UNITED NATIONS UNIVERSITY

UNU-WIDER

World Institute for Development Economics Research

Research Paper No. 2006/05

On the Empirics of Aid and Growth

A Fresh Look

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January 2006

Abstract

The paper contributes to the empirics of aid and growth by taking a fresh look at the aid-policies-growth nexus emanating from the very influential but also debatable paper on the subject by Burnside and Dollar: 'Aid, Policies and Growth'. We employ three different datasets (including the one used in the Burnside and Dollar paper) and Bayesian instrumental variable methods to test the robustness of the central finding of the Burnside and Dollar paper related to the aid and policy interaction coefficient. In doing so, we applied Bayesian instrumental variable techniques to find the most probable parameter values in the growth equation. We also test for the exogeneity of the instrumental variables used. We find that the marginal effect of the disputed (Aid/GDP) x Policy variable on real per capita GDP growth is substantially smaller than in Burnside and Dollar, thus casting serious doubts on the robustness of their findings, and most importantly, on the validity of the policy lessons emerged from the Burnside-Dollar study.

Keywords: aid, growth, policies, aid effectiveness, Bayesian instrumental variable methods

JEL classification: F35

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This study is a revised version of the paper presented at the 16-17 September 2005 project meeting on Development Aid: A Fresh Look, directed by George Mavrotas and Mark McGillivray.

UNU-WIDER acknowledges the financial contributions to its research programme by the governments of Denmark (Royal Ministry of Foreign Affairs), Finland (Ministry for Foreign Affairs), Norway (Royal Ministry of Foreign Affairs), Sweden (Swedish International Development Cooperation Agency—Sida) and the United Kingdom (Department for International Development).

ISSN 1810-2611 ISBN 92-9190-7771-5 (internet version)

Acknowledgements

The authors would like to thank Jani Luoto, David Roodman and WIDER project meeting participants for useful comments and suggestions. All the remaining errors are our own.

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Camera-ready typescript prepared by T:mi LHR Editorial and Secretarial Assistance

1 Introduction

The aid and growth empirics are as old as aid-giving itself. Indeed, for almost five decades numerous empirical studies have tried in various ways to analyse the impact of aid on growth in aid-recipient countries and thus shed light on the crucial issue of aid effectiveness. For many years the empirical literature on the effectiveness of aid remained inconclusive partly due to lack of good data on aid but also partly due to inappropriate econometrics and simplistic empirical specifications employed in most of the empirical studies.[1] Recent years, however, have witnessed important changes in the aid arena[2] which *inter alia* revived the interest in aid effectiveness issues. Needless to say, current discussion (and debate) on how the Millennium Development Goals (MDGs) can be achieved has generated additional interest in aid effectiveness issues.

One of these changes is related to the focus of the research and policy aid community on the impact of domestic policies in recipient countries on the overall aid-growth nexus. In this regard, the turning point in the aid-growth empirics was the Burnside and Dollar seminal paper published in the *American Economic Review* in 2000 (in fact an earlier version by the same authors was published in 1997 as a background paper for the World Bank study *Assessing Aid* (1998)). One of the key conclusions of the Burnside and Dollar (2000: 847) paper is that aid works better in countries with sound policy regimes and more precisely that '…. aid has a positive impact on growth in developing countries with good fiscal, monetary, and trade policies but has little effect in the presence of poor policies'. The central finding of the Burnside and Dollar study is that aid works only in a good policy environment. Consequently it has been very influential among donor agencies since it provided the donor community with an important policy criterion for allocating aid, namely that aid should be given on a selective basis to countries that have adopted good policies.[3]

At the same time, the Burnside and Dollar study has mobilized a relatively large and still growing empirical literature trying to delve deeper in the aid-policies-growth nexus emphasized by these authors. Many studies have seriously questioned the validity of the empirical results (and thus the policy lessons emerging from the Burnside and Dollar study) on grounds such as inappropriate econometrics, problematic definition of the 'policy' variable, inappropriate specification of the empirical model, endogeneity issues, etc.[4]

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1 It is clearly beyond the scope of the present paper to review the vast early literature of the aid-growth empirics. Tarp (2000); Mavrotas (2000); Beynon (2002); McGillivray (2003); Collier and Dollar (2004) and Addison, Mavrotas and McGillivray (2005) provide recent assessments of the aid effectiveness literature; see also Mosley (1987); White (1992) and Cassen (1994) on earlier reviews of the above literature.

2 Burnell (2004) provides a fascinating discussion of the changing landscape of aid in the 1990s; see also Addison, Mavrotas and McGillivray (2005).

3 See Collier and Dollar (2001, 2002); Beynon (2002, 2003); McGillivray (2003) and Munro (2005) on the selectivity issue.

4 See Hansen and Tarp (2000, 2001); Dalgaard and Hansen (2001); Lensink and White (2001); Guillaumont and Chauvet (2001) and more recently Dayton-Johnson and Hoddinot (2003); Denkabe (2004); Chauvet and Guillaumont (2004); Dalgaard, Hansen and. Tarp (2004) and Ram (2004).

In a recent critique, Easterly, Levine and Roodman (2004) convincingly show, by adding four more years (1994-97) to the original dataset, that the finding regarding the aid-policy interaction is not robust to the use of these additional data, thus casting serious doubts on the policy implications emanating from the Burnside and Dollar study.

The present paper takes a fresh look at the aid-growth empirics by adding a new methodological dimension to the Burnside and Dollar paper and the overall aid-growth empirics. More precisely, we use three different datasets (including the one used in the Burnside and Dollar paper) and Bayesian instrumental variable methods to test the robustness of the central finding relating to the aid and policy interaction coefficient. In doing so, we apply Bayesian instrumental variable techniques to obtain the most probable parameter values in the growth equation. Similarly to the approach adopted in Easterly, Levine and Roodman (2004), we do not deviate from the Burnside and Dollar specification since our primary focus is to test its central empirical finding without employing a different specification. We also test for the exogeneity of the instrumental variables used. We find that the problematic interaction term of aid and policy is not statistically significant in the model even with the heteroscedastic-consistent estimator, and most importantly, its marginal effect on real per capita GDP growth is substantially smaller than in the Burnside and Dollar (2000) paper. This obviously raises important questions regarding the robustness of the Burnside-Dollar findings and the validity of the crucial policy implications emerging from their study.

