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## Environmental Vulnerability and Social Unrest: A Comparative Index

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Component	Interpretation	Variable	Reference
Exposure	Global Risk Index Cross-References with Least Developed Countries	-	Eckstein, Kunzel, & Schafer (2018)
Sensitivity	Food Supply Vulnerability	Per capita food supply variability (kcal/capita/day)	FAOSTAT (2013)
	Arable Land	Agricultural Area	FAOSTAT (2017)
	Reliance on Imports	Value of food imports over total merchandise exports (%) (3-year average)	FAOSTAT (2017)
	Political Stability	Political stability and absence of violence/terrorism (index)	FAOSTAT (2017)
	Control of Corruption	Extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	WGI (2016)
	Income Inequality	Gini coefficient as a measure of statistical dispersion intended to represent the income or wealth distribution of a nation's residents	WB (2015)
	Previous Political or Ethnic Strife	Likelihood of political instability and/or politically motivated violence, including terrorism	WGI (2016)
	Human Development	Level of average achievement in key dimensions of human development: a long and healthy life, being knowledgeable and have a decent standard of living	HDI (2015)
Adaptive Capacity	Gross Agricultural Production	Gross Agricultural Production	USDA (2017)
	Government Effectiveness	The quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies	WGI (2016)
	Regulatory Quality	The ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	WGI (2016)

Table 1. Summary of variables used to calculate exposure, sensitivity and adaptive capacity and their interpretation.

Political Stability and Absence of Violence/Terrorism
Orderly transfers
Armed conflict
Violent demonstrations
Social Unrest
International tensions / terrorist threat
Cost of Terrorism
Political terror scale
Security Risk Rating
Intensity of internal conflicts: ethnic, religious or regional
Intensity of violent activities...of underground political organizations
Intensity of social conflicts (excluding conflicts relating to land)
Government stability
Internal conflict
External conflict
Ethnic tensions
<i>Protests and riots.</i> The risk that the nature and impact of protests and riots (excluding those related to labour) cause damage to assets or injure or detain people, particularly if these disrupt normal movement, business operations, and activity.
<i>Terrorism.</i> The risk that the activities of any non-state armed group or individual cause (or are likely to cause) property damage and/or death/injury through violence. This risk definition includes terrorism, which uses violence (or the threat of) to advance a political cause, and similar tactics used by "for profit" organised crime.
<i>Interstate war.</i> This risk measures resultant impacts (death/property damage) and means, covering the spectrum from targeted military strikes against limited targets to full-scale war with the aim of changing the government and/or occupation.
<i>Civil war.</i> The risk of intra-state military conflict, in the form of an organised insurgency, separatist conflict, or full-blown civil war, in which rebels/insurgents attempt to overthrow the government, achieve independence, or at least heavily influence major government policies.

Table 2. Individual variables from multiple data sources used to create the World Governance Indicator political stability and absence of violence/terrorism scores.

Control of Corruption
Corruption among public officials
Public Trust in Politicians
Diversion of Public Funds
Irregular Payments in Export and Import
Irregular Payments in Public Utilities
Irregular payments in tax collection
Irregular Payments in Public Contracts
Irregular Payments in Judicial Decisions
State Capture
Is corruption in government widespread?
Level of "petty" corruption between administration and citizens
Level of corruption between administrations and local businesses
Level of corruption between administrations and foreign companies
Corruption
Corruption index
<i>Corruption.</i> The risk that individuals/companies will face bribery or other corrupt practices to carry out business, from securing major contracts to being allowed to import/export a small product or obtain everyday paperwork. This threatens a company's ability to operate in country. or opens it up to legal or regulatory penalties and reputational damage.
Transparent, accountability and corruption in public sector
How many elected leaders (parliamentarians) do you think are involved in corruption? How many judges and magistrates do you think are involved in corruption?
How many judges and magistrates do you think are involved in corruption?
How many government officials do you think are involved in corruption?
How many border/tax officials do you think are involved in corruption?
Transparency, accountability and corruption in public sector
How common is it for firms to have to pay irregular additional payments to get things done?
Percentage of total annual sales do firms pay in unofficial payments to public officials?
How often do firms make extra payments in connection with taxes, customs, and judiciary?
How problematic is corruption for the growth of your business?
Anti-Corruption policy
Prosecution of office abuse
Anti-Corruption and Transparency
Corruption (FNT)
Frequency of household bribery - paid a bribe to one of the 8/9 services
Frequency of corruption among public institutions: Political parties
Frequency of corruption among public institutions: Parliament/Legislature
Frequency of corruption among public institutions: Media
Frequency of corruption among public institutions: Legal system/Judiciary
Frequency of corruption among public institutions: Public officials
Accountability
Accountability, transparency and corruption in rural areas
Frequency of corruption
Transparency, accountability and corruption in public sector
To what extent does corruption exist in a way that detracts from the business environment for foreign companies?
Frequency of corruption among government officials
Bribing and corruption exist in the economy
Factor 2: Absence of Corruption

