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Dynamic Determinants of Access to Weapons: Global Evidence

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Abstract

This study investigates the determinants of and persistence in access to weapons using a global sample of 163 countries for the period 2010 to 2015. The empirical evidence is based on Generalised Method of Moments (GMM). Hysteresis in access to weapons is consistently more apparent in countries with below-median levels in access to weapons, compared to their counterparts with above-median levels in access to weapons. The hysteresis hypothesis within this context is the propensity of past values of access to weapons to influence future values of access to weapons. Factors that consistently drive access to weapons are: perceptions of crime; criminality; conflict intensity; political instability; military expenditure, violent demonstrations and terrorism. The effects of these drivers are contingent on initial levels of access to weapons. Policy recommendations for managing access to weapons are discussed.

1. Introduction

The purpose of this study builds on three tendencies in policy and academic circles, notably: (i) the increasing cost of conflicts in the globe; (ii) the relevance of policy makers to have insights into the hysteresis (or persistence) of access to weapons and determinants of such hysteresis and (iii) attendant gaps in the literature. The highlighted points are substantiated in the same chronology.

First, the cost of conflicts and crime is steadily increasing across the world. This now represents a substantial policy syndrome, not least because as of 2014, about 13% of the global Gross Domestic Product (GDP) was allocated to preventing and mitigating the consequences of terrorism and conflicts. This narrative is consistent with the Global Peace Index (GPI, 2015) and Asongu and Kodila-Tedika (2017). To put this point into more perspective, the corresponding annual expenditure is equivalent to the GDP of the following countries: the United Kingdom (UK), Spain, Germany, France, Canada and Brazil. Access to weapons is logically a fundamental cause of conflicts and crimes for which the substantial proportion of global GDP is devoted to curtailing. In the light of the other global development concerns (e.g. the post-2015 development agenda), the underlying expenditure might be better spent in addressing concerns surrounding the achievement of sustainable development goals.

Second, given the importance of access to weapons in fuelling conflicts and wars, it is relevant for policy to have insights into factors that drive the persistence in access to weapons and how such persistence varies across important fundamentals (e.g. income levels and regional proximity). In essence, a critical understanding of these concerns can enlighten policy makers on measures that can be implemented to prevent, reduce or increase access to weapons, contingent on policy objectives.

Third, this study is also important because of an apparent gap in the literature. Accordingly, as far as we have reviewed, the extant literature has not focused on determinants of and persistence in access to weapons in the world. Accordingly, the existing literature surrounding the subject matter can be summarized in two categories, namely, on: determinants of access to weapons and drivers of the weaponry industry. With regard to the latter category, studies have focused on, *inter alia*: nuclear proliferation and security guarantees (Bleek & Lorber, 2015); questioning the incidence of nuclear weapons on conflicts and wars (Bell & Miller, 2015); the relationship between nuclear deployment, nonproliferation and nuclear strategy (Fuhrmann & Sechser, 2014); investigating the relevance of possessing nuclear weapons (Suni, 2015) and the importance of weapon law and assault weapon bans on murder rates (Gius, 2014).

As concerns the former category, the literature has largely articulated, among others: mitigating access to weapons by individuals who have suicide intensions (Barber & Miller, 2014); access to firearms by citizens who are victimized by mental disorders (Pinals et al., 2015); the importance of technological corporation in the fabrication of nuclear weapons (Brown & Kaplow, 2014); defence signals and defensive weapons in plants (Maag et al.,

2015) and nexuses between ornaments, the choice of weapons and sex (McCullough et al., 2016).

The theoretical basis for investigating the determinant of access to weapons is broadly in line with both contemporary and non-contemporary literature on the hysteresis (or persistence) of (in) economic phenomena. On the contemporary front, we find recent studies that have focused on inclusive development (see Mayer-Foulkes, 2010; Asongu, 2014; Asongu & Nwachukwu, 2017a); financial intermediary development (Stephan & Tsapin, 2008; Goddard et al., 2011) and stock market development (Narayan et al., 2011; Bruno et al., 2012; Asongu, 2013). Conversely, non-contemporary studies constitute the bulk of seminal papers on cross-country economic convergence (see Baumol, 1986; Barro, 1991; Mankiw et al., 1992; Barro & Sala-i-Martin, 1992, 1995).

