# Fragility, Conflicts and Taxation: Focus on Sub-Saharan Africa

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Fondation pour les Etudes et Recherches sur le Développement International

### October 26, 2022

(A.A. Dama - FERDI)

Fragility, Conflicts and Taxation

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# Presentation outline



- Objective and Contributions
- Literature

# 2 Results

- Empirical results Average effects
- Empirical results Specific countries
- Empirical results Beyond conflicts
- Empirical results Robustness

# On the triple constraint of Sub-Saharan Africa

# Most affected region by conflicts

Latest classification of WBG: 51% of FCS are in Africa. 60% of FCS in conflict situation are in Africa  $\sim$  Conflicts in Africa

Poverty and underdevelopment

# B Limited fiscal space

Tax revenue around 12% in LICs while 23% in HICs. Non-resource tax revenue 11% in LICs while 21% in HICs Non-resource tax

# Taking Tilly's Theory South

- Wars make states stronger through its effects on public expenditure and taxation
- Studies extending the war-making / state-making framework to developing countries have resulted in mixed conclusions
- Need of comparative case studies in studying the relationship
- Extension of Tilly's theory beyond conflict

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# Objective

- Average effects: Study the impacts of violent conflicts on tax revenue in Sub-Saharan Africa
- Specific conflicts: Case studies for five countries
- Average effects of broader measure of fragility: Relationship between events (other than conflicts) and tax revenue

### Contributions

- Empirical evidence of the relationship between conflicts and taxation in SSA
- We look at both the average effects and the effects of specific conflicts
- Extension of the analysis to broader measure of fragility

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# Related Literature

- War making and state making connection → Battese and Coelli (1988) (Hintze et al., 1975; Peacock and Wiseman, 1961; Tilly, 1985)
- Cost of wars → (Abadie and Gardeazabal, 2003; Brück and De Groot, 2013; Collier, 1999; Costalli et al., 2017)
- Determinants of tax revenue in developing countries → (Burgess and Stern, 1993; Besley and Persson, 2013, 2014)

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Non-resource tax Per capita (Constant 2010 US\$)	(1)	(2)	(3)	(4)	(5)
Conflicts Dummy	-2.171*	$-4.123^{**}$	$-4.918^{***}$	$-4.184^{***}$	-5.350***
	(1.276)	(1.643)	(1.538)	(1.521)	(1.525)
Non-resource tax Per capita (Constant 2010 US) <sub>(t-1)</sub>	$1.018^{***}$	$0.930^{***}$	$0.908^{***}$	$0.757^{***}$	$0.759^{***}$
	(0.012)	(0.032)	(0.033)	(0.055)	(0.055)
GDP per capita (constant 2010 US\$)				$0.045^{**}$	$0.045^{**}$
				(0.018)	(0.019)
Agriculture, value added (% of GDP)				0.041	0.061
				(0.099)	(0.088)
Total trade (% of GDP)				0.089	0.063
				(0.080)	(0.087)
Country FE	No	Yes	Yes	Yes	Yes
Time FE	No	No	Yes	No	Yes
Observations	1393	1393	1393	1199	1199
Number of countries	42	42	42	40	40
R-squared	0.976	0.978	0.979	0.981	0.982
Adjusted R-squared	0.976	0.977	0.978	0.981	0.981

### Table 1: Impact of conflict on tax revenue (entropy balancing)

Table 2:	Impact	of	conflict	on	tax	revenue	(entropy	balancing)	) —	Controlling	for
						specificit	ies				

