Aid, Policies and Growth: Revisiting with New Data

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Abstract

In a highly influential paper, Burnside and Dollar (2000) conclude that aid promotes growth in the presence of sound policies. With an extended dataset, Easterly, Levine and Roodman (2004) overturn this result. We revisit this highly debated topic by updating the data with an additional 15 years and X countries. Overwhelmingly, our results support ELR. It does not appear that aid is effective at promoting growth even in a good policy environment.

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1. Introduction

Burnside and Dollar (2000, henceforth BD) conclude that aid can positively influence growth in healthy policy environments, sparking one of most debated topics in development economics and among policymakers. Easterly, Levine and Roodman (2004, henceforth ELR), using the exact methodology over a larger dataset, overturn BD's findings weakening the significance of the aid-policy-growth relationship.

Since the release of both seminal articles, many academic articles are published on the aid-policy-growth debate: BD (2000) has been cited by 4084 research, ELR (2004) has been cited by 1001 research, and two following up reply and revisiting works of BD (2004) together have been also cited by about 700 research[1]. The debate continues, among the literature, studies with pro-ELR conclusions include Brumm (2003), Ram (2004), Islam (2005), Rajan and Subramanian (2008), Minoiu and Reddy (2010), Doucouliagos and Paldam (2011), Tashrifov (2012), and Chatelain and Ralf (2014). However, a number of articles support BD's conclusion (Burnside and Dollar, 2004; Dalgaard, Hansen and Tarp, 2003[2]; Ali and Isse, 2005; Verschoor and Kalwij, 2006; Alvi, Mukherjee and Shukralla, 2008; Javid and Qayyum, 2011). Contributing to the ambiguity, Dayton-Johnson and Hoddinott (2003) and Kohama, Sawada and Kono (2004) find mixed results.

With the exception of ELR, these follow-up studies carry out variations of BD's original framework using a variety of alternative approaches including different measures of foreign aid and policies, alternative model specifications (for example, GMM, propensity score matching), a variety of additional control variables and instruments, as well as different country samples and time periods. These differences in methodology may partly explain the ambiguity of the findings.

[1] The citation count numbers are up to Sept 20. 2015, and they still grow.

[2]Burnside and Dollar (2004) and Dalgaard, Hansen and Tarp (2003) switch from a strict policy index and include measures of institutional quality.

In this paper, we do not deviate from the specifications and methodology of BD and ELR. We simply revisit their original work with updated data.[3] There are several reasons to do so. First, the importance of replicating major findings as new data is available is becoming increasingly important (Dewald et.al 1986). Replication avoids data manipulation and disagreement over model selection caused by "…usual limitation of choosing a specification without clear guidance from the theory" (ELR 2004, p.774). Additionally, ELR overturn BD's findings with only four additional years (1994-1997) and 6 additional countries. Our dataset includes an additional 19 years (1966-1969 &1998-2012) and 13 (under ELR specification) more countries over ELR. In terms of number of observations, we almost double what ELR has. Appendix 3 provides more details. It is possible that the results may differ once we expand the data.

We replicate the findings from both BD and ELR with updated data using multiple specifications: 1) BD years (1970-1993), BD countries and full sample; 2) ELR years (1970-1997), ELR countries and full sample; 3) extended years (1962-2012), BD countries, ELR countries, and full sample; 4) post-Cold war (1990-2012), BD countries, ELR countries, and full sample. We find that BD's findings are not robust to the updated data. Simply using new data over the same years and countries as BD shows that aid does not promote growth even in a healthy policy environment. Overwhelmingly, our results suggest ELR is correct.

Our work contributes to the long-standing aid-policy-growth academic debate and reminds policymakers that simply providing aid to countries identified as having 'good' policies may not create a 'quick' growth fix. This is especially important in light of the post-2015 Sustainable Development Goals. Our work also relates to the emerging aid effectiveness literature emphasizing that donors should be more selective in allocating aid to

[3] We thank ELR (2004) for publicly sharing their dataset and methodology for replication.

countries with better institutions (Paris Declaration, 2005; High Level Forum, 2008; Easterly and Pfutze, 2008).

2. Empirical Methodology

To investigate the relationship between aid, policy, and growth, BD employ methods of Pooled Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS) using a panel dataset with four-year averages. We follow BD's preferred growth regression with controls including a measure of aid/GDP, a policy index, an aid*policy interaction term, log initial GDP, ethnic fractionalization, political assassinations, a fractionalization*assassinations interaction term, a measure of institutional quality, and a measure of financial depth (M2/GDP lagged), regional dummies for Sub-Saharan Africa and fast-growing East Asian countries, and country and time dummies. In some specifications, an aid^2*policy term is included. The instruments employed in 2SLS include three extra regional variables Franc Zone countries, Central American countries and Egypt, a lagged arms imports over total imports variable and its interaction term with policy index, a population term, two interactions of population and squared population with policy index, an initial GDP per capita term and its interaction with policy index.

In order to reconstruct the database, we gather all variables from the original sources in BD and ELR and expand the dataset from 1962-2012 and 75 countries (under ELR specification). Appendix 1 contains the specific source and method of calculation for each variable, as well as the correlations between the new data and BD and ELR. Given the length of time between our study and BD and ELR, some of the variables are discontinued. For those variables, we extrapolate based on ELR's data and update by filling in the missing data with the closest observation. Summary statistics are provided in Appendix 2.

We describe the construction of the two main variables, aid and the policy index. Unlike usual aid defined in other literature - OECD's Net Official Development Assistance (ODA),

BD measure aid in terms of Effective Development Assistance (EDA)[4] over GDP. Basically, they regress EDA on ODA, get the regression coefficient and then multiply it with new ODA data to get the new EDA. We extrapolate in the same way and find the correlations between newly extrapolated aid and BD/ELR aids are quite high, respectively equal to 0.576/0.751 with pair-wise method, with list-wise they are both over 0.8.