Table 3. Individual variables from multiple data sources used to create the World Governance Indicator political stability and absence of violence/terrorism scores.

Government Effectiveness
Quality of bureaucracy / institutional effectiveness
Excessive bureaucracy / red tape
Infrastructure
Quality of primary education
Satisfaction with public transportation system
Satisfaction with roads and highways
Satisfaction with education system
Coverage area: public school
Coverage area: basic health services
Coverage area: drinking water and sanitation
Coverage area: electricity grid
Coverage area: transport infrastructure
Coverage area: maintenance and waste disposal
Bureaucratic quality
Infrastructure disruption. This reflects the likelihood of disruption to and/or inadequacy of infrastructure for transport, including due to terrorism/ insurgency, strikes, politically motivated shutdowns, natural disasters; infrastructure includes (as relevant) roads, railways, airports, ports, and customs checkpoints.
State failure. The risk the state is unable to exclusively ensure law and order, and the supply of basic goods such as food, water, infrastructure, and energy, or is unable to respond to or manage current or likely future emergencies, including natural disasters and financial or economic crises
Policy instability. The risk the government's broad policy framework shifts over the next year, making the business environment more challenging. This might include more onerous employment or environmental regulation; local content requirements; import/export barriers, tariffs, or quotas; other protectionist measures; price controls or caps; more "political" control of monetary policy, or simply more direct intervention into the operations and decisions of private companies etc
Quality of public administration
Quality of budgetary and financial management
Efficiency of revenue mobilization
Government handling of public services
Health
Education
Quality of public administration
Efficiency of revenue mobilization
Quality of budgetary & financial management
How problematic are telecommunications for the growth of your business ?
How problematic is electricity for the growth of your business?
How problematic is transportation for the growth of your business?
Consensus Building (MI)
Governance Capability (MI)
Resource Efficiency (MI)
Civil Service Integrity
Public Management
Business Environment & Infrastructure
Welfare
Health and Education
Allocation & management of public resources for rural development
Trust in Government
Quality of public administration
Quality of budgetary and financial management
Efficiency of revenue mobilization
Government economic policies do not adapt quickly to changes in the economy
The public service is not independent from political interference
Government decisions are not effectively implemented
Bureaucracy hinders business activity
The distribution infrastructure of goods and services is generally inefficient
Policy direction is not consistent

Table 4. Individual variables from multiple data sources used to create the World Governance Indicator government effectiveness scores.