In the classical inference theory, a sufficient number of observations is more important than in Bayesian statistics, and the efficiency of the estimator is greater when a large number of observations is available. This is because the classical theory of inference is based on asymptotic properties. Furthermore, there is a conceptual difference between the classical school and the Bayesians regarding the interpretation of the parameter estimates and confidence intervals. For instance, the Bayesian posterior interval estimate gives us a specified probability g that parameter value, say θ, lies in that confidence interval conditional on the observed data. Thus, the confidence interval in the classical theory is similar to the Bayesian case, but its interpretation is different—it is considered as a random interval so that the probability it contains, the unknown parameter θ, has a specified confidence coefficient for all possible values of θ. This implies that according to the classical theorists, a confidence interval can be obtained if the calculations are repeated many times or really a large dataset is available. But even then, there is no guarantee that the calculated confidence interval would contain the unknown parameter value θ. This, however, is not the case in the Bayesian theory of inference, as explained above.[5]

Despite these advantages, the Bayesian estimation methods face the same problems as their classical counterpart: for instance, heteroscedasticity and endogeneity issues must be addressed in order to obtain consistent and efficient parameter estimates. The selection of instrumental variables also needs to be addressed since the consistency of the values of the parameters of interest depends on the instrumental variables used. Against this background, we apply in this paper a Bayesian two-stage estimation method to the Burnside and Dollar (2000) regressions, and we also test for the

5 See O'Hagan (1988) and Zellner (1971) for a detailed discussion of the Bayesian approach.

exogeneity of the instruments, both for the Burnside and Dollar (2000) data and the extended datasets.

2 Econometric methodology

The methodology employed in this paper builds on Luoma, Luoto and Siivonen (2003) and Kleibergen and Zivot (2003). It is noted that Luoma, Luoto and Siivonen (2003) allow for heteroscedasticity contrary to the Kleibergen and Zivot (2003) paper.

Burnside and Dollar (2000) use an unbalanced dataset for 56 countries and six periods starting from 1970-73 to 1990-93, i.e., 275 observations. They estimate a growth model by employing Equations 1 and 2 below. In doing so, they use heteroscedastic-consistent OLS and 2SLS estimators to derive the parameter values for the system:

$$g_{it} = y_{it}\beta_y + a_{it}\beta_a + p_{it}'\beta_p + a_{it}p_{it}'\beta_1 + z_{it}'\beta_z + g_t + \varepsilon_{it}^g \tag{1}$$

$$a_{it} = y_{it}\gamma_y + p_{it}'\gamma_p + z_{it}'\gamma_z + a_t + \varepsilon_{it}^a \tag{2}$$

where i stands for countries and t for time, g_{it} represents per capita real GDP growth, y_{it} is the logarithm of initial real per capita GDP, and a_{it} represents aid receipts relative to GDP. $\mathbf{p}_{it}$ is a P x 1 vector of policies that affect growth, $\mathbf{z}_{it}$ is a K x 1 vector of other exogenous variables, a_t and g_t represent fixed-time effects. The expected value of the error terms ε_{it}^g and ε_{it}^a is conventionally zero.

In order to estimate the parameter values of growth Equation (1), we employ a limited information simultaneous equation model in the form:

$$y_1 = Y_2\beta + Z\gamma + \varepsilon_1, \tag{3}$$

$$Y_2 = X\Pi + Z\Gamma + V_2. \tag{4}$$

We then assume that there is an unbalanced collection of time observations for N individuals T_i observations for each, and due to the unbalanced data we have total number of observations, $n = \sum_{i=1}^{N} T_i$. Then y_1 is an n x 1 vector and Y_2 is an n x (m-1) matrix of endogenous variables—there are in all m endogenous variables in the model. Z is an n x k_1 matrix of included exogenous variables. X is an n x k_2 matrix for excluded exogenous variables (i.e., instruments), and ε_1 is an n x 1 vector of structural errors. V_2 is an n x (m-1) matrix of reduced-form errors. The parameters of interest are in (m-1) x 1 vector β and k_1 x 1 vector γ. Matrices X and Z are assumed to be of full rank, uncorrelated with ε_1 and V_2, and weakly exogenous with regard to the parameter β.

The elements ε_{1i} of ε_1 and the rows V_{2i} of V_2 are assumed to be normally distributed with zero mean and m x m covariance matrix:

$$\Sigma_i = \text{var}\begin{pmatrix} \varepsilon_{1i} \\ V_{2i} \end{pmatrix} = \lambda_i \begin{pmatrix} \sigma_{11} & \Sigma_{12} \\ \Sigma_{21} & \Sigma_{22} \end{pmatrix} \tag{5}$$

Note that the coefficient λ_i accounts for heteroscedasticity where i = 1, …, N.

Substituting the reduced-form equation of Y_2 in (4) in Equation (3) for y_1 gives us the unrestricted reduced-form (URF) of the model in Equations (6) and (7). The URF form expresses endogenous variables as a linear function of the exogenous variables and is given by:

$$y_1 = W\delta + v_1, \tag{6}$$

$$Y_2 = UB + V_2, \tag{7}$$

where $W = (UB\ Z)$, $\delta = (\beta'\ \gamma')'$, $U = (X\ Z)$, $B = (\Pi'\ \Gamma')'$ and $v_1 = \varepsilon_1 + V_2\beta$.

Now we have

$\Omega_i = \text{var}\begin{pmatrix} v_{1i} \\ V_{2i} \end{pmatrix} = \lambda_i \begin{pmatrix} \omega_{11} & \Omega_{12} \\ \Omega_{21} & \Omega_{22} \end{pmatrix}$. Using basic matrix calculus we find that $\omega_{11.2} = \varpi_{11} - \Omega_{12}\Omega_{22}^{-1}\Omega_{21}$. Luoma, Luoto and Siivonen (2003) follow Kleibergen and Zivot (2003) by setting the identifying restriction $\phi = \Omega_{22}^{-1}\Omega_{21}$ which implies that $e_1 = v_1 - V_2\phi$ and V_2 are independent and $\text{var}(e_{1i}) = \lambda_i\,\omega_{11.2}$.

The likelihood function for the Bayesian two-stage model with heteroscedasticity correction (B2SH) is:

$$L = P(Y_2|X, Z, \theta)P(y_1|Y_2, X, Z, \theta) \tag{8}$$

where the parameter vector θ contains all model parameters.

Explicit forms of likelihood functions for $P(Y_2|X, Z, \theta)$ and $P(y_1|Y_2, X, Z, \theta)$ are

$$P(y_1|Y_2, X, Z, \theta) \propto \omega_{11.2}^{-0.5n} |\Lambda|^{-0.5} \exp\{-0.5\, \omega_{11.2}^{-1} (y_1 - W\delta - V_2\phi)'\, \Lambda^{-1}(y_1 - W\delta - V_2\phi)\} \tag{9}$$

and

$$P(Y_2|X, Z, \theta) \propto |\Omega_{22}|^{-0.5n}|\Lambda|^{-0.5(m-1)} \exp\{-0.5\, \text{tr}\, \Omega_{22}^{-1} (Y_2 - UB)'\, \Lambda^{-1}(Y_2 - UB)\} \tag{10}$$

respectively.

The diagonal matrix Λ is an n x n covariance-variance matrix consisting of heteroscedasticity correction parameters, i.e., $\Lambda = \text{diag}(\lambda_i)$; $\lambda_i = \exp(\xi z_i)$[6] where z_i is a variable possibly identical to some other variable(s) in the model as argued in Luoma, Luoto and Siivonen (2003). Following Luoma, Luoto and Siivonen (2003) we also use Jeffrey's non-informative prior distributions[7] for the model parameters to obtain posterior distributions. The prior and posterior distributions of parameters are shown in

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6 The variable z_i should not be confused with the notation used in Equation (1).