The policy index is constructed from measures of budget balance, inflation, and the Sachs-Warner openness index. To reconstruct the policy index[5], we run the growth regression minus aid and aid*policy but including inflation, budget surplus, and the SW openness index, collect the coefficients to create a beta policy index; then calculate the constant, which is the difference between the mean of GDP growth rate and the mean of the beta policy index[6]; and, lastly, add the constant back to the beta policy index. Our newly constructed policy index has very high correlations with BD/ELR's, respectively are 0.943/0.933. Appendix 1 provides more details about variable specifications. Also refer to Appendix 7 for details of regression setting up.

3. Results

We replicate the findings from both BD and ELR with updated data using multiple specifications: 1) BD years (1970-1993), BD countries and full sample; 2) ELR years (1970-1997), ELR countries and full sample; 3) extended years (1962-2012), BD countries, ELR countries, and full sample; 4) post-Cold war (1990-2012), BD countries, ELR countries, and full sample. We also report the original findings from both BD and ELR. With use of BD and ELR's original datasets, we match our replication with their original works. We do not include the original replication in the paper to save space.

[4] The EDA definition and data is originally from Chang et al. (1998)
[5] See Jan Dehn (2000) for a clear explanation on the policy index procedure.
[6] By doing so, BD claim that "the index can be interpreted as a country's predicted growth rate."(2000, p. 855)

BD and ELR both test their specifications with including and excluding outliers[7]. We follow ELR and use the HADI method to test for outliers and exclude those observations when indicated. All tables below report the main tests with BD and ELR specifications. We first show the results corresponding to the OLS and 2SLS specifications from BD regressions 4 (all countries) and 7 (low-income countries), which includes the outliers and adds an aid^2*policy term. Next, we report the findings for OLS and 2SLS for BD regressions 5 (all countries) and 8 (low-income countries) excluding the outliers and dropping the aid^2*policy term.[8]

[Insert Table 1]

In Table 1, Panel A, we first test the model under the same time period as BD with newly collected data. BD's original results show positive and significant coefficients on the aid*policy interaction term in six of eight specifications. Once we replicate BD's exact specification (same years and country sample) with the updated data, this result disappears. The interaction term is insignificant in all specifications. This holds when we expand to our full country sample. In Table 1, Panel B, we update ELR's specifications. The interaction term is never positive and significant supporting ELR's original results. In one specification (new data, ELR countries), the interaction term is actually negative and slightly significant.

The most striking finding from this replication is that BD's result disappears only by updating the data but not changing the year or country selection.

[Insert Table 2]

In Table 2, we extend the model to our full time period, 1962-2012 (with a one period lag, 1962-1966). Panel A replicates the BD specifications and Panel B replicates the ELR

[7] When we apply the HADI method, some of the models have minor difference in the coefficient of Aid*Policy when compared with BD and ELR. In addition, ELR believe that outliers should not change the conclusion; our results also support this claim.

[8] We follow BD in defining lower income countries as a country with real GDP per capita below $1,900 constant (1985) U.S. dollars in year of 1970.

specifications.[9] None of the aid*policy interaction term coefficients is significant. We do not place much weight on this finding as it is also not robust. Collectively, these results suggest that in the long run, we do not observe any evidence supporting a good policy environment favors aid effectiveness. ELR's conclusion holds in the long run period[10].

[Insert Table 3]

Lastly, in Table 3, we examine the post-Cold War period from 1990-2012 as the aid landscape changed significantly during this period (Griffin 2000, Dunning 2004). In both Panel A and Panel B, for the first time, we find 10[11] regressions with positive and significant interaction terms out of total 32. But, 5 out of the 10 regression are from lower-income country samples may suggest that BD's 1970 standard of lower income country definition not fitting post-Cold War period well.

Also, 9 of the 10 regressions are from models with Hadi Method may indicate the facts that with post-Cold war data: to some extent, the model does show significant non-linear association beyond what outliers contributed. As many quadratic terms are positive and significant, and once quadratic terms are gone, the effects are pushed to linear term aid*policy. This pattern does not show in either BD or ELR's work.

Does this suggest aid actually works under good policy environment after 1990? To answer this question, Table-3 also adds the coefficients of aid, policy and the marginal effects of aid. Insignificant policy, insignificant or significant but negative coefficients of aid and marginal effects of aid together indicate that even assume presence of good policy condition,

[9] BD and ELR have slightly different model specifications because they define regional country dummies and low income countries slightly different. See Appendix 6 for differences.

[10] As robustness, we use a new version of ICRGE ranging from 1984-2012, which is also used for post-Cold War period models. The results remain the same, so we do not tabulate in order to save space. They are available upon request.

[11] This is under BD's significant level standard, under ELR, the count is 9. Actually, BD and ELR use different significant level standards, for coefficient with p-value greater than 0.05 but less than 0.1, it is considered as significant under BD, but not significant under ELR. This is one potential reason why ELR found way less interaction terms being significant than BD, but not something major.

we fail to reject the hypothesis that aid being ineffectively promoting growth[12]. Actually, none of the policy terms are significant[13]- good policy assumption does not hold in the post-Cold War period. Overall, none of the significant interaction terms matter anymore, results do not robustly support that aid can promote growth in a healthy policy environment.

4. Conclusion

In this paper, we extend the BD database to 1962-2012 covering 69 countries. Our results support ELR's conclusion that, we fail to find any evidence that aid may promote growth even in the presence of sound polices, especially in the post-Cold War period, policy becomes irrelevant. This reiteration remains an important finding as policymakers continue to operate as it aid can be made effective if given under the 'right' conditions.

[12] Except for 2 regressions with aid being positive and significant, all the other 94 regressions are not supporting aid being promoting growth.

[13] As ELR suggested, this may occur as a result of an improvement in the institutional environment of recipient countries. Also, the new data set updates the openness variable, trade openness status change could potentially affect the policy index. Another potential reason could be the new data set incorporates a quite amount of former communist countries, or countries in transition, like Albania and China, etc. Refer to appendices 4 and 8 for more details.