Regulatory Quality
Unfair competitive practices
Price controls
Discriminatory tariffs
Excessive protections
Discriminatory taxes
Burden of government regulations
Extent and effect of taxation
Prevalence of Trade Barriers
Intensity of Local Competition
Ease of starting a new business
Effectiveness of anti-trust policy
Stringency of environmental regulations
Investment Freedom
Financial Freedom
Ease of starting a business governed by local law?
Ease of setting up a subsidiary for a foreign firm?
Share of administered prices
Does the State subsidize commodity prices (i.e. food and other essential goods, excluding oil)?
Does the State subsidize the price of petrol at the pumps?
Importance, de facto, of barriers to entry for new competitors in markets for goods and services (excluding the financial sector and beyond the narrow constraints of the market)... related to the administration (red tape etc.)
Importance, de facto, of barriers to entry for new competitors in markets for goods and services (excluding finance and beyond the narrow constraints of the market)... related to the practices of already established competitors
Efficiency of competition regulation in the market sector (excluding financial sector)
Investment profile
Regulatory burden. The risk that normal business operations become more costly due to the regulatory environment. This includes regulatory compliance and bureaucratic inefficiency and/or opacity. Regulatory burdens vary across sectors so scoring should give greater weight to sectors contributing the most to the economy.
Tax inconsistency. Tax inconsistency also captures the risk that fines and penalties will be levied for non-compliance with a tax code that appears disproportionate or manipulated for political ends.
Trade policy
Regional integration
Business regulatory environment
Trade policy
Business regulatory environment
How problematic are labor regulations for the growth of your business?
How problematic are tax regulations for the growth of your business?
How problematic are customs and trade regulations for the growth of your business?
Organization of the Market and Competition
Price liberalisation
Trade & foreign exchange system
Competition policy
Enabling conditions for rural financial services development
Investment climate for rural businesses
Access to agricultural input and product markets
Business regulatory environment
Trade policy
Protectionism in the country negatively affects the conduct of business
Competition legislation in your country does not prevent unfair competition
Price controls affect pricing of products in most industries
Access to capital markets (foreign and domestic) is easily available
Ease of doing business is not a competitive advantage for your country
Financial institutions' transparency is not widely developed in your country
Customs' authorities do not facilitate the efficient transit of goods
The legal framework is detrimental to your country's competitiveness
Foreign investors are free to acquire control in domestic companies
Public sector contracts are sufficiently open to foreign bidders
Real personal taxes are non distortionary
Real corporate taxes are non distortionary
Banking regulation does not hinder competitiveness
Labor regulations hinder business activities
Subsidies impair economic development
Easy to start a business
Factor 6: Regulatory Enforcement

Table 5. Individual variables from multiple data sources used to create the World Governance Indicator regulatory quality scores.

	Food Supply Variability (kcal/capita/day)	Arable Land Per Capita (ha)	Reliance on Imports (%)	Political Stability (index)	Control of Corruption (index)	Income Inequality (index)	Previous Political or Ethnic Strife (index)	Human Development (index)	Agricultural Productivity (\$USD)	Government Effectiveness (index)	Regulatory Quality (index)
Bangladesh	42	4.81651E-05	22	-1.15	-0.8	32.1	-1.24	0.579	24,091,412.34	-0.69	-0.8
Burundi	-	0.000117647	81	-1.73	-1.18	42.4	-2.08	0.404	1,242,031.84	-1.4	-0.83
Cambodia	60	0.000244845	7	-0.1	-1.3	37.9	0.18	0.563	4,432,109.20	-0.7	-0.47
Djibouti	22	2.15653E-06	661	-0.45	-0.65	40.9	-0.63	0.473	44,832.92	-0.97	-0.7
Ethiopia	25	0.000363062	50	-1.48	-0.44	33	-1.57	0.448	12,449,484.68	-0.64	-1.1
Haiti	55	0.000171802	121	-0.73	-1.35	60.8	-0.67	0.493	1,617,003.91	-2.06	-1.24
Lao PDR	18	0.000228842	9	0.48	-0.93	36.7	0.5	0.586	2,667,877.39	-0.39	-0.73
Madagascar	44	0.000144449	25	-0.4	-0.9	41	-0.4	0.512	3,583,397.47	-1.17	-0.69
Malawi	67	0.000216278	17	-0.07	-0.75	46.1	-0.06	0.476	2,932,697.55	-0.73	-0.84
Mauritania	46	0.000107604	14	-0.66	-0.8	37	-0.74	0.513	551,170.84	-0.79	-0.74
Mozambique	22	0.000201714	19	-0.58	-0.87	45.6	-1.05	0.418	2,753,202.67	-0.85	-0.7
Myanmar	28	0.000207615	9	-1.17	-0.65	38.1	-0.63	0.556	20,146,477.21	-0.98	-0.87
Nepal	22	7.37509E-05	69	-0.93	-0.76	32.8	-0.79	0.558	6,238,127.69	-0.81	-0.76
Niger	28	0.000844221	25	-0.98	-0.64	34	-1.08	0.353	3,570,466.32	-0.59	-0.67
Solomon Islands	27	3.40436E-05	22	0.74	-0.34	37	0.51	0.515	121,170.51	-0.99	-0.96
Sudan	57	0.000512889	31	-2.17	-1.61	35.4	-2.38	0.49	11,236,660.14	-1.41	-1.49
Uganda	36	0.000171898	32	-0.86	-1.06	39.5	-0.72	0.493	5,276,790.64	-0.57	-0.21
Vanuatu	46	7.55849E-05	93	0.57	-0.1	37.3	0.51	0.597	74,675.87	-0.88	-0.29

Table 6. Raw data for selected countries and individual variables.

