

Economic Volatility and Inequality: Do Aid and Remittances Matter?

Economic and Social Research Council (ESRC) - DFID

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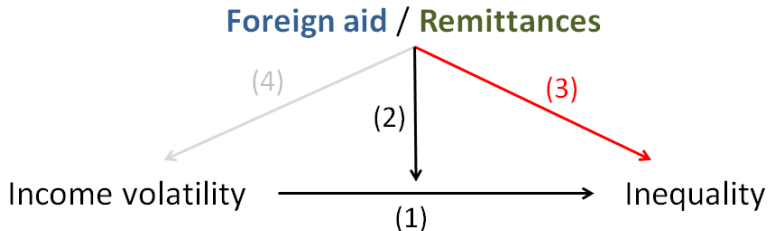
Research questions

- Income volatility has an adverse impact on income distribution
- Aid/Remittances can mitigate the adverse effect of macroeconomic volatility on inequality
- Aid/Remittances can directly affect income distribution
- Aid/Remittances tends to dampen the negative effect of external shocks

Do aid and remittances affect inequality through their **mitigating/stabilizing/direct** effect?

The Aid/Remittances-Inequality-Volatility nexus

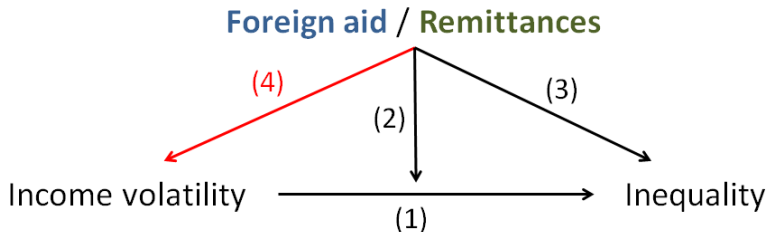
Figure: Potential means of connection



- (3) Direct impact of external financing flows on inequalities
 - Calderon and al. (2009): no association
 - Layton and Fuller (2008) : increase inequality
 - Bjornskov (2011): increase in democracies
 - Chauvet and Mespe-Soms (2007) : decrease in democracies

The Aid/Remittances-Inequality-Volatility nexus

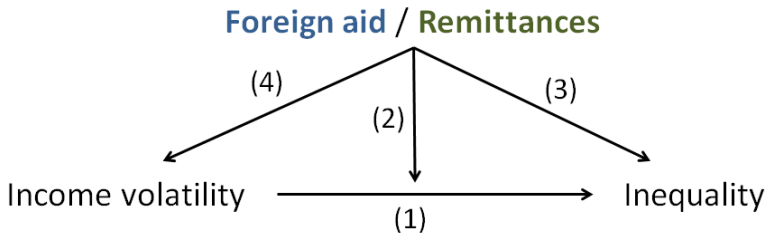
Figure: Potential means of connection



- (4) Stabilizing impact of flows on income volatility
 - Aid/Remitt. dampen the adverse impact of ext. shocks on growth: Guillaumont & Chauvet (2001), Collier & Dehn (2001) - and ...
 - On its volatility - Guillaumont & le Goff (2010), Guillaumont & Wagner (2012)

The Aid/Remittances-Inequality-Volatility nexus

Figure: Potential means of connection



- (1) Adverse effects of income volatility on income inequality
- (2) Mitigating effects of aid and remittances
- (3) Direct impact of external financing flows on inequalities
- (4) Stabilizing impact of flows on income volatility

Empirical Specification

- Income volatility and inequality

$$INEQ_{i,t} = \alpha VOLY_{i,(t,t-5)} + \gamma X_{i,(t,t-5)} + \mu_i + \tau_t + \epsilon_{i,t}$$

- Mitigating effect of aid and remittances

$$INEQ_{i,t} = \alpha VOLY_{i,(t,t-5)} + \delta EXT.FINA_{i,(t,t-5)} + \gamma X_{i,(t,t-5)} \\ + \beta EXT.FINA_{i,(t,t-5)} * VOLY_{i,(t,t-5)} + \mu_i + \tau_t + \epsilon_{i,t}$$

Estimations using

- Panel fixed effects estimator and...

