Zagreb International Review of Economics & Business, Vol. 15, No. 1, pp. 1-22, 2012

ISSN 1331-5609; UDC: 33+65

Foreign Financial Aid, Government Policies and Economic Growth: Does the Policy Setting in Developing Countries Matter?

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Abstract: Does foreign aid contribute to economic growth? If so, is the impact of aid conditional on good policies? This is a controversial issue. While the World Bank (1998) contends that the aid is effective only if recipient governments have good policies, others refute this view and argue that aid enhances economic growth regardless of the type of policies. This paper proposes new measures of policy that are more directly controlled by recipient governments and examines whether any significant relationship exists between foreign aid, government policies and economic growth. It is revealed that foreign aid has a positive impact on real growth per capita and this effect is not contingent upon the type of economic policies adopted by the recipient countries.

Keywords: World Bank, Foreign Aid, Government Policies, Economic Growth and Generalised Method of Moments

JEL Classification: C1, C8, O10, O11, O19, O47.

Does foreign aid contribute to economic growth? If so, is the impact of aid conditional on good policies? This has been a controversial issue. While Burnside and Dollar (1997 and 2000), and the World Bank (1998) contend that the impact of aid is effective only if governments have good policies, others refute this view and argue that aid enhances economic growth regardless of the type of policies.[2]

Traditionally foreign financial aid has been viewed as a significant incentive for development however this view has always been controversial. The debate on the effects of financial aid on growth can only be resolved with empirical evidence. The experience of many developing countries could reveal that effective foreign aid should bring a package of finance and good ideas, and that a proper combination of these two is important for economic development. Experience with a number of developing countries, shows that there needs to be better macroeconomic manage-

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ment and established institutions for effective use of foreign financial aid. Studies by Burnside and Dollar (1997, 2000) and Collier and Dollar (2001) found that foreign financial aid can raise economic growth and reduce poverty in the long run but only under a good policy environment.

A key study challenging this view is Hansen and Tarp (2001). The principal contribution of this research is to construct a different policy index variable (from that used by the extant literature) that may be more appropriate in measuring the effectiveness of foreign aid. That is why a new macroeconomic policy index containing the policy measures that recipient governments can directly control has been introduced. Using data from the World Bank (1998), five panels of four years covering the periods 1974-1977 to 1990-1993 for 56 aid-receiving developing countries examine whether any significant relationship exists between foreign aid, government policies and economic growth. The estimation strategy involved econometric techniques including the ordinary least square (pooled OLS) model, fixed-effects (FE) model, random-effects (RE) model, FE within instrument variables (IV) model, two stage least square (2SLS) model estimator and GMM (Generalised Method of Moments) using the Arellano and Bond (1991) dynamic panels model.

A key finding of this research is that the aid-policy interaction parameter, which was statistically significant in Burnside and Dollar (2000), is no longer a significant determinant even in countries with sound policy environments. However, the interaction of $(Aid)^2$ with Policy is positive and statistically significant in most cases, indicating the presence of scale effects of aid. The coefficient of the Aid/GDP ratio is statistically significant and has positive coefficient parameters in almost all estimated regressions. An additional key finding is that the log of the initial level of income is statistically significant, thus indicating conditional convergence among the countries in the sample. Overall our regression results are more efficient than those in other studies. This addresses three key questions: (a) Does foreign financial aid contributes to economic growth? (b) Is the impact of financial aid conditional on the policy setting? and (c) Is there a conditional convergence among the countries in the sample?

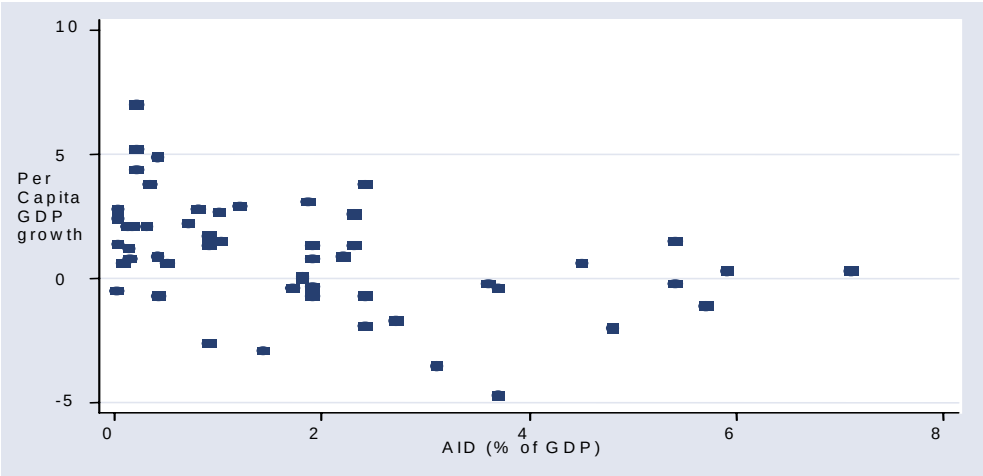
The plan of this paper is as follows. Section 1 discusses the theoretical background and debate of recent aid-policy-growth empirical studies. Section 2 reviews the issue of the construction of the policy index. Section 3 sets out the model and lists the data sources.[3] Section 4 discusses the results and their broader implications. Finally, section 5 concludes.

Theoretical Background and Aid-Policy-Growth Debate

According to the Development Assistance Committee (DAC) of the Organisation of Economic Cooperation and Development (OECD) foreign financial aid consists of

grants, concessional loans and net of previous aid loans - a measure that absolves of past loans as current aid. This measure of foreign aid is called net Official Development Assistance (ODA). Foreign aid is usually associated with ODA and is targeted toward countries with low per capita income (see Figure 1).

Figure 1: Partial scatters of initial GDP per capita against foreign aid



Note: Countries with low per capita income have received more foreign aid and vice versa.
Source: Author's own calculation

Regardless of the recent trend of large private capital inflow to developing countries, foreign aid remains an important source of external capital to lower income countries. In some cases this amount is about eight per cent of Gross Domestic Product (World Bank, 1998).

Many developing countries have received substantial foreign aid but have shown both success and failure in terms of growth and poverty reduction. For example, Botswana and the republic of Korea have gone through crisis to rapid economic development. Foreign aid played a significant role in each transformation, contributing ideas, to support agricultural reforms and restructure of public service. Therefore financial aid has changed the lives of millions of the poor in low-income countries. On the other hand, in countries such as Zaire, Zambia, Nicaragua, and Malawi decades of large scale foreign assistance has resulted in failure (World Bank, 1998).