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Appendix 1: Data description

Variable name	Abbreviation	Correlation with BD/ELR	Data source	Notes
Per-capita GDP growth	agdpgrowth	0.934/0.965	WDI 2014	Constant 2005 U.S. dollars.
Initial GDP per capita	linitialagdp	0.824/0.810	WDI 2014	Natural logarithm of GDP per capita for first year of period; constant 2005 U.S. dollars.
Ethnic fractionalization	ethnic	0.701/0.715	Norwegian Social Science Data Services (NSD)-MacroDataGuide 2003	Dataset compiled by Alesina et al. (2003). Measures probability that two individuals will belong to different ethnic groups.
Assassinations	assa	1.000/0.999	Banks, Arthur. 2002. Cross-National Time-Series Data Archive	Website Global Development Network Growth Database. Data range 1960-1993.
Assassinations (filled)	assafilled	1.000/0.999	ELR (2004) and Banks, Arthur. (2002)	Based on ELR's assassination data (1966-97) and our assa data above (1960-93); update the missing years with duplicated closing years observation.
Institutional quality	bdicrge/elricrge	N/A	PRS Group's IRIS III data set (see Knack and Keefer 1995)	As ELR stated elricrge based on 1982 values, bdicrge based on 1980 values. Computed as the average of five variables. Update the missing years with duplicated existing years value, since there is only one point value for each country.
Institutional quality New	icrge8412	0.504/0.460	PRS Group International Country Risk Guide	Copyrights 1984-present TABLE 2B: Composite Dataset
M2/GDP, lagged	M2gdplagged	0.820/0.265*	WDI 2014	*Calculated with pairwise correlation, with listwise, they equal to 0.821/0.819.
Sub-Saharan Africa	bdssa/elrssa	N/A	BD(2000)/ELR(2004)	Same as that in BD(2000)/ELR(2004)#
East Asia	bdeasia/elrasia	N/A	BD(2000)/ELR(2004)	Same as that in BD(2000)/ELR(2004)
Franc Zone	bdfrz/ elrfrz	N/A	BD(2000)/ELR(2004)	Same as that in BD(2000)/ELR(2004)
Central America	elrcentam/ elrcentam	N/A	BD(2000)/ELR(2004)	Same as that in BD(2000)/ELR(2004)
Egypt	bdegypt/ elregypt	N/A	BD(2000)/ELR(2004)	Same as that in BD(2000)/ELR(2004)

Budget surplus	elrbbfilled	0.740/0.824	BD(2000)/ELR(2004)	Budget surplus data is no longer available post 1997. We fill in the missing years with adjacent year observation.
Inflation	linfl	0.950/0.935	WDI 2014	Ln (1+Inlfation), where inflation is GDP deflator.
Sachs-Warner Openness updated	openness	0.945/0.907	Sachs and Warner data sets (1995); Wacziarg and Welch (2008); Clemens et al.(2011)	Updated Sachs-Warner trade openness data to 2010, based on Wacziarg and Welch (2008) and Clemens et al. (2011) Appendices. Refer to Appendix 7 for a comparison with BD/ELR samples.
Aid(Effective Development Assistance)/ GDP)	aid100	0.576**/0.751	Pwt8.0/Chang et al. 1998; IMF 2014; DAC 2014.	Aid100= EDA/GDP*100, to match with original works' scale. In BD (2000) and ELR (2004) use pwt 6.1 for GDP data (with chain series). Average annual EDA in 2012 US$/average annual real GDP in 2005 US dollars. From pwt8.0 using chained PPPs, **list-wise correlation is 0.803.
Population	lpop	0.999/1.000	WDI 2014	Natural logarithm of population
Arms imports/total imports lagged	armimports_lag	0.878/ 0.859	WDI 2014	Arms imports (SIPRI trend indicator values). Total imports in 2005 constant US dollars.
Policy Index	policy	0.943/0.933	BD(2000)/ELR(2004);WDI 2014;Sachs and Warner data sets (1995); Wacziarg and Welch (2008); Clemens et al.(2011)	Correlation is calculated between BD data set(1970-1993)/ELR data set(1970-1997) and our full data set(1962-2012)

Notes: # refer to Appendix 6.

Appendix 2: Summary statistics, full sample

Variable	Obs	Mean	Std. Dev.	Min	Max
Per-capita GDP growth	548	2.100	3.297	-11.52	18.00
Initial GDP per capita (log)	548	7.286	1.042	4.803	9.927
Ethnic fractionalization	548	0.530	0.252	0.00200	0.930
Institutional quality	548	4.502	1.632	1.600	9.500
M2/GDP, lagged	548	52.49	299.9	4.623	6,798
Budget surplus filled	548	-0.0297	0.0423	-0.306	0.147
Inflation	548	0.153	0.332	-0.0945	3.598
Sachs-Warner Openness updated	548	0.488	0.485	0	1
Aid/GDP*100	548	1.798	2.408	-0.104	19.07
Arms imports/total imports lagged	548	0.0245	0.0600	0	0.667
Population	548	16.56	1.584	12.63	21.01
Assassinations filled	548	0.493	1.216	0	11.50
Policy Index	548	2.126	0.832	-4.418	3.684
Aid*policy	548	3.639	5.183	-12.46	41.16
Aid^2*policy	548	18.08	54.29	-35.14	784.9

Notes: 1. Observations under ELR specification used in 2SLS model; with OLS, it increases to 687.