It is worthwhile to articulate that, new theories of economic growth were constructed in the post-Keynesian era. In essence, the theoretical studies became prominent owing to considerable improvements in the neoclassical revolution which culminated in significant changes in cross-country differences in income levels. Concepts of market equilibrium models were proposed and applied within this theoretical framework. Such models were essentially founded on economic growth theories which predicted absolute decrease in cross-country variations in income levels (see Mayer-Foulkes, 2010). Consistent with Mayer-Foulkes (2010), the highlighted convergence trends in per capita income have been fundamentally traceable to the positive externalities from "free market competition". The attendant convergence literature can be summarized into two main schools of thought. First, one strand of studies has established the presence of divergence or the absence of convergence. This strand is substantiated with the arguments that owing to multiple equilibria and the variations in initial endowments, it is not feasible to establish convergence in income levels across nations (Barro, 1991; Pritchett, 1997). Conversely, another strand of the theoretical literature holds that, regardless of initial conditions, variations in income levels across countries can occur within the perspective of countries' steady state and long-run equilibrium (Asongu & Nwachukwu, 2017a).

It is relevant to clarify that this study is not positioned to confirm or reject any of the contending strands. The purpose of the inquiry is to leverage on the information criteria used by both studies to either reject or confirm the evidence of convergence. In order to provide more space for policy implications, the analysis is tailored to emphasize initial levels of access to weapons. The motivation for articulating initial levels of the outcome indicator is that blanket policies on determinants of and persistence in access to weapons may be

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ineffective, unless they are contingent on existing levels of access to weapons and therefore tailored distinctly across countries with high and low levels in access to weapons. Consistent with contemporary development literature, the emphasis of fundamental features is critical to results with more robust policy implications (D'Amico, 2010; Narayan et al., 2011; Beegle et al., 2016; Mlachila et al., 2017; Asongu & le Roux, 2017; Asongu & Nwachukwu, 2017b; Asongu et al., 2017, 2018a, 2018b, 2018c).

The rest of the study is organized as follows. The data and methodology are covered in Section 2 while Section 3 presents and discusses the results. Section 4 concludes with future research directions.

2. Data and Methodology

2.1 Data

The paper investigates a sample of 163 countries with data for the period 2010 to 2015 from a plethora of sources, namely: the Uppsala Conflict Data Program (UCDP) Battle-Related Deaths Dataset; Institute for Economics and Peace (IEP); the United Nations Committee on Contributions; a Qualitative assessment by the Economic Intelligence Unit (EIU) analysts' estimates; the United Nations Office on Drugs and Crime (UNODC) Surveys on Crime Trends and the Operations of Criminal Justice Systems (CTS). Consistent with recent literature, the geographical and temporal scopes are motivated by data availability constraints at the time of the study (Asongu & Nwachukwu, 2019; Asongu et al., 2019a, 2019b).

The dependent variable is "access to weapons" in terms of ease of access to small arms and light weapons. A multitude independent variables are employed in the conditional information set, namely: internal conflict fought; external conflicts; deaths from internal conflicts; deaths from external conflicts; intensity of internal conflict; perception of criminality; displaced people; political instability; political terror; terrorism impact; homicide; violent crime; violent demonstrations; incarcerations; security officers and polices; military expenditure; armed service personnel; weapon imports; weapons exports and United Nations Peace Keeping Funding (UNPKF). These control variables have been substantially documented in the literature on weapon proliferation and access to weapons (Barber & Miller, 2014; Brown & Kaplow, 2014; Brown & Kaplow, 2014; Maag et al., 2015; McCullough et al., 2016).

