

Aid's Approach to Technical Efficiency: Stochastic Frontier Modeling reveals Multi-Dimensionality

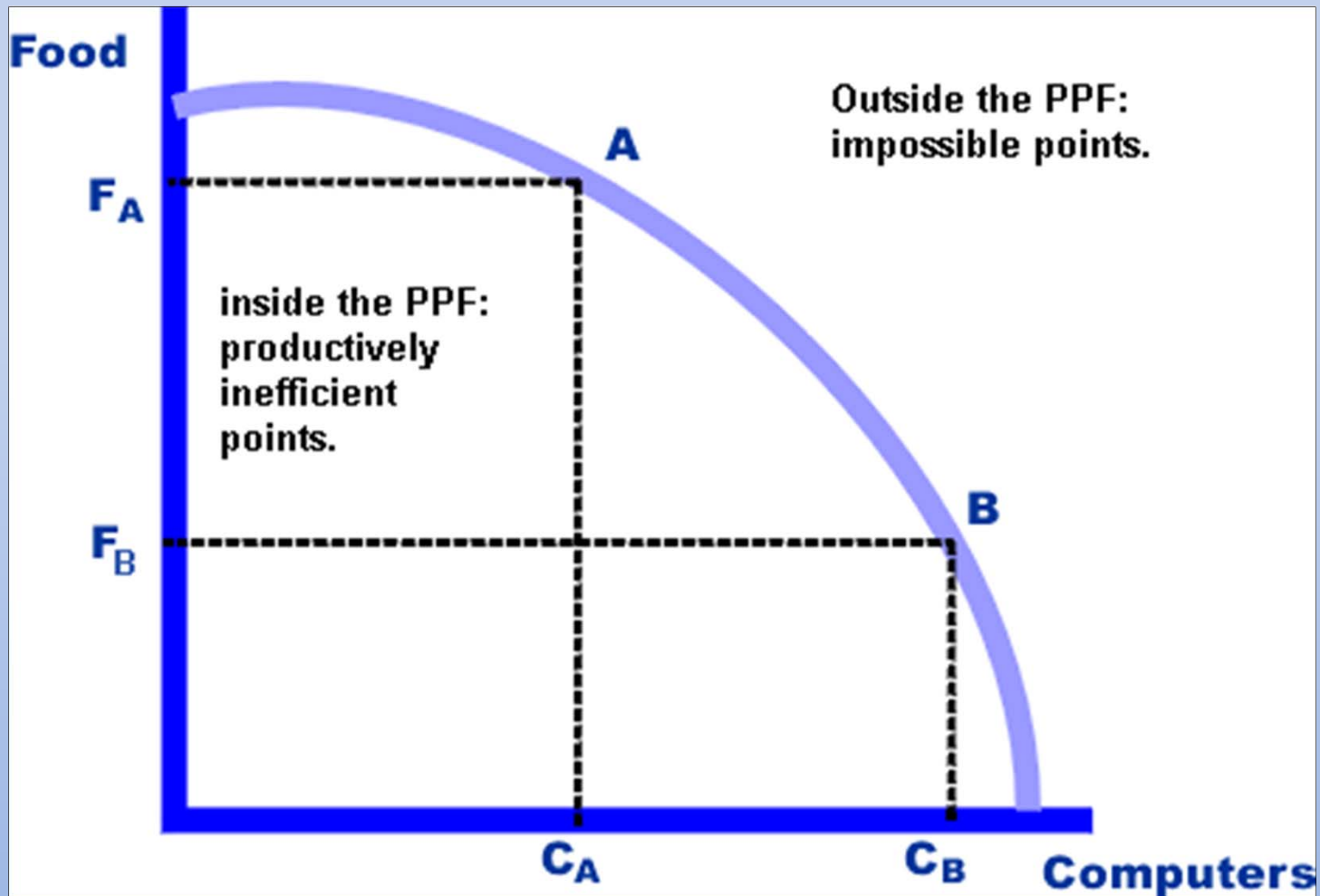
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New v. Old (Us v. Them)

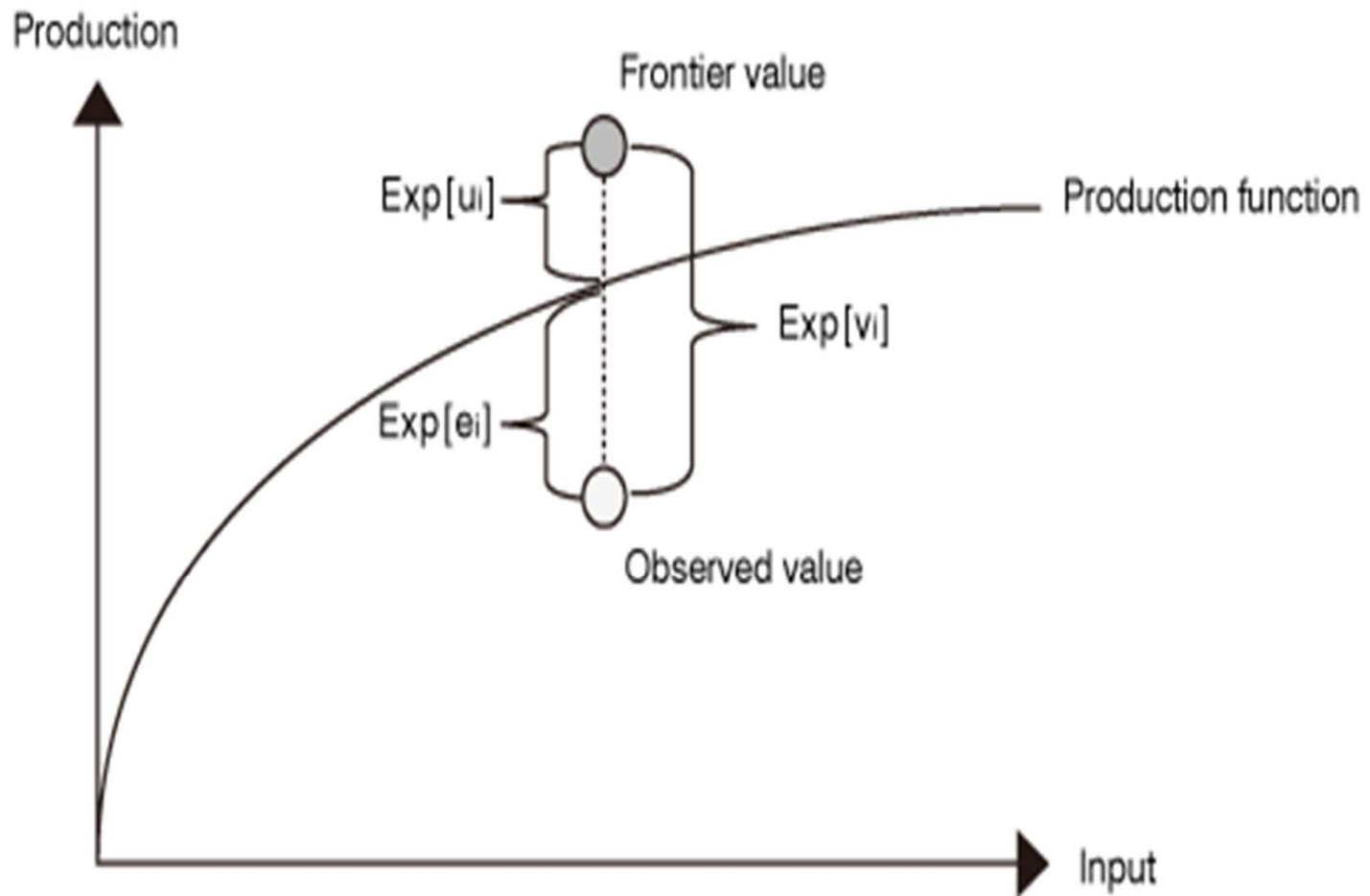
- Efficiency v. Effectiveness
 - Effectiveness: dollar in, dollar out
 - Increasing or decreasing outputs
 - Efficiency: level of aid donors should provide to maximize growth
- Stochastic Frontier Analysis
 - Is a dollar here better spent than a dollar there?