	Most Food Variability	Least Agricultural Land Per Capita	Most Reliance on Imports	Least Political Stability	Most Corrupt	Most Inequality	Most Strife	Lowest HDI	Lowest GAP	Least Effective Governance	Worst Regulatory Quality	Sum
Bangladesh	7	3	11	5	9	18	4	16	18	14	8	113
Burundi		7	4	2	4	4	2	2	5	3	7	40
Cambodia	2	15	18	14	3	9	15	15	12	13	16	132
Djibouti	14	1	1	12	13	6	11	5	1	7	12	83
Ethiopia	13	16	6	3	16	16	3	4	16	15	3	111
Haiti	3	9	2	9	2	1	10	9	6	1	2	54
Lao PDR	17	14	16	16	6	13	16	17	7	18	11	151
Madagascar	6	8	9	13	7	5	13	10	11	4	14	100
Malawi	1	13	14	15	12	2	14	6	9	12	6	104
Mauritania	4	6	15	10	10	11	8	11	4	11	10	100
Mozambique	15	11	13	11	8	3	6	3	8	9	13	100
Myanmar	10	12	17	4	14	8	12	13	17	6	5	118
Nepal	16	4	5	7	11	17	7	14	14	10	9	114
Niger	11	18	10	6	15	15	5	1	10	16	15	122
Solomon Islands	12	2	12	18	17	12	17	12	3	5	4	114
Sudan	8	17	8	1	1	14	1	7	15	2	1	75
Uganda	9	10	7	8	5	7	9	8	13	17	18	111
Vanuatu	5	5	3	17	18	10	18	18	2	8	17	121

Table 7. Ranked data for selected countries and individual variables representing the least and most vulnerable country with 1 representing most vulnerable and 18 representing least vulnerable.

	Score	Rank
Burundi	40	1
Haiti	54	2
Sudan	75	3
Djibouti	83	4
Madagascar	100	5
Mauritania	100	6
Mozambique	100	7
Malawi	104	8
Ethiopia	111	9
Uganda	111	10
Bangladesh	113	11
Nepal	114	12
Solomon Islands	114	13
Myanmar	118	14
Vanuatu	121	15
Niger	122	16
Cambodia	132	17
Lao PDR	151	18

Table 8. Summed score of individual variable ranking for selected countries in order of most to least vulnerable.

	Food Supply Variability	Arable Land Per Capita	Reliance on Imports	Political Stability	Control of Corruption	Income Inequality	Previous Political or Ethnic Strife	Human Development	Agricultural Productivity	Government Effectiveness	Regulatory Quality
Food Supply Variability	1	0.041	-0.235	-0.054	-0.446	0.356	-0.006	0.138	-0.032	-0.383	-0.137
Arable Land Per Capita	-	1	-0.29	-0.371	-0.196	-0.184	-0.354	-0.542	0.099	0.123	-0.235
Reliance on Imports	-	-	1	0.034	0.121	0.156	-0.017	-0.116	-0.254	-0.166	0.035
Political Stability	-	-	-	1	0.488	0.108	<b>0.961</b>	0.424	-0.511	0.295	0.475
Control of Corruption	-	-	-	-	1	-0.352	0.452	0.121	-0.05	0.446	0.356
Income Inequality	-	-	-	-	-	1	0.085	-0.208	-0.394	<b>-0.683</b>	-0.186
Previous Political or Ethnic Strife	-	-	-	-	-	-	1	<b>0.546</b>	-0.38	0.315	<b>0.502</b>
Human Development	-	-	-	-	-	-	-	1	0.261	0.15	0.201
Agricultural Productivity	-	-	-	-	-	-	-	-	1	0.135	-0.261
Government Effectiveness	-	-	-	-	-	-	-	-	-	1	<b>0.567</b>
Regulatory Quality	-	-	-	-	-	-	-	-	-	-	1

Table 9. Correlations coefficients calculated for all selected variables to investigate the dependence between multiple variables and each other.