Table 1: Definitions and sources of variables

Variables	Definitions and sources of variables
Internal conflicts fought	Number and duration of internal conflicts Uppsala Conflict Data Program (UCDP) Battle-Related Deaths Dataset, Non-State Conflict Dataset and One-sided Violence Dataset; Institute for Economics and Peace (IEP)
Deaths from external conflict	Number of deaths from organised conflict (external) UCDP Armed Conflict Dataset
Deaths from internal conflict	Number of deaths from organised conflict (internal)International Institute for Strategic Studies (IISS) Armed Conflict Database (ACD)
External conflicts fought	Number, duration and role in external conflicts UCDP Battle-Related Deaths Dataset; IEP
Intensity of internal conflict	Intensity of organised internal conflict Qualitative assessment by EIU analysts
Perceptions of Criminality	Level of perceived criminality in society Qualitative assessment by EIU analysts
Displaced people	Number of refugees and internally displaced people as a percentage of the population Office of the High Commissioner for Refugees (UNHCR) Mid-Year Trends; Internal Displacement Monitoring Centre (IDMC)
Political instability	Political instability Qualitative assessment by EIU analysts
Political Terror	Political Terror Scale Qualitative assessment of Amnesty International and US State Department yearly reports
Terrorism impact	Impact of terrorism IEP Global Terrorism Index (GTI)
Homicides	Number of homicides per 100,000 people United Nations Office on Drugs and Crime (UNODC) Surveys on Crime Trends and the Operations of Criminal Justice Systems (CTS); EIU estimates
Violent crime	Level of violent crime Qualitative assessment by EIU analysts
Violent demonstrations	Likelihood of violent demonstrations Qualitative assessment by EIU analysts
Incarceration	Number of jailed population per 100,000 people World Prison Brief, International Centre for Prison Studies, University of Essex
Security Officers & Police	Number of internal security officers and police per 100,000 people UNODC; EIU estimates
Military expenditure	Military expenditure as a percentage of GDP The Military Balance, IISS
Armed Services Personnel	Number of armed services personnel per 100,000 people The Military Balance, IISS
Weapon imports	Volume of transfers of major conventional weapons as recipient (imports) per 100,000 people Stockholm International Peace Research Institute (SIPRI) Arms Transfers Database
Weapon exports	Volume of transfers of major conventional weapons as supplier (exports) per 100,000 people SIPRI Arms Transfers Database
United Nations Peacekeeping Funding.	Financial contribution to UN peacekeeping missions United Nations Committee on Contributions; IEP
Access to Weapons	Ease of access to small arms and light weapons Qualitative assessment by EIU analysts

UNODC: United Nations Office on Drugs and Crime. EIU: Economic Intelligence Unit. UNHCR: United Nations High Commissioner for Refugees. GDP: Gross Domestic Product. IISS: The International Institute for Strategic Studies. UN: United Nations. IEP: Institute for Economics and Peace.

Table 2: Summary Statistics and presentation of countries

Panel A: Summary Statistics					
Variables	**Mean**	**Standard dev.**	**Minimum**	**Maximum**	**Obsers**
Internal conflicts fought	1.458	1.024	1.000	5.000	977
Deaths from external conflict	1.105	0.335	1.000	3.371	978
Deaths from internal conflict	1.405	0.933	1.000	5.000	978
External conflicts fought	1.642	1.166	1.000	5.000	978
Intensity of internal conflict	2.412	1.162	1.000	5.000	978
Criminality	3.153	0.917	1.000	5.000	978
Displaced people	1.348	0.872	1.000	5.000	978
Political instability	2.545	1.030	1.000	5.000	978
Political Terror	2.584	1.091	1.000	5.000	978
Terrorism impact	1.799	0.936	1.000	5.000	978
Homicides	2.797	1.154	1.103	5.000	978
Violent crime	2.768	1.136	1.000	5.000	978
Violent demonstrations	2.912	0.969	1.000	5.000	978
Incarceration	2.194	0.889	1.150	5.000	978
Security Officers & Police	2.728	0.911	1.081	5.000	978
Military expenditure	1.966	0.824	1.000	5.000	978
Armed Services Personnel	1.648	0.725	1.000	5.000	978
Weapon imports	1.489	0.868	1.000	5.000	978
Weapon exports	1.342	0.932	1.000	5.000	978
United Nations Peacekeeping Funding.	2.291	1.164	1.000	5.000	978
Access to Weapons	3.116	1.080	1.000	5.000	978