Stochastic Frontier Analysis



Stochastic Frontier Analysis

Figure 1: Outline image of stochastic frontier analysis



Stochastic Frontier Model

$$y_i = x_i' \beta + v_i - u_i$$

Data Description

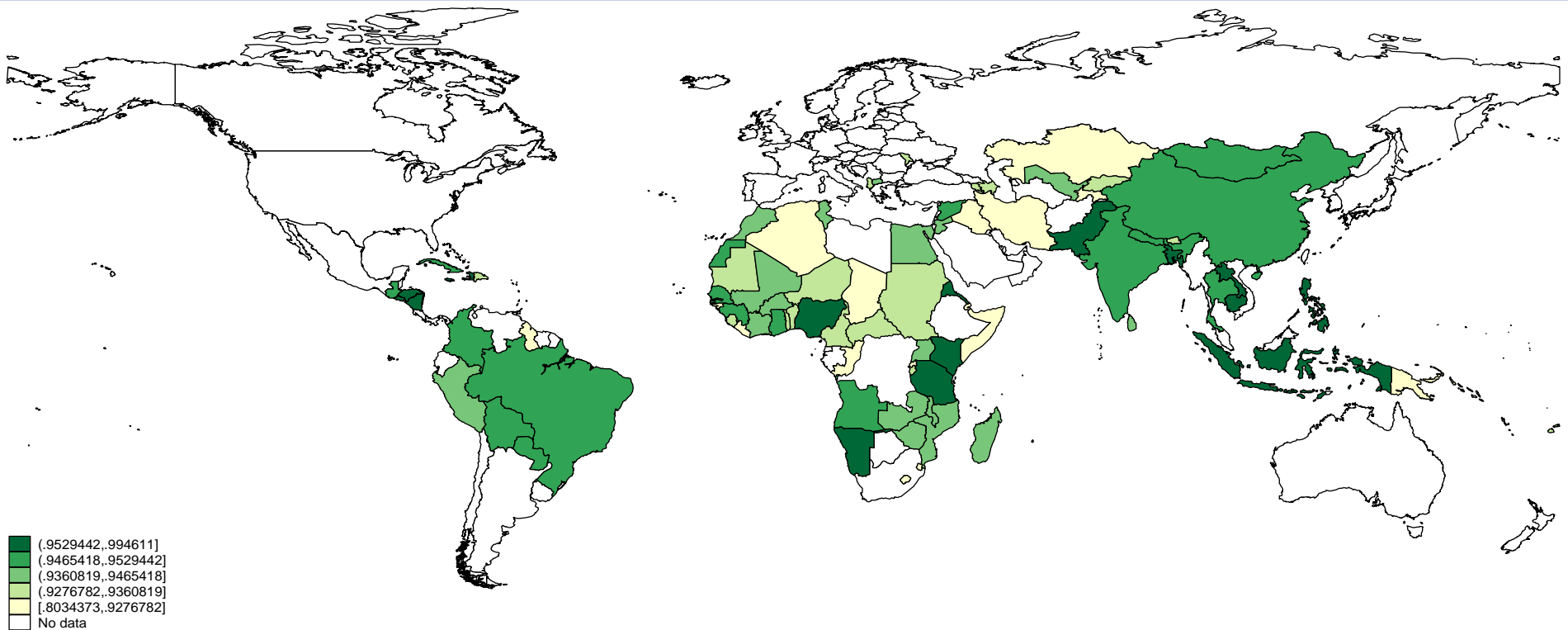
- Lower and lower-middle income countries
 - World Bank classification
- 84 countries
- 1973-2003
- Aid data: OECD
- Aid programs:
 - Energy, Education, Health, Population, Government Accountability, Government Security, Water/Sanitation, Food

