aid/GDP x Policy are about the same as in regression (11). In

the next section we will treat Policy as an endogenous variable and re-estimate this last equation with instruments for Policy.

Table 5 provides a useful summary of the TSLS results obtained with and without middle-income countries and with and without outliers. The derivative of growth with respect to aid has been consistently estimated to be insignificantly different from zero for observations with average policy (=1.3). The point estimates for this derivative evaluated at a good policy level (=2.5) are all positive. From the low-income country data set we have good confidence that these estimates are significantly different from zero. In the full data set we would have to go to a higher level of policy before we would have such confidence. The most consistent and robust result is that aid has a larger impact on growth in a good policy environment: this result emerges from all of the regressions with confidence ranging from the .01 to the .10 level.[6]

The reason why this result is so robust can be seen in Figure 4. Our results arise from the presence of more than 20 observations with an Aid/GDP x Policy measure above 4.9. It is remarkable that all of these observations have positive unexplained growth. In principle one could have an Aid/GDP x Policy measure around 5 through a combination of large amounts of aid and mediocre policies. In fact, most of these observations have good policy -- in the 2-3 range -- and amounts of aid in the 3-7% of GDP range. It is this group that is consistently growing well -- better than can be explained by the other variables in the growth regressions. These observations cover a wide range of countries including Mali, Ghana, Botswana, Bolivia, El Salvador, and Honduras.

4. Aid and Policies

Up to this point we have taken policies to be exogenous. In this section we relax that assumption in order to investigate whether aid has affected policies and/or whether policies have influenced the distribution of aid. To answer these questions we need to make assumptions about which independent variables can be excluded from the different equations.

We begin by estimating an equation for the allocation of Aid/GDP. There is a literature that has addressed this question [Maizels and Nissanke (1984); McKinlay and Little (1978, 1979); Frey and Schneider (1986); Trumbull and Wall (1994)]. In general this literature has found that donors' strategic interests play an important role in the allocation of aid, whereas commercial interests have not been important. Furthermore, aid is given to countries with low income, and aid/GDP is much higher for countries with small populations. Frey and Schneider find evidence that commitment of World Bank assistance is associated with good policies such as low inflation, but no one has examined whether total aid is allocated in favor of good policies.

The aid allocation equation has large negative coefficients on initial income and population (Table 6).[7] To capture donors' strategic interests we use dummy variables for Sub-Saharan Africa (to which most European aid is directed), the Franc zone (which gets special treatment from France), Egypt (ally of the U.S.), and Central American countries (also in the U.S. sphere of influence). All of these, except the dummy for Sub-Saharan Africa, have large positive coefficients in the aid allocation equation. To capture strategic

interests we also use a measure of arms imports relative to total imports lagged one period. This variable helps explain the allocation of aid to middle-income countries, but has only minor relevance in the low-income country data set.

In the aid equation we instrument for policy using the political-institutional variables from the growth regression. Thus, a key assumption is that these variables do not belong in the aid equation directly. Also, we have two approaches to making the policy index endogenous. In one variant we treat the Sachs-Warner openness dummy as exogenous and use it as an instrument, and in the other variant we do not use it as an instrument. Results for the aid equation are similar, and here we present the former variant. It can be seen that policy has a positive coefficient with a *t*-statistic of 3.63, indicating that donors do reward good policy, after controlling for income, population, and strategic interests.

We estimate separate equations for bilateral and multilateral aid, and for World Bank aid which is part of the latter. The donor interest variables are more important for bilateral than for multilateral aid, for which only the Franc zone dummy is important. In each equation there is a significant positive coefficient on policy. For total, bilateral, and multilateral aid the coefficients indicate that a one standard deviation improvement in the policy index would increase aid receipts by about one-fifth of the mean level of assistance; for World Bank aid the increase is one-third of the mean level. Note that the mean level of bilateral aid is more than twice that of multilateral aid, and that the World Bank represents only about one-quarter of the latter.