Political Stability	Previous Political or Ethnic Strife
-1.15	-1.24
-1.73	-2.08
-0.1	0.18
-0.45	-0.63
-1.48	-1.57
-0.73	-0.67
0.48	0.5
-0.4	-0.4
-0.07	-0.06
-0.66	-0.74
-0.58	-1.05
-1.17	-0.63
-0.93	-0.79
-0.98	-1.08
0.74	0.51
-2.17	-2.38
-0.86	-0.72
0.57	0.51

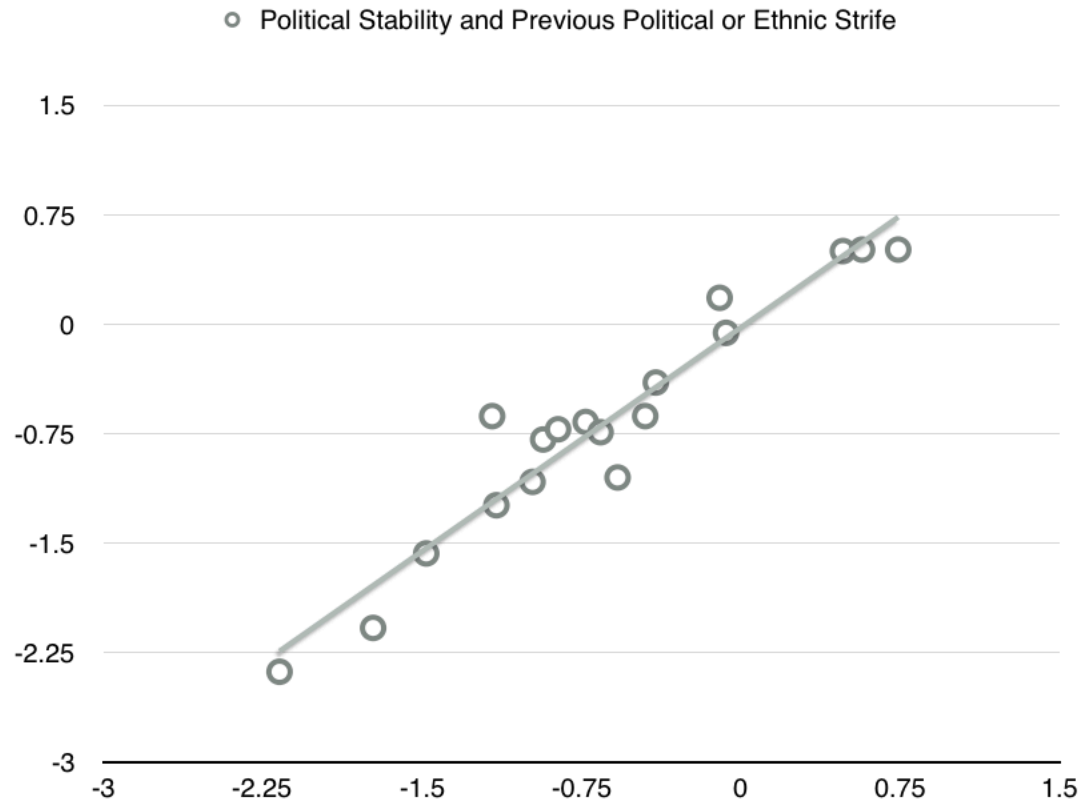


Figure 1. Variables political stability and previous political or ethnic strife demonstrate a strong positive correlation.

Human Development	Previous Political or Ethnic Strife
0.579	-1.24
0.404	-2.08
0.563	0.18
0.473	-0.63
0.448	-1.57
0.493	-0.67
0.586	0.5
0.512	-0.4
0.476	-0.06
0.513	-0.74
0.418	-1.05
0.556	-0.63
0.558	-0.79
0.353	-1.08
0.515	0.51
0.49	-2.38
0.493	-0.72
0.597	0.51