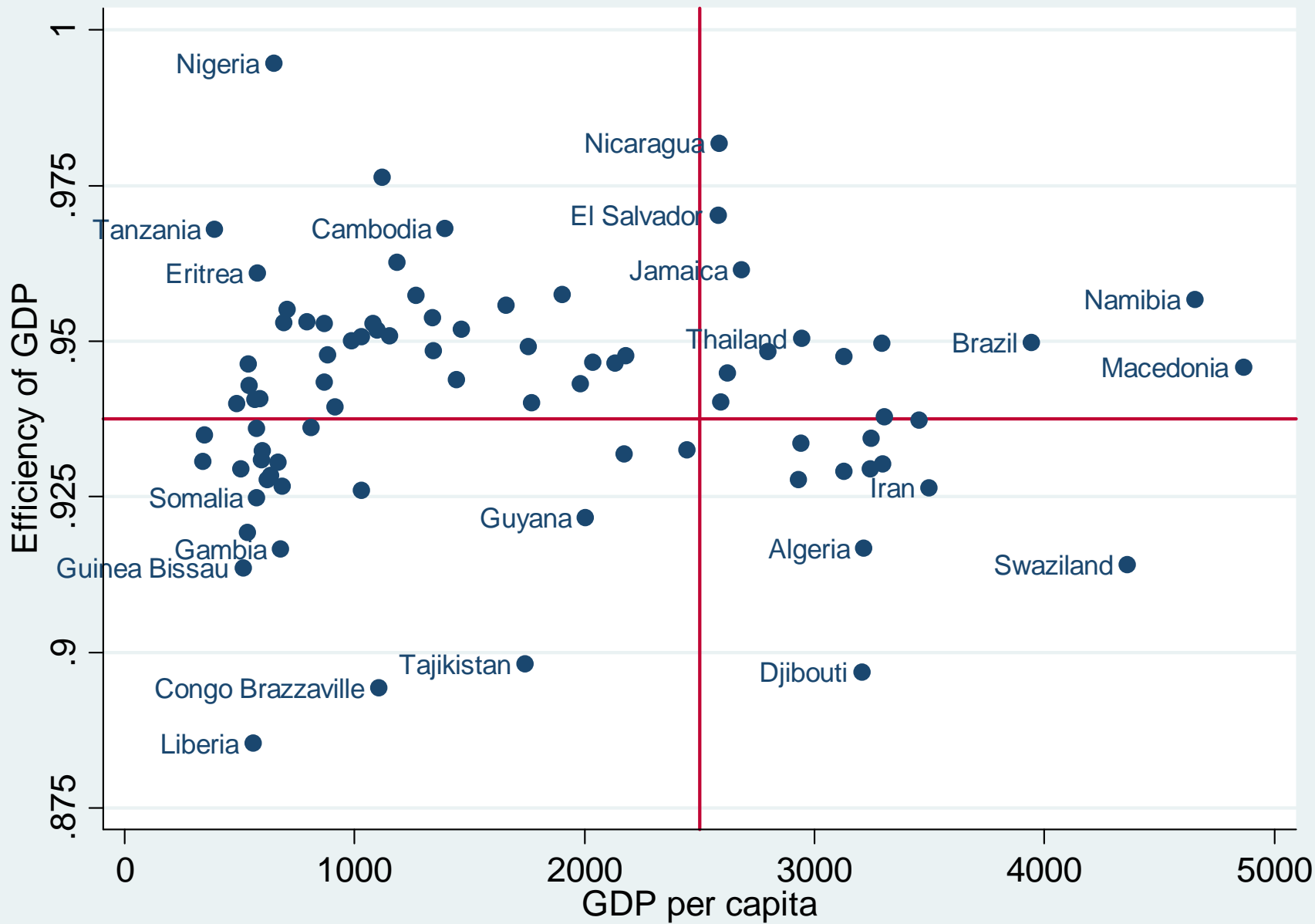
Frontier Estimators	HDI	GDP
Lagged DV	.8873***	.8860***
Agriculture Percent	-.0001***	-.0006**
British colony	.3221***	-.6153
French Colony	.1197***	-.2757
Mountainous terrain	.0431***	-.1073*
Oil	.2521***	.5916*
Post Cold War	-.0001	-.0029
Logged population	.0096***	-.0013
Interstate Conflict	-.0000	-.0022
Society Conflict	-.0001	.0012
Ethic fractionalization	-.3950***	.8907*
Trade Openness	.0000*	.0005***
Life Expectancy		.0016***
Latin America	.1984***	-.5579**
Sub-Saharan Africa	.0153	-.4213***
Asia	.0817***	-.3793***
North Africa & Middle East	-.5408***	.8358
Polity 2	-.0001**	-.0006

Error Estimators	HDI	GDP
Education Aid	-.5076	.3516***
Health Aid	.5484	-.0357
Population	1.1319*	-.5489**
Government Society & Accountability	1.613***	-.8177***
Government Security	-7.2458	.3582*
Water Aid	-.1347	-.1578
Energy Aid	-1.3833***	-.5321***
Food Aid	-3.1862	.0954

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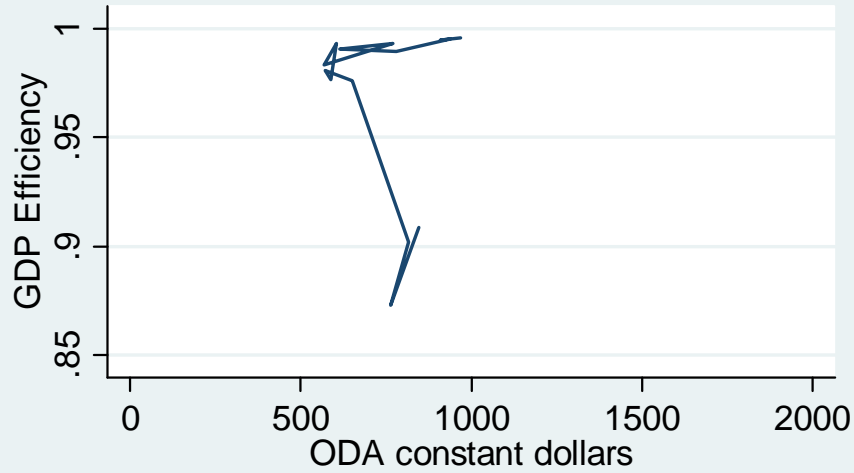
Technical Efficiency at Achieving Growth in GDP, Given Inputs and Technology