While donors have made some effort to reward good policy, they are pursuing other interests as well. Some evidence that these different objectives conflict can be

gained by looking simply at the partial correlation of aid and policy after controlling for income level and population (Table 7). For bilateral aid this correlation is essentially zero, indicating that countries with the same populations and level of income but different policies have received the same level of assistance on average. Thus, the allocation of aid toward donors' friends tends to direct it to poor policies; after controlling for those effects donors make some effort to reward good policy. The net effect is to make bilateral aid orthogonal to policy after adjusting for income level and population. For multilateral and World Bank aid, the partial correlation with policy is positive and quite strong.

Turning to the policy equation, we estimate it as a function of the institutional-political variables that are also in the growth regression and of aid, for which we instrument. From a theoretical point of view, the coefficient on aid could go either way. Since good policies are one factor influencing allocations, aid may promote such policies. On the other hand, it is easy to see how aid might lead to bad policies. We have pointed out that there is no necessary relationship between aid and the budget surplus measure that is one our policies. But the fact of donor support may increase poor countries' access to capital markets and result in larger borrowings and deficits. The existence of aid to finance imports might also reduce the need of closed economies to liberalize their trade regimes to encourage exports. A priori, the effect of aid on policies could go either way.

The key to identifying the policy equation is the assumption that variables such as population and the Franc zone dummy belong in the aid equation but not in the policy equation. With this approach, we find the effect of aid on policies to be insignificantly different from zero (Table 8). Some may find this result surprising, but there are a number of reasons to believe it. On looking more closely at the data, we found that

donors are inconsistent in their treatment of policy. For example, Ghana's aid receipts mirror fairly closely its policy performance, with aid increasing as it reformed (Figure 5). In Zambia, on the other hand, the exact opposite is observed: policy deteriorated continuously throughout this period while aid climbed continuously (Figure 6). More generally, there is very little correlation between aid and policy (Figure 7). We interpret these results to mean that donors have been pursuing different objectives that are not necessarily consistent, and as a result there has not been any systematic influence of aid on policy.

We also estimate an equation for government consumption (Table 8). We retained this variable throughout the growth analysis in order to reiterate that it has no robust association with growth. It turns out that government consumption is strongly a function of aid. We model government consumption as a function of the institutional-political variables that affect our policy index. Following other literature, we also include population and the dependency ratio of the population as explanatory variables (Rodrik, 1996). In this equation we distinguish between bilateral aid and multilateral aid; the former has a large positive association with government consumption whereas the latter has none. Since we think that population belongs in this equation as an explanatory variable, the key instruments now are donor interest variables. The results suggest that the aid associated with donor interests -- primarily bilateral aid -- increases government consumption, which in turn has no positive association with growth. This result provides some insight into why aid is not effective in the typical recipient. The simple relationship between bilateral aid and government consumption is plotted in Figure 8 and is quite striking.[8]

The final step in our work is to re-estimate the growth equation treating both aid and policy as endogenous. Since the institutional-political variables are included in the growth regression, there is a question as to which instruments to use for policy. One option is to treat the Sachs-Warner openness dummy as exogenous and to create instruments that interact this with other exogenous variables such as population. We already have evidence that aid has not systematically affected policy. Thus the main endogeneity that we are concerned with here is correlation of the error term in the policy equation with the error term in the growth equation. In other words, inflation and budget surplus are not strictly speaking choice variables of the government: they combine policy choices with shocks. A negative shock to growth could cause a negative shock to the quality of budget or inflation policies. A similar argument cannot be made about the zero-one trade openness dummy. Table 8 presents the growth regression with the policy index treated as endogenous and with the openness dummy as an instrument. Results are shown both with and without the outliers. The results are very similar to the regressions in which policy is treated as exogenous [for example, regression (12) in Table 4]. In particular, we still have 95% confidence that the derivative of growth with respect to aid is a positive function of policy.[9]

Thus, there is robust evidence that aid has a positive effect on growth in an environment of good fiscal, monetary, and trade policies. Aid has not systematically affected these policies during the 1970-93 period; but when good policy and aid have happened to coincide the outcome has been very good. These results imply that aid would be more effective if greater effort were made to direct it to good policy performers. The potential benefits from such a change can be gauged through a simple counterfactual.