7 We use non-informative prior information since we want to keep the analysis as objective as possible.

Appendix II. The Metropolis-Hastings algorithm (see Robert and Casella 1999) is used to make draws from the joint posterior p.d.f for B and ξ. The convergence of the Markov chain is controlled visually.

3 Data issues and empirical results

We use three datasets to estimate the parameter values of Equations 1 and 2 above. The dataset labelled as A[8] is the Easterly, Levine and Roodman (2004) counterpart of the original Burnside and Dollar (2000) panel dataset for 56 countries and six 4-year periods from 1970 to 1993. Although the dataset is not identical, Easterly, Levine and Roodman (2004) have managed to replicate the Burnside-Dollar results. The dataset labelled as B is a panel dataset for the original Burnside and Dollar (2000) countries (excluding Somalia (SOM) and Tanzania (TZA)) over the period 1970-2001, consisting of eight 4-year periods. In total, dataset B has 374 observations for 54 countries while the Burnside and Dollar dataset A has 275 observations with outliers included. Panel dataset C contains in total 448 observations for 69 countries covering the same time period as dataset B. Appendix I provides details on how these datasets have been constructed as well as information on definition of variables and relevant data sources. Table 2 in Appendix I lists the countries and time periods covered in datasets A, B and C. Note that outliers[9] are excluded only from dataset A and neither outlier detection nor exclusion methods are undertaken for datasets B and C.

In what follows, we estimate the parameter values for regressions 4 and 5 of Table 4 in Burnside and Dollar study (2000), in which regression 4 also includes the disputed $(\text{Aid/GDP})^2$ x Policy variable, whereas it is dropped from regression 5 since it was found to be not significant in regression 4.

The policy index has been constructed as in Burnside and Dollar (2000). Parameter values for the policy index for datasets A, B and C[10] are given below and full estimation results without the estimated effects of time dummies of regression 1 are reported in Table 3 in Appendix III for all datasets.[11] For the countries included in datasets B and C, we use the following linear combinations to depict the policy conditions at given time period:

Dataset B: Policy_B = 1.428 + 5.213*Budget Surplus (BB) – 2.142*Inflation (INFL) + 1.515*Openness (SACW).

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8 Estimation results reported in Appendix III are obtained using datasets A, B and C. The data source for dataset A is Easterly, Levine and Roodman (2004). Datasets B and C are obtained using the data from Roodman (2004).

9 Burnside and Dollar (2000) drop Gambia in 1986-89 and 1990-93, Guyana in 1990-93 and Nicaragua in 1986-89 and 1990-93 from their sample.

10 The parameter values used in Burnside and Dollar (2000) to derive the policy index are 1.28, 6.85, -1.40 and 2.16, where 1.28 is the parameter value of the constant.

11 Although our estimate regarding the effect of the fast growing Asia countries is marginally lower than Burnside and Dollar (2000), overall we do manage to replicate their results of regression 1 in Table 3 using dataset A constructed by Easterly, Levine and Roodman (2004). The parameter signs for datasets B and C are the same and the levels of marginal effects are similar to those for dataset A.

Dataset C: $Policy_C$ = 1.746 + 6.634*Budget Surplus (BB) – 2.161*Inflation (INFL) + 1.088*Openness (SACW).

Estimation results for the Burnside-Dollar regressions 4 and 5 using samples A, B and C are reported in Tables 4a and 4b in Appendix III. The dependent variable is the real per capita GDP growth and the results are reported without time dummies. B2S stands for the Bayesian two-stage estimator without heteroscedasticity correction, B2SH is the B2S with heteroscedasticity-consistent values. We obtain the results reported in Tables 4a and 4b by employing the year 1970 GDP values in natural logarithm to account for heteroscedasticity of the form $Cov((y_1, Y_2)_i \mid X_i, Z_i, \theta) = \exp(\zeta z_i)\Sigma_i$. The assumption is that initial GDP per capita levels lead to heterogeneous real per capita GDP growth paths.

We draw 20,000-90,000 samples from the conditional posterior distribution of the parameters in Equation (1). We set the burn-in period[12] to the tenth of the sample length to ensure as noiseless statistical inference as possible. The simulated parameter values are the calculated medians of the simulated densities[13] and thus they are the most probable values for the parameter estimates of the given variables. The lower and the upper bounds for the 95 per cent posterior probability interval are reported in brackets below the parameter estimate values. The interpretation of this parameter probability interval is that, given the dataset, 95 per cent of all possible parameter values lie in this region.

Regarding the exogeneity of the instrumental variables we would like to stress that the application of the Stock and Yogo (2002) method for testing weak instruments in the data used in regression 4 indicates that this hypothesis cannot be rejected at the 5 per cent level.[14] The problem is not as severe for the data related to regression 5: allowing for a slightly higher bias in the parameter estimates leads us to reject the hypothesis of weak instruments at the 5 per cent level.

Turning to the empirical results reported in Table 4a, it is evident that estimation with the homoscedastic errors assumption produces parameter estimates with the same signs as in Burnside and Dollar (2000). However, the levels of marginal effects change slightly. The variable measuring institutional quality (ICRGE) and the Sub-Saharan dummy are the only statistically significant variables in these regressions. It is also noteworthy that the parameter values of the variables (Aid/GDP) x Policy and $(Aid/GDP)^2$ x Policy become significant in dataset B but lose their significance again when regression 4 is estimated using dataset C.

Heteroscedasticity-consistent estimation leads to somewhat different findings in connection with regression 4. The 95 per cent posterior probability interval for the heteroscedasticity parameter does not contain zero and hence heteroscedasticity is significant. Negative values of the heteroscedasticity parameter indicate that random

12 The purpose of the burn-in period is to account for possible non-stationary values.

13 To account for a possible bias due to the Markov chain, we utilize every 5th value.

14 In the regressions, there are three and two endogenous variables included, respectively, i.e., Aid/GDP, (Aid/GDP) x Policy and $(Aid/GDP)^2$ x Policy in regression 4 and Aid/GDP and (Aid/GDP) x Policy in regression 5.

growth opportunities are less probable in high GDP per capita growth countries. Although not a statistically significant finding in itself, what is striking is the result that the initial GDP variable shows a positive parameter value when dataset B is used in regression 4.

In Table 4b we report results for regression 5 in Burnside and Dollar (2000). This regression does not contain the $(Aid/GDP)^2$ x Policy variable and thus the number of variables to be instrumented is lower. The institutional quality and the policy index variables are the only ones having a statistically significant marginal effect on the GDP per capita growth while the East Asia dummy becomes significant when dataset C is used in the estimation. Similarly, the negative effect of the Sub-Saharan dummy becomes significant when datasets B and C are used. Overall, the signs of the parameters remain the same as in Burnside and Dollar (2000) except for the sign of the interaction of ethnic fractionalization and assassinations.