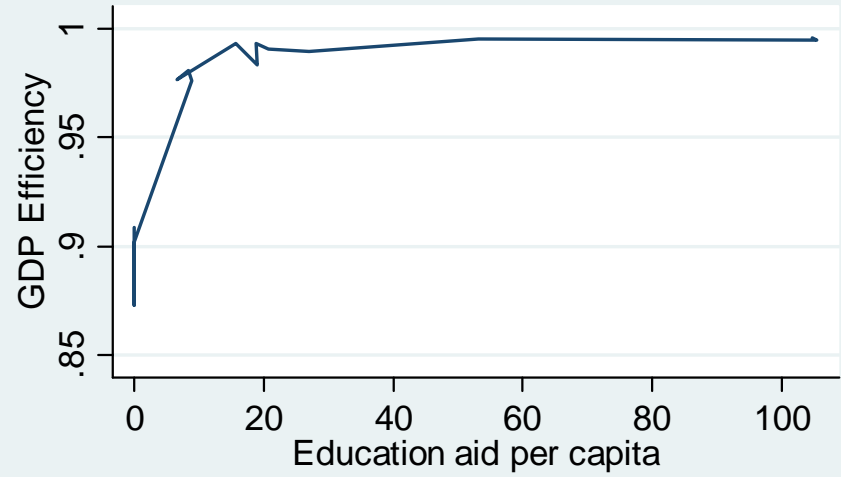


Tanzania

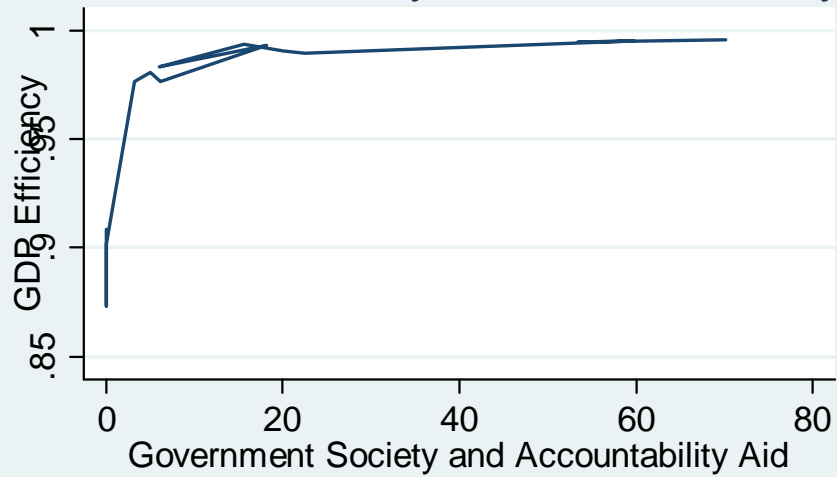
Overall Aid



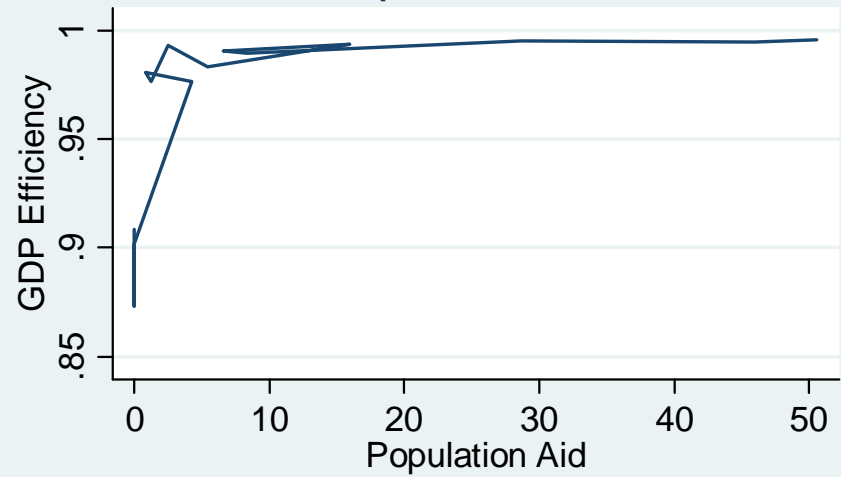
Education



Government Society and Accountability Aid



Population Aid

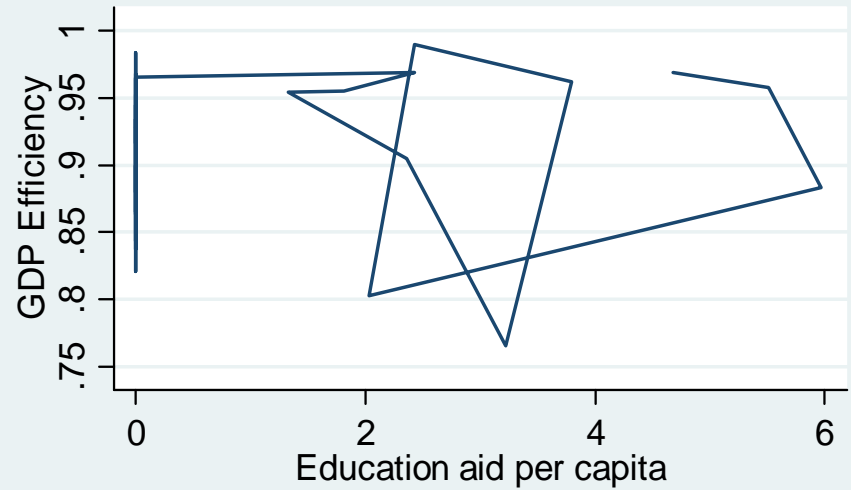


Guinea Bissau

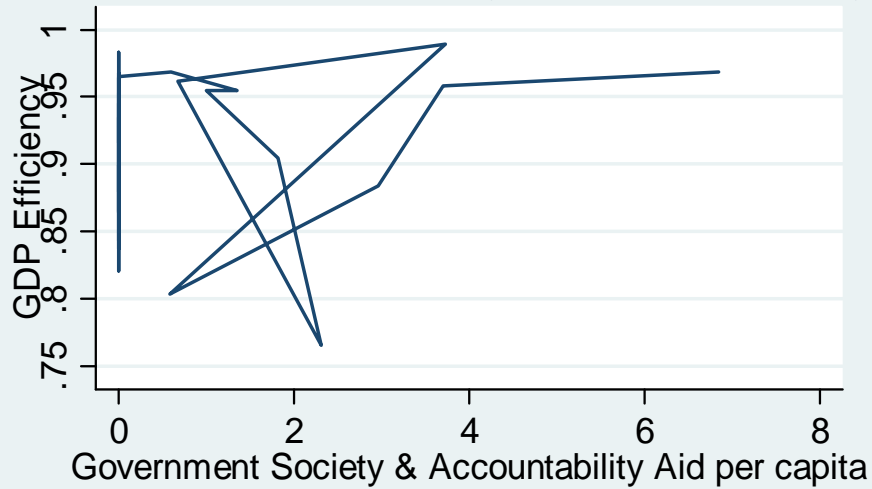