We reallocated 1970-93 aid for our sample of poor countries by setting the coefficients on the donor interest variables to zero and by doubling the coefficient on policy in the aid equation (Table 6). (We scaled the result to have the same mean as the actual data.) This reallocation shifts resources from donors' friends to countries with good policy. The estimated impact on growth can be calculated from the coefficients of the growth regressions. Using regression (8) the mean change in growth rate would be .17 percentage point; with regression (12) the mean change would be .34. The difference stems from the fact that the estimated impact of aid is much greater in the regressions that exclude the middle-income countries. The actual mean growth rate of our poor countries was 1.1%, so that the impact of a more efficient allocation of aid would be quite significant.

A final point is that there is a marked trend toward better policy among poor countries, which means that the climate for effective aid is improving. In our sample the mean of the policy index reached a nadir of 1.0 in the 1982-85 period, and then climbed to a peak of 1.8 in the most recent period, 1990-93. We emphasized that the effect of aid was consistently estimated to be positive for a policy level of 2.5: by 1990-93 15 of our 40 poor countries had attained that level. Going beyond our sample, Sachs and Warner (1995) identify 35 developing countries that liberalized between 1985 and 1994. Many of these countries are very poor, including Benin, Cameroon, Ghana, India, Kenya, Mali, Nepal, Uganda, and Zambia. Hence there are many good opportunities to address poverty in an efficient manner. Ironically, the past two years have seen cutbacks in the financing of foreign aid: in 1994 OECD countries gave the smallest amount, as a share of their

GDP, in twenty years. Thus, the climate for effective aid is improving, while the amount of aid diminishes.

5. Conclusion

In this paper we have investigated several questions regarding the interactions among foreign aid, economic policies and growth. Our primary question concerned the effect of aid on growth. Consistent with other authors, we found that on average aid has had little impact on growth. However, a robust finding was that aid has a positive impact on growth in a good policy environment. This effect goes beyond the direct impact that the policies themselves have on growth.

A second question concerned the allocation of aid: do donors reward good policy? We found that on the margin good policies are rewarded by higher aid.[10] However, we found that other variables, which we regard as reflecting donor interest, have even greater explanatory power in the aid allocation equations for total and bilateral aid. This finding, combined with a separate finding that bilateral aid is strongly positively correlated with government consumption, may help to explain why the impact of foreign aid on growth is not more broadly positive.

Finally, we assessed what we consider to be an interesting counterfactual. Suppose more aid were allocated on the basis of policy rather than on the basis of donor interest, while leaving the total quantity of aid, and the policies of recipients, unchanged. Our results suggest that this would raise the mean growth rate in our sample of poor countries from 1.10% to 1.44%. We think that this is interesting food for thought at a

time when the policies of recipients are generally improving while the world budget for aid is shrinking.

References

Alesina, Alberto, Reza Baqir and William Easterly. 1996. "Public Goods and Ethnic Divisions." World Bank, mimeo.

Barro, Robert. 1991. "Economic Growth in a Cross Section of Countries." *Quarterly Journal of Economics* 56 (2): 407-43.

Barro, Robert, and Jong-Wha Lee. 1993. "International Comparisons of Educational Attainment." *Journal of Monetary Economics* 32 (3): 363-94.

Boone, Peter. 1994. "The Impact of Foreign Aid on Savings and Growth." London School of Economics, mimeo.

—. 1996. "Politics and the Effectiveness of Foreign Aid." *European Economic Review* 40: 289-329.

Chenery, Hollis B., and Moshe Syrquin. 1975. *Patterns of Development: 1950-1970*. Oxford: Oxford University Press.

Christiano, Lawrence J. 1989. "Understanding Japan's Saving Rate: the Reconstruction Hypothesis." *Federal Reserve Bank of Minneapolis Quarterly Review*, 2 (Spring): 10-25.

Easterly, William R., and Ross Levine. 1996. "Africa's Growth Tragedy: Policies and Ethnic Divisions." World Bank mimeo.

Easterly, William R., and Sergio T. Rebelo. 1993. "Fiscal Policy and Economic Growth: An Empirical Investigation." *Journal of Monetary Economics* 32(3): 417-58.

Fernandez-Arias, Eduardo and Luis Serven. 1997. "Measuring Aid Flows: A New Approach." World Bank, mimeo.