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Non-resource tax Per capita (Constant 2010 US\$)	(1)	(2)	(3)	(4)	(5)	(6)
Conflicts Dummy	-4.489***	-5.670***	-5.287**	-6.308***	-6.940***	-8.272***
	(1.576)	(1.584)	(2.085)	(2.004)	(2.538)	(2.557)
Non-resource tax Per capita (Constant 2010 US\$) (t-1)	$0.773^{***}$	$0.775^{***}$	$0.798^{***}$	$0.803^{***}$	$0.747^{***}$	$0.758^{***}$
	(0.050)	(0.049)	(0.032)	(0.032)	(0.058)	(0.053)
GDP per capita (constant 2010 US\$)	$0.042^{***}$	$0.042^{**}$	$0.037^{***}$	$0.035^{***}$	$0.040^{***}$	$0.037^{***}$
	(0.016)	(0.017)	(0.008)	(0.008)	(0.012)	(0.012)
Agriculture, value added (% of GDP)	0.055	0.075	0.076	0.127	0.240	$0.339^{**}$
	(0.095)	(0.088)	(0.082)	(0.085)	(0.149)	(0.152)
Total trade (% of GDP)	0.096	0.065	0.072	0.048	0.189	0.151
	(0.081)	(0.087)	(0.132)	(0.131)	(0.136)	(0.139)
Ethnic Fractionalization	-111.391*	-106.942				
	(65.970)	(67.528)				
Total natural resources rents (% of GDP)			-0.089	-0.155		
			(0.200)	(0.193)		
ICRG index					4.979	-0.930
					(10.691)	(13.125)
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	No	Yes	No	Yes
Observations	1,199	1,199	1,199	1,199	771	771
Number of countries	40	40	40	40	28	28
R-squared	0.983	0.982	0.986	0.986	0.982	0.984
Adjusted R-squared	0.982	0.982	0.985	0.985	0.982	0.982

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Table 3: Impact of conflict on tax revenue (entropy balancing) – Controlling for alternative sources of funding

Non-resource tax Per capita (Constant 2010 US\$)	(1)	(2)	(3)	(4)
Conflicts Dummy	-1.989	-2.760**	-1.860	-2.669**
	(1.235)	(1.252)	(1.188)	(1.163)
Non-resource tax Per capita (Constant 2010 US $)_{(t-1)}$	$0.597^{***}$	$0.610^{***}$	$0.641^{***}$	$0.651^{***}$
	(0.088)	(0.084)	(0.087)	(0.084)
GDP per capita (constant 2010 US)	$0.048^{***}$	$0.047^{***}$	$0.038^{***}$	$0.036^{***}$
	(0.015)	(0.016)	(0.011)	(0.011)
Agriculture, value added (% of GDP)	-0.048	-0.032	-0.059	-0.029
	(0.078)	(0.079)	(0.064)	(0.070)
Total trade (% of GDP)	$0.178^{**}$	$0.172^{*}$	0.161*	0.138
	(0.087)	(0.089)	(0.086)	(0.089)
Aid	-0.178**	-0.202**		
	(0.082)	(0.083)		
Public debt			-0.016	-0.018
			(0.016)	(0.026)
Country FE	No	Yes	Yes	Yes
Time FE	No	No	Yes	No
Observations	1,175	1,175	1,099	1,099
Number of countries	40	40	37	37
R-squared	0.922	0.926	0.930	0.934
Adjusted R-squared	0.919	0.920	0.927	0.929



Source: Author

Figure 1: Gap - Central African Republic

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#### Figure 2: Gap - Cote d'Ivoire

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Figure 3: Gap - Republic of Congo

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#### Figure 4: Gap - Guinea

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Figure 5: Gap - Guinea-Bissau

### Table 4: Fragility and tax revenue (OLS) - Any type of events

Non-resource tax (% of GDP)	(1)	(2)	(3)	(4)	(5)	(6)
Event per capita	-0.013***	-0.009**	-0.008*			
	(0.005)	(0.004)	(0.005)			
Violent event per capita				-0.026***	-0.019***	$-0.017^{***}$
				(0.007)	(0.006)	(0.006)
Non-resource tax (% of GDP) (t-1)		0.672***	0.682***		$0.669^{***}$	$0.679^{***}$
		(0.022)	(0.023)		(0.022)	(0.023)
GDP per capita (PPP constant 2017						
international \$, log)			-0.231			-0.241
			(0.384)			(0.382)
Observations	1,315	1,161	$1,\!127$	1,315	1,161	$1,\!127$
R-squared	0.235	0.598	0.616	0.241	0.600	0.616
Number of countries	151	112	109	151	112	109
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Fragility and tax revenue	e (OLS) – by type of events
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Non-resource tax (% of GDP)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Battle per capita	-0.026**	-0.025***	-0.022**						
	(0.012)	(0.009)	(0.009)						
Explosion & remote violence per capita				-0.093**	-0.056*	-0.060**			
				(0.039)	(0.029)	(0.030)			
Violence against civilians per capita							-0.060***	-0.036***	-0.033**
							(0.013)	(0.013)	(0.013)
Non-resource tax (% of GDP) (t-1)		$0.675^{***}$	0.685***		0.673***	0.683***		$0.664^{***}$	$0.675^{***}$
		(0.022)	(0.022)		(0.022)	(0.023)		(0.023)	(0.023)
GDP per capita (PPP constant 2017									
international \$, log)			-0.211			-0.337			-0.205
			(0.383)			(0.388)			(0.383)
Observations	1,315	1,161	1,127	1,315	1,161	1,127	1,315	1,161	1,127
R-squared	0.616	0.616	0.618	0.234	0.616	0.616	0.616	0.599	0.618
Number of countries	151	112	109	151	112	109	151	112	109
Country FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