Overall Aid



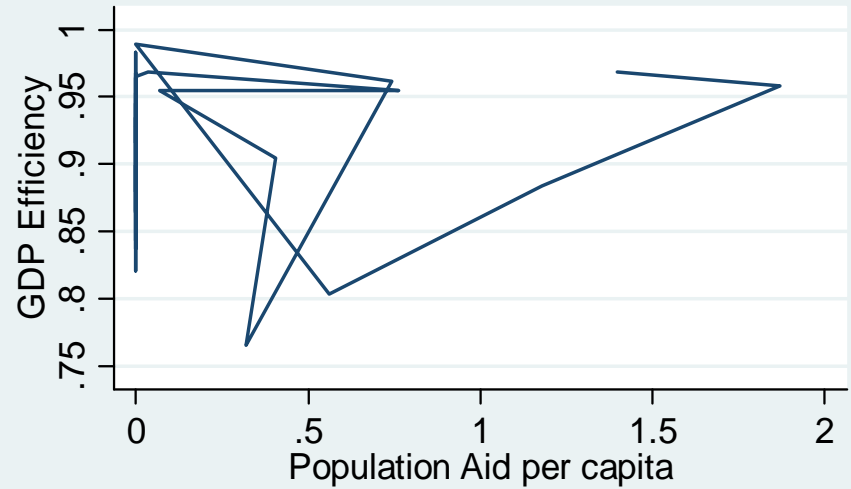
Education



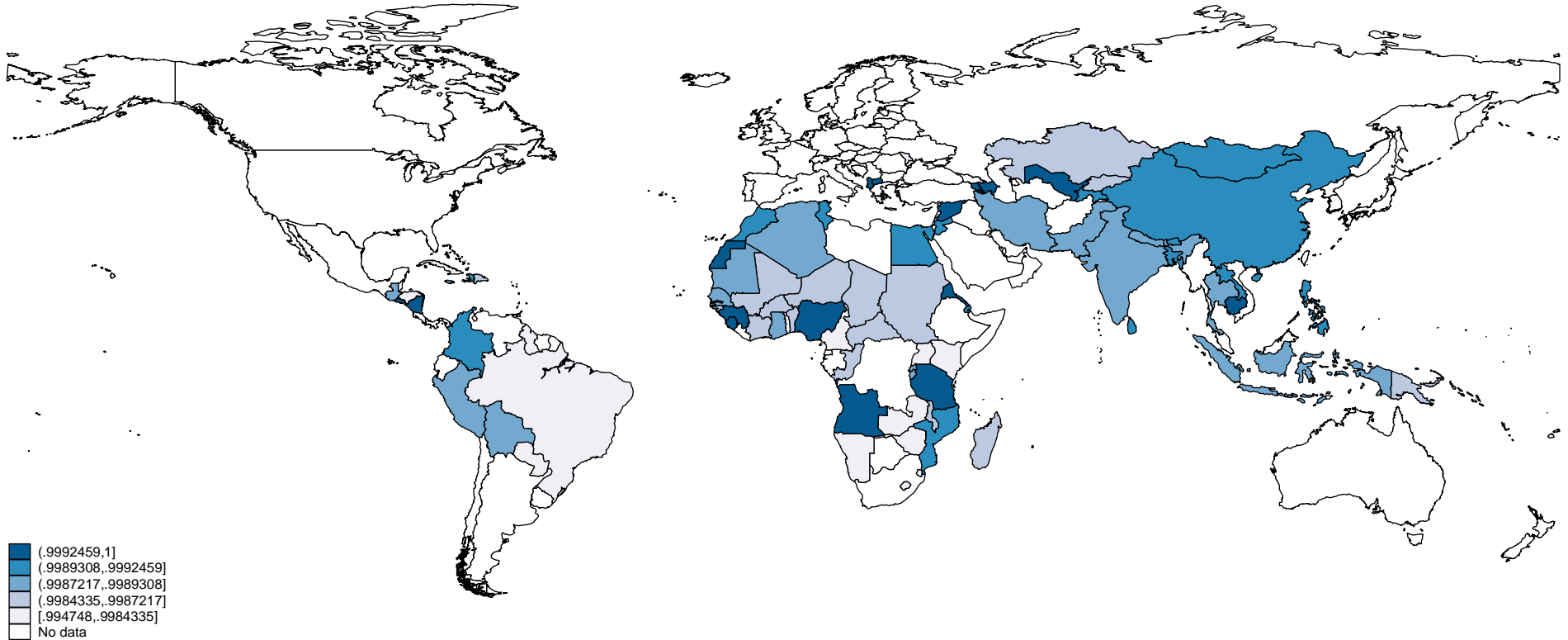
Government Society & Accountability

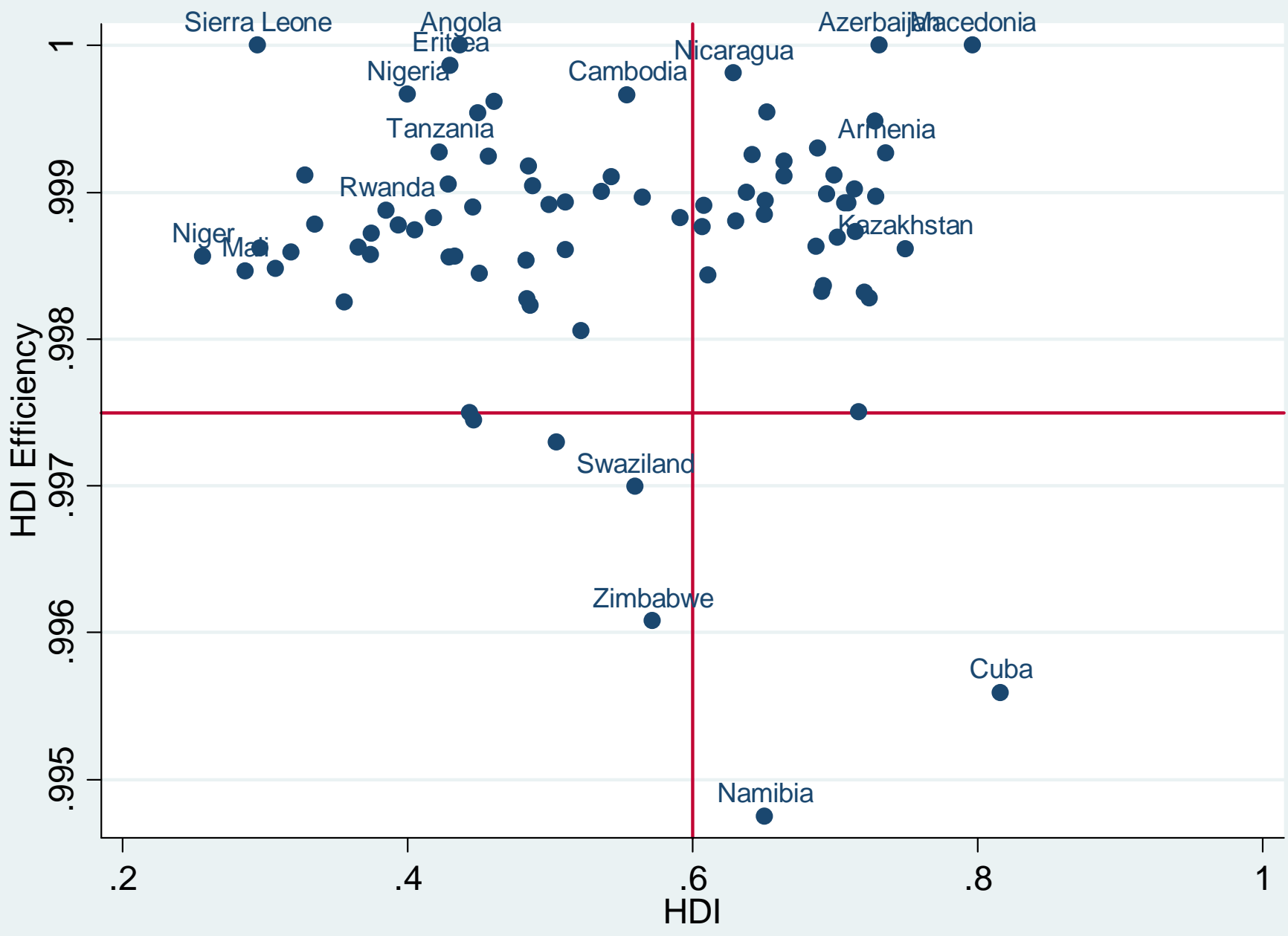


Population



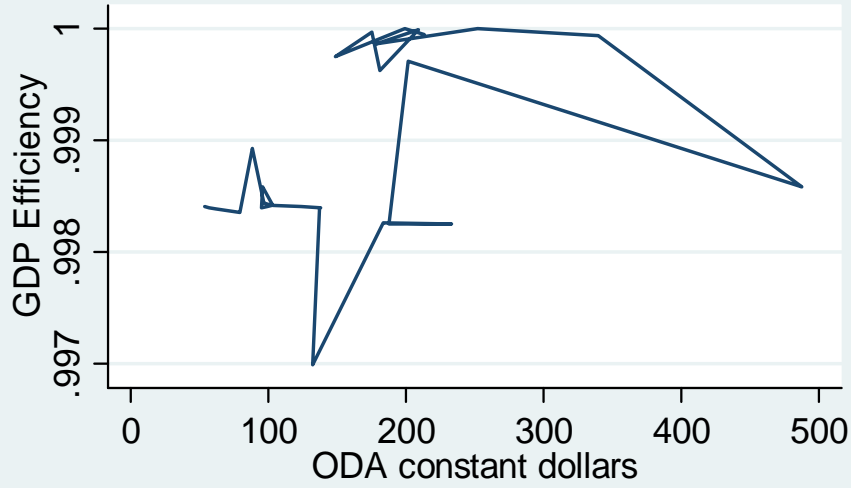
Technical Efficiency at Achieving Human Development, Given Inputs and Technology