Fischer, Stanley. 1993. "The Role of Macroeconomic Factors in Growth." *Journal of Monetary Economics* 32(3): 485-512.

Frey, Bruno S., and Friedrich Schneider. 1986. "Competing Models of International Lending Activity." *Journal of Development Economics* 20: 225-45.

Griffin, K. 1970. "Foreign Capital, Domestic Savings and Economic Development." *Oxford Bulletin of Economics and Statistics* 32 (February): 99-112.

King, Robert G., and Ross Levine. 1993. "Finance, Entrepreneurship, and Growth: Theory and Evidence." *Journal of Monetary Economics* 32 (3): 512-42.

Knack, Stephen, and Phillip Keefer. 1995. “Institutions and Economic Performance: Cross-Country Tests Using Alternative Institutional Measures.” *Economics and Politics* 7 (3): 207-227.

Levine, Ross and David Renelt. 1992. “A Sensitivity Analysis of Cross-Country Growth Regressions.” *American Economic Review* 82(4): 942-963.

Levy, V. 1988. “Aid and Growth in Sub-Saharan Africa: The Recent Experience.” *European Economic Review* 32 (9): 1777-95.

Maizels, A., and M. K. Nissanke. 1984. “Motivations for Aid to Developing Countries.” *World Development* 12 (9): 879-900.

McKinlay, R. D., and R. Little. 1979. “The U.S. Aid Relationship: A Test of the Recipient Need and Donor Interest Models.” *Political Studies* 27 (2): 236-250.

——. 1978. “The French Aid Relationship: A Foreign Policy Model of the Distribution of French Bilateral Aid: 1964-1970.” *Development and Change*, 9: 459-478.

Mosley, Paul and John Hudson. 1996. “Aid, Conditionality and Moral Hazard,” University of Reading Department of Economics and Department of Agricultural Economics and Management Discussion Papers in Development Economics, Series G, Volume III (1995/96), No. 26.

Mosley, Paul, John Hudson and Sara Horrel. 1987. “Aid, the Public Sector and the Market in Less Developed Countries.” *Economic Journal* 97 (September): 616-641.

Pritchett, Lant. 1996. “Mind Your P's and Q's: The Cost of Public Investment is *Not* the Value of Public Capital.” Policy Research Working Paper No. 1660, The World Bank.

Rebelo, Sergio. 1992. “Growth in Open Economies.” *Carnegie-Rochester Conference Series on Public Policy* 36(1): 5-46.

Rodrik, Dani. 1996. “Why Do More Open Economies Have Larger Governments?” mimeo.

Sachs, Jeffrey D. and Andrew Warner. 1995. “Economic Reform and the Process of Global Integration.” *Brookings Papers on Economic Activity* (1):1-118.

Svensson, Jakob. 1996a. “Collusion Among Interest Groups: Foreign Aid and Rent Dissipation.” World Bank, mimeo.

——. 1996b. “When Is Foreign Aid Policy Credible? Aid Dependence and Conditionality.” Institute for International Economic Studies, Stockholm University, mimeo.

Trumbull, William N., and Howard J. Wall. 1994. “Estimating Aid-Allocation Criteria with Panel Data.” *Economic Journal* 104:876-82.

Weisskopf, T. E. 1972. “The Impact of Foreign Capital Inflow on Domestic Savings in Underdeveloped Countries.” *Journal of International Economics* 25-38.

Table 1. Aid, Policies and Growth: Summary Statistics

	Per Capita GDP Growth (% p.a.)	Per Capita GDP 1970-73 (1985 $)	Aid/GDP (%)	Policy (Index)	Aid x Policy
All Obs. (272)					
Mean	1.2	1833	1.6	1.3	1.8
Median	1.3	1419	0.8	1.0	0.8
Standard deviation	3.6	1479	2.1	1.2	4.8
Low-Income (189)					
Mean	1.1	1138	2.1	1.3	2.4
Median	1.2	1132	1.3	1.0	1.2
Standard deviation	3.6	471	2.3	1.2	5.7
Low-Income w/o 5 Outliers (184)					
Mean	1.2	1138	1.9	1.3	2.1
Median	1.2	1132	1.2	1.0	1.2
Standard deviation	3.6	471	1.9	1.1	3.2