However, the magnitude of the parameter values changes dramatically when a new dataset is employed in the estimation. It becomes clear that even though the effect of the aid-policy interaction term is not statistically significant, it is more than two times smaller than the coefficient reported in Burnside and Dollar (2000). It is, therefore, evident that the aid-policy interaction term does not have an effect on GDP growth, and this is in sharp contrast to the central conclusion emerging from Burnside and Dollar. Under heteroscedasticity-consistent estimation, we note that the simulated density functions of the parameter of the aid x policy variable are all symmetric but the variance of the parameter is estimated slightly higher with dataset A as compared to datasets B and C. On the contrary, the kurtosis of density function for the values of this parameter is larger for datasets B and C. Similarly to regression 4 results, we get statistically significant negative values for the heteroscedasticity parameter. In fact, the effect of the aid and policy interaction term is quite similar to the one reported by Easterly, Levine and Roodman (2004) for their expanded dataset.

4 Sensitivity analysis

In this section we conduct a sensitivity analysis to test the robustness of our results in Tables 4a and 4b. The sensitivity results are reported in Tables 5a and 5b in Appendix III. In Table 5a and 5b, we re-run the earlier regressions with the policy index (Policy) constructed in such a way that the variable weights for inflation (INFL), openness (SACW) and budget surplus (BB) have exactly the same values as in Burnside and Dollar (2000). In addition, we use GDP per capita values for both 1970 and 1982 to capture heteroscedasticity.

The sensitivity of the results of B2S estimation to change in the policy index weights for both regression 4 and 5 is much smaller than the sensitivity of the results attained with the B2SH estimator. Our results show that the B2SH results for regression 4 are sensitive both to the weights used in the policy index and to the values of the variable used to account for heteroscedasticity. For instance, when we use the 1970 GDP per capita values to account for heteroscedasticity, we find that the effect of $(Aid/GDP)^2$ x Policy on GDP per capita growth is zero. However, this coefficient gets its expected value when the year 1982 GDP per capita values are used to account for heteroscedasticity.

Finally, regression results for regression 5 in Table 4b are sensitive to the value of the initial GDP per capita used to account for heteroscedasticity—the GDP per capita values for the year 1982 in dataset B change the sign of the convergence parameter to positive, but this is no longer the case when the much broader dataset C is used.

5 Concluding remarks

In this paper we have tried to contribute to the recent empirical literature on aid and growth by taking a fresh look at the aid-policies-growth nexus emanating from the very influential but also debatable seminal paper by Burnside and Dollar (2000).

We employ three different datasets (including the one used in the Burnside and Dollar paper) and Bayesian instrumental variable methods to test for the robustness of the central finding of the Burnside and Dollar paper with regard to the aid and policy interaction coefficient. In doing so, we apply Bayesian instrumental variable techniques to find the most probable parameter values in the growth equation. We also test for the exogeneity of the instrumental variables used.

Although the weights used in the construction of the policy variable seem to some extent to have an impact on the results, we can clearly conclude that the marginal effect of the disputed (Aid/GDP) x Policy variable on real per capita GDP growth is substantially smaller than in Burnside and Dollar (2000), thus casting serious doubts on the robustness of their findings, and most importantly, on the validity of the policy lessons emerged from their study. At the same time, our findings echo recent concern over the Burnside-Dollar results by Easterly, Levine and Roodman (2004) who, by extending the original Burnside and Dollar dataset by four years, have reached the same conclusion. The paper clearly demonstrates that the aid-growth empirics is still an area that requires further research before robust policy conclusions are drawn.

Appendices

Appendix I

Description of datasets

Table 1: Definitions of variables and data sources for datasets B and C

Table 2: Countries and time-periods covered in datasets A, B and C

Appendix II

Description of the conditional and marginal prior distributions for the parameters

Appendix III

Table 3: Policy index construction; estimation results for regression 1 in Burnside and Dollar (2000)

Table 4a: Estimation results for regression 4 in Burnside and Dollar (2000)

Table 4b: Estimation results for regression 5 in Burnside and Dollar (2000)

Table 5a: Sensitivity analysis regressions using dataset B

Table 5b: Sensitivity analysis regressions using dataset C

Appendix I

Dataset A

Description of dataset A can be found in Easterly, Levine and Roodman (2004) on page 3. Their data can be downloaded at www.cgdev.org. We use variables denoted 'BD'—Burnside and Dollar.

Data construction for sets B and C

Datasets B and C are collected from the data sheet in Roodman (2004) and are based on datasets used in Easterly, Levine and Roodman (2004). Roodman's (2004) dataset can also be downloaded at www.cgdev.org. Note that some variables have been revised by Roodman (2004). Other elements have been added to match the datasets of the tested regressions. The time period covered has been extended to 2001 for most variables. All data were collected from standard cross-country sources (see Table 1 below). In what follows, we provide further information on the construction of the dataset.[15]

(a) Revisions since Easterly, Levine and Roodman (2004) (from Burnside and Dollar (2000) dataset)

- Some observations for inflation were completed with wholesale inflation where consumer price inflation was unavailable.
- The update of the Sachs-Warner variable was slightly revised, influenced by the independent update by Wacziarg and Welch (2002).
- Missing values for Effective Development Assistance (EDA) during 1975-95: the period of the EDA dataset was filled in in a manner similar to the method used for filling the missing values outside this period, via a regression of EDA on net ODA.
- ICRGE now varies over time, instead of taking the 1982 values throughout. Observations before 1982 were assigned 1982 values. In addition, the variable was revised in order to extend it beyond 1997. In 1998, the PRS Group stopped reporting two of ICRGE's original components, 'expropriation risk' and 'repudiation of government contracts', so these were dropped entirely from ICRGE, leaving 'corruption', 'bureaucratic quality', and 'rule of law'. On annual data, the revised ICRGE has a 0.97 correlation with the original.
- Missing values for ethnolinguistic fractionalization were filled in from Roeder (2001).

(b) Expansion of period

- The original Roodman (2004) data were collected for all available years over 1958-2001 but here only data for the period 1970-2001 are used.
- The 1998-2001 values for the updated Sachs-Warner variable are based on 1998 data only. Currency Data International, a long-time source of black market premium data, which is one component of Sachs-Warner, shut down in 1999.

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15 These notes are based on Roodman (2004) and modified where appropriate.