2. Under BD specification, 2SLS has 485 observations; with OLS, increases it to 601.

Appendix 3 - Difference in sample between BD, ELR and new data set

Panel A:Difference in sample between BD and new data set

	BD data set	**New data set, BD specification**
Obs unique to set 1970-1993	BOL3 GUY5 LKA5 NIC5 SYR4 DZA3 GUY6 LKA6 NIC6 TTO5 DZA4 GUY7 MDG8 NIC7 TTO7 GHA3 GUY8 MWI5 NIC8 TZA6 GHA4 HTI3 MWI6 PRY3 TZA7 GHA5 HTI4 MWI7 PRY4 VEN3 GHA6 HTI5 MWI8 PRY5 VEN4 GHA7 HTI6 NER4 PRY6 ZAR3 GHA8 HTI7 NER5 PRY7 ZAR4 GMB4 JAM4 NGA3 PRY8 ZAR5 GMB5 JAM5 NGA4 SLE3 ZAR6 GMB7 JAM6 NGA5 SOM4 ZAR7 GUY3 LKA3 NIC3 SOM5 ZMB8 GUY4 LKA4 NIC4 SYR3	BGD5 ETH8 MLT4 PAN8 SGP8 ZAF8 BGD6 MLI4 MLT6 SGP5 TUN3 ZWE5 BGD7 MLI5 PAN6 SGP6 TUN4 BWA8 MLI6 PAN7 SGP7 TUN5
Obs for 1962-69 & 1994-2012*	None	ARG2 CIV11 ETH11 LKA9 NER12 SEN13 TUR9 ARG9 CIV12 ETH12 LKA10 NGA9 SGP9 TUR10 ARG10 CMR2 GAB2 LKA11 NGA10 SLE9 TUR11 ARG11 CMR9 GAB9 LKA12 NGA11 SLE10 TUR12 ARG12 CMR10 GAB12 LKA13 NGA12 SLE11 TUR13 BGD9 CMR11 GAB13 MAR2 NGA13 SLE13 URY2 BGD10 CMR12 GHA12 MAR9 PAK2 SLV2 URY9 BGD11 CMR13 GMB12 MAR10 PAK9 SLV9 URY10 BGD12 COL2 GMB13 MAR11 PAK10 SLV10 URY11 BGD13 COL9 GTM2 MAR12 PAK11 SLV11 URY12 BOL9 COL10 GTM9 MAR13 PAK12 SLV12 URY13 BOL10 COL11 GTM10 MDG2 PAK13 SLV13 VEN9 BOL11 COL12 GTM11 MDG10 PAN9 SYR9 VEN10 BOL12 COL13 GTM13 MDG13 PAN10 SYR10 VEN11 BOL13 CRI2 HND2 MEX2 PAN12 SYR11 VEN12 BRA2 CRI9 HND13 MEX9 PAN13 SYR12 VEN13 BRA9 DOM2 IDN9 MEX10 PER2 TGO2 ZAF9 BRA10 DOM10 IDN10 MEX11 PER9 TGO9 ZAF10 BRA11 DOM11 IDN11 MEX12 PER10 TGO10 ZAF11 BRA12 DOM12 IDN12 MEX13 PER11 THA2 ZAF12 BRA13 DOM13 IDN13 MLI9 PER12 THA9 ZAF13 BWA9 ECU2 IND2 MLI10 PER13 THA10 ZMB2 BWA10 ECU9 IND9 MLI11 PHL2 THA11 ZMB10

BWA11	ECU10	IND10	MLI12	PHL9	THA12	ZMB11
BWA12	ECU11	IND11	MLI13	PHL10	THA13	ZMB12
BWA13	ECU12	IND12	MLT9	PHL11	TTO2	ZMB13
CHL2	ECU13	IND13	MLT10	PHL12	TTO11	ZWE9
CHL9	EGY2	KEN2	MLT11	PHL13	TTO12	ZWE11
CHL10	EGY9	KEN9	MWI13	PRY9	TTO13	ZWE12
CHL11	EGY10	KEN10	MYS2	PRY10	TUN2	
CHL12	EGY11	KEN11	MYS9	PRY11	TUN9	
CHL13	EGY12	KEN13	MYS10	PRY12	TUN10	
CIV2	EGY13	KOR2	MYS11	SEN2	TUN11	
CIV9	ETH9	KOR9	MYS12	SEN10	TUN12	
CIV10	ETH10	KOR10	MYS13	SEN12	TUN13	

Number of Obs	275	601

Notes: * 1962-1965 observations are lagged for one period in the model.
Country codes refer to International Standards Organization (ISO) 3-digit alphabetic codes; numbers represent different 4-year period, starts in 1962. For example, BOL3 means Bolivia 1970-1973

Panel B:Difference in sample between ELR and new data set

	ELR data set					**New data set, ELR specification**					
Obs unique to	BOL3	HTI7	MMR7	PNG5	TUR5	BFA3	BRA4	COG6	MLT6	SGP6	ZAF8
set 1970-1997	BWA4	HTI8	MMR8	PNG6	TUR6	BFA4	CHN6	IRN3	MLT9	SGP7	ZMB3
	DOM9	HTI9	MMR9	PNG7	TUR7	BFA5	CHN7	IRN4	PAN6	SGP8	ZMB4
	DZA9	JAM4	MWI5	PNG8	UGA6	BGD5	CHN8	MLI4	PAN7	SGP9	ZMB5
	GHA3	JAM5	MWI6	PNG9	UGA9	BGD6	CHN9	MLI5	PAN8	TUN3	ZMB6
	GHA4	JAM6	MWI7	PRY3	VEN3	BGD7	COG3	MLI6	PAN9	TUN4	
	GHA5	JAM8	MWI8	PRY4	VEN4	BRA3	COG5	MLT4	SGP5	TUN5	
	GHA6	JAM9	NER4	PRY5	ZAR3						
	GHA7	JOR4	NER5	PRY6	ZAR4						
	GHA8	LKA3	NGA3	PRY7	ZAR5						
	GHA9	LKA4	NGA4	PRY8	ZAR6						
	GMB4	LKA5	NGA5	SLE3	ZAR7						
	GMB5	LKA6	NIC3	SYR3	ZAR8						
	GUY9	MDG8	NIC4	SYR4	ZAR9						
	HND9	MDG9	NIC5	TTO5	ZMB8						
	HTI3	MMR3	NIC6	TTO7	ZMB9						
	HTI4	MMR4	NIC7	TTO9							
	HTI5	MMR5	NIC8	TUR3							
	HTI6	MMR6	NIC9	TUR4							
Obs for 1962-69	None					ALB10	CHN10	ECU13	IRN11	MLI12	PRY10	TUN13