Empirical Specification

- Income volatility and inequality

$$INEQ_{i,t} = \eta INEQ_{i,(t-5)} + \alpha VOLY_{i,(t,t-5)} + \gamma X_{i,(t,t-5)} + \mu_i + \tau_t + \epsilon_{i,t}$$

- Mitigating effect of aid and remittances

$$INEQ_{i,t} = \eta INEQ_{i,(t-5)} + \alpha VOLY_{i,(t,t-5)} + \delta EXT.FINA_{i,(t,t-5)} + \gamma X_{i,(t,t-5)} + \beta EXT.FINA_{i,(t,t-5)} * VOLY_{i,(t,t-5)} + \mu_i + \tau_t + \epsilon_{i,t}$$

Estimations using

- Panel fixed effects estimator and...
- Dynamic System GMM estimator**

Inequality Data issues

- Data on inequality are scarce and often lack of comparability...
- ... as the underlying surveys don't use the same concepts of households or income
- We chose inequality data from WIID Database
- Due to data availability, we also favor data using income rather than consumption

Computing income instability

- Macro volatility has often been measured as the standard deviation of the growth rate of GDP per capita
- We favour a method that measures economic volatility as the standard deviation of the cycle of the output
- The cycle of output is the residual of an econometric regression accounting for a time trend as well as a stochastic trend:

$$y_t = \alpha t_t + \beta y_{t-1} + \epsilon_t$$

where t_t is a time trend, y_t is income per capita in year t and y_{t-1} is income per capita in year $t - 1$. Volatility of income is then measured as the standard deviation of ϵ_t

Sample of study

- 142 countries over 1973-2012, 5-years average periods
- In order to keep the sample as large as possible we keep aid recipient and non-recipient
 - $\ln(\text{aid}/\text{GDP})$ is then computed following Wagner (2003)...
 - as $\ln(\max\{0.0001, 0.0001 + \text{EXT.FINA}_{i,(t,t-5)}\})$
 - We also introduce in each specification a no-aid dummy

Panel fixed effects results

Fixed effects estimator	1	2	3	4	5
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
GDP per capita volatility	0.052*** (0.015)	-0.079*** (0.025)	-0.066*** (0.013)	-0.123*** (0.033)	-0.116*** (0.024)
GDP per capita (in log)	0.514* (0.262)	-1.135*** (0.405)	-0.573*** (0.219)	-1.563*** (0.522)	-1.172*** (0.398)
GDP per capita squared (in log)	-0.032** (0.015)	0.072*** (0.026)	0.035** (0.013)	0.100*** (0.034)	0.074*** (0.025)
Population growth	-0.011 (0.018)	0.018 (0.039)	0.014 (0.021)	0.023 (0.049)	0.021 (0.037)
Rural population (in log)	-0.023 (0.037)	0.080 (0.059)	0.018 (0.032)	0.091 (0.075)	0.048 (0.056)
Inflation (in log)	0.010 (0.011)	-0.017 (0.024)	0.001 (0.010)	-0.020 (0.030)	-0.007 (0.020)
Sec. school enrolt. (gross, in log)	-0.118** (0.055)	0.284*** (0.102)	0.182*** (0.061)	0.395*** (0.136)	0.322*** (0.109)
Govt. expenditures (% GDP, in log)	0.062 (0.048)	-0.221** (0.102)	-0.144*** (0.051)	-0.274** (0.130)	-0.241** (0.093)
Consumption dummy	-0.029 (0.028)	0.064 (0.057)	0.031 (0.035)	0.078 (0.076)	0.049 (0.062)
Number of observations	520	477	475	477	475
Number of countries	142	140	140	140	140

Panel fixed effects results

Table: Mitigating and direct effect of foreign aid

Fixed effects estimator	1	2	3	4	5
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
GDP per capita volatility	0.062*** (0.017)	-0.106*** (0.033)	-0.077*** (0.016)	-0.160*** (0.043)	-0.144*** (0.032)
Net ODA (% GDP, in log)	-0.008 (0.010)	-0.035* (0.021)	-0.006 (0.011)	-0.040+ (0.026)	-0.020 (0.020)
No ODA dummy	-0.048 (0.135)	-0.381 (0.291)	0.012 (0.195)	-0.419 (0.371)	-0.148 (0.305)
Volatility x ODA	-0.004 (0.004)	0.013** (0.006)	0.005+ (0.003)	0.017** (0.008)	0.013* (0.007)
Number of observations	514	471	469	471	469
Number of countries	142	140	140	140	140
Control variables	yes	yes	yes	yes	yes