Thus there is substantial debate on the effect of foreign financial aid on economic growth. In an early survey, Mosely (1980) presented a historical review of the related literature and found that foreign aid stimulates economic growth. However, Vos (1988) showed that foreign aid has depressed the growth of recipient countries. Further, Gyimah-Brempong (1992), Potiowsky and Qayum (1992) and White (1992)

found no clear evidence of the impact of foreign aid on growth of recipient countries. But the comprehensive literature survey by Hansen and Tarp (2000) of three generations of empirical aid-growth study, including the Harrod-Domar models, the reduced form models of aid-growth, and the new growth theory models concluded that a positive relationship exists between aid and growth.

Furthermore policy settings were added to the debate on the linkage between foreign aid and economic growth. Two competing views have emerged. On one hand, Burnside and Dollar (1997) and the World Bank (1998) contend that foreign aid contributes to economic growth effectively in a good policy environment, while it has had no measurable effect in countries with poor policies. Burnside and Dollar (1997: 4) say, for example: 'foreign aid accelerates growth and poverty reduction in developing countries that pursue sound economic policies. It has had no measurable effect in countries with poor policies'. The World Bank (1998: 2,14), stressed almost identically: 'financial aid works in a good policy environment… aid has a large effect when countries have sound management … policies have a critical influence on the effectiveness of aid'. The main point is that foreign aid has a substantial positive effect on countries that pursue good policies, but has a negative effect in countries with bad policies. Their argument is that foreign aid should be reallocated in favour of poor countries with good policies.

Contrary to the World Bank (1998) and Burnside and Dollar's (2000) argument, some of the empirical literature suggests that there is indeed a positive relationship between foreign aid and economic growth, and that this is largely independent of the policy environment. Good policy does enhance growth, but is not a necessary condition for aid to be effective. The main results in this context are those of Durbarry et al. (1998), Hadjimichael et al. (1995), and Hansen and Tarp (2001) who all find a significant impact of foreign aid on economic growth, as long as the foreign aid to GDP ratio is not enormously high.

Hansen and Tarp (2001) contend that there is a robust aid-growth link even in countries hampered by an unfavourable policy environment. They argue that much is still not known about the complex links between foreign aid, policies and economic growth and critique the Burnside and Dollar (2000) and World Bank (1998) studies by pointing out that their results were sensitive to data and model specification, and most notably, the critical aid-policy interaction depended only on five observations and expansion of the sample by two per cent. In addition, a foreign aid variable was tested only in its interaction with policy. It was not quadratic, which is a rule of thumb in many empirical studies. Hansen and Tarp (2001) therefore, added quadratic aid and quadratic policy in order to re-evaluate Burnside and Dollar's (2000) findings, which were consequently nullified. The issue of which policies should be included in the policy index also added a critical edge to the debate, understanding the importance of endogeneity and exogeniety of policy variables.

A critical review of aid policies also reveals that the resources available to donors have constantly diminished since the 1980s, providing an impetus to the debate to evolve further. From the Development Assistance Committee (DAC) of the Organisation of Economic Cooperation and Development (OECD) to the Bretton Woods Institutions, donor countries and agencies increasingly focused on the responsibility of recipient countries in sharing the cost of development. A paradigm shift in foreign aid in the 1990s, is evident in the key initiatives such as the New Development Strategy of the OECD/DAC (1998) and Poverty Reduction Strategy Paper initiatives of the World Bank (1999). In both documents, the agenda of donor countries and agencies is couched in such phrases as partnership with and ownership of recipient countries in the process of development (JICA, 1998; World Bank, 2001). In addition, factors such as good governance, democracy and civil society that were previously regarded as political issues were increasingly mentioned as conditions facilitating economic growth consequent upon a program of foreign aid.

Irrespective of what perspective one holds, this debate, clearly, has left many unresolved questions both theoretical and empirical.

Construction of the Policy Index

The extant studies, which examined the linkage between aid, policy and growth, used the Burnside and Dollar (2000) policy index. This included: the budget surplus share of GDP, inflation rate, and trade openness. A combination of these was defined as a policy index and expressed in the following equation.[4]

$$Policy = f\left\{\beta\left(bud.surp.\right) + \beta\left(\text{inf}lation\right) + \beta\left(openness\right)\right\}, \tag{1a}$$

$$Policy = 1.28 + 6.85\left(bud.surp\right) - 1.4\left(\text{inf}lation\right) + 2.16\left(openness\right), \tag{1b}$$

This study argues that the use of this policy index, especially its inclusion of inflation as a direct policy indicator, is inappropriate. Before deciding which policy variable should form the policy index, a qualification is necessary. While many types of selection are possible, the present study emphasises controllability by the government. For example, no government or central bank can directly control inflation rates unless it follows a successful inflation- targeting program. Most developing countries do not. However, they can better manage narrow money supply (M1) growth, which influences inflation rates. Hence, narrow money is a better indicator of policy than inflation. Inflation should be considered more as an outcome of a policy than a policy itself. This is also the case for budget surplus. In terms of the 'openness' variable they used Sachs-Warner's (1995) measure of openness as a dummy variable,

which has been criticised by Rodrik and Rodriguez (2000) for being biased and not relevant in classifying the type of economy (for example, a closed economy or a socialist one).

In this research, the sum of annual weights of narrow money (annual growth), tax revenue (share of GDP), total public expenditure (share of GDP) and trade openness are used as an alternative policy index as follows:

$$Policy = f\left\{\beta\left(\frac{TR}{GDP}\right)+\beta\left(\frac{Exp}{GDP}\right)+\beta\left(\frac{dM1}{dt}\right)+\beta(Openness)\right\}, \quad (2a)$$

$$Policy = f\left\{\beta\left(\frac{TR}{GDP}\right)+\beta\left(\frac{Exp}{GDP}\right)+\beta\left(\frac{dM2}{dt}\right)+\beta(Openness)\right\}, \quad (2b)$$

In equation (2a), the $\left(\frac{dM1}{dt}\right)$ reflects narrow money growth and in (2b), the $\left(\frac{dM2}{dt}\right)$ reflects broad money growth. Almost all developing countries use these indicators for monetary management rate; the tax revenue share of GDP (TaxRev/GDP) means that high tax revenue collection for the government is a greater fiscal control of the recipient government; the public expenditure share of GDP implies the government spending level, which could be spent for effective purposes and (openness)[5] is a sum of country levels of exports and imports as a share of GDP, which indicates a country degree of trade openness. All these policy variables are within government control. Replacing the model with a set of actual policy variables could be helpful in illuminating the debate on aid effectiveness.