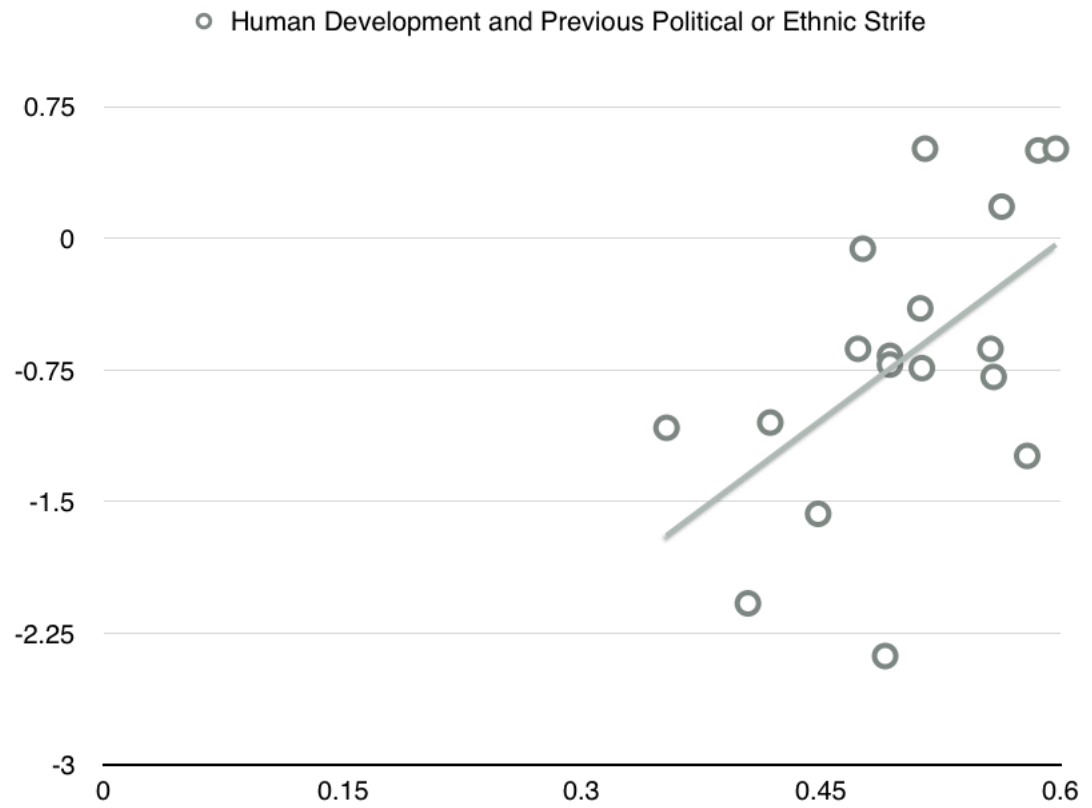


Figure 2. Variables human development and previous political or ethnic strife demonstrate a moderate positive correlation.

Regulatory Quality	Government Effectiveness
-0.8	-0.69
-0.83	-1.4
-0.47	-0.7
-0.7	-0.97
-1.1	-0.64
-1.24	-2.06
-0.73	-0.39
-0.69	-1.17
-0.84	-0.73
-0.74	-0.79
-0.7	-0.85
-0.87	-0.98
-0.76	-0.81
-0.67	-0.59
-0.96	-0.99
-1.49	-1.41
-0.21	-0.57
-0.29	-0.88