### Robustness - Average effects

Alternative estimator: GMM-system • GMM results

## Robustness - Specific countries

Placebo analysis

Pessaran (2006) CCE estimator 
 CCE results

### Robustness - Beyond conflicts

Alternative estimator: Box-Cox transformation of the number of events

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Source: Author using UCDP/PRIO

Figure A1: Conflict-ridden countries in Africa -1980-2021



Figure A2: Number of years in active conflicts -1980-2015

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Source: Author using UCDP/PRIO

Figure A3: Average intensity level - 1980-1989



Source: Author using UCDP/PRIO

Figure A4: Average intensity level - 2010-2019





Source: Author using UNU WIDER GRD

Figure A5: Non-resource tax as percentage of GDP - Average 1980-2021



Source: Author using UNU WIDER GRD

Figure A6: Non-resource tax as percentage of GDP - 1980-1989

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**Dependent**: Non-resource tax revenue from (Caldeira et al., 2019) **Therests**: Violent conflicts from UCPD/PRIO (Gleditsch et al., 2002; Pettersson et al., 2019); Broader measure of fragility from ACLED **Controls**:

- Standard: Level of Development, Trade openness, the structure of the economy from World Bank WDI
- **Specificity**: ethnic fractionalization, natural resources endowment, Institutional quality from (Alesina et al. (2003), WDI, ICRG)
- Alternative source of funding: Aid, Public external debt from (WDI, IDS)

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# Average effects

Average effects using OLS, Entropy Balancing, and GMM-system.

$$y_{i,t} = \beta c_{i,t} + \delta y_{i,t-1} + \gamma x_{i,t} + \alpha_i + \theta_t + \mu_{i,t}$$
(1)

Average effects in the medium term using Local Projection

$$y_{i,t+h} = \beta_h c_{i,t} + \delta_h y_{i,t+h-1} + \gamma_h x_{i,t} + \alpha_i + \mu_{i,t+h}, h = 0, 1, \dots, 10$$
(2)

Effects on specific countries using SCM (see Abadie et al., 2015). Setup:

- The treated unit and the control group must not have missing data on the outcome in the 23-year sample period
- In case of multiple conflicts, I select the first one in the chronological order
- the treated country must have experienced its first conflict in 1993 and the treated unit must have experienced a conflict at the latest in 2005.
- The potential donor pool of a treated unit contains countries which did not experience any conflict in that particular 23-year-long time frame
- I construct the donor pool by restricting the size of the potential donor pool to consider only units similar to the treated units

#### Results

Table A1:	Impact (	of c	onflict	on	tax	revenue	(OLS)	
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Non-resource tax Per capita (Constant 2010 US\$)	(1)	(2)	(3)	(4)	(5)
Conflicts Dummy	-4.156*	-5.733**	-5.940*	-12.285*	-13.411*
	(2.316)	(2.535)	(3.240)	(6.951)	(7.507)
Non-resource tax Per capita (Constant 2010 $US\underline{\$}_{(t-1)}$	$1.014^{***}$	$0.938^{***}$	$0.919^{***}$	$0.707^{***}$	$0.704^{***}$
	(0.012)	(0.027)	(0.026)	(0.063)	(0.062)
GDP per capita (constant 2010 US\$)				$0.078^{***}$	$0.075^{***}$
				(0.017)	(0.017)
Agriculture, value added (% of GDP)				-0.021	0.281
				(0.292)	(0.332)
Total trade (% of GDP)				-0.270	-0.376
				(0.312)	(0.285)
Constant	3.948	27.353***	$28.664^{***}$	-23.353	-18.151
	(2.729)	(8.527)	(10.363)	(19.615)	(14.921)
Country FE	No	Yes	Yes	Yes	Yes
Time FE	No	No	Yes	No	Yes
Observations	1393	1393	1393	1199	1199
Number of countries		42	42	40	40
R-squared	0.9819	0.8328	0.8407	0.8659	0.8706
Adjusted R-squared	0.9819	0.8326	0.8365	0.8654	0.8662