Data and Model Specification

The data set covering the five four-year periods from 1974-1993 for 56 aid-receiving countries is used (Table A1 in Appendix). Data on the new index of policy variables is obtained from the World Development Indicators (WDI, 2001). The foreign aid variable covering aid flows originates from the OECD/DAC countries. As some data are missing for some countries, because they are either not available or not disclosed, the total number of observations is reduced. Panel data are used with observations on countries over time periods. The error term can be expressed: $U_{it}=\mu_i+\varepsilon_{it,}$ where μ_i is a time invariant country specific effect (parameter) and ε_{it} is random noise (error).

The model used for the empirical analysis to estimate the relationship between foreign aid, good policy settings and economic growth reported in this research is specified as follows.

$$\Delta Y_{it} = \beta_0 + y_{i0}\beta_1 + \left(Aid\ \right)_{it}\beta_2 + P_{it}\beta_3 + \left(Aid\ * P\right)_{it}\beta_4 +$$
$$+\left(Aid\ \right)_{it}^2\beta_5 + \left\{\left(Aid\ \right)^2 * P\right\}_{it}\beta_6 + P_{it}^2\beta_7 + Z_{it}\beta_z + \lambda_t + u_{it},$$

Where

ΔY_{it} - is the average annual rate of growth of real GDP per capita,
y_{i0} - is the real GDP per capita in the initial year,
$(Aid)_{it}$ - is the foreign aid receipts relative to GDP,
P_{it} - is the P x 1 vector of policies that affect growth,
Z_{it} - is the K x 1 vector of other exogenous variables that might affect growth and the allocation of aid,
λ_t - is the constant term that may change over time or an intercept dummy that takes the value one for period t and 0 otherwise, and
u_{it} - is the error term i and
t - index country and time respectively.

Equation (3) is the same as the empirical model used by Burnside and Dollar (1997 and 2000) and Hansen and Tarp (2001). Using this model the paper examines whether the coefficient of (Aid*Policy) is strongly significant (as Burnside and Dollar found) or not (as Hansen and Tarp found). However, this study proposes the new policy variable (2), which is different from their policy measures, equation (1). Following Knack et al. (1995), Easterly and Levine (1997), Burnside and Dollar (1997, 2000), World Bank (1998), Hansen and Tarp (2001) and Easterly et al. (2003), a subset of the (K x 1) vector of exogenous variables (Z_{it}), which are not affected by the level of foreign aid or growth rate in the aid-growth equation is also included. These variables (such as a measure of institutional quality and ethno-linguistic fractionalisation) include the different institutional and political factors that might affect economic growth. Table A3 in the Appendix shows statistical summaries of explanatory variables, which are used in this study. Furthermore this paper introduced a time period dummy variables, to capture time-variant effects across all the aid-recipient countries.

Following previous studies, foreign aid is assumed to be endogenous. However the policy variable is not treated as endogenous in all regressions because many individual policy variables are not correlated with the initial level of GDP per capita. By using Hausman's (1979) test for endogeneity (see also Wooldridge (2002)) the reduced form is estimated for endogenous variables and regressions (tests) are run to check whether the instrument variables correlate with endogenous variables. The set of (ten) instruments are uses to improve efficiency for the endogenous regressors.

The estimators are consistent with different assumptions about the time invariant country specific effects (μ_i). All of the estimators assume that the idiosyncratic error term ε_{it} has a zero mean and is uncorrelated with the variables in X_{it}. As in the case where there are no endogenous covariates, there are varying perspectives on what

assumptions should be made about the (μ_i) The time-invariant country specific effects may occur at fixed time or randomly. If they are assumed to be fixed, then the (μ_i) may be correlated with the variables in $X_{it,}$ and the "within" estimator is efficient within a class of limited information estimators. Now, consider a simple five-period model and rewrite (3) as:

$$\Delta Y_{it} = \beta_0 + \delta y_{it-1} + \sum_{j=1}^{k} \beta_j X_{jit} + \lambda_5 d5_t + \mu_i + \varepsilon_{it}, \tag{4}$$

Taking the mean over time of each variable will give

$$\Delta \bar{Y}_i = \beta_0 + \delta \bar{y}_i + \sum_{j=1}^{k} \beta_j \bar{X}_{ji} + \lambda_5 \bar{d}5 + \mu_i + \bar{\varepsilon}_i, \tag{5}$$

Subtracting (5) from (4) gives

$$\Delta Y^*_{i5} = \delta y^*_{i5} + \sum_{j=1}^{k} \beta_j X^*_{ji5} + \lambda_5 + \varepsilon^*_{i5}, \tag{6}$$

OLS on the model (6) is called fixed effects estimation. The estimate of β_j is also called the "within" estimate.

Alternatively, the (μ_i) may be random, in which case the (μ_i) are assumed to be independent and identically distributed over the panels. If the (μ_i) are uncorrelated with the variables in $X_{it,}$ then the GLS random effects estimators are more efficient than the within estimator (Stata Corp., 2001). However, both methods (FE (within) IV and random-effects estimators) are used to find which method has the best properties (of consistency and efficiency) for the aid-policy-growth model.

The instrument variable estimator for the dynamic panels introduced by Anderson and Hsiao (1981) generates consistent estimates for our parameters in (3). Therefore alternatively to the fixed effects estimator model, differencing all the data could eliminate the country specific effects. To remove the entire specific unobserved effects, first write (3) as:[6]

$$\Delta Y_{it} = \beta_0 + \delta y_{it-1} + \sum_{j=1}^{k} \beta_j X_{jit} + \lambda_t + u_{it}, \tag{7}$$

Upon differencing equation (7) becomes:

$$\Delta Y_{it} - \Delta Y_{it-1} = \delta\left(y_{it-1} - y_{it-2}\right) + \sum_{j=1}^{k} \beta_j \left(X_{jit} - X_{ji,t-1}\right) + \left(\lambda_t - \lambda_{t-1}\right) + \varepsilon_{it} - \varepsilon_{it-1}, \tag{8}$$

In (8) all the regressors are correlated with the error term.[7] This problem is solved by introducing lagged observations of some regressors as instruments.[8]

Finally, the Generalised Method of Moment (GMM) dynamic panel model (Arellano and Bond, 1991)[9] is used for the purpose of over-identifying restrictions and finding conditional convergence of the log of initial level of income per capita.