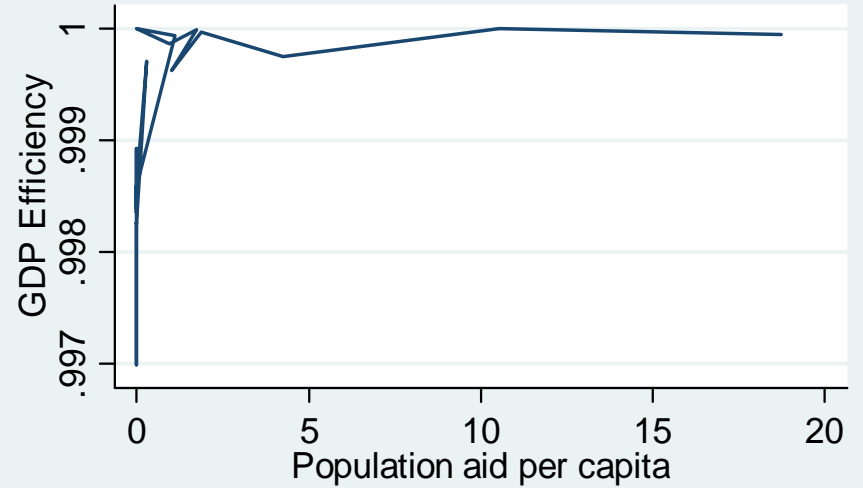


Rwanda

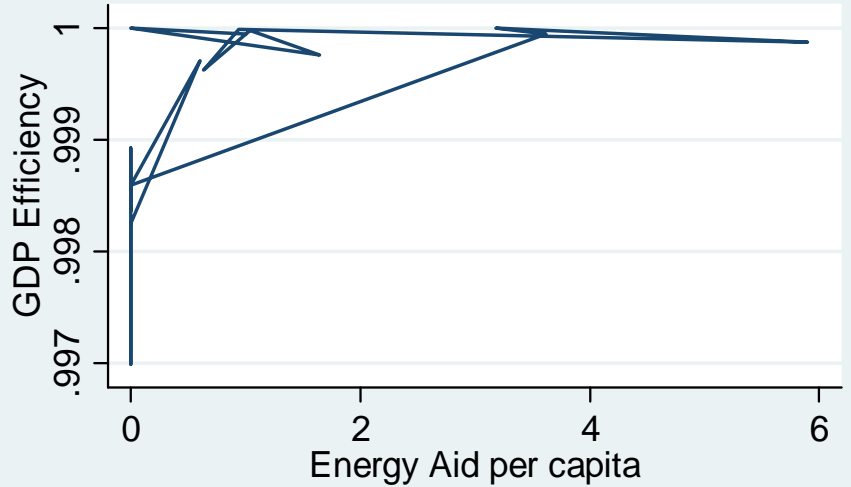
Overall Aid



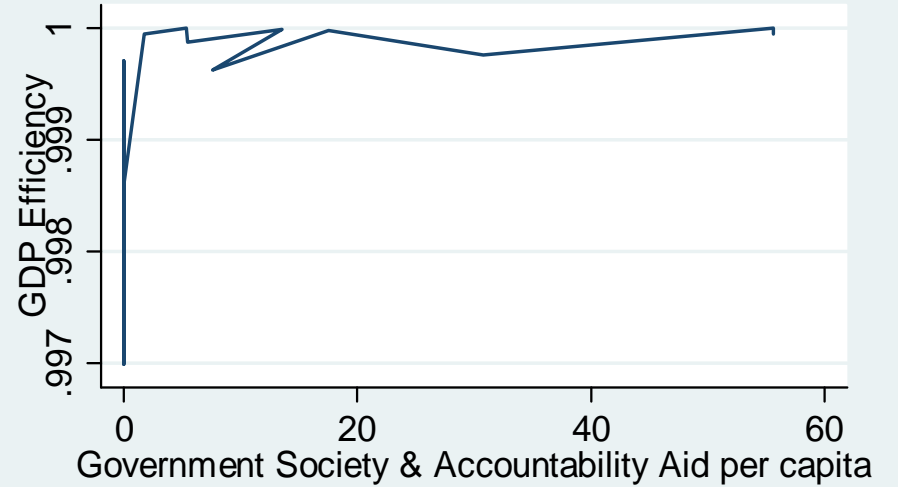
Population



Energy

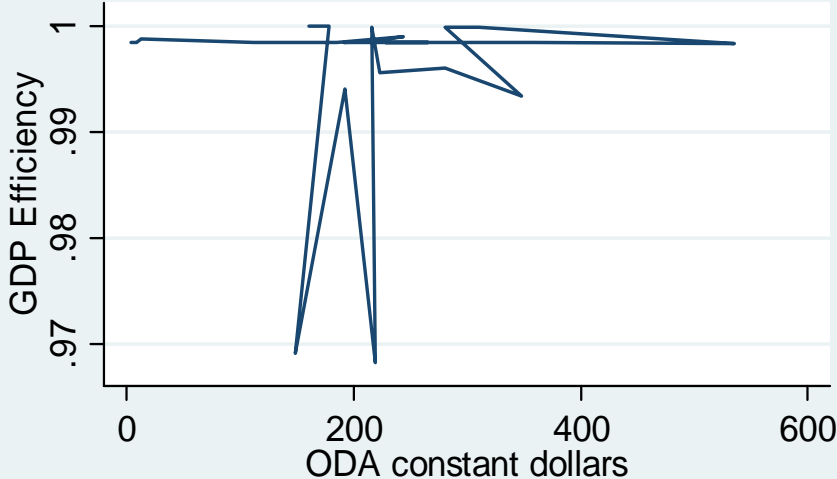


Government Society & Accountability

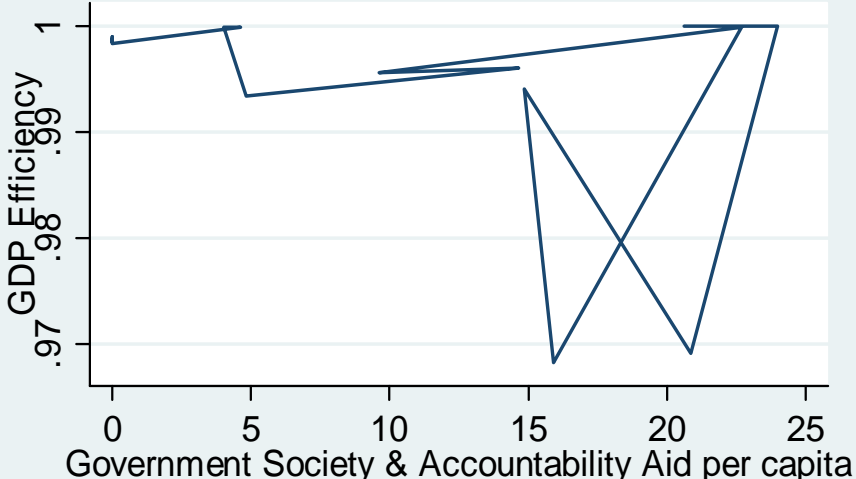


Zimbabwe

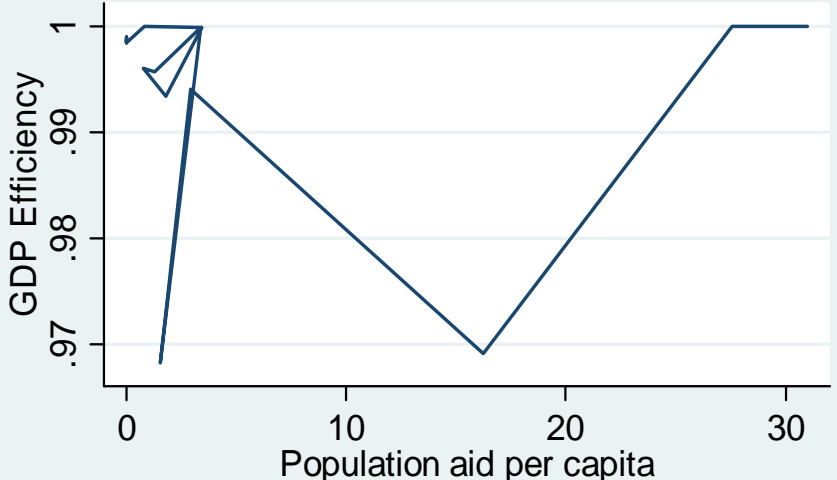
Overall Aid



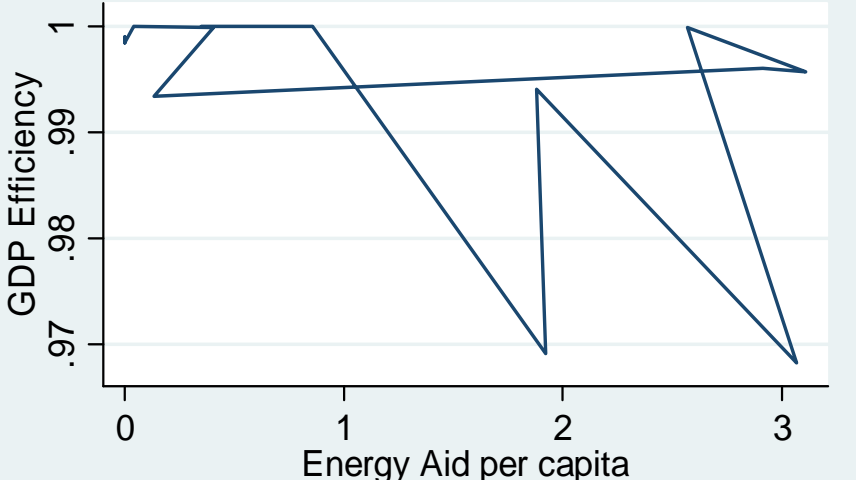
Government Society & Accountability



Population

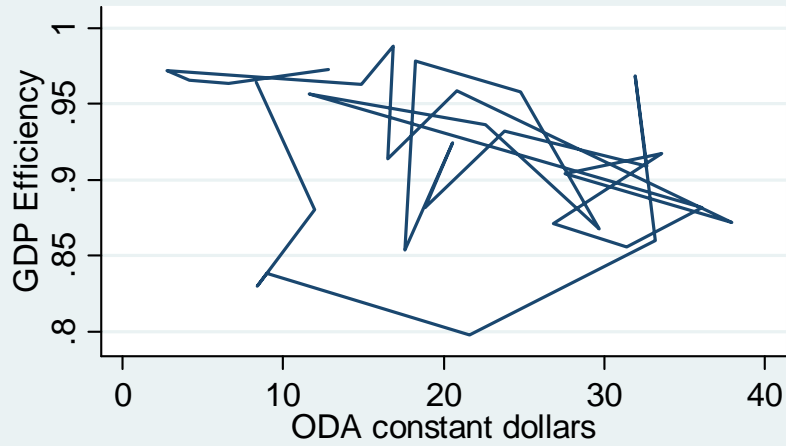


Energy

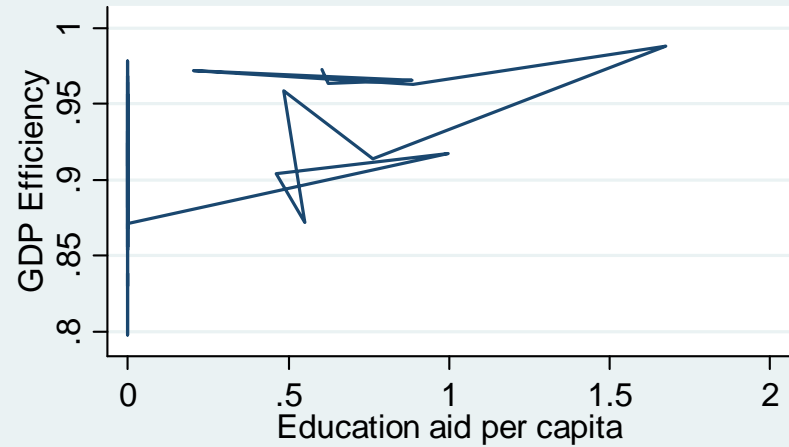


Swaziland

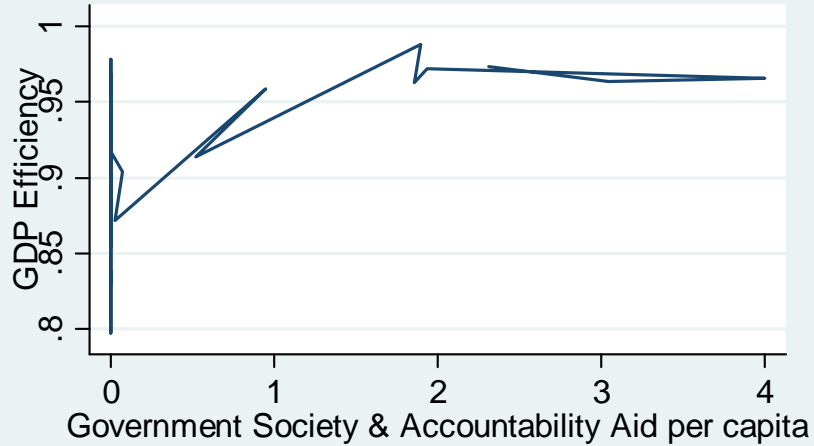
Overall Aid



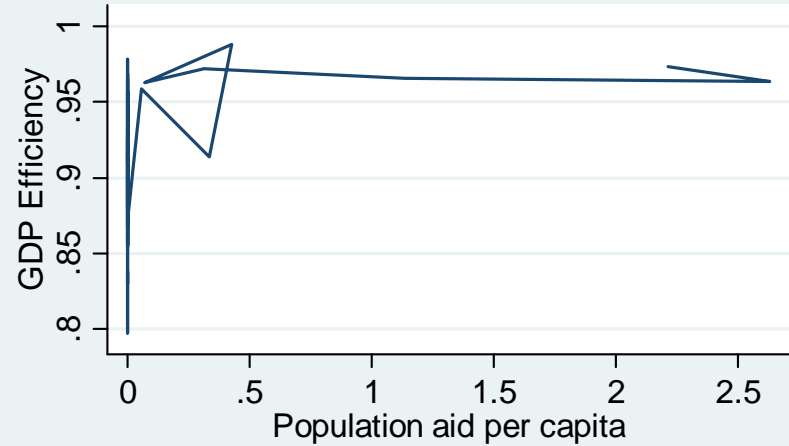
Education



Government Society & Accountability



Population



Concluding Thoughts

- Implications and Further Investigation:
 - Sectors of Aid
 - Aggregating them can confound the interpretation of aid's effects and effectiveness
 - Exhibit conflicting effects on efficiency
 - Exhibit conflicting effects on various measures of growth and development
 - Stochastic Frontier Model
 - By not examining the 1:1 correlation between aid and an outcome, we capture the broader picture of how aid can be used to promote development and growth
 - Try to understand the components of countries where aid is efficient v. those where it is incredibly inefficient

Error Determinants	HDI	GDP
Education Aid	-.5076	.3516***
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Population	1.1319*	-.5489**
Government Society & Accountability	1.613***	-.8177***
Government Security	-7.2458	.3582*
Water Aid	-.1347	-.1578
Energy Aid	-1.3833***	-.5321***
Food Aid	-3.1862	.0954

Appendix: AID CATEGORIES

EDUCATION

Education policy and administrative management
Education facilities and training
Teacher training
Educational research
Primary education
Basic life skills for youth and adults
Early childhood education
Secondary education
Vocational training
Higher education
Advanced technical and managerial training

HEALTH

Health policy and administrative management
Medical education/training
Medical research
Medical services
Basic health care