Panel B: Presentation of countries

"Afghanistan; Albania; Algeria; Angola; Argentina; Armenia; Australia; Austria; Azerbaijan; Bahrain; Bangladesh; Belarus; Belgium; Benin; Bhutan; Bolivia; Bosnia and Herzegovina; Botswana; Brazil; Bulgaria; Burkina Faso; Burundi; Cambodia; Cameroon; Canada; Central African Republic; Chad; Chile; China; Colombia; Costa Rica; Cote d' Ivoire; Croatia; Cuba; Cyprus; Czech Republic; Democratic Republic of the Congo; Denmark; Djibouti; Dominican Republic; Ecuador; Egypt; El Salvador; Equatorial Guinea; Eritrea; Estonia; Ethiopia; Finland; France; Gabon; Georgia; Germany; Ghana; Greece; Guatemala; Guinea; Guinea-Bissau; Guyana; Haiti; Honduras; Hungary; Iceland; India; Indonesia; Iran; Iraq; Ireland; Israel; Italy; Jamaica; Japan; Jordan; Kazakhstan; Kenya; Kosovo; Kuwait; Kyrgyz Republic; Laos; Latvia; Lebanon; Lesotho; Liberia; Libya; Lithuania; Macedonia (FYR); Madagascar; Malawi; Malaysia; Mali; Mauritania; Mauritius; Mexico; Moldova; Mongolia; Montenegro; Morocco; Mozambique; Myanmar; Namibia; Nepal; Netherlands; New Zealand; Nicaragua; Niger; Nigeria; North Korea; Norway; Oman; Pakistan; Palestine; Panama; Papua New Guinea; Paraguay; Peru; Philippines; Poland; Portugal; Qatar; Republic of the Congo; Romania; Russia; Rwanda; Saudi Arabia; Senegal; Serbia; Sierra Leone; Singapore; Slovakia; Slovenia; Somalia; South Africa; South Korea; South Sudan; Spain; Sri Lanka; Sudan; Swaziland; Sweden; Switzerland; Syria; Taiwan; Tajikistan; Tanzania; Thailand; The Gambia; Timor-Leste; Togo; Trinidad and Tobago; Tunisia; Turkey; Turkmenistan; Uganda; Ukraine; United Arab Emirates; United Kingdom; United States of America; Uruguay; Uzbekistan; Venezuela; Vietnam; Yemen; Zambia and Zimbabwe".

Standard dev: Standard deviation. Obsers: Observations.

Table 3: Correlation matrix (uniform sample size: 731)

Crime	Sec	Hom	Inca	Wea	CoIn	Dem	Crim	PolIn	PolTe	Wimp	TerIm	DIC	ICF	Milit	ASP	UNP	NHW	Wexp	DP	ECF	DEC	
1.00	-0.023	**0.510**	-0.054	**0.615**	**0.517**	**0.473**	**0.672**	**0.449**	**0.531**	-0.318	0.302	0.337	0.318	-0.008	-0.158	0.277	-0.022	-0.155	0.182	-0.240	-0.042	Crime
	1.000	-0.024	0.274	-0.035	-0.014	-0.084	-0.117	-0.0007	-0.068	0.148	-0.021	0.011	-0.071	0.128	0.228	-0.032	0.066	0.014	0.064	-0.077	-0.163	Sec
		1.000	0.184	**0.564**	0.320	0.276	**0.612**	0.241	0.394	-0.335	0.029	0.189	0.179	-0.150	-0.246	0.320	-0.194	-0.209	0.010	-0.222	-0.143	Hom
			1.000	-0.104	-0.037	-0.149	-0.059	-0.138	-0.018	-0.063	-0.013	-0.078	-0.125	0.076	0.180	-0.151	0.169	0.119	-0.053	0.229	0.084	Inca
				1.000	**0.548**	**0.526**	**0.649**	**0.573**	**0.551**	-0.349	0.288	0.319	0.380	0.089	-0.119	0.349	-0.123	-0.165	0.239	-0.240	0.038	Wea
					1.000	**0.533**	**0.480**	**0.658**	**0.639**	-0.273	**0.558**	0.469	**0.514**	0.198	0.026	0.289	0.002	-0.227	0.338	-0.305	-0.002	CoIn
						1.000	**0.566**	**0.659**	**0.533**	-0.269	0.371	0.283	0.281	0.048	-0.043	0.291	-0.041	-0.222	0.138	-0.198	0.043	Dem
							1.000	**0.528**	**0.589**	-0.394	0.247	0.294	0.279	-0.186	-0.246	0.394	-0.138	-0.283	0.235	-0.236	0.011	Crim
								1.000	**0.589**	-0.257	0.300	0.222	0.272	0.294	0.092	0.335	0.129	-0.205	0.279	-0.269	0.069	PolIn
									1.000	-0.326	**0.590**	**0.590**	**0.583**	0.186	-0.018	0.335	0.129	-0.205	0.279	-0.269	0.041	PolTe
										1.000	-0.043	-0.130	-0.098	0.314	**0.498**	-0.208	0.124	0.127	-0.059	0.125	0.233	WImp
											1.000	**0.719**	**0.720**	0.250	0.136	0.031	0.426	0.090	0.269	-0.141	0.082	TerIm
												1.000	**0.803**	0.095	0.009	0.076	0.237	-0.061	0.311	-0.145	0.118	DIC
													1.000	0.158	0.046	0.106	0.221	-0.075	0.297	-0.163	0.288	ICF
														1.000	**0.579**	0.209	0.048	0.232	0.024	0.235	0.187	Milit
															1.000	-0.135	0.255	0.105	0.235	0.024	-0.149	ASP
																1.000	-0.245	0.078	-0.257	-0.198	0.398	UNP
																	1.000	0.390	-0.109	0.104	0.402	NHW
																		1.000	-0.103	0.102	0.114	Wexp
																			1.000	-0.019	0.213	DP
																				1.000	0.213	ECF
																					1.000	DEC