Table 2. OLS Panel Growth Regressions
(including Middle Income Countries)

Time dimension: six four-year periods, 1970-73 to 1990-93
Countries: 56 aid recipients
Dependent variable: Growth rate of per capita GDP

Regression No.	(1)	(2)	(3)	(4)	(5)
Observations	284	287	272	272	267
Constant	2.53	2.62	1.60	.56	.92
	(.65)	(.71)	(.35)	(.12)	(.19)
Initial GDP per capita	-.60	-.60	-.48	-.39	-.44
	(1.04)	(1.15)	(.75)	(.60)	(.65)
Ethnic fractionalization	-.007	-.006	-.006	-.005	-.005
	(.90)	(.81)	(.78)	(.67)	(.66)
Assassinations	-.42	-.45	-.40	-.42	-.43
	(1.50)	(1.63)	(1.45)	(1.54)	(1.58)
Ethnic x assassin	.008	.008	.007	.007	.007
	(1.63)	(1.74)	(1.53)	(1.54)	(1.60)
Institutional quality	.66	.65	.66	.67	.71
	(3.75)	(3.75)	(3.70)	(3.76)	(3.95)
M2/GDP (lagged)	.012	.008	.021	.028	.022
	(.95)	(.62)	(1.37)	(1.65)	(1.27)
Sub-Saharan Africa	-1.43	-1.58	-1.33	-1.42	-1.47
	(1.68)	(2.18)	(1.54)	(1.63)	(1.68)
East Asia	.81	.86	.89	1.12	1.26
	(1.43)	(1.52)	(1.53)	(1.83)	(2.05)
Budget surplus	4.07	5.35	4.39	2.27	.90
	(1.03)	(1.68)	(1.08)	(.50)	(.18)
Inflation	-1.56	-1.41	-1.58	-1.21	-1.19
	(3.92)	(3.46)	(3.94)	(2.51)	(2.16)
Openness	2.11	2.07	2.17	1.83	1.61
	(4.11)	(4.07)	(4.13)	(3.32)	(2.76)
Gov consumption	-2.53	--	-7.35	-9.14	-8.25
	(.55)		(1.41)	(1.77)	(1.43)
Aid/GDP	--	--	.09	.08	-.05
			(.82)	(.58)	(.27)
Aid x Policy	--	--	--	.19	.24
				(1.63)	(2.87)
Aid^2 x Policy	--	--	--	-.02	--
				(1.68)	
R^2	.41	.41	.40	.40	.40
Adjusted R^2	.38	.38	.35	.35	.35

Note: *t*-statistics (in parentheses) have been calculated with White's heteroskedasticity–consistent standard errors, for all regressions in the paper.

Table 3. TSLS Panel Growth Regressions
(Including Middle Income Countries)

Time dimension: six four-year periods, 1970-73 to 1990-93
Countries: 56 aid recipients
Dependent variable: Growth rate of per capita GDP

Regression No.	(6)	(7)	(8)
Observations	272	272	267
Constant	4.20	3.34	5.25
	(.75)	(.53)	(.81)
Initial GDP per capita	-.81	-.84	-.95
	(1.06)	(1.06)	(1.11)
Ethnic fractionalization	-.009	-.010	-.010
	(1.05)	(.88)	(1.03)
Assassinations	-.40	-.46	-.39
	(1.40)	(1.59)	(1.38)
Ethnic x assassin	.007	.007	.007
	(1.52)	(1.49)	(1.45)
Institutional quality	.63	.63	.69
	(3.42)	(3.10)	(3.70)
M2/GDP (lagged)	.025	.052	.019
	(1.48)	(1.43)	(1.14)
Sub-Saharan Africa	-.95	-.84	-.92
	(1.12)	(.81)	(1.00)
East Asia	.67	1.31	1.24
	(1.10)	(1.85)	(1.88)
Budget surplus	4.16	-4.09	-.08
	(1.00)	(.67)	(.01)
Inflation	-1.57	-.18	-1.16
	(3.76)	(.18)	(2.09)
Openness	2.41	1.39	1.46
	(4.13)	(1.58)	(2.06)
Gov consumption	-4.14	-7.10	-2.59
	(.63)	(.80)	(.30)
Aid/GDP	-.16	-.52	-.58
	(.27)	(1.07)	(1.23)
Aid x Policy	--	.68	.32
		(1.21)	(1.78)
Aid^2 x Policy	--	-.05	--
		(.86)	
R^2	.39	.33	.38
Adjusted R^2	.34	.28	.33

Instruments: Pop (Ln population), Pop^2, Inf (infant mortality beginning of period), Inf^2, Pop x Policy, Inf x Policy, arms imports (lagged), dummies for Egypt, franc zone countries, Central American countries.