& 1998-2012	ALB12 CHN11 EGY2 IRN12 MLI13 PRY11 TUR10	
	ALB13 CHN12 EGY10 IRN13 MLT10 PRY12 TUR11	
	ARG2 CHN13 EGY11 JOR10 MLT11 SEN2 TUR12	
	ARG10 CIV2 EGY12 JOR11 MWI13 SEN10 TUR13	
	ARG11 CIV10 EGY13 JOR12 MYS2 SEN12 UGA10	
	ARG12 CIV11 ETH10 JOR13 MYS10 SEN13 UGA11	
	BFA2 CIV12 ETH11 KEN2 MYS11 SLE10 UGA12	
	BFA11 CMR2 ETH12 KEN10 MYS12 SLE11 UGA13	
	BFA12 CMR10 GAB2 KEN11 MYS13 SLE13 URY2	
	BFA13 CMR11 GAB12 KEN13 NER12 SLV2 URY10	
	BGD10 CMR12 GAB13 KOR2 NGA10 SLV10 URY11	
	BGD11 CMR13 GHA12 KOR10 NGA11 SLV11 URY12	
	BGD12 COG2 GIN12 LBR11 NGA12 SLV12 URY13	
	BGD13 COG10 GMB12 LKA10 NGA13 SLV13 VEN10	
	BOL10 COG11 GMB13 LKA11 PAK2 SYR10 VEN11	
	BOL11 COG12 GTM2 LKA12 PAK10 SYR11 VEN12	
	BOL12 COG13 GTM10 LKA13 PAK11 SYR12 VEN13	
	BOL13 COL2 GTM11 MAR2 PAK12 TGO2 ZAF10	
	BRA2 COL10 GTM13 MAR10 PAK13 TGO10 ZAF11	
	BRA10 COL11 HND2 MAR11 PAN10 THA2 ZAF12	
	BRA11 COL12 HND13 MAR12 PAN12 THA10 ZAF13	
	BRA12 COL13 IDN10 MAR13 PAN13 THA11 ZMB2	
	BRA13 CRI2 IDN11 MDG2 PER2 THA12 ZMB10	
	BWA10 DOM2 IDN12 MDG10 PER10 THA13 ZMB11	
	BWA11 DOM10 IDN13 MDG13 PER11 TTO2 ZMB12	
	BWA12 DOM11 IND2 MEX2 PER12 TTO11 ZMB13	
	BWA13 DOM12 IND10 MEX10 PER13 TTO12 ZWE11	
	CHL2 DOM13 IND11 MEX11 PHL2 TTO13 ZWE12	
	CHL10 ECU2 IND12 MEX12 PHL10 TUN2	
	CHL11 ECU10 IND13 MEX13 PHL11 TUN10	
	CHL12 ECU11 IRN2 MLI10 PHL12 TUN11	
	CHL13 ECU12 IRN10 MLI11 PHL13 TUN12	
Number of Obs	356	687

Notes: * 1962-1965 observations are lagged for one period in the model.
Country codes refer to International Standards Organization (ISO) 3-digit alphabetic codes; numbers represent different 4-year period, starts in 1962. For example, BOL3 means Bolivia 1970-1973

Appendix 4 – Country differences in BD/ELR samples and post-1990 new sample

BD 70-93 sample versus post-1990 new sample *		**ELR 70-97 sample versus post-1990 new sample #**	
BD unique countries	**NEW unique countries**	**ELR unique countries**	**NEW unique countries**
Algeria	Albania	Algeria	Albania
Guyana	Azerbaijan	Guyana	Azerbaijan
Haiti	Burkina Faso	Haiti	Bangladesh
Jamaica	Bangladesh	Jamaica	Belarus
Nicaragua	Belarus	Myanmar	China
Somalia	China	Nicaragua	Guinea
Tanzania	Congo, Rep.	Papua New Guinea	Croatia
Congo, Dem. Rep.	Guinea	Congo, Dem. Rep.	Kazakhstan
	Croatia		Liberia
	Iran, Islamic Rep.		Moldova
	Jordan		Malta
	Kazakhstan		Panama
	Liberia		Singapore
	Moldova		
	Malta		
	Panama		
	Singapore		
	Uganda		
	South Africa		

Notes: *observations under BD specification; # observations under ELR specification.

Appendix 5 - Outliers excluded from regressions

	Regressions	Outliers
1	BD original,1970-93	GAM7 GAM8 GUY8 NIC7 NIC8
2	New data, BD countries,1970-93	BWA5 BWA6 GAB4 GMB7 GMB8 SLV6 SLV8 ZMB7 ZMB8
3	New data, full sample,1970-93	BWA5 BWA7 GMB7 MLI6 SLV8 ZMB8
		BWA6 GAB4 GMB8 SLV6 ZMB7
4	ELR original,1970-97	BRA7 BRA8 GAB4 GAM8 GUY9 JOR5 NIC7
5	New data, ELR countries,1970-97	BRA7 BWA6 GAB4 MLI8 SLV9 ZMB8
		BWA5 BWA7 GMB8 SLV8 ZMB7 ZMB9
6	New data, full sample,1970-97	BRA7 BWA6 GAB4 MLI8 SLV9 ZMB8
		BWA5 BWA7 GMB8 SLV8 ZMB7 ZMB9
7	New data, BD countries,1962-2012	BWA5 BWA6 GAB4 GMB7 SLV8 ZMB7 ZMB8
8	New data, full sample,	BWA5 BWA6 GAB4 GMB7 MLI6 SLV8 ZMB7 ZMB8
	BD specification,1962-2012	
9	New data, ELR countries,1962-2012	BWA5 BWA6 GAB4 GMB7 IRN5 SLV8 ZMB7 ZMB8
10	New data, full sample,	BRA7 BWA5 BWA7 GMB7 LBR12 LBR8 MLI8 SLV8 ZMB7
	ELR specification,1962-2012	BRA8 BWA6 GAB4 IRN5 LBR13 LBR9 SLV7 SLV9 ZMB8
11	New data, BD countries,1990-2012	ARG8 MWI10 MWI13 NER8 SLE11 TGO8 ZMB8
		BRA8 MWI11 MWI9 NGA11 SLV8 TGO9
12	New data, full sample,	AZE12 GNB8 JOR8 LBR8 SLV8 ZMB8
	BD specification,1990-2012	GMB8 GNB9 LBR13 LBR9 SLV9
13	New data, ELR countries,1990-2012	ARG8 BRA8 MWI11 NGA11 TGO8
		BFA8 MWI10 MWI13 SLE11 TGO9
14	New data, full sample,	AZE12 GNB10 GNB9 LBR9 SLV9
	ELR specification,1990-2012	GMB8 GNB8 LBR8 SLV8 ZMB8