Following Burnside and Dollar (2000) the study estimates the impact of Aid on growth. The aggregate production function form $Y = AK^{\lambda}$ is examined to see whether foreign financial aid affects output through its effect on the stock of capital (as investment). The derivative of growth with respect to aid for all regressions is:

$$\frac{dY}{dF} = \lambda A K^{\lambda-1} \frac{\partial K}{\partial F}, \tag{9}$$

where dY indicates the increase in output effected by the contribution of aid. $\partial K/\partial F$ is the portion of an additional unit of aid that is invested, and dF is the amount of aid contributed. Alternatively growth with respect to aid can be derived as:

$$\frac{\partial Y}{\partial (Aid)} = \beta_k + 2\beta_{kk} * \bar{X}_k + \sum_{j \neq k} \beta_{kj} * \bar{X}_{ji}, \tag{10}$$

where $\bar{X}_s$ are the means of explanatory variables used in the regressions.

Regressions, Results and Discussion

First, following Burnside and Dollar (1997), equation (3) is estimated without including aid and policy index by using the simple pooled OLS model for unbalanced panels of 56 aid receiving-countries across five-periods. The results are presented in Table 1 (column 1) institutional quality (Government), openness, initial level of per capita GDP growth and the dummies for Sub-Saharan Africa and for East Asia are generally significant in growth regression. Aid is introduced in the regression column (2), where the differences of changing explanatory variables and their impact in growth regression can be seen. Aid is insignificant with a negative coefficient.

To build a policy index[10], which consists of tax revenue, total public expenditure, terms of trade and annual growth of money indicators, regression coefficients are used from column 1 Table 1:

$$Policy = .0364 + .00098\left(\frac{TR}{GDP}\right) - .00031\left(\frac{Exp}{GDP}\right) - 4.89e^{-06}\left(\frac{dM1}{dt}\right) + .00004\,(Openness), \tag{11a}$$

Given the sizes (and signs) of the coefficients, it appears that TaxRev/GDP and Openness have large effects on the policy index, while the index of policy can be negative if (dM1/dt) or (Exp/GDP) are growing.

In column (3) in Table 1, regression results were reported after using the new policy index. This index is significant and has a very large coefficient with a large t-statistic.

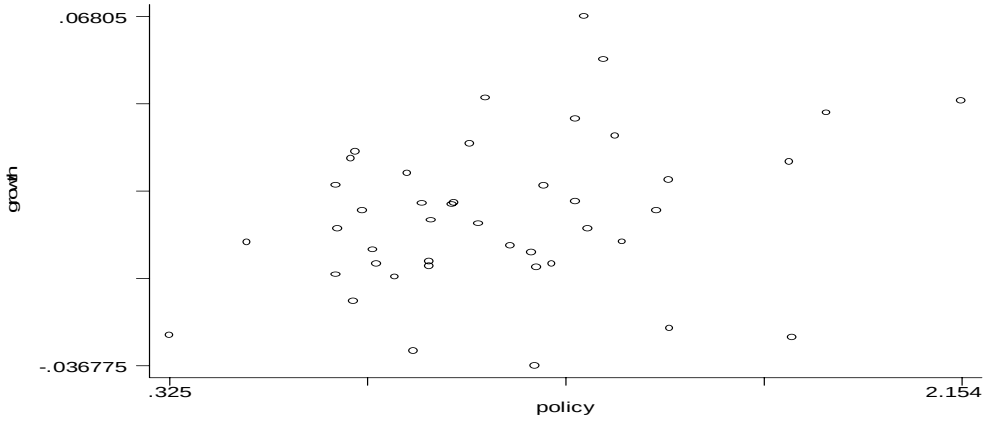
Table 1: Aid, Policies and Economic Growth: estimates for 56 aid-receiving countries, using individual and joint policy variables.

Dep. var: Growth	OLS		
Regression	1	2	3
TR/GDP	0.00098(1.48)	0.001(1.47)	-
TE/GDP	-0.00031(-0.75)	-0.00029(-0.71)	-
dM1/dt	-4.89e-06(-3.09)*	-4.37e-06(-2.48)	-
Openness	0.00004(0.39)	0.00001(0.09)	-
Ethnf	-0.00012(-1.14)	-0.0001(-0.88)	-0.00005(-0.63)
Assassin	-0.0028(-0.74)	-0.003(-0.74)	-0.003(-0.97)
Ethnf*Assassin	0.00005(0.67)	0.00005(0.67)	0.00006(0.84)
Icrge (Government)	0.0077(3.67)*	0.0078(3.71)*	0.0068(3.82)*
Fin.Dev.	-0.00008(-0.35)	-0.00001(-0.48)	-0.00004(-0.23)
Initial GDP/capita	-0.0059(-1.77)***	-0.0051(-1.30)*	-0.0037(-1.22)
East Asia	0.0235(2.86)*	0.0242(2.93)*	0.024(3.36)*
Sub-Saharan Africa	-0.0178(-2.41)**	-0.019(-2.39)**	-0.021(-3.25)*
Aid	-	0.0235(0.45)	0.0279(0.090)
Policy index	-	-	0.962(3.92)*
Degrees of freedom	223	222	272
R^2	0.35	0.33	0.34

Note: (*) indicates statistical significance at the 1% level, (**) at the 5% level and (***) at the 10% level.
Source: Author's own calculation

The new policy index is significantly correlated with economic growth, which suggests that the alternative measure of policy also affects the growth rate of real GDP per capita (see Figure 2).

Figure 2: Partial scatters of growth against new policy index



Source: Author's own calculation

However the aid variable has a small positive coefficient, which is almost the same as in Burnside and Dollar (2000). Now it is clear that almost all other variable

coefficients, as in Table 1, are similar in terms of magnitude and significance across three regressions where individual and joint policy variables are used.