Basic health infrastructure
Basic nutrition
Infectious disease control
Health education
Malaria control
Tuberculosis control
Health personnel development

POPULATION POLICIES/PROGRAMMES AND REPRODUCTIVE HEALTH

Population policy and administrative management
Reproductive health care
Family planning
STD control including HIV/AIDS
Personnel development for population and reproductive health

WATER SUPPLY AND SANITATION

Water resources policy and administrative management
Water resources protection
Water supply and sanitation - large systems
Basic drinking water supply and basic sanitation
River development
Waste management/disposal
Education and training in water supply and sanitation

Appendix: AID CATEGORIES

GOVERNMENT AND ACCOUNTABILITY

Economic and development
policy/planning
Public sector financial management
Legal and judicial development
Government administration
Strengthening civil society
Elections
Human rights
Free flow of information
Women's equality organizations and
institutions

GOVERNMENT SECURITY

Security system management and reform
Civilian peace-building, conflict prevention
and resolution
Post-conflict peace-building (UN)
Reintegration and SALW control
Land mine clearance
Child soldiers (Prevention and
demobilization)

ENERGY GENERATION AND SUPPLY

Energy policy and administrative
management
Power generation/non-renewable
sources
Power generation/renewable sources
Electrical transmission/ distribution
Gas distribution
Oil-fired power plants
Gas-fired power plants
Coal-fired power plants
Nuclear power plants
Hydro-electric power plants
Geothermal energy
Solar energy
Wind power
Ocean power
Biomass
Energy education/training
Energy research

Appendix: AID CATEGORIES

FOOD STABILITY

Agricultural policy and administrative management

Agricultural development

Agricultural land resources

Agricultural water resources

Agricultural inputs

Food crop production

Industrial crops/export crops

Livestock

Agrarian reform

Agricultural alternative development

Agricultural extension

Agricultural education/training