Note: Country codes refer to International Standards Organization (ISO) 3-digit alphabetic codes; numbers represent different 4-year period, starts in 1962. For example, BOL3 means Bolivia 1970-1973

Appendix 6- List of BD and ELR country dummy variables

Variable Name	Abbreviation	BD(2000)		ELR(2004)		
Sub-Saharan Africa	Botswana	Ghana	Senegal	Botswana	Gambia	Senegal
	Cameroon	Kenya	Sierra Leone	Burkina Faso	Ghana	Sierra Leone
	Congo, Dem. Rep.	Madagascar	Somalia	Cameroon	Kenya	South Africa
	Cote d'Ivoire	Malawi	Tanzania	Congo, Dem. Rep.	Madagascar	Togo
	Ethiopia	Mali	Togo	Congo, Rep.	Malawi	Uganda
	Gabon	Niger	Zambia	Cote d'Ivoire	Mali	Zambia
	Gambia	Nigeria	Zimbabwe	Ethiopia	Niger	Zimbabwe
				Gabon	Nigeria	
East Asia	Indonesia	Malaysia	Thailand	Indonesia	Malaysia	Thailand
	Korea, Rep.	Philippines		Korea, Rep.	Philippines	
Franc Zone	Cameroon	Mali	Togo	Burkina Faso	Cote d'Ivoire	Niger
	Cote d'Ivoire	Niger		Cameroon	Gabon	Senegal
	Gabon	Senegal		Congo, Rep.	Mali	Togo
Central America	Costa Rica	Guatemala	Nicaragua	Costa Rica	Guatemala	Nicaragua
	El Salvador	Honduras		El Salvador	Honduras	

Appendix 7-Regression and specification setting up

To investigate the relation of aid-policy-growth, BD employ methods of Pooled Ordinary Least Squares (OLS) and Two-Stage Least Squares (2SLS). The model specification is, GDP growth rate being the LHS variable; initial real GDP, amount of international aid, policy index, interaction term of aid and policy and other control variables being the RHS variables.

This expresses as the following equation:

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

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

Where *i* denotes countries, *t* denotes period, g_{it} is per capita real GDP growth, y_{it} is natural logarithm of per capita real GDP, a_{it} is international aid received relative to its total GDP, g_t and a_t are fixed-time effects, $z_{it}^{'}$ is a vector of other exogenous variables,

p_{it} is the policy index vector constructed by BD[14], which basically leave the weights of different policies to the gross regression. It follows the steps:

i) Run equation (1) without aid and aid*policy terms, and collect the policy coefficients

$$g_{it} = y_{it}\beta_y + p_{it}^{'}\beta_p + z_{it}^{'}\beta_z + g_t + \varepsilon_{it}^{g} \quad (3)$$

ii) Construct a variable called "Policy^0", with coefficients collected from step i), and calculate the mean of Policy^0

$$p_{it}^{o} = \beta_b BudgetSurp\quad lus + \beta_i Inflation + \beta_o Openness \quad \text{and get } \overline{p} \quad (4)$$

iii) Calculate the constant of the policy index, which is the difference between the mean of GDP growth rate and the mean of Policy^0[15], $Cons\tan t = \overline{g} - \overline{p}$ (5)

iv) At last, we add the constant term up to p_{it}^{0}, and get the policy index;

$$p_{it} = p_{it}^{0} + cons\ \tan\ t \quad (6)$$

[14] This is known as "Burnside & Dollar Policy Index", which Jan Dehn (2000) has clear statement about the procedure.

[15] By doing so, BD claim that "the index can be interpreted as a country's predicted growth rate."(2000,p. 855)

Appendix 8- Countries with trade openness status changed between BD/ELR samples and post-90 sample

Comparisons	**Countries**		
Compared with BD sample	Argentina	Honduras	Senegal
	Bangladesh	Kenya	Sierra Leone
	Brazil	Sri Lanka	Syrian Arab Republic
	Côte D'ivoire	Madagascar	Trinidad And Tobago
	Cameroon	Niger	South Africa
	Dominican Republic	Nigeria	Zambia
	Ecuador	Pakistan	Zimbabwe
	Egypt, Arab Rep.	Panama	
	Ethiopia	Peru	
Compared with ELR sample	Albania	Honduras	Panama
	Argentina	Iran, Islamic Rep.	Senegal
	Burkina Faso	Kenya	Syrian Arab Republic
	Bangladesh	Liberia	Trinidad And Tobago
	China	Madagascar	Uganda
	Côte D'ivoire	Malta	Uruguay
	Congo, Rep.	Niger	Zambia
	Dominican Republic	Nigeria	Zimbabwe
	Ethiopia	Pakistan	

Notes: Countries listed here include: either BD/ELR do not have that country, or trade openness status has changed after 1993/1997.