Given that a principal aim of this research is to examine whether or not the interaction of aid with policy is a significant determinant of growth, interaction of aid with policy and aid quadratic variables are included to estimate Fixed-Effects and Random-Effects models (explanation of using FE and RE models is given in the methodology and model specification section) and examine which model is more efficient and valid for the aid-policy-growth regression (results of FE and RE models are given in Table 2).

Table 2: Aid, Policies and Economic Growth: estimates for 56 aid-receiving countries, panel data for 1974-1993

Dep. var: Growth	FE	RE
Aid	0.424(2.04)**	0.138(0.90)
Policy	1.225(3.09)*	0.968(2.90)*
Aid*Policy	-3.394(-0.92)	-0.352(-0.11)
$(Aid)^2$	-0.579(-2.06)**	-0.225(-1.33)
Ethnf	-	-0.00007(-0.62)
Assassin	-0.0069(-1.69)***	-0.0037(-1.17)
Ethnf*Assassin	0.00012(1.48)	0.00007(1.06)
Fin.Dev.	-0.00013(-0.45)	-0.00007(-0.46)
Govern.	-	0.07(3.72)*
Initial GDP per capita	-0.0159(-1.02)	-0.0027(-0.78)
Degrees of freedom	217	221
Sigma_e	0.029	0.029
p-value(F-test)	0.035	-

Note: All the regressions in Appendix 2 have time and regional dummies, not reported here.
Source: Author's own calculation

Between the FE and RE results, the FE model is more efficient, although it is not consistent. The coefficient of aid is positive and is statistically significant at five per cent for FE. The Policy index for both FE and RE models is significant and has large positive coefficients. However the coefficients of interaction of Aid*Policy remain insignificant and have a negative sign. The coefficients of other variables are almost the same. To ascertain which regression model (FE or RE) is a more efficient predictor the following two statistical tests, Bruesch-Pagan (1980) and Hausman (1978), are conducted. The Hausman specification test is to choose either the fixed effects or random effects models. Both tests reject the null hypothesis and conclude that the fixed effects estimation is better. However, although the fixed effects model is efficient, it is inconsistent. Hence instrument variables are used for both FE and RE models in the next regressions to see if there are endogeneity problems in our models. Apart from using FE estimation to remove country specific effects, additionally, because some variables (explanatory) on the right of

the equation (3) are endogenous, the reduced form was used to compare the OLS and 2SLS estimates and determine whether the differences are statistically significant (Wooldridge, 1999: 483-484).

Instruments for three suspected endogenous variables (Aid, Aid^2 and Aid*Policy) are constructed and the Hausman test and the F-test are used to determine whether the instruments are correlated with the endogenous variables. On this basis ten instrumental variables are isolated to proxy for the endogenous variables in the growth regression. This model is also estimated using two stage least squares (2SLS), and Table 3 compares the results from 2SLS and FE (within instrument variables) estimation. The FE model has more significant coefficients. Aid*Policy is, however, insignificant, whereas Policy is significant in both. Since the FE (within IV) model is more efficient (Wooldridge, 2000; StataCorp., 2001) it was preferred over the 2SLS model.

Table 3: Aid, Policies and Economic Growth: estimates for 56 aid-receiving countries, panel data for 1974-1993

Regression	FE(within) InVar	2SLS
Aid	0.666(2.00)**	0.191(0.79)
$(Aid)^2$	-1.34(-2.36)**	-3.98(-1.19)
Aid*Policy	-1.115(-0.18)	-1.35(-0.31)
Policy	1.07(2.20)**	1.011(2.55)*
Ethnf	-	-0.0001(-1.01)
Assassin	-0.0079(-1.87)***	-0.043(-1.31)
Ethnf*Assassin	0.0014(1.61)***	0.00008(1.19)
Fin.Dev.	-0.00012(-0.039)	-0.00007(-0.39)
Govern.	-	0.0073(3.35)*
Initial GDP per capita	0.0019(0.08)	-0.0045(-1.07)
SSA	-	-0.002(-2.39)**
Easia	-	0.026(2.92)*
N observ-n	271	271
Sigma_e	0.030	0.030

Note: Instrumented variables are Aid, $(Aid)^2$ and Aid*Policy.

Source: Author's own calculation

The main results here are collected in Table 4 that reports results from the (more efficient) FE (IV) estimation. Two versions of the model are estimated with results in Columns 1 (a) and 2 (a) referring to the policy index with growth of M1 whereas results in columns 1 (b) and 2 (b) refer to estimation with the policy index incorporating M2. In columns 2 (a) and 2 (b) is used the additional variable $(Aid)^2$*Policy (interaction of aid quadratic with policy index). Aid*Govern is used throughout.

Table 4: Aid, Policies and Economic Growth: estimates for 56 aid-receiving countries, panel data for 1974-1993

Dep. var: Growth	FE within instrument variables			
Regression	1(a)	1(b)	2(a)	2(b)
Aid	0.712(1.92)***	0.77(1.39)	1.76(1.58)	2.68(1.40)
$(Aid)^2$	-1.30(-2.30)*	-1.52(-2.37)**	-4.14(-1.45)	-5.24(-1.18)
Policy	1.08(2.54)*	1.65(3.62)*	1.44(2.19)**	1.68(3.59)*
Aid*Policy	-1.023(-0.24)	0.0973(1.60)	-9.26(-0.66)	-0.17(-0.14)
Aid*Govern	-0.016(-0.28)	-0.024(-0.23)	-0.26(-1.07)	-0.502(-1.22)
$(Aid)^2$*Policy	-	-	32.17(0.76)	4.86(0.93)
$(Aid)^2$*Govern.	-	-	0.53(0.86)	0.94(0.96)
Assassin	-0.008(-1.9)***	-0.0067(-1.60)	-0.007(-1.7)***	-0.0069(-1.60)
Ethnf*Assassin	0.00014(1.61)	0.00012(1.40)	0.00013(1.52)	0.00013(1.43)
Fin.Dev.	-0.00014(-0.46)	-0.0005(-1.28)	-0.0002(-0.67)	-0.0006(-1.49)
Initial GDP per capita	0.0007(0.04)	0.00025(0.01)	-0.020(-1.25)	-0.0085(-0.48)
N- observation	271	271	271	271
Sigma_e	0.0296	0.0292	0.0292	0.0297
F-test p-value	0.065	0.007	0.068	0.019

Note: Instruments used: Arms imports(t-1); Policy(t-1); $(Policy)^2$(t-1); Aid(t-1); $(Aid)^2$(t-1); Policy* Aid(t-1); Policy*$(Aid)^2$(t-1); Policy*Initial GDP per capita; Policy*(Initial GDP per capita)^2 and Policy*ln(Population).