Panel fixed effects results

Table: Mitigating and direct effect of remittances

Fixed effects estimator	1	2	3	4	5
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
GDP per capita volatility	0.084*** (0.030)	-0.183*** (0.060)	-0.125*** (0.034)	-0.275*** (0.080)	-0.241*** (0.063)
Remittances (% GDP, in log)	0.015+ (0.010)	-0.061*** (0.017)	-0.033*** (0.010)	-0.081*** (0.022)	-0.062*** (0.018)
Volatility x Remittances	-0.024+ (0.016)	0.057* (0.029)	0.035** (0.018)	0.084** (0.041)	0.072** (0.033)
Number of observations	470	435	433	435	433
Number of countries	136	135	135	135	135
Control variables	yes	yes	yes	yes	yes

System GMM results

Syst-GMM estimator	1	2	3	4	5
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
Lagged dependent	0.509*** (0.105)	0.311** (0.127)	0.380*** (0.125)	0.293** (0.126)	0.369*** (0.107)
GDP per capita volatility	0.059** (0.027)	-0.086 (0.068)	-0.057+ (0.039)	-0.114+ (0.069)	-0.095* (0.055)
Net ODA (% GDP, in log)	0.019* (0.010)	0.001 (0.025)	0.002 (0.016)	-0.007 (0.030)	0.006 (0.025)
No ODA dummy	0.208* (0.121)	0.262 (0.292)	0.119 (0.200)	0.208 (0.360)	0.241 (0.321)
Volatility x ODA	-0.015* (0.009)	0.030 (0.021)	0.019+ (0.012)	0.041* (0.022)	0.033* (0.018)
Number of observations	415	354	351	354	351
Number of countries	122	116	115	116	115
Control variables	yes	yes	yes	yes	yes
AR1 (p-value)	0.000	0.055	0.003	0.046	0.005
AR2 (p-value)	0.430	0.837	0.471	0.965	0.886
Hansen test (p-value)	0.687	0.586	0.563	0.523	0.621

System GMM results

Syst-GMM estimator	1	2	3	4	5
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
Lagged dependent	0.475*** (0.116)	0.492*** (0.106)	0.468*** (0.155)	0.517*** (0.111)	0.558*** (0.126)
GDP per capita volatility	0.094 (0.079)	-0.084 (0.226)	-0.137+ (0.090)	-0.073 (0.272)	-0.148 (0.184)
Remittances (% GDP, in log)	0.008 (0.016)	0.020 (0.035)	-0.016 (0.016)	0.030 (0.043)	-0.006 (0.033)
Volatility x Remittances	-0.008 (0.028)	-0.100 (0.108)	0.032 (0.046)	-0.126 (0.150)	-0.010 (0.097)
Number of observations	387	335	332	335	332
Number of countries	117	111	110	111	110
Control variables	yes	yes	yes	yes	yes
AR1 (p-value)	0.001	0.049	0.004	0.026	0.004
AR2 (p-value)	0.774	0.487	0.445	0.576	0.570
Hansen test (p-value)	0.439	0.617	0.564	0.463	0.352

Robustness checks

- Robustness 1 - Alternative dependent variable

▶ Rob. 1

- Robustness 2 - Combining remittances and foreign aid

▶ Rob. 2

- Robustness 3 - Effect of Democracy

▶ Rob. 3

Discussion about the transmission channels

What are the mechanisms that may be at play and explain why aid mitigates the negative effect of output volatility on inequality

- Asymmetric effects of volatility on the poor
 - Poorest people are more likely to cut their investments in physical and human capital in time of output contractions
 - Aid allows more public spending in favour of the poor

Asymmetric effects and human capital

- High output volatility is associated with lower education outcomes [▶ Figure 1](#)
- This negative relationship appears only for countries receiving small amounts of aid [▶ Figure 2](#) [▶ Figure 3](#)
- Estimates with education outcomes as dependent variable [▶ Estimates educ.](#)

Discussion about the transmission channels

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- Asymmetric effects of volatility on the poor
 - Poorest people are more likely to cut their investments in physical and human capital in time of output contractions
 - Aid allows more public spending in favour of the poor
- Stabilizing effect of aid on volatility
 - Aid mitigates the negative effect of volatility on the poor by decreasing income volatility directly

Stabilizing effect of aid on volatility

- External flows volatility (exports) is negative for income volatility and thus, for income inequality
- Aid reduces income volatility by directly stabilizing the flow of external resources on the poor
- Augmented Chauvet and Guillaumont (2009) model

$$\begin{aligned} VOLY_{i,(t,t-5)} = & \eta VOLY_{i,(t-5,t-10)} + \alpha X_{i,(t,t-5)} + \gamma Z_{i,(t,t-5)} + \\ & \phi X_{i,(t,t-5)} * VOLX_{i,(t,t-5)} + \beta X_{i,(t,t-5)} * VOLX_{i,(t,t-5)} * AID_{i,(t,t-5)} \\ & + \nu AID_{i,(t,t-5)} + \theta AID_{i,(t,t-5)} * VOLA_{i,(t,t-5)} + \mu_i + \tau_i + \epsilon_{i,(t,t-5)} \end{aligned}$$

▶ Estimates stab.