Table 1
Definitions of variables and data sources for datasets B and C

Variables	Code	Data source	Notes
Per capita GDP growth	GDPG	World Bank (2003)	
Initial GDP per capital	LGDP	Summers and Heston (1991) updated using GDPG	Natural logarithm of GDP/capital for first year of period: constant 1985 dollars.
Ethno-linguistics fractionalization. 1960	ETHNF	Roeder (2001)	Probability that two individuals will belong to different ethnic groups.
Assassinations per capita	ASSAS	Banks (2002)	Assassinations per capita.
Institutional quality	ICRGE	PRS Group's IRIS III dataset (see Knack and Keefer 1995)	Revised version of the variable. Computed as the average of the three components still reported after 1997.
M2/GDP, lagged one period	M2-1	World Bank (2003)	
Sub-Saharan Africa	SSA	World Bank (2003)	Codes nations in the southern Sahara as Sub-Saharan.
East Asia	EASIA		Dummy for China, Indonesia, South Korea, Malaysia, the Philippines, and Thailand, following Burnside and Dollar.
Budget surplus	BB	World Bank (2003); IMF (2003)	World Bank primary data source. Additional values extrapolated from IMF, using series 80 and 99b (local currency budget surplus and GDP).
Inflation	INFL	World Bank (2003); IMF (2003)	Natural logarithm of 1+inflation rate. World Bank primary data source. Wholesale price inflation from IMF used where consumer price data unavailable.
Sachs-Warner, updated	SACW	Sachs and Warner (1995); Easterly, Levine and Roodman (2004); Wacziarg and Welch (2002)	Extended to 1998. Slightly revised pre-1993. Full description will be published separately.
Effective development assistance/real GDP	AID	Chang, Fernandez-Arias and Serven (1998); DAC (2002); IMF (2003); World Bank (2003); Summer and Heston (1991)	Available values for 1975-95 from Chang, Fernandez-Arias and Serven. Missing values extrapolated based on regression of EDA on net ODA. Converted to 1985 dollars with World Import Unit Value index from IMF, series 75. GDP computed similarly to LGDP above.
Population	LPOP	World Bank (2003)	Natural logarithm of population.
Arms imports/total imports lagged	ARMS-1	US Department of State (various years)	

Source: Roodman (2004).

Table 2
Countries and time-periods covered in datasets A, B and C

	C	B	A	1970-73	1974-77	1978-81	1982-85	1986-89	1990-93	1994-97	1998-01
Argentina	ARG	ARG	ARG	1*	1*	1*	1*	1*	1*	1	1
Burkina Faso	**BFA**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Bulgaria	**BGR**									**1**	**1**
Bolivia	BOL	BOL	BOL	1*	1*	1*	1*	1*	1*	1	1
Brazil	BRA	BRA	BRA	1*	1*	1*	1*	1*	1*	1	1
Botswana	BWA	BWA	BWA		1	1*	1*	1*	1	1	1
Chile	CHL	CHL	CHL	1*	1*	1*	1*	1*	1*	1	1
China	**CHN**							**1**	**1**	**1**	**1**
Cote d'Ivoire	CIV	CIV	CIV			1*	1	1	1	1	1
Cameroon	CMR	CMR	CMR		1*	1*	1*	1*	1*	1	1
Congo, Rep.	**COG**								**1**	**1**	**1**
Colombia	COL	COL	COL	1*	1*	1*	1*	1*	1*	1	1
Costa Rica	CRI	CRI	CRI	1*	1*	1*	1*	1*	1*	1	1
Cyprus	**CYP**					**1**	**1**	**1**	**1**	**1**	**1**
Dominican Republic	DOM	DOM	DOM	1*	1*	1*	1*	1*	1*	1	1
Algeria	DZA	DZA	DZA	*	*					1	1
Ecuador	ECU	ECU	ECU	1*	1*	1*	1*	1*	1*	1	1
Egypt, Arab Rep.	EGY	EGY	EGY		1*	1*	1*	1*	1*	1	1
Ethiopia	ETH	ETH	ETH				1*	1*	1	1	1
Gabon	GAB	GAB	GAB	1*	1*	1*	1*	1*	1*		
Ghana	GHA	GHA	GHA	1*	1*	1*	1*	1*	1*	1	
Gambia	GMB	GMB	GMB	1*	1*	1*	1*	*	1*		
Guatemala	GTM	GTM	GTM	1*	1*	1*	1*	1*	1*	1	1
Guyana	GUY	GUY	GUY	*	*	*	*	*	*	1	
Honduras	HND	HND	HND	1*	1*	1*	1*	1*	1*	1	1
Haiti	HTI	HTI	HTI	1*	1*	1*	1*	1*	1	1	1
Hungary	**HUN**							**1**	**1**	**1**	**1**
Indonesia	IDN	IDN	IDN	1*	1*	1*	1*	1*	1*	1	1
India	IND	IND	IND	1*	1*	1*	1*	1*	1*	1	1

Table 2 continues

Table 2 (con't)
Countries and time-periods covered in datasets A, B and C

	C	B	A	1970-73	1974-77	1978-81	1982-85	1986-89	1990-93	1994-97	1998-01
Iran, Islamic Rep.	**IRN**					**1**	**1**	**1**	**1**	**1**	**1**
Jamaica	JAM	JAM	JAM		1*	1*	1*		1	1	1
Jordan	**JOR**				**1**	**1**	**1**	**1**	**1**	**1**	**1**
Kenya	KEN	KEN	KEN	1*	1*	1*	1*	1*	1*	1	1
Korea, Rep.	KOR	KOR	KOR	1*	1*	1*	1*	1*	1*	1	
Sri Lanka	LKA	LKA	LKA	1*	1*	1*	1*	1*	1*	1	1
Morocco	MAR	MAR	MAR	1*	1*	1*	1*	1*	1*	1	1
Madagascar	MDG	MDG	MDG	1*	1*			1*	1*	1	1
Mexico	MEX	MEX	MEX	1*	1*	1*	1*	1*	1*	1	1
Mali	MLI	MLI	MLI					1*	1	1	1
Myanmar	**MMR**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
Malawi	MWI	MWI	MWI			1*	1*	1*	1*		
Malaysia	MYS	MYS	MYS	1*	1*	1*	1*	1*	1*	1	1
Niger	NER	NER	NER		1*	1*					
Nigeria	NGA	NGA	NGA	1*	1*	1*	1*	1*	1*	1	1
Nicaragua	NIC	NIC	NIC	1*	1*	1*	1*	1*	1*	1	1
Pakistan	PAK	PAK	PAK	1*	1*	1*	1*	1*	1*	1	1
Peru	PER	PER	PER	1*	1*	1*	1*	1*	1*	1	1
Philippines	PHL	PHL	PHL	1*	1*	1*	1*	1*	1*	1	1
Papua New Guinea	**PNG**					**1**	**1**	**1**	**1**	**1**	**1**
Poland	**POL**									**1**	**1**
Paraguay	PRY	PRY	PRY	1*	1*	1*	1*	1*	1*	1	1
Romania	**ROM**									**1**	**1**
Senegal	SEN	SEN	SEN	1*	1*	1*	1*			1	1
Singapore	**SGP**			**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Note: Countries in bold have been included in dataset C only.