Source: Author's own calculation

The estimated results show that the interaction term Aid*Policy remains insignificant regardless of including new variables. $(Aid)^2$*Policy, Aid*Govern and $(Aid)^2$*Govern are also not significant. However, policy is significant and has the right sign. Aid, by itself, is significant only in column 1(a). In each of these regressions the instrument variables are uncorrelated with the error term, which is shown by F-test p-value.

Since the fixed effects estimation using instrumental variables is an overall inconsistent estimator an alternative method of estimation, the GMM dynamic panels of Arellano-Bond (1981), is used. This provides consistent results and permits an estimation of the over-identifying restrictions and level of conditional convergence of log of initial income per capita across all countries in the sample. However GMM leads to loss of observations.[11]

The results of the GMM estimation are reported in Table 5. Here the results of the M1 index of policy are reported (results using the M2 measures are given in Appendix Table A2). It is clear that the significance of Aid*Policy depends crucially on the list of variables included in the regression. Aid*Policy is significant with a negative sign in only one regression. However, in the same regression $(Aid)^2$*Policy has a positive sign and is significant. Policy is significant except when $(Policy)^2$ is included in the regression. Aid*Govern is significant (with a negative sign) in the equations in which it appears.

The GMM estimates are important since they are both consistent as well as efficient. The effect of aid in the GMM regressions depends upon the specification. The coefficient of aid is significant when quadratic terms in aid and policy are used.

Table 5: The Arrelano-Bond dynamic panel model (GMM) regressions for aid-receiving countries

Dep.var: Growth rate per capita	GMM			
Regression	1	2	3	4
lngdppc	-0.073(-3.67)*	-0.078(-3.89)*	-0.071(-3.58)*	-0.0794(-3.89)*
Aid	0.024(0.15)	0.247(1.14)	0.59(1.96)**	1.107(2.08)**
$(Aid)^2$	-0.027(-0.13)	0.112(0.48)	-1.66(-2.49)*	-2.05(-1.71)***
Aid*Policy	-2.029(-0.47)	0.76(0.15)	-15.33(-1.97)**	-8.59(-0.94)
Policy	1.009(2.38)**	0.82(1.61)***	1.74(3.83)*	1.014(1.54)
$(Policy)^2$	-	-	-	10.54(1.18)
$(Aid)^2$*Policy	-	-	38.13(2.41)**	26.66(1.10)
Aid*Govern.	-	-0.10(-1.67)***	-	-0.201(-1.76)***
$(Aid)^2$*Govern.	-	-	-	0.229(0.90)
Assassin	-0.0042(-1.17)	-0.004(-1.12)	-0.004(-1.14)	-0.0038(-1.03)
Ethnf*Assassin	0.0001(1.96)**	0.0001(1.93)**	0.0001(1.94)**	0.0001(1.85)***
Fin.Dev.	-0.00024(-0.67)	-0.0003(-0.86)	-0.004(-1.14)	-0.0003(-0.95)
Number obs-n	163	163	163	163
Sargan p-value	0.47	0.49	0.44	0.44

Source: Author's own calculation

An important result from the GMM estimation is that the coefficient of lagged per capita income is significant and negative in all versions of the model. This is a strong result on convergence, which has not been reported in this literature so far. The GMM estimates are, thus, consistent and efficient and indicate conditional convergence among the 56 countries in the sample.[12]

One aim of the GMM estimation is to find the number of overidentifying restrictions and their validity. There are only three endogenous explanatory variables and ten new instrument variables in the aid-policy-growth model. Using the xtabond and the two-step model computed results are for the Sargan test of Arrelano and Bond's (1991) dynamic panels.[13] Overall Sargan's test results in Table 5 illustrate that the null hypothesis is no longer rejected and allow the conclusion that the over-identifying restrictions are valid. Test results also show that the signs of the estimated coefficients do not change. An important problem with all the aid-policy growth regressions in Burnside and Dollar (2000), Hansen and Tarp (2001) and other related literature, is that they are not able to establish conditional convergence (even at 15 per cent or 20 per cent). In this study since the log of initial level of income per capita is statistically significant in the GMM panel data estimated regression, there is a statistically significant conditional convergence among all the countries in the sample.

Finally, using equation (10), the derivative of growth with respect to aid is used to present a straightforward interpretation of this empirical research. Results in Table 6 indicate that the OLS, the RE and the 2SLS coefficients for the effect of aid on growth are not significant. However the FE, FE (within IV), and GMM methods show a significant effect on growth of aid when the variable $(Aid)^2$*Policy is included.

Table 6: The impact of aid on growth for 56 aid receiving countries

Regression/Table	Method	dY/dAid
(1.3) / Table 1	OLS	0.028 (0.09)
(2.1) / Table 2	FE	0.214(2.04)**
(2.2) / Table 2	RE	0.098(0.90)
(3.1) / Table 3	FE (within I.V.)	0.47(2.01)**
(3.2) / Table 3	2SLS	-0.34(-0.78)
(2.1a) / Table 4	FE(within IV)	0.51 (1.92)***
(2.2a) / Table 4	-	0.86 (1.58)**
(3.1) / Table 5	GMM	-0.06(-0.15)
(3.2) / Table 5	-	-0.16(-1.14)
(3.3) / Table 5	-	0.02(1.96)**
(3.4) / Table 5	-	0.04(2.08)**

Source: Author's own calculation

In Table 7 the robustness of Aid-Policy-Growth regressions across 56 aid receiving countries is compared using a different definition of Aid and alternative policy variables. Burnside and Dollar (2000) and Easterly et al., (2003) ignored country specific effects and therefore they used OLS and 2SLS estimator models, while Hansen and Tarp (2001) used, and the current study uses, the GMM estimator model because of country specific effects.