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Table A2: Impact of conflict on tax revenue	(GIVIIVI-S	ystem)
Variables	(1)	(2)
Conflicts Dummy	-5.377**	-4.737***
	(2.124)	(1.584)
Non-resource tax Per capita (Constant 2010 US\$) (t-1)	$0.992^{***}$	$0.941^{***}$
	(0.012)	(0.014)
GDP per capita (constant 2010 US\$)		0.014**
		(0.007)
Agriculture, value added (% of GDP)		-0.260
		(0.354)
Total trade (% of GDP)		0.070
		(0.077)
Observations	1393	1199
Number of countries	42	40
Instruments	6	9
AR1 P-value	0.02	0.03
AR2 P-value	0.67	0.68
Hansen P-value	0.29	0.94
Long Run conflict effects	-703.543	-80.200**
Standard error	1109.67	33.562

Table A2:	Impact of	of conflict	on tax	revenue	(GMM-s	system)
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#### Results

#### Table A3: Impact of conflict on tax revenue (GMM-system) - Controlling for specificities

Variables	(1)	(2)	(3)
Conflicts Dummy	-4.897***	-6.257***	-4.700
	(1.439)	(2.185)	(3.109)
Non-resource tax Per capita (Constant 2010 US\$) (t-1)	$0.937^{***}$	$0.922^{***}$	$0.881^{***}$
	(0.015)	(0.012)	(0.076)
GDP per capita (constant 2010 US\$)	$0.014^{**}$	$0.018^{***}$	0.021*
	(0.007)	(0.006)	(0.013)
Agriculture, value added (% of GDP)	-0.296	-0.052	0.187
	(0.361)	(0.362)	(0.286)
Total trade (% of GDP)	0.017	$0.170^{**}$	$0.270^{**}$
	(0.080)	(0.076)	(0.105)
Ethnic Fractionalization	-30.837**		
	(15.583)		
Total natural resources rents (% of GDP)		$-1.675^{***}$	
		(0.625)	
ICRG index			$71.490^{**}$
			(29.381)
Observations	1,199	1,199	771
Number of countries	40	40	28
Instruments	10	10	10
AR1 P-value	0.03	0.03	0.04
AR2 P-value	0.69	0.65	0.12
Hansen P-value	0.95	0.83	0.74
Long Run conflict effects	$-77.646^{***}$	$-80.246^{**}$	-39.496
Standard error	29.553	31.166	35.564

Table A4: Impact of conflict on tax revenue (GMM-system) - Controlling for alternative sources of funding Go back to robustness

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Variables	(1)	(2)
Conflicts Dummy	-4.379**	-4.891***
	(1.764)	(1.664)
Non-resource tax Per capita (Constant 2010 US <u>\$)(t-1)</u>	$0.942^{***}$	$0.797^{***}$
	(0.014)	(0.066)
GDP per capita (constant 2010 US\$)	$0.014^{**}$	$0.036^{***}$
	(0.007)	(0.013)
Agriculture, value added (% of GDP)	-0.314	-0.099
	(0.327)	(0.239)
Total trade (% of GDP)	0.060	$0.130^{*}$
	(0.084)	(0.072)
Aid	0.064	
	(0.202)	
Public debt		-0.091*
		(0.047)
Observations	1,175	1,111
Number of countries	40	37
Instruments	10	10
AR1 P-value	0.03	0.02
AR2 P-value	0.69	0.58
Hansen P-value	0.76	0.92
Long Run conflict effects	$-74.975^{**}$	$-24.092^{*}$
Standard error	33.884	12.561

#### Fig. A1: Gap Distribution of individual effects of conflicts for the five treated countries



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