Regression	HDI	GDP	OLS GDP	Error	HDI	GDP	OLS GDP
Lagged DV	.8873***	.8860***	.8904***	Education Aid	-.5076	.3516***	.0009
Agriculture Percent	-.0001***	-.0006**	-.0006*	Health Aid	.5484	-.0357	.0026
British colony	.3221***	-.6153	-.1172	Population	1.1319*	-.5489**	.0076*
French Colony	.1197***	-.2757	-.0468	Gov't. Society & Acct.	1.613***	-.8177***	.0094**
Mountainous terrain	.0431***	-.1073*	.0071	Gov't Security	-7.2458	.3582*	-.0007
Oil	.2521***	.5916*	-.0325	Water Aid	-.1347	-.1578	-.0023
Post Cold War	-.0001	-.0029	.0084	Energy Aid	-1.3833***	-.5321***	.0034
Logged population	.0096***	-.0013	-.0050	Food Aid	-3.1862	.0954	-.0017
Interstate Conflict	-.0000	-.0022	-.0056				
Society Conflict	-.0001	.0012	-.0002				
Ethic fractionalization	-.3950***	.8907*	-.1358				
Trade Openness	.0000*	.0005***	.0006***				
Life Expectancy		.0016***	.0023***				
Latin America	.1984***	-.5579**	-1054*				
Sub-Saharan Africa	.0153	-.4213***	.1177				
Asia	.0817***	-.3793***	.0217				
North Africa & Middle East	-.5408***	.8358	.1016				
Polity 2	-.0001**	-.0006	-.0006				

Variable	N	Mean	Std. Dev.	Min	Max
Lagged HDI	2029	7.27	0.826	5.043	9.18
Agr Pct	2029	28.67	14.721	2.2728 4	93.97
British col	2029	0.34	0.4740	0	1
French Col	2029	0.29	0.4566	0	1
Mts terr	2029	2.12	1.4391	0	4.55
Oil	2029	0.189	0.3918	0	1
Post CW	2029	0.4756	0.4995	0	1
Log pop	2029	9.0796	1.514	5.857	14.07
Interstate Conflict	2029	0.0759	0.4284	0	3
Society Conflict	2029	1.081	2.0520	0	10
Ethic frac	2029	0.5751	0.2538	0.0394	1
Trade Open	2029	65.438	36.178	1.9828	256.78
Life Expec	2029	56.3858	9.4251	23.641	77.143

Variable	N	Mean	Std. Dev.	Min	Max
Lat Amer	2029	0.164613	0.3709	0	1
SS Africa	2029	0.495318	0.5001	0	1
Asia	2029	0.18482	0.3882	0	1
NAfME	2029	0.106949	0.309	0	1
Polity 2	2029	-1.75308	6.2753	-10	10
Ed Aid	2029	0.800596	1.2793	0	6.3065
Health Aid	2029	0.62186	1.0780	0	5.0876
Pop Aid	2029	0.354859	0.7942	0	4.536
Gov Society & Accty	2029	0.634458	1.058	0	4.8689
Gov Sec	2029	0.128411	0.472	0	4.3094
Water Aid	2029	0.768565	1.2460	0	5.8736
Enrg Aid	2029	0.665884	1.2996	0	6.4991
Food Aid	2029	0.49877	1.0067	0	5.812