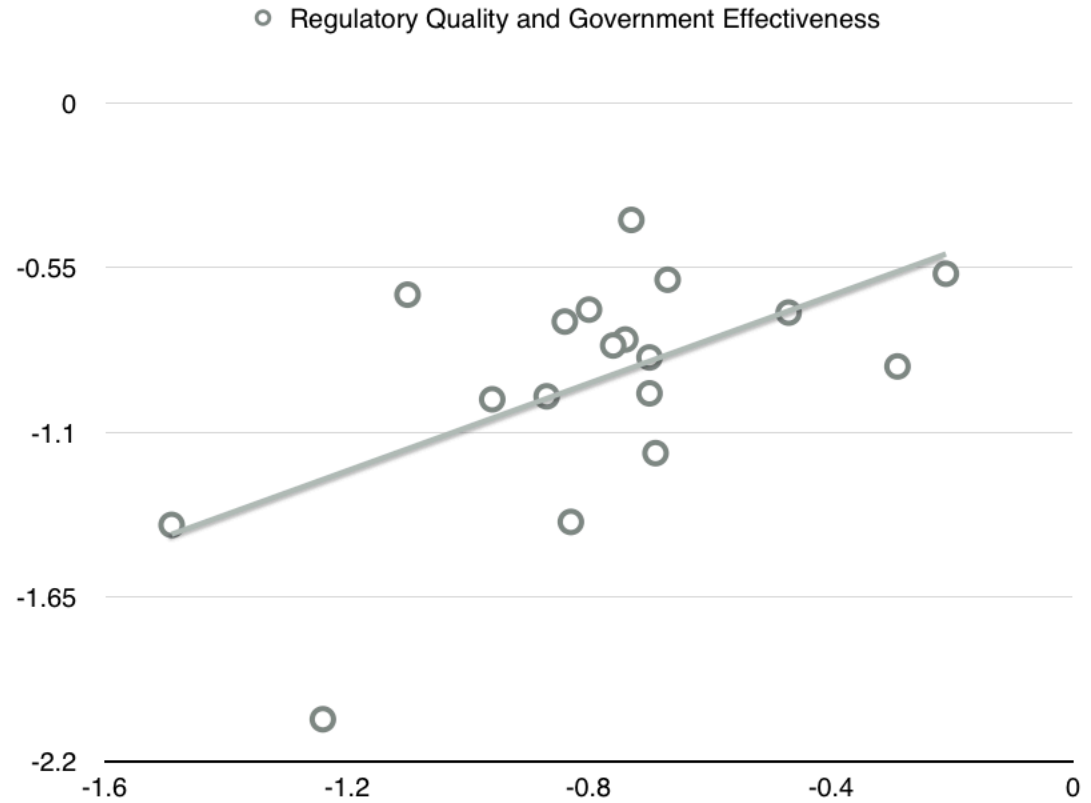


Figure 3. Variables regulatory quality and government effectiveness demonstrate a moderate positive correlation.

Regulatory Quality	Previous Political or Ethnic Strife
-0.8	-1.24
-0.83	-2.08
-0.47	0.18
-0.7	-0.63
-1.1	-1.57
-1.24	-0.67
-0.73	0.5
-0.69	-0.4
-0.84	-0.06
-0.74	-0.74
-0.7	-1.05
-0.87	-0.63
-0.76	-0.79
-0.67	-1.08
-0.96	0.51
-1.49	-2.38
-0.21	-0.72
-0.29	0.51