The main reason for arriving at different results in GMM estimation (see Table 8) are: different panel data estimation techniques are used, including time period dummies and new variables; a different definition of aid and alternative policy measures; none of the chosen instrument variables are correlated with error terms. One implication of this estimation is that the results are technique-specific.[14]

Table 7: Comparing the robustness of panel regressions to alternative definition of aid and policy. The effect of policy on aid effectiveness

Variable	Burnside and Dollar (OLS)	Hansen and Tarp (GMM)	Easterly et al. (OLS)	Current study GMM
Aid	0.49 (0.12)	0.24(2.28)	0.156(0.49)	0.59(1.96)**
$(Aid)^2$	-	-0.75(2.31)	-	-1.66(-2.49)*
Policy	0.78(0.20)**	-	0.86(4.12)*	1.74(3.83)*
Aid*Policy	0.20(0.09)**	-0.006(0.22)	0.188(1.3)	-15.32(-1.97)**
$(Aid)^2$*Policy	-0.02(0.008)**	-	-	38.12(2.41)**
$(Policy)^2$	-	0.0002(0.26)	-	-
Lgdppc Ethnf Assassin	-0.56(0.56)	0.001(0.13)	-0.78(-1.46)	-0.71(-3.58)*
Icrge	-0.42(0.72)	0.002(0.26)	-0.4(-0.51)	-0.00005(-0.60)
Fin.dev	-0.45(0.26)*	-0.45(1.98)	-0.42(-1.51)	-0.004(-1.14)
Ethnfassas	0.67(0.17)**	0.81(4.57)	0.749(4.29)*	0.0072(3.74)*
Inflation	0.016(0.014)	0.010(0.54)	0.011(0.77)	-0.00035(-0.94)
Budg.surp	0.80(0.44)*	0.911(2.15)	0.79(1.72)***	0.0001(1.94)**
Openness	-	-0.013(2.22)	-	-
N-observ-s	-	0.096(2.36)	-	-
	-	0.016(2.67)	-	-
	275	211	266	163

Sources: Burnside and Dollar (2000), Hansen and Tarp (2001), Easterly (2003) and current study (2004).

Table 8: Differences between current study and others

Data	From 1974 to 1993, five four-year periods, the same as Hansen and Tarp's (2001) study
Technique used	In order to remove the country specific effects and get efficiently consistent estimators the FE within Instrument Variables and Generalised Method of Moments are used in this study. While Burnside and Dollar (2000), Easterly et al., (2003) and others ignored the country specific effects and used OLS and 2SLS, Hansen and Tarp (2001) have used the GMM technique.
Definition of aid and policy	Burnside and Dollar (2000) used a new definition of aid, which includes only grants, however we have used the standard definition of aid, which is Official Development Assistance that includes loans and grants. This is the same as Hansen and Tarp (2001) and Easterly et al., (2003) and other studies. I use two new Policy indexes in this study, which are: Policy=TR/GDP+TE/GDP+dM1/dt+Openness Policy= TR/GDP+TE/GDP+dM2/dt+Openness

Source: Author's own calculation

In sum, the results of this study show that Aid/GDP ratio has a positive relationship with growth rate and is significant in the main regressions of GMM. However, these results differ from other studies in the area of the importance of policy to aid effectiveness. It has been shown that the parameter of interaction Aid*Policy which was an important determinant of the effectiveness of aid in Burnside and Dollar

(1997) actually plays an insignificant role. This result is in common with Hansen and Tarp (2001). However, Hansen and Tarp do not analyse the role of $(Aid)^2$*Policy. In this estimation it turns out to be a positive and significant determinant of the effectiveness of aid, in some, but not all cases. So, if the policy environment is to have any impact on the effectiveness of aid, the quantum of aid should be large. Hence, it can be concluded that the evidence in favour of the importance of the policy environment to the effectiveness of aid is, in general, weak.

Conclusions

Whether aid is effective and if this effectiveness is contingent upon good policy, are questions of profound importance for developing countries. If the Burnside-Dollar thesis is accepted, one should not bemoan the recent drop in aid flows, especially in the face of poor policy performance by developing countries.

The series of results by Hansen and Tarp (2001) questioned this wisdom and the present research extends this analysis in two important directions. First, it questions the construction of the policy index used by extant authors and emphasises the need to include variables that are directly controllable by the government in the policy index, and to eschew using consequences of policy in the policy index. Second, this study provides robust estimations of the effects of aid on economic growth and points out that some of the results of the extant literature could well be sensitive to data/model specification/technique of estimation.

These results, with the new policy index, indicate that the relationship between policy and the effectiveness of aid is tenuous, at best. Policy appears to be a relevant determinant of the effectiveness of aid only if such aid is forthcoming in large amounts. Hence this paper emphasises, as a general proposition, the need to increase aid flows irrespective of the policy environment in developing countries. In specific instances, for example, large volumes of aid, this conclusion may need to be modified.

Another important result of this research is the conditional convergence obtained across the countries in the sample. This result is not possible with the old policy index. Thus the need for appropriate specification and robust econometric estimation is underscored.

Finally, the paper, by emphasising, the fragility of some of the results, underscores the need for further research in this area.

NOTES

[1] This paper is drawn from my Ph.D. dissertation at the Australian national University. I would like to thank Prof. Raghbendra Jha and Prof. Tom Kompas for their helpful comments and suggestions.

[2] Initially the World Bank (1998 and 2000) maintained that foreign aid assists to increase economic growth in countries with good economic management and it was a message to all donors that aid should be allocated to recipient countries in line with their policy conditions. Since then World Bank report and Burnside and Dollar (1997, 2000) viewpoints about effectiveness of aid and policy conditions have come under substantial evaluation (critique) by Lensink and White (2000), Hansen and Tarp (2001), Dalgaard and Hansen (2001), Hermes and Lensink (2001), Hoeven (2001), Easterly, Levine and Roodman (2003) and Easterly (2003).

[3] Country statistical summaries of explanatory variables are given in the Appendix.

[4] For clarity Burnside and Dollar (2000) decided that it is better to have one measure of policy variables than three separate policy variables. They thought that the main aspect of their policy index is that it loads the policy variables in line with their correlation with growth.

[5] Guillaumont and Chauvet (2001) argue that weak terms of trade have negative consequences for the growth rate.

[6] Anderson and Hsiao (1981, 1982) planned using further lags of the level of difference of the dependent variable to instrument the lagged dependent variables included in a dynamic panel model after random affects had been removed by first differencing.