Crime: Perceptions of criminality. Sec: Security Office & Police. Hom: Homicide. Inca: Incarceration. Wea: Access to Weapons. CoIn: Intensity of Internal Conflict. Dem: Violent Demonstrations. Crim: Violent crime. PolIn: Political Instability.
PolTe: Political Terror. Wimp: Weapons import. TerIm: Terrorism Impact. DIC: Deaths from internal conflict. ICF: Internal Conflict Fought. Milit: Military Expenditure. ASP: Armed Services Personnel. UNP: United Nations Peacekeeping Funding.
NHW: Nuclear and Heavy Weapons. Wexp: Weapons Export. DP: Displaced People. ECF: External Conflict Fought. DEC: Deaths from external conflict.

The definitions and sources of variables are disclosed in Table 1 whereas the summary statistics and sampled countries are presented respectively in Panel A and Panel B of Table 2. The correlation matrix is provided in Table 3. From the summary statistics, it is apparent that variables are comparable (from the perspective of means). Moreover, given the standard deviations, one can be confident that reasonable estimated relationships will emerge from the regressions. Since we are using 20 variables in the conditioning information set, concerns of multicollinearity are very likely to emerge. The concerns about multicollinearity (identified in bold) are avoided the modelling exercise. Hence, we avoid introducing two variables with a high degree of substitution in the same specification.

2.2 Methodology

In this study, the Generalised Method of Moments (GMM) estimation approach is adopted because it is consistent with behavior of the data on the one hand and on the other, aligns with conditions and advantages for the application of the estimation approach. Moreover, the underlying empirical strategy is in accordance with recent literature on the convergence of macroeconomic outcomes (see Asongu & Nwachukwu, 2017a; Doyle, 2017). The following four fundamental points motivate the empirical approach. First, the T(6)<N(163) condition for the application of the technique is met because the number of periods in a time series of each cross section is substantially lower than the number of cross sections. Second, given that the estimation strategy is designed to be applied on panel data, the empirical strategy does not eliminate cross-country variations. Third, by employing instrumental variables and controlling for time-invariant variables, there is some bite on endogeneity. Fourth, the *system* estimator corrects inherent small biases that are specific to the *difference* estimator.

The Roodman (2009a, 2009b) extension of Arellano and Bover (1995) is adopted in place of traditional *difference* and *system* GMM approaches. This is essentially because the more contemporary approach has been documented to: (i) limit the proliferation of instruments   (or restrict over-identification) and (ii) control for cross-sectional dependence (Asongu & Nwachukwu, 2016a; Boateng et al., 2018; Baltagi, 2008; Love & Zicchino, 2006).