Table 4. TSLS Panel Growth Regressions (excluding Middle Income Countries)

Time dimension: six four-year periods, 1970-73 to 1990-93
Countries: 40 aid recipients
Dependent variable: Growth rate of per capita GDP

Regression No.	(9)	(10)	(11)	(12)
Observations	189	189	184	184
Constant	3.49	10.9	7.58	5.94
	(.39)	(1.33)	(.80)	(.65)
Initial GDP per capita.	-1.26	-1.87	-1.53	-1.26
	(1.09)	(1.68)	(1.17)	(1.02)
Ethnic fractionalization	-.013	-.022	-.013	-.009
	(.89)	(1.70)	(1.11)	(.84)
Assassinations	-1.15	-.51	-.74	-.76
	(1.78)	(.96)	(1.46)	(1.54)
Ethnic x assassin	.006	.003	.003	.002
	(.47)	(.35)	(.23)	(.20)
Institutional quality	.87	.92	.97	.93
	(3.16)	(4.16)	(4.48)	(4.39)
M2/GDP (lagged)	.091	.029	.026	.024
	(1.74)	(1.45)	(1.17)	(1.22)
Sub-Saharan Africa	-1.83	-1.11	-1.84	-2.10
	(1.73)	(1.31)	(2.34)	(2.75)
East Asia	3.53	1.52	2.38	2.33
	(2.46)	(1.74)	(2.73)	(2.72)
Budget surplus	-14.1	-4.64	-4.06	--
	(1.65)	(.63)	(.64)	
Inflation	3.78	.92	.85	--
	(1.55)	(.55)	(.65)	
Openness	-.99	1.56	.09	--
	(.53)	(1.46)	(.08)	
Gov consumption	-10.4	.41	.92	1.38
	(1.01)	(.06)	(.11)	(.18)
Policy	--	--	--	-.04
				(.08)
Aid/GDP	-.94	-1.01	-1.03	-.82
	(1.69)	(1.81)	(2.15)	(1.81)
Aid x Policy	1.53	.37	.68	.58
	(2.30)	(1.69)	(3.18)	(3.22)
Aid^2 x Policy	-.11	--	--	--
	(1.78)			
R^2	.22	.37	.43	.45

Adjusted R^2	.13	.30	.36	.39

Instruments: Pop (Ln population), Pop^2, Inf (infant mortality beginning of period), Inf^2, Pop x Policy, Inf x Policy, arms imports (lagged), dummies for Egypt, franc zone countries, Central American countries

Table 5. Estimated Impact of Aid on Growth

	Derivative of growth with respect to Aid/GDP estimated from regression no.				
Evaluated at:	**(7)**	**(8)**	**(9)**	**(11)**	**(12)**
(a) Policy = 1.3	-.16	-.16	.02	-.15	-.07
(b) Policy = 2.5	.18	.22	.91[a]	.67[b]	.63[b]
Difference (b) - (a)	.34[b]	.38[b]	.89[c]	.82[d]	.70[d]

Significantly different from zero at:
(a) .15 level; (b) .10 level; (c) .05 level; (d) .01 level

Table 6. TSLS Aid Allocation Regressions

Time dimension: six four-year periods, 1970-73 to 1990-93
Countries: 40 aid recipients
Dependent variable: Aid as a percent of GDP