Table 1 - Replication with new data 1970-93/97, BD and ELR regressions 4, 7, 5, 8

Notes: Robust standard errors are reported in parentheses *** p<0.01, ** p<0.05, * p<0.1. Country and time fixed effects are included in all regressions. Each specification includes a constant term, measure of aid/GDP, a policy index, an aid*policy interaction term, log initial GDP, ethnic fractionalization, political assassinations, a fractionalization*assassinations interaction term, a measure of institutional quality, and a measure of financial depth (M2/GDP lagged), regional dummies for Sub-Saharan Africa and fast-growing East Asian countries. See Appendix 1 for detailed data description. ELR original does not report results for 4/2SLS and 7/2SLS. Regression numbers are matched with BD/ ELR original works. Regression and specification set up refer to Appendix 6

		Outliers included				Hadi Method, outliers excluded			
		All countries		Lower income countries		All countries		Lower income countries	
		4/OLS	4/2SLS	7/OLS	7/2SLS	5/OLS	5/2SLS	8/OLS	8/2SLS
Panel A: BD 1970-1993, coefficients for Aid*Policy and Aid^2*policy term									
Aid*policy	BD original	0.20**	0.37	0.27**	0.43	0.19**	0.18*	0.26**	0.25**
		(0.09)	(0.33)	(0.12)	(0.49)	(0.07)	(0.10)	(0.08)	(0.01)
	New data, BD countries	0.10	0.35	0.12	0.03	0.04	-0.02	0.00	-0.10
		(0.10)	(0.31)	(0.12)	(0.24)	(0.12)	(0.13)	(0.12)	(0.15)
	New data, full sample	0.14	0.41	0.12	0.05	-0.08	-0.08	-0.01	-0.14
		(0.09)	(0.33)	(0.12)	(0.24)	(0.10)	(0.12)	(0.12)	(0.16)
Aid^2*policy	BD original	-0.02*	-0.04	-0.02**	-0.04				
		(0.01)	(0.04)	(0.01)	(0.05)				
	New data, BD countries	0.00	-0.04	-0.01	0.00				
		(0.01)	(0.04)	(0.01)	(0.02)				
	New data, full sample	-0.01	-0.05	-0.01	-0.01				
		(0.01)	(0.04)	(0.01)	(0.02)				
Observation	BD original	275	275	189	189	270	270	184	184
	New data, BD countries	261	215	173	138	252	208	167	135
	New data, full sample	283	228	177	141	272	219	171	138
Panel B: ELR 1970-1997, coefficients for Aid*Policy and Aid^2*policy term									
Aid*policy	ELR original	-0.14		-0.27		-0.15	0.01	-0.20	-0.20
		(1.31)		(1.89)		(1.09)	(0.05)	(1.26)	(0.65)
	New data, ELR countries	0.00	0.24	0.06	0.05	-0.12*	-0.20**	-0.04	-0.15
		(0.09)	(0.22)	(0.10)	(0.24)	(0.07)	(0.09)	(0.08)	(0.14)
	New data, full sample	0.05	0.29	0.12	0.23	-0.08	-0.19**	0.06	0.04

		(0.08)	(0.24)	(0.10)	(0.25)	(0.07)	(0.09)	(0.08)	(0.16)
Aid^2*policy	ELR original	0.03**		0.03**					
		(2.25)		(2.35)					
	New data, ELR countries	0.00	-0.04	0.00	-0.01				
		(0.01)	(0.03)	(0.01)	(0.02)				
	New data, full sample	0.00	-0.04	0.00	-0.01				
		(0.01)	(0.03)	(0.01)	(0.02)				
Observation	ELR original	356	356	244	244	345	345	236	236
	New data, ELR countries	338	285	226	185	326	275	222	182
	New data, full sample	362	297	238	192	350	287	234	189

Table 2 - Full sample 1962-2012, BD and ELR regressions 4, 7, 5, 8

Notes: Robust standard errors are reported in parentheses *** p<0.01, ** p<0.05, * p<0.1. Country and time fixed effects are included in all regressions. Each specification includes a constant term, measure of aid/GDP, a policy index, an aid*policy interaction term, log initial GDP, ethnic fractionalization, political assassinations, a fractionalization*assassinations interaction term, a measure of institutional quality, and a measure of financial depth (M2/GDP lagged), regional dummies for Sub-Saharan Africa and fast-growing East Asian countries. BD and ELR specifications differ in their definitions of regional dummies and low-income. See Appendix 1 for detailed data description. # The region dummies are different for BD and ELR, refer to Appendix 6.

		Outliers included				Hadi Method, outliers excluded			
		All countries		Lower income countries		All countries		Lower income countries	
		4/OLS	4/2SLS	7/OLS	7/2SLS	5/OLS	5/2SLS	8/OLS	8/2SLS
Panel A: BD 1962-2012, coefficients for Aid*Policy and Aid^2*policy term									
Aid*policy	New data, BD countries	0.04	0.07	0.06	-0.10	0.01	0.08	0.01	0.04
		(0.07)	(0.19)	(0.08)	(0.26)	(0.06)	(0.09)	(0.07)	(0.14)
	New data, full sample#	0.05	0.07	0.04	-0.09	0.00	0.08	-0.03	0.02
		(0.06)	(0.18)	(0.07)	(0.22)	(0.06)	(0.08)	(0.07)	(0.14)
Aid^2*policy	New data, BD countries	0.00	0.01	0.00	0.03				
		(0.01)	(0.03)	(0.01)	(0.03)				
	New data, full sample	0.00	0.01	0.00	0.02				
		(0.00)	(0.03)	(0.01)	(0.02)				
Observation	New data, BD countries	558	453	380	298	551	448	375	295
	New data, full sample	601	485	389	307	593	479	384	303
Panel B: ELR 1962-2012, coefficients for Aid*Policy and Aid^2*policy term									
Aid*policy	New data, ELR countries	0.03	0.14	0.07	0.02	0.01	0.06	0.01	0.00
		(0.06)	(0.17)	(0.08)	(0.23)	(0.06)	(0.08)	(0.07)	(0.14)
	New data, full sample#	0.04	0.07	0.06	0.09	0.04	0.09	0.11	0.16
		(0.07)	(0.17)	(0.10)	(0.27)	(0.07)	(0.10)	(0.10)	(0.19)
Aid^2*policy	New data, ELR countries	0.00	-0.01	0.00	0.00				
		(0.01)	(0.03)	(0.01)	(0.03)				
	New data, full sample	0.01**	0.02	0.01**	0.02				
		(0.00)	(0.03)	(0.00)	(0.02)				
Observation	New data, ELR countries	617	509	421	336	609	503	416	333
	New data, full sample	687	548	459	355	669	536	449	351

Table 3 - Full sample 1990-2012, BD and ELR regressions 4, 7, 5, 8

Notes: Robust standard errors are reported in parentheses *** p<0.01, ** p<0.05, * p<0.1. Country and time fixed effects are included in all regressions. Each specification includes a constant term, measure of aid/GDP, a policy index, an aid*policy interaction term, log initial GDP, ethnic fractionalization, political assassinations, a fractionalization*assassinations interaction term, a measure of institutional quality, and a measure of financial depth (M2/GDP lagged), regional dummies for Sub-Saharan Africa and fast-growing East Asian countries. BD and ELR specifications differ in their definitions of regional dummies and low-income. See Appendix 1 for detailed data description. # The region dummies are different for BD and ELR, refer to Appendix 6.