The following equations in level (1) and first difference (2) summarise the standard *system* GMM estimation procedure.

$$W_{i,t} = \sigma_0 + \sigma_1 W_{i,t-\tau} + \sum_{h=1}^{20} \delta_h X_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \tag{1}$$

$$W_{i,t} - W_{i,t-\tau} = \sigma_1(W_{i,t-\tau} - W_{i,t-2\tau}) + \sum_{h=1}^{20} \delta_h(X_{h,i,t-\tau} - X_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} + \varepsilon_{i,t-\tau}) \qquad (2)$$

where, $W_{i,t}$ is an indicator of access to weapons in country i at period t, σ_0 is a constant, X is the vector of control variables (internal conflict fought; external conflicts; deaths from internal conflicts; deaths from external conflicts; intensity of internal conflict; perception of criminality; displaced people; political instability; political terror; terrorism impact; homicide; violent crime; violent demonstrations; incarcerations; security officers and polices; military expenditure; armed services personnel; weapon imports; weapons exports and United Nations Peace Keeping Funding (UNPKF)), τ represents the coefficient of auto-regression which is one for the specification, ξ_t is the time-specific constant, η_i is the country-specific effect and $\varepsilon_{i,t}$ the error term. In what follows, we provide insights into the identification process.

Identification and exclusion restriction are indispensable for a sound GMM estimation. As far as the identification process is concerned, we are consistent with recent empirical literature (Asongu & Nwachukwu, 2016b; Tchamyou & Asongu, 2017; Boateng et al., 2018; Tchamyou, 2019a, 2019b; Tchamyou et al., 2019) in considering years as exclusively exogenous variables while the indicators in the conditioning information set are acknowledged as "endogenous explaining", "suspected endogenous" and predetermined variables. It is important to articulate that this identification process is in accordance with Roodman (2009b) in perspective that it is not very feasible for years to be endogenous after a first difference[1].

As concerns exclusion restrictions, consistent with the process of identification, the time invariant variables affect the dependent variables exclusively via the channels constituting the conditioning information set. Hence, the assumption of exclusion restriction holds when the corresponding hypothesis of exclusion restriction is not rejected. The hypothesis of exclusion restriction is the Difference in Hansen Test (DHT) for the exogeneity of instruments. In other words, the strictly exogenous variables or main instruments should elucidate "access to weapons" exclusively via the engaged suspected endogenous variables or selected mechanisms. It is broadly consistent with the standard IV procedure in which, failure to reject the null hypothesis corresponding to the Sargan Overidentifying Restrictions (OIR) test implies that the strictly exogenous variables affect access to weapons exclusively through

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[1] Hence, the procedure for treating *ivstyle* (years) is 'iv (years, eq(diff))' whereas the *gmmstyle* is employed for predetermined variables.

the suspected endogenous variable channels (see Beck et al., 2003; Asongu & Nwachukwu, 2016c).

3. Empirical results

3.1 Presentation of results

The empirical findings are disclosed in Tables 4-5. Each table has three sets of specifications. There are multiple sets of specifications to avoid the concerns of multicollinearity identified in Table 3. Consistent with the motivation of the study, in order to articulate the dynamic character of the analysis, the full sample is disaggregated into below- and above-median sub-samples, in order to assess how initial levels of access to weapons affect the investigated determinants and persistence. Four main information criteria are used to examine the validity of the GMM models[2]. Based on these criteria, the models are overwhelmingly valid. It is also imperative to emphasize that, whereas the models may be valid, the validity of models is not a sufficient condition to conclude on evidence of persistence in the outcome variable. This perspective is substantiated in what follows.

In the light of the attendant literature, convergence is established when the estimated lagged value of the dependent variable meets two critical conditions, namely: the estimated coefficient has to be statistically significant on the one hand and on the other hand, the corresponding estimated coefficient should fall within an interval that is consistent with the convergence criterion. Within the framework of this study, the absolute value of the underlying estimated lagged endogenous variable should fall within the interval of zero and one. This criterion is consistent with recent literature on the subject (see Fung, 2009, p. 58; Asongu, 2013, p. 192; Prochniak & Witkowski, 2012a, p. 20; Prochniak & Witkowski, 2012b, p. 23; Asongu & Nwachukwu, 2016d, p. 459).