Appendix II

Following Luoma, Luoto and Siivonen (2003), the conditional and marginal prior distributions for the parameters are:

$p(\xi) \propto$ constant,

$p(\Omega_{22}, \omega_{11.2}) \propto |\Omega_{22}|^{-0.5m}\, \omega_{11.2}^{-1}$,

$p(B|\xi, \omega_{11.2}, \Omega_{22}) \propto |\Omega_{22}|^{-0.5k}|U'\Lambda^{-1}U|^{0.5(m-1)}$,

$p(\phi|B, \xi, \omega_{11.2}, \Omega_{22}) \propto \omega_{11.2}^{-0.5(m-1)}\, |\Omega_{22}|^{0.5}$.

and

$p(\delta|\phi, B, \xi, \omega_{11.2}, \Omega_{22}) \propto \omega_{11.2}^{-0.5(m+k_1-1)}\, |W'\Lambda^{-1}W|^{0.5}$, where $k = k_1 + k_2$ i.e. the total number of exogenous variables in the model

The joint prior distribution is obtained by multiplying the conditional and marginal prior together, and can be shown to be;

$$p(\delta, \phi, B, \xi, \omega_{11.2}, \Omega_{22}) \propto |\Omega_{22}|^{-0.5(k+m-1)}\, \omega_{11.2}^{-0.5(2m+k_1)}\; |U'\Lambda^{-1}U|^{0.5(m-1)}\, |W'\Lambda^{-1}W|^{0.5}.$$

Using the product of the joint prior combined together with the likelihood function for the parameters $(\delta, \phi, B, \xi, \omega_{11.2}, \Omega_{22})$ we get the conditional and marginal posteriors of the parameters as follows:

$$q(\delta|\phi, B, \xi, \varpi_{11.2}, \Omega_{22}, y_1, Y_2, X, Z) \propto \omega_{11.2}^{-0.5(m+k_1-1)}\, |W'\Lambda^{-1}W|^{0.5} \exp\{-0.5\,\omega_{11.2}^{-1}(\delta-\hat{\boldsymbol{\delta}})'W'\Lambda^{-1}W(\delta-\hat{\boldsymbol{\delta}})\},$$

$$q(\phi|B, \xi, \omega_{11.2}, \Omega_{22}, y_1, Y_2, X, Z) \propto \omega_{11.2}^{-0.5(m-1)}\, |V_2'\Lambda^{-1}MV_2|^{0.5} \exp\{-0.5\,\omega_{11.2}^{-1}(\phi-\hat{\varphi})'\, V_2'\Lambda^{-1}MV_2(\phi-\hat{\varphi})\},$$

$$(\omega_{11.2}|\, B, \xi, \Omega_{22}, y_1, Y_2, X, Z) \propto \omega_{11.2}^{-0.5(n+2)}\, [v'\Lambda^{-1}Mv]^{0.5n}\exp\{-0.5\,\omega_{11.2}^{-1}\, v'\Lambda^{-1}Mv\},$$

$$q(\Omega_{22}|B, \xi, y_1, Y_2, X, Z) \propto |V_2'\Lambda^{-1}V_2|^{0.5(n+k-1)}|\Omega_{22}|^{-0.5(n+m+k-1)}\exp\{-0.5\mathrm{tr}\,\Omega_{22}^{-1}\, V_2'\Lambda^{-1}V_2\}$$

and

$$q(B, \xi|\, y_1, Y_2, X, Z) \propto |U'\Lambda^{-1}U|^{0.5(m-1)}|\Lambda|^{-0.5m}|V_2'\Lambda^{-1}MV_2|^{-0.5}[v'\Lambda^{-1}Mv]^{-0.5n} |V_2'\Lambda^{-1}V_2|^{-0.5(n+k-1)}$$

where $\hat{\delta} = (W'\Lambda^{-1}W)^{-1}W'\Lambda^{-1}(y_1 - V_2\phi)$, $\hat{\varphi} = (V_2'\Lambda^{-1}MV_2)^{-1}V_2'\Lambda^{-1}My_1$, $M = I - W(W'\Lambda^{-1}W)^{-1}W'\Lambda^{-1}$, $v = y_1 - V_2\hat{\varphi}$ and $V_2 = Y_2 - UB$. Due to the unknown functional form of $q(B, \xi|\, y_1, Y_2, X, Z)$ we have to use the M-H algorithm to derive samples from it. In addition, we recall that $n = \sum_{i=1}^{N} T_i$.

Appendix III

Table 3
Policy index construction; estimation results for regression 1 in Burnside and Dollar (2000)

	Regression 1		
	A	B	C
Regressor	OLS	OLS	OLS
Initial GDP	-0.65 [0.55]	-0.09 [0.45]	-0.39 [0.36]
Ethnic fractionalization	-0.58 [0.73]	-0.27 [0.65]	-0.48 [0.66]
Assassinations	-0.44* [0.27]	-0.42** [0.20]	-0.36 [0.23]
Ethnic fractionalization x assassinations	0.81* [0.45]	0.64* [0.35]	0.18 [0.59]
Institutional quality	0.64** [0.17]	0.39** [0.12]	0.36** [0.11]
M2/GDP (lagged)	0.015 [0.015]	0.01 [0.01]	0.00 [0.01]
Sub-Saharan Africa	-1.53** [0.73]	-1.18* [0.68]	-1.47** [0.58]
East Asia	0.89 [0.56]	0.85* [0.48]	1.5** [0.50]
Budget surplus	6.85** [3.39]	5.21 [4.78]	6.63 [4.23]
Inflation	-1.4** [0.41]	-2.14** [0.37]	-2.16** [0.38]
Openness	2.16** [0.51]	1.52** [0.40]	1.09** [0.42]
Observations	275	374	448

Notes: */** Significant at the 10/5 per cent level. Values in brackets are White heteroscedasticity-consistent standard errors.

Dataset A is the Easterly, Levine and Roodman (2004) counterpart for the original Burnside and Dollar (2000) data. Dataset B extends the time period of dataset A by two periods for nearly the same countries (except Somalia and Tanzania). Dataset C contains more countries than datasets A and B. Variables in datasets B and C are revised versions of those in dataset A, see Appendix I.

Table 4a
Estimation results for regression 4 in Burnside and Dollar (2000)