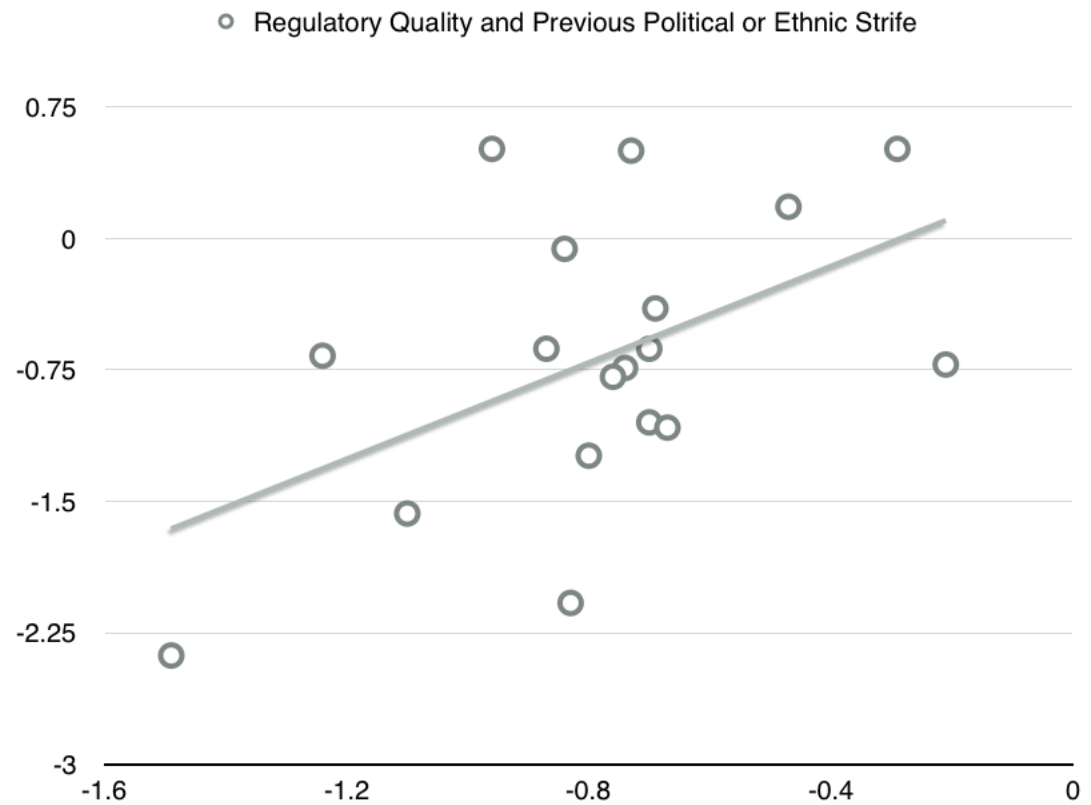


Figure 4. Variables regulatory quality and previous political or ethnic strife demonstrate a moderate positive correlation.

Income Inequality	Government Effectiveness
32.1	-0.69
42.4	-1.4
37.9	-0.7
40.9	-0.97
33	-0.64
60.8	-2.06
36.7	-0.39
41	-1.17
46.1	-0.73
37	-0.79
45.6	-0.85
38.1	-0.98
32.8	-0.81
34	-0.59
37	-0.99
35.4	-1.41
39.5	-0.57
37.3	-0.88

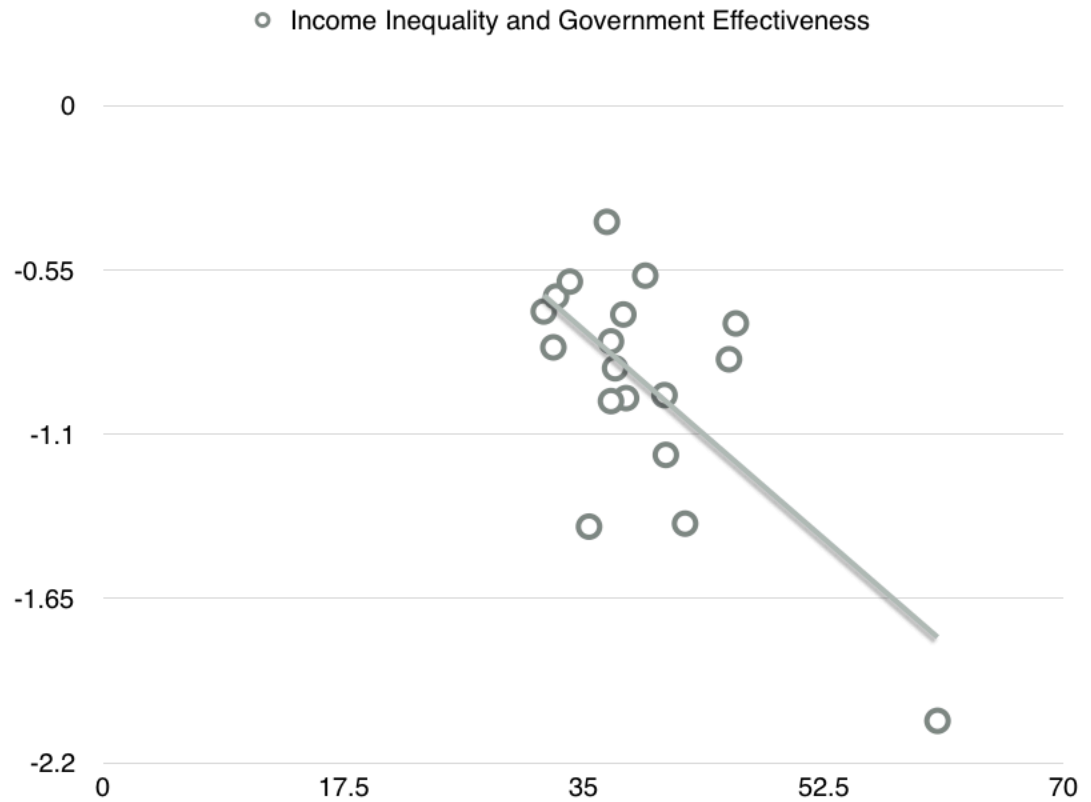


Figure 5. Variables income inequality and government effectiveness demonstrate a moderate negative correlation.