Type of Aid **Mean** **Observations**	**Total** **2.16** **191**	**Bilateral** **1.47** **191**	**Multilateral** **.69** **191**	**World Bank** **.16** **191**
Constant	35.8 (7.25)	19.8 (8.67)	15.9 (5.20)	4.57 (5.46)
Initial GDP per capita	-2.67 (6.90)	-1.44 (6.72)	-1.23 (5.50)	-0.43 (6.56)
Population	-.85 (6.57)	-0.49 (7.75)	-.36 (4.76)	-0.07 (3.52)
Policy	.44 (3.63)	.28 (3.54)	.15 (2.89)	0.05 (3.00)
Sub-Saharan Africa	-0.03 (0.06)	0.32 (1.59)	-0.34 (1.32)	-.10 (1.36)
Egypt	1.71 (4.11)	1.55 (4.28)	0.16 (1.10)	0.09 (1.62)
Franc Zone	.52 (1.46)	.30 (1.16)	.22 (1.66)	.04 (0.53)
Central America	0.73 (1.64)	.84 (2.58)	-0.11 (0.54)	-0.03 (0.46)
Arms imports (lagged)	.0.01 (0.88)	0.01 (0.94)	0.001 (0.44)	-0.002 (2.11)
R^2	.62	.56	.57	.51
Adjusted R^2	.59	.52	.54	.47

Instruments: Ethnic, assassinations, ethnic x assassin, institutional quality, M2/GDP (lagged), East

Asia, Inf, Pop x openness, inf x openness, institutions x openness, pop^2, inf^2

Table 7. Partial Correlation of Aid and Policy

Time dimension: six four-year periods, 1970-73 to 1990-93
Countries: 40 aid recipients
Dependent variable: Aid as a percent of GDP

Type of Aid **Mean** **Observations**	**Total** **2.16** **191**	**Bilateral** **1.47** **191**	**Multilateral** **0.69** **191**	**World Bank** **0.16** **191**
Constant	34.6 (16.5)	20.8 (13.9)	13.8 (15.0)	3.81 (12.3)
Initial GDP per capita	-2.49 (11.3)	-1.45 (9.22)	-1.03 (10.6)	-0.35 (10.8)
Population	-0.81 (11.0)	-0.48 (9.21)	-0.32 (10.0)	-0.06 (5.67)
Policy	0.14 (1.43)	0.01 (0.20)	0.13 (2.91)	0.05 (3.17)
R^2	0.61	0.52	0.56	0.49
Adjusted R^2	0.59	0.50	0.54	0.46

Table 8. TSLS Regressions with Policy as an Endogenous Variable

Time dimension: six four-year periods, 1970-73 to 1990-93
Countries: 40 aid recipients

Dependent variable **Observations**	**Policy** **191**	**Government Consumption** **183**	**Per Capita GDP Growth** **189**	**Per Capita GDP Growth** **184**
Constant	-0.93 (.53)	-66.9 (2.02)	1.68 (0.21)	7.02 (.76)
Initial GDP per capita	0.29 (1.25)	7.14 (2.74)	-0.87 (0.82)	-1.39 (1.12)
Ethnic fractionalization	0.004 (1.22)	0.01 (1.04)	-0.003 (0.26)	-.009 (.80)
Assassinations	0.29 (2.33)	-1.72 (1.95)	-1.39 (2.26)	-.85 (1.67)
Ethnic x Assassin	-0.009 (2.87)	0.03 (1.54)	0.009 (0.76)	.002 (.17)
Institutional quality	.27 (3.24)	-0.81 (2.19)	0.61 (2.06)	.91 (4.07)
M2/GDP (lagged)	-0.02 (2.52)	0.08 (1.30)	0.10 (1.81)	.03 (1.38)
Sub-Saharan Africa	-0.36 (1.68)	2.16 (1.95)	-2.50 (2.50)	-2.19 (2.71)
East Asia	1.29 (7.15)	-1.71 (1.59)	2.77 (1.55)	2.64 (2.26)
Aid/GDP	-0.01 (0.15)	--	-0.41 (0.75)	-1.00 (1.80)
Bilateral Aid/GDP	--	4.34 (3.17)		--
Multilateral Aid/GDP	--	-0.56 (0.29)		--

Population	--	0.96 (1.17)	--
Dependent Population	--	0.03 (0.56)	--

Table 8 (continuation)