	Regression 4						
	A			B		C	
Regressor	BD 2SLS	B2S 95%	B2SH 95%	B2S 95%	B2SH 95%	B2S 95%	B2SH 95%
Initial GDP	-0.71	-0.75	-0.80	-0.37	0.03	-0.63	-0.40
		[-1.52; 0.10]	[-1.64; 0.03]	[-1.16; 0.38]	[-0.85; 0.83]	[-1.36; 0.10]	[-1.39; 0.61]
Ethnic fractionalization	-0.47	-0.51	-0.10	-0.27	0.17	-0.70	-0.33
		[-2.19; 1.10]	[-1.95; 1.67]	[-1.69; 1.08]	[-1.33; 1.73]	[-2.04; 0.74]	[-2.43; 1.55]
Assassinations	-0.44	-0.45	-0.37	-0.37	-0.32	-0.34	-0.18
	*	[-1.01; 0.12]	[-0.94; 0.19]	[-0.78; 0.08]	[-0.76; 0.10]	[-0.77; 0.12]	[-0.72; 0.34]
Ethnic fractionalization x assassinations	0.75	0.79	0.66	0.44	0.43	0.12	-0.30
	*	[-0.39; 1.99]	[-0.52; 1.92]	[-0.52; 1.41]	[-0.60; 1.44]	[-0.87; 1.03]	[-1.50; 0.88]
Institutional quality	0.68	**0.67**	**0.72**	**0.41**	**0.40**	**0.37**	0.33
	**	[0.31; 1.02]	[0.30; 1.15]	[0.20; 0.60]	[0.18; 0.62]	[0.17; 0.57]	[0.00; 0.60]
M2/GDP (lagged)	0.025	0.02	0.02	0.02	0.01	0.01	0.02
		[0.00; 0.06]	[-0.02; 0.06]	[0.00; 0.05]	[-0.17; 0.04]	[-0.01; 0.03]	[-0.03; 0.06]
Sub-Saharan Africa	-1.71	**-1.62**	**-1.93**	**-1.10**	**-1.33**	**-1.24**	**-1.44**
	**	[-3.10; -0.12]	[-3.94; -0.23]	[-2.15; -0.07]	[-2.55; -0.16]	[-2.33; -0.24]	[-2.82; -0.10]
East Asia	1.27	1.25	1.56	1.07	1.25	**1.44**	**1.49**
	**	[-0.33; 2.83]	[-0.06; 3.26]	[-0.09; 2.33]	[-0.04; 2.50]	[0.35; 2.60]	[0.11; 2.85]
Policy Index	0.65	0.66	0.46	**0.49**	**0.62**	**0.91**	**0.74**
	**	[-0.05; 1.37]	[-0.27; 1.09]	[0.05; 0.95]	[0.18; 1.05]	[0.41; 1.39]	[0.02; 1.44]
Aid/GDP	-0.1	-0.12	-0.01	-0.37	-0.05	-0.32	-0.19
		[-0.54; 0.31]	[-0.52; 0.49]	[-0.91; 0.10]	[-0.69; 0.55]	[-0.77; 0.132]	[-0.97; 0.54]
(Aid/GDP) x Policy	0.37	0.35	0.61	**0.88**	0.50	0.02	0.39
		[-0.36; 1.05]	[-0.21; 1.51]	[0.26; 1.53]	[-0.18; 1.24]	[-0.55; 0.56]	[-1.12; 1.77]
(Aid/GDP)^2 x Policy	-0.038	-0.04	-0.07	**-0.16**	-0.08	0.01	-0.06
		[-0.11; 0.04]	[-0.18; 0.03]	[-0.28; -0.04]	[-0.22; 0.05]	[-0.08; 0.11]	[-0.31; 0.22]
Heteroscedasticity parameter			**-0.71**		**-0.66**		**-0.53**
			[-0.87; -0.52]		[-0.81; -0.52]		[-0.66; -0.40]
Observations	275	275		374		448	

Notes: */** Significant at the 10/5 per cent level. B2S is the Bayesian two-stage estimator and B2SH is the B2S with heteroscedasticity correction. Parameter values in bold are statistically significant, i.e., lie on the 95 per cent posterior probability interval (lower and upper bounds given in brackets). The heteroscedasticity in B2SHs is captured by using GDP per capita values for the year 1970 for each country.

Table 4b
Estimation results for regression 5 in Burnside and Dollar (2000)

	A			B		C	
Regressor	**BD 2SLS**	**B2S 95%**	**B2SH 95%**	**B2S 95%**	**B2SH 95%**	**B2S 95%**	**B2SH 95%**
Initial GDP	-0.9	**-0.91**	-0.87	-0.16	-0.04	-0.61	-0.47
		[-1.8; -0.05]	[-1.81; 0.02]	[-0.95; 0.61]	[-0.86; 0.79]	[-1.33; 0.11]	[-1.30; 0.37]
Ethnic fractionalization	-0.73	-0.72	-0.52	-0.38	-0.08	-0.71	-0.34
		[-2.27; 0.90]	[-2.21; 1.20]	[-1.74; 0.99]	[-1.55; 1.30]	[-2.13; 0.66]	[-1.97; 1.03]
Assassinations	-0.41	-0.40	-0.34	-0.41	-0.37	-0.36	-0.24
		[-1.00; 0.15]	[-0.85; 0.16]	[-0.86; 0.01]	[-0.79; 0.03]	[-0.79; 0.11]	[-0.68; 0.21]
Ethnic fractionalization x assassinations	0.71	0.71	0.68	0.60	0.53	0.13	-0.15
		[-0.46; 1.90]	[-0.48; 1.86]	[-0.33; 1.55]	[-0.42; 1.52]	[-0.81; 1.07]	[-1.09; 0.86]
Institutional quality	0.66	**0.66**	**0.66**	**0.39**	**0.38**	**0.37**	**0.36**
	**	[0.33; 1.00]	[0.27; 1.03]	[0.18; 0.59]	[0.16; 0.59]	[0.18; 0.56]	[0.17; 0.57]
M2/GDP (lagged)	0.017	0.02	**0.00**	0.02	0.01	0.01	0.01
		[-0.02; 0.05]	[-0.03; 0.04]	[-0.01; 0.04]	[-0.02; 0.04]	[-0.01; 0.03]	[-0.01; 0.03]
Sub-Saharan Africa	-1.29	-1.28	-1.44	**-1.13**	**-1.21**	**-1.27**	**-1.40**
		[-2.81; 0.25]	[-3.47; 0.46]	[-2.16; -0.10]	[-2.31; -0.14]	[-2.26; -0.26]	[-2.41; -0.30]
East Asia	1.15	1.18	1.33	0.92	1.09	**1.43**	**1.46**
	**	[-0.20; 2.61]	[-0.24; 2.88]	[-0.19; 2.06]	[-0.16; 2.31]	[0.36; 2.55]	[0.30; 2.62]
Policy Index	0.74	**0.73**	**0.74**	**0.89**	**0.81**	**0.89**	**0.86**
	**	[0.18; 1.26]	[0.22; 1.26]	[0.51; 1.25]	[0.46; 1.16]	[0.51; 1.28]	[0.47; 1.26]
Aid/GDP	-0.32	-0.33	-0.10	-0.15	-0.04	-0.31	-0.19
		[-0.96; 0.26]	[-0.94; 0.77]	[-0.60; 0.34]	[-0.59; 0.52]	[-0.75; 0.16]	[-0.77; 0.37]
(Aid/GDP) x Policy	0.18	0.18	0.10	0.07	0.08	0.07	0.07
	*	[-0.06; 0.43]	[-0.18; 0.40]	[-0.09; 0.23]	[-0.08; 0.26]	[-0.09; 0.25]	[-0.10; 0.24]
Heteroscedasticity parameter			**-0.65**		**-0.45**		**-0.34**
			[-0.87; -0.44]		[-0.61; -0.29]		[-0.48; -0.21]
Observations	270	270		374		448	

Notes: See Table 4a.