Conclusion

- Volatility has a robust and positive impact on inequality
- Aid dampens the positive impact of volatility on inequality
- Aid also tends to reduce volatility
- The effect of remittances is more uncertain
- Two potential reasons for the mitigating effect of aid:
 - **Increase of public expenditures in favor of the poor**
 - **Stabilizing aid flows that reduce income volatility**

Thank you!

	1	2	3	4	5
Syst. GMM estimator					
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
Lagged dependent	0.559*** (0.096)	0.005 (0.136)	0.153 (0.125)	0.061 (0.136)	0.135 (0.136)
GDP pc growth vola.	0.012** (0.005)	0.014 (0.028)	-0.001 (0.015)	0.024 (0.036)	0.007 (0.028)
Net ODA (% GDP, in log)	0.007 (0.011)	0.004 (0.040)	0.015 (0.020)	-0.005 (0.054)	0.014 (0.039)
No ODA dummy	0.085 (0.128)	0.202 (0.494)	0.291 (0.247)	0.174 (0.674)	0.379 (0.487)
Volatility x ODA	-0.000 (0.001)	0.005** (0.002)	0.002+ (0.001)	0.007** (0.003)	0.005** (0.002)
Number of observations	466	393	389	392	389
Number of countries	123	116	115	116	115
Control variables	yes	yes	yes	yes	yes
AR1 (p-value)	0.000	0.066	0.022	0.079	0.050
Hansen test (p-value)	0.478	0.317	0.944	0.450	0.748

	1	2	3	4	5
Syst. GMM estimator					
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
Lagged dependent	0.567*** (0.071)	0.391*** (0.120)	0.544*** (0.124)	0.456*** (0.102)	0.559*** (0.095)
GDP pc volatility	0.065 (0.054)	-0.114 (0.218)	-0.072 (0.093)	-0.082 (0.243)	-0.112 (0.251)
Net ODA (% GDP, in log)	0.002 (0.009)	-0.014 (0.023)	0.007 (0.014)	-0.011 (0.033)	-0.001 (0.029)
No ODA dummy	0.062 (0.129)	-0.017 (0.302)	0.105 (0.186)	-0.013 (0.431)	0.013 (0.366)
Volatility x ODA	-0.003 (0.013)	0.045+ (0.028)	0.022* (0.013)	0.042+ (0.034)	0.025 (0.033)
Remittances (% GDP, in log)	-0.010 (0.016)	0.025 (0.032)	0.002 (0.021)	0.029 (0.041)	0.000 (0.030)
Volatility x remittances	0.031 (0.039)	-0.036 (0.084)	0.015 (0.051)	-0.033 (0.149)	0.034 (0.121)
Number of observations	381	329	326	329	326
Number of countries	117	111	110	111	110
Control variables	yes	yes	yes	yes	yes
AR1 (p-value)	0.000	0.052	0.001	0.025	0.002
AR2 (p-value)	0.988	0.547	0.276	0.553	0.481
Hansen test (p-value)	0.974	0.739	0.623	0.728	0.541

	1	2	3	4	5
Syst. GMM estimator					
Dep. var. (in log)	Gini	Q1	Q2	Q1/Q5	(Q1+Q2)/Q5
Lagged dependent	0.405*** (0.104)	0.401*** (0.128)	0.556*** (0.117)	0.430*** (0.115)	0.544*** (0.101)
GDP pc volatility	0.067*** (0.024)	-0.036 (0.043)	-0.052* (0.027)	-0.070 (0.055)	-0.086* (0.047)
Net ODA (% GDP, in log)	0.013 (0.011)	-0.011 (0.021)	-0.001 (0.014)	-0.017 (0.029)	-0.006 (0.023)
No ODA dummy	0.041 (0.140)	0.252 (0.285)	0.122 (0.185)	0.217 (0.387)	0.249 (0.308)
Volatility x ODA	-0.017** (0.007)	0.021* (0.011)	0.018** (0.008)	0.032** (0.015)	0.032** (0.013)
Polity IV index	0.004+ (0.003)	-0.003 (0.008)	-0.001 (0.004)	-0.003 (0.010)	-0.001 (0.007)
Polity x ODA	-0.001 (0.001)	0.002+ (0.001)	0.000 (0.001)	0.002 (0.002)	0.001 (0.001)
Number of observations	401	343	340	343	340
Number of countries	114	109	108	109	108
Control variables	yes	yes	yes	yes	yes
AR1 (p-value)	0.001	0.016	0.000	0.007	0.000
AR2 (p-value)	0.353	0.670	0.391	0.790	0.755
Hansen test (p-value)	0.930	0.333	0.345	0.228	0.202