Dependent variable **Observations**	**Policy** **191**	**Government Consumption** **183**	**Per Capita GDP Growth** **189**	**Per Capita GDP Growth** **184**
Policy	--	--	-0.17 (0.14)	-.24 (.30)
Gov consumption	--	--	-4.72 (0.43)	1.50 (.19)
Aid x Policy	--	--	1.27 (1.58)	.76 (2.05)
Aid^2 x Policy	--	--	-0.11 (1.65)	--
R^2	0.40	0.18	0.24	0.42
Adjusted R^2	0.35	0.09	0.16	0.36
Instruments:	Population Inf Pop^2 Inf^2 Egypt Central America Franc Zone Arms imports	Same	Same plus Pop x openness Inf x openness Institutions x openness	Same

Appendix Table 1. Countries Included in the Data Set

Sub-Saharan Africa	Latin America	MENA	East Asia	South Asia
Botswana	Bolivia	Algeria	Indonesia	India
Cameroon*	Dominican Rep.	Egypt	Korea	Pakistan
Cote d'Ivoire*	Ecuador	Morocco	Philippines	Sri Lanka
Ethiopia	El Salvador+	Tunisia	Thailand	
Gambia	Guyana	Syria	Malaysia	
Ghana	Haiti	Turkey		
Kenya	Honduras+			
Madagascar	Nicaragua+			
Malawi	Paraguay			
Mali*	Argentina			
Niger*	Brazil			
Nigeria	Chile			
Senegal*	Colombia			
Sierra Leone	Costa Rica+			
Somalia	Guatemala+			
Tanzania	Jamaica			
Togo*	Mexico			
Zaire	Peru			
Zambia	Trinidad & Tobago			
Zimbabwe	Uruguay			
Gabon*	Venezuela			

Note: Countries below the line are the middle-income countries dropped to form the low-income data set.

* Franc zone countries
\+ Central American countries

[1] Because we use 2SLS our actual specification must include an equation for the interaction term $a_{it} p_{it}$. We have left this equation out of the discussion for clarity. We could have used an alternative instrumental variables estimator in order to avoid specifying and identifying this additional equation, but we chose not to do so.

[2] The error term in the policy equation may also be correlated with the error term in the growth equation, providing an additional rationale to instrument for policy.

[3] If we treat budget surplus, inflation, and openness as endogenous variables and instrument for them with lagged values of these variables, the coefficients on the policy variables are nearly identical to those in

regression (2). A policy index formed from these alternative coefficients is correlated .994 with the index that we use.

[4] Since the model has diminishing marginal returns to capital it is appropriate to include a quadratic term in aid.

[5] The negative outliers are two Nicaragua observations (1986-89, 1990-93) while the positive outliers are two Gambia observations (1986-89, 1990-93) and Guyana, 1990-93.

[6] As an additional robustness check we introduced aid interacted with institutional quality into the growth regression. The coefficient on this variable was insignificantly different from zero, and the results for aid interacted with policy were unchanged. We obtained a similar result for aid interacted with the Freedom House civil liberties index. Some voices are calling for aid to be allocated on the basis of human rights. The latter result suggests that such an approach would not lead to a more effective allocation of aid.

[7] We present the equation for the low-income countries including the outliers. The equation without the outliers is similar. Recall that two of the outliers have very bad policy and large aid, and three have very good policy and large aid. Hence the outliers tend to balance each other when investigating the aid-policy relationship.

[8] The observant reader will note that 1% of GDP in bilateral aid is associated with 4.3% of GDP in government consumption. This is possible because aid is measured relative to real GDP at international prices whereas government consumption is relative to GDP at local prices. The consumption price level in developing countries is about one-quarter of the international level. The investment price level, on the other hand, is about the same in developing and developed countries.

[9] If we make the stronger assumption that the trade openness dummy is endogenous and eliminate it as an instrument the result is similar in that aid/GDP has a significant negative coefficient and Aid/GDP x Policy has a significant positive coefficient. In this variant there is a large negative coefficient on the policy index itself, but a large standard error as well. This reflects the fact that there are no good instruments for policy in the regression. Nevertheless, the key result -- the significant effect of Aid/GDP x Policy -- is preserved.

[10] Conditioning on our other, in some cases nontestable, identifying assumptions, we found that the reverse was not true: aid does not appear to induce improvements in policy.