Table 5a
Sensitivity analysis regressions using dataset B

	Regression 4			Regression 5		
Year of initial GDP per capita		1970	1982		1970	1982
Regressor	B2S 95%	B2SH 95 %	B2SH 95%	B2S 95%	B2SH 95 %	B2SH 95%
Initial GDP	-0.25	-0.05	0.138	-0.25	-0.17	0.062
	[-1.02; 0.54]	[-0.88; 0.77]	[-0.75; 0.98]	[-1.00; 0.48]	[-1.03; 0.61]	[-0.77; 0.86]
Ethnic fractionalization	-0.52	-0.11	-0.518	-0.48	-0.30	-0.64
	[-1.99; 0.84]	[-1.57; 1.44]	[-1.98; 1.03]	[-1.83; 0.87]	[-1.81; 1.24]	[-2.08; 0.88]
Assassinations	**-0.45**	-0.38	-0.405	**-0.43**	-0.40	-0.41
	[-0.88; -0.02]	[-0.82; 0.04]	[-0.83; 0.05]	[-0.87; -0.01]	[-0.83; 0.07]	[-0.86; 0.00]
Ethnic fractionalization x assassinations	0.68	0.56	0.534	0.65	0.58	0.59
	[-0.26; 1.61]	[-0.45; 1.54]	[-0.53; 1.58]	[-0.31; 1.61]	[-0.43; 1.58]	[-0.40; 1.60]
Institutional quality	**0.35**	**0.33**	**0.290**	**0.35**	**0.33**	**0.28**
	[0.13; 0.54]	[0.10; 0.56]	[0.05; 0.52]	[0.13; 0.56]	[0.11; 0.54]	[0.06; 0.49]
M2/GDP (lagged)	0.03	0.02	0.010	0.03	0.02	0.01
	[0.00; 0.05]	[0.00; 0.05]	[-0.02; 0.04]	[0.00; 0.05]	[0.00; 0.05]	[-0.01; 0.04]
Sub-Saharan Africa	-0.86	-0.92	-0.505	-0.88	-0.86	-0.47
	[-1.93; 0.23]	[-2.12; 0.27]	[-1.84; 0.87]	[-1.94; 0.17]	[-1.91; 0.29]	[-1.70; 0.76]
East Asia	0.70	0.89	1.244	0.72	0.80	1.10
	[-0.51; 1.90]	[-0.41; 2.12]	[0.00; 2.47]	[-0.44; 1.23]	[-0.38; 1.98]	[-0.05; 2.23]
Policy Index	**0.88**	**0.81**	**0.731**	**0.85**	**0.84**	**0.83**
	[0.40; 1.36]	[0.36; 1.27]	[0.30; 1.22]	[0.46; 1.23]	[0.47; 1.21]	[0.46; 1.18]
Aid/GDP	-0.23	-0.08	0.149	-0.21	-0.16	0.05
	[-0.72; 0.28]	[-0.66; 0.54]	[-0.72; 0.92]	[-0.71; 0.28]	[-0.74; 0.36]	[-0.64; 0.75]
(Aid/GDP) x Policy	0.04	0.10	0.311	0.09	0.07	0.05
	[-0.57; 0.66]	[-0.71; 0.92]	[-0.99; 1.44]	[-0.08; 0.26]	[-0.11; 0.24]	[-0.15; 0.25]
(Aid/GDP)^2 x Policy	0.01	0.00	-0.060	–	–	–
	[-0.11; 0.12]	[-0.17; 0.15]	[-0.30; 0.23]			
Heteroscedasticity parameter		**-0.65**	**-1.18**		**-0.42**	**-0.89**
		[-0.79; -0.50]	[-1.32; -1.03]		[-0.57; -0.27]	[-1.05; -0.71]
Observations	374	374	374	374	374	374

Notes: Weights for variables in policy index construction are the same as in Burnside and Dollar (2000). B2S is the Bayesian two-stage estimator and B2SH is the B2S with heteroscedasticity correction. Parameter values in bold are statistically significant, i.e., lie on the 95 per cent posterior probability interval. The lower and upper bounds of that interval are given in brackets. In B2SH estimation we use GDP per capita values for both 1970 and 1982 to capture heteroscedasticity in the data.

Table 5b
Sensitivity analysis regressions using dataset C

	Regression 4			Regression 5		
Year of initial GDP per capita		1970	1982		1970	1982
Regressor	B2S 95%	B2SH 95 %	B2SH 95%	B2S 95%	B2SH 95 %	B2SH 95%
Initial GDP	**-0.75**	-0.62	-0.79	**-0.72**	-0.55	-0.57
	[-1.50; -0.02]	[-1.59; 0.22]	[-1.68; 0.23]	[-1.43; -0.03]	[-1.35; 0.24]	[-1.47; 0.24]
Ethnic fractionalization	-0.71	-0.10	-0.75	-0.76	-0.40	-0.71
	[-2.04; 0.70]	[-1.89; 1.81]	[-2.56; 1.09]	[-2.17; 0.64]	[-1.90; 1.05]	[-2.33; 0.82]
Assassinations	-0.33	-0.22	-0.33	-0.35	-0.28	-0.32
	[-0.79; 0.12]	[-0.71; 0.29]	[-0.90; 0.18]	[-0.80; 0.12]	[-0.73; 0.15]	[-0.78; 0.16]
Ethnic fractionalization x assassinations	0.12	-0.15	0.07	0.15	-0.07	0.05
	[-0.89; 1.09]	[-1.23; 0.95]	[-1.02; 1.20]	[-0.87; 1.08]	[-1.02; 0.89]	[-1.00; 1.04]
Institutional quality	**0.37**	**0.39**	**0.36**	**0.36**	**0.33**	**0.31**
	[0.16; 0.58]	[0.14; 0.67]	[0.06; 0.61]	[0.17; 0.56]	[0.12; 0.53]	[0.11; 0.51]
M2/GDP (lagged)	0.01	0.01	0.02	0.02	0.01	0.01
	[-0.01; 0.04]	[-0.03; 0.04]	[-0.02; 0.05]	[-0.01; 0.04]	[-0.01; 0.04]	[-0.01; 0.04]
Sub-Saharan Africa	**-1.09**	-1.17	-1.02	**-1.11**	**-1.20**	-0.98
	[-2.02; -0.05]	[-2.36; 0.11]	[-2.26; 0.15]	[-2.13; -0.07]	[-2.30; -0.07]	[-2.11; 0.12]
East Asia	**1.37**	1.16	1.29	**1.43**	**1.26**	**1.34**
	[0.20; 2.46]	[-0.19; 1.16]	[-0.10; 2.66]	[0.28; 2.51]	[0.09; 2.43]	[0.12; 2.45]
Policy Index	**0.70**	**0.85**	**0.70**	**0.65**	**0.72**	**0.72**
	[0.28; 1.11]	[0.35; 1.39]	[0.09; 1.21]	[0.27; 1.03]	[0.36; 1.1]	[0.33; 1.09]
Aid/GDP	-0.44	-0.26	-0.47	-0.44	-0.29	-0.33
	[-0.93; 0.07]	[-0.92; 0.40]	[-1.13; 0.23]	[-0.90; 0.04]	[-0.90; 0.33]	[-1.00; 0.33]
(Aid/GDP) x Policy	0.04	-0.27	0.08	0.14	0.11	0.11
	[-0.44; 0.52]	[-1.35; 0.73]	[-0.87; 1.20]	[-0.01; 0.30]	[-0.05; 0.28]	[-0.06; 0.28]
(Aid/GDP)^2 x Policy	0.02	0.07	0.01	–	–	–
	[-0.06; 0.10]	[-0.11; 0.26]	[-0.19; 0.17]			
Heteroscedasticity parameter		**-0.39**	**-0.05**		**-0.34**	**-0.30**
		[-0.52; -0.27]	[-0.18; 0.07]		[-0.46; -0.20]	[-0.44; -0.16]
Observations	448	448	448	448	448	448

Notes: See Table 5b.

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