	1	2	3	4	5
Dep. var. (school enrolment rate)	sec. gross	sec. gross	sec. net	sec. gross	sec. net
Lagged dependent	1.036*** (0.103)	0.822*** (0.029)	0.881*** (0.099)	0.723*** (0.081)	0.754*** (0.087)
GDP pc volatility	-0.170** (0.071)	-0.047*** (0.017)	-0.024 (0.087)	-0.024 (0.089)	-0.066 (0.134)
Net ODA (% GDP, in log)		-0.015 (0.015)	0.005 (0.032)	-0.025 (0.034)	-0.017 (0.032)
No ODA dummy		-0.208 (0.190)	0.154 (0.434)	-0.275 (0.498)	-0.157 (0.400)
Volatility x ODA		0.007* (0.004)	0.014*** (0.004)	0.044** (0.022)	0.017 (0.019)
Remittances (% GDP, in log)				0.059+ (0.036)	-0.003 (0.042)
Volatility x Remittances				-0.099 (0.073)	0.015 (0.065)
Number of observation	690	684	281	597	245
Number of countries	162	162	107	152	97
Control variables	yes	yes	yes	yes	yes
AR 1 (p-value)	0.002	0.001	0.095	0.005	0.058
AR 2 (p-value)	0.164	0.164	0.851	0.121	0.634
Hansen test (p-value)	0.130	0.491	0.757	0.193	0.155

Syst. GMM estimator	1	2	3	4	5	6	7	8
Dep. var.	GDP per capita volatility							
Lagged dependent	0.088	0.070	-0.031	0.239	0.060	0.114	-0.004	0.304
	(0.124)	(0.071)	(0.115)	(0.233)	(0.122)	(0.146)	(0.091)	(0.242)
ODA (% GDP)	-0.005	0.019	0.022	-0.009	-0.010	0.048	0.016	0.018
	(0.020)	(0.018)	(0.024)	(0.009)	(0.063)	(0.049)	(0.022)	(0.043)
ODA*ODA vola.	0.000	-0.003	0.003	-0.003	0.012	-0.008	0.006	-0.004
	(0.004)	(0.006)	(0.008)	(0.011)	(0.021)	(0.020)	(0.010)	(0.022)
No ODA dummy	0.461	-0.185	0.076	-0.090	0.329	-0.246	0.051	0.128
	(0.512)	(0.183)	(0.453)	(0.296)	(0.358)	(0.266)	(0.344)	(0.398)
Exports (% GDP)	0.001	0.002	-0.001	-0.006	0.001	0.002	-0.001	0.000
	(0.002)	(0.003)	(0.010)	(0.006)	(0.003)	(0.003)	(0.006)	(0.003)
Exports*Exp. vola.	0.006**	-0.000	0.017	0.005*	0.005	-0.000	0.016	-0.003
	(0.002)	(0.006)	(0.021)	(0.003)	(0.007)	(0.008)	(0.011)	(0.007)
Exports*Exp. vola.*ODA	-0.000*	-0.000*	-0.002**	0.001	-0.002***	-0.001*	-0.002***	0.000
	(0.000)	(0.000)	(0.001)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)
Number of observations	642	483	447	329	642	483	447	329
Number of countries	174	155	118	102	174	155	118	102
Control var. set	1	2	1	2	1	2	1	2
Developing countries only	No	No	Yes	Yes	No	No	Yes	Yes
AR1 (p-value)	0.260	0.005	0.125	0.141	0.171	0.041	0.133	0.249
AR2 (p-value)	0.603	0.303	0.352	0.163	0.822	0.265	0.343	0.695
Hansen test (p-value)	0.356	0.683	0.689	0.273	0.143	0.530	0.776	0.544