		Outliers included				Hadi Method, outliers excluded			
		All countries		Lower income countries		All countries		Lower income countries	
		4/OLS	4/2SLS	7/OLS	7/2SLS	5/OLS	5/2SLS	8/OLS	8/2SLS
Panel A: BD 1990-2012, coefficients for Aid*Policy and Aid^2*policy term									
Aid*policy	New data, BD countries	0.29	0.68	0.35	0.22	0.18	1.01*	0.67**	1.66**
		(0.26)	(0.84)	(0.26)	(1.05)	(0.26)	(0.52)	(0.28)	(0.45)
	New data, full sample*	-0.10	-0.54	-0.17	-0.62	0.07	0.58	0.10	0.58
		(0.30)	(0.54)	(0.40)	(0.63)	(0.26)	(0.50)	(0.16)	(0.43)
Aid^2*policy	New data, BD countries	0.03**	0.03	0.03**	0.07				
		(0.01)	(0.05)	(0.01)	(0.04)				
	New data, full sample	0.01**	0.07*	0.01*	0.07**				
		(0.00)	(0.04)	(0.00)	(0.03)				
Aid	New data, BD countries	-1.05**	-2.24	-1.11**	-1.62	-0.47	-2.56**	-1.23**	-3.51**
		(0.52)	(1.53)	(0.50)	(1.87)	(0.53)	(1.12)	(0.53)	(0.87)
	New data, full sample	-0.02	-0.25	0.19	-0.09	-0.20	-1.77	-0.21	-1.52
		(0.61)	(1.09)	(0.79)	(1.32)	(0.58)	(1.20)	(0.39)	(0.94)
Policy	New data, BD countries	0.12	0.43	-0.67	0.52	0.30	0.07	-1.15	-1.04
		(0.59)	(0.72)	(0.90)	(1.45)	(0.51)	(0.57)	(0.85)	(1.09)
	New data, full sample	0.62	1.02	1.61	2.35	0.18	0.23	0.70	0.73
		(0.95)	(0.76)	(1.69)	(1.47)	(0.67)	(0.74)	(0.80)	(1.08)
Marginal Effects of Aid	New data, BD countries	-0.35**	-0.82**	-0.22	-0.71**	-0.14	-0.66**	0.04	-0.33**
		(0.13)	(0.36)	(0.14)	(0.29)	(0.09)	(0.23)	(0.10)	(0.13)
	New data, full sample	-0.17	-0.91**	-0.09	-0.77**	-0.07	-0.61**	0.00	-0.32**
		(0.11)	(0.33)	(0.12)	(0.22)	(0.10)	(0.26)	(0.08)	(0.14)
Observation	New data, BD countries	282	232	194	153	269	224	192	151

	New data, full sample	382	309	262	203	371	304	252	199
Panel B: ELR 1990-2012, coefficients for Aid*Policy and Aid^2*policy term									
Aid*policy	New data, ELR countries	0.29	0.35	0.44*	0.23	0.24	0.76**	0.62**	1.28**
		(0.20)	(0.52)	(0.24)	(0.84)	(0.19)	(0.37)	(0.25)	(0.47)
	New data, full sample*	0.03	-0.38	0.14	-0.50	0.22*	0.46	0.20*	0.67**
		(0.18)	(0.42)	(0.25)	(0.45)	(0.12)	(0.33)	(0.10)	(0.30)
Aid^2*policy	New data, ELR countries	0.01	0.03	0.01	0.06				
		(0.01)	(0.04)	(0.01)	(0.04)				
	New data, full sample	0.00**	0.08	0.00	0.07**				
		(0.00)	(0.05)	(0.00)	(0.03)				
Aid	New data, ELR countries	-0.92**	-1.49	-1.12**	-1.52	-0.55	-1.92**	-1.22**	-2.74**
		(0.43)	(0.98)	(0.49)	(1.45)	(0.39)	(0.81)	(0.48)	(0.98)
	New data, full sample	-0.23	-0.53	-0.35	-0.27	-0.51	-1.49*	-0.43	-1.68**
		(0.37)	(0.83)	(0.49)	(0.97)	(0.32)	(0.88)	(0.28)	(0.69)
Policy	New data, ELR countries	0.08	0.25	-0.71	0.25	0.15	-0.01	-0.88	-1.34
		(0.45)	(0.54)	(0.84)	(1.47)	(0.41)	(0.42)	(0.79)	(1.09)
	New data, full sample	0.45	0.73	-0.23	0.86	0.16	0.22	-0.33	-0.71
		(0.59)	(0.49)	(1.21)	(1.16)	(0.37)	(0.49)	(0.48)	(0.84)
Marginal Effects of Aid	New data, ELR countries	-0.25**	-0.63**	-0.11	-0.51**	-0.06	-0.42**	0.03	-0.15
		(0.11)	(0.29)	(0.11)	(0.25)	(0.07)	(0.16)	(0.08)	(0.12)
	New data, full sample	-0.13	-0.87**	-0.03	-0.67**	-0.07	-0.56**	-0.02	-0.30**
		(0.11)	(0.39)	(0.13)	(0.21)	(0.09)	(0.26)	(0.07)	(0.14)
Observation	New data, ELR countries	318	266	218	175	308	258	216	173
	New data, full sample	382	309	247	189	372	305	242	187