Following Hansen and Tarp (2001), here in equation (5.4) the ΔY_{it} is the growth rate average, y_{it-1} is the log of the initial per capita GDP, X_{jit} are the *n* additional regressors.

[7] In equation (5) y_{it-1} is correlated with ε_{it-1} and also X_{jit} are correlated with $\varepsilon_{it-1.}$

[8] Follow Hansen and Tarp (2001), under the assumption that X_{jit} is predetermined $X_{ji,t-1}$ is a solid instrument and $X_{ji,t-n}$ is valid if $X_{ji,t-1}$ is endogenous, as I have decided for Aid variables.

[9] Arellano and Bond (1991), using the GMM framework, which was developed by Hansen (1982) classified number lags of dependent variables and the predetermined variables as valid instruments and suggested how to join these lagged levels with first differences of the truly exogenous variables into a very large instrument matrix. Arellano and Bond (1991) obtained the corresponding one step and two step GMM estimators. They also derived a Sargan test for over-identifying restrictions for this estimator.

[10] The alternative policy index including broad money supply indicator is stipulated in Appendix.

[11] Arellano and Bond (1991) recommended using the one-step results for inference on the coefficients. A number of studies have found that the two-step standard error is biased downward in small samples. Therefore, the Arellano and Bond (1991) one-step result is only recommended only for inference. They found evidence that the one-step Sargan test over rejects in the presence of heteroskedasticity.

[12] Caselli et al., (1996) argued for and supported the use of GMM panel data measurement in conditional convergence analysis in the Solow-Swan augmented growth model.

[13] As our test results illustrate, the two-step Sargan test may be better for inference on model specification as long we do not have a small sample. For more information see Stata Corp., (2001).

[14] There, is also the possibility that changes in data could change results as noted by Sala-I-Martin and Barro (1995).

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Appendix

Table A1: Data series

Variable name	Description	Source
Aid	Official development assistance as a share of GDP	OECD-DAC data as reported in Hansen and Tarp (2000).
Growth	Average growth rate of real GDP per capita	WDI (1998)
Igdppc	Initial level of real GDP per capita	WDI (1998)
Assasin	Number of assassinations per 100,000 population	Easterly and Levine (1997)
Financial development	Lagged one period of M2 as a share of GDP	Burnside and Dollar (2000)
Ethnic fractionalisation	Index of ethnolinguistic fractionalisation, 1960	Easterly and Levine(1997)
Icrge	Institutional quality; security of property rights and efficiency of the government bureaucracy	Knack and Keefer (1995)
M1/GDP	M1 as a share of GDP	WDI (1998)
M2/GDP	M2 as a share of GDP	WDI (1998)
TaxRev/GDP	Tax revenue as a share of GDP	WDI (1998)
Trade Openness	Sum of Exports and Imports as a share of GDP	WDI (2001)
Exp/GDP	Total Government Expenditure as a share of GDP	WDI (1998)

Source: Author's own calculation

List of Sample Countries

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

Note: An asterisk indicates the country is treated as a middle-income aid-recipient

Source: Hansen and Tarp (2001).

Alternative Policy Index:

The alternative policy index includes policy measures such as money growth (dM2/dt), tax revenue (share of GDP), total expenditure (share of GDP) and trade openness.

$$Policy = .0392 + .00107\left(\frac{TR}{GDP}\right) - .0005\left(\frac{Exp}{GDP}\right) - 9.86e^{-07}\left(\frac{dM2}{dt}\right) + .000085\left(Openness\right), \quad (11.b)$$

Table A2: The Arrelano-Bond dynamic panel model (GMM) regressions for aid-receiving countries (using alternative policy index, (11b))

Dep. var: Growth rate per capita	GMM			
Regression	1	2	3	4
Lngdppc	-0.068(-3.44)*	-0.068(-3.45)*	-0.068(-3.46)*	-0.071(-3.53)*
Aid	0.0026(0.02)	-0.012(-0.08)	0.036(0.21)	0.36(0.64)
$(Aid)^2$	-0.124(-0.39)	-0.09(-0.30)	-0.216(-0.60)	0.39(0.28)
(Aid)*Policy	0.452(1.06)	0.38(0.97)	-0.14(-0.17)	-0.52(-0.58)
Policy	2.19(4.06)*	2.18(4.05)*	2.18(4.03)*	2.03(3.70)*
$(Policy)^2$	-	-0.104(-0.55)	-	-
$(Aid)^2$*Policy	-	-	2.41(0.96)	4.96(1.65)***
Aid*Govern.	-	-	-	-0.106(-0.90)
$(Aid)^2$*Govern.	-	-	-	-0.1001(-0.36)
Assassin	-0.004(-1.11)	-0.004(-1.11)	-0.004(-1.21)	-0.004(-1.13)
Ethnf*Assassin	0.0001(1.85)***	0.0001(1.85)***	0.0001(1.9)**	0.0001(1.88)***
Fin.Dev.	-0.0005(-1.8)***	-0.0006(-2.07)**	-0.0004(-1.43)	-0.0006(-1.8)***
Number obs-n	163	163	163	163
Sargan p-value	0.39	0.39	0.32	0.41

Note: * indicates statistical significance at the 1% level, ** at the 5% level and *** at the 10% level

Source: Author's own calculation

Table A3: Statistical summaries of explanatory variables

Variable	Obs.	Mean	Std. Dev.	Min	Max
Aid	278	0.061313	0.086966	-0.0003	0.5391
$(Aid)^2$	278	0.011295	0.035536	0	0.29063
Aid*Policy	278	0.009127	0.016066	-0.0000387	0.14132
$(Policy)^2$	280	0.020875	0.018524	0.000961	0.19625
lgdppc	278	6.601312	0.8995506	4.5455	8.6361
Ethnf Assassin	280	47.39286	30.16483	0	93.0
TaxRev/GDP	280	0.423214	1.225621	0	11.5
Exp/GDP dM1/dt	230	14.75961	6.630041	2.3	40.46
Openness	236	21.58411	10.70313	3.42	85.1
Icrge	278	25.77827	14.94177	0	85.57
Fin.Dev	279	55.30108	29.80231	0	234.0
Ethnf*Assas	280	4.598357	1.216992	2.2708	7.0
Policy	276	30.16683	13.8984	8.9733	98.3865
	280	16.30089	59.20763	0	736.0
	280	0.1345	0.0529	0.031	0.44

Source: Author's own calculation