Cognizant of the above insights, when comparing below- and above-median sub-samples, the sub-sample which reflects a higher estimated lagged coefficient is logically the sub-sample that reflects a higher level of persistence in access to weapons. The intuition behind the inference is that, within a comparative framework, the magnitude is important for

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[2] "*First, the null hypothesis of the second-order Arellano and Bond autocorrelation test (AR(2)) in difference for the absence of autocorrelation in the residuals should not be rejected. Second the Sargan and Hansen overidentification restrictions (OIR) tests should not be significant because their null hypotheses are the positions that instruments are valid or not correlated with the error terms. In essence, while the Sargan OIR test is not robust but not weakened by instruments, the Hansen OIR is robust but weakened by instruments. In order to restrict identification or limit the proliferation of instruments, we have ensured that instruments are lower than the number of cross-sections in most specifications. Third, the Difference in Hansen Test (DHT) for exogeneity of instruments isalso employed to assess the validity of results from the Hansen OIR test. Fourth, a Fischer test for the joint validity of estimated coefficients is also provided*" (Asongu & De Moor, 2017, p.200).*

comparison because it translates how past values in access to weapons affects future values in access to weapons.

The following findings are apparent in Tables 4-5. First, hysteresis in access to weapons is more important in countries with below-median levels of access to weapons. This tendency is consistent across tables and specifications. The hysteresis hypothesis within this context is the propensity of past values of access to weapons to influence future values of access to weapons. Second, the following factors consistently drive access to weapons: perceptions of crime; criminality; conflict intensity; political instability; military expenditure; violent demonstrations and terrorism.

Table 4: Drivers of access to weapons (First main sets of specifications)

	Dependent variable: Access to Weapons								
	First Set of Specification			**Second Set of Specification**			**Third Set of Specification**		
	Full Sample	Access ≤M	Access >M	Full Sample	Access ≤M	Access >M	Full Sample	Access ≤M	Access >M
Constant	0.219	0.045	**1.325*****	-0.027	0.031	**1.478*****	-0.195	-0.085	**1.115*****
	(0.170)	(0.123)	**(0.292)**	(0.207)	(0.183)	**(0.277)**	(0.154)	(0.131)	**(0.245)**
Access to weapons (-1)	**0.861*****	**0.745*****	**0.507*****	**0.894*****	**0.913*****	**0.492*****	**0.998*****	**0.926*****	**0.627*****
	(0.042)	**(0.062)**	**(0.080)**	**(0.039)**	**(0.061)**	**(0.066)**	**(0.042)**	**(0.053)**	**(0.057)**
Crime	0.049	**0.078****	**0.085*****	---	---	---	---	---	---
	(0.040)	**(0.036)**	**(0.026)**						
Criminality	---	---	---	**0.065***	0.016	-0.020	---	---	---
				(0.036)	(0.030)	(0.036)			
Security Officers & Police	-0.040	0.019	-0.001	-0.055	0.038	**0.083***	**-0.067****	-0.036	0.001
	(0.035)	(0.032)	(0.028)	(0.033)	(0.036)	**(0.042)**	**(0.026)**	(0.036)	(0.036)
Conflict intensity	---	---	---	**0.092*****	**0.079*****	**0.059***	---	---	---
				(0.031)	**(0.028)**	**(0.034)**			
Political Instability	0.030	0.023	**0.099*****	---	---	---	**0.095*****	**0.060***	**0.103****
	(0.032)	(0.033)	**(0.027)**				**(0.034)**	**(0.033)**	**(0.041)**
Weapons import	-0.015	-0.013	-0.003	0.018	-0.028	0.045	---	---	---
	(0.027)	(0.030)	(0.024)	(0.025)	(0.023)	(0.031)			
Displaced persons	**-0.076****	**0.115****	**0.035***	---	---	---	---	---	---
	(0.032)	**(0.052)**	**(0.020)**						
Military Expenditure	**0.116*****	**0.083***	0.022	---	---	---	0.052	0.048	0.049
	(0.034)	**(0.049)**	(0.024)				(0.035)	(0.059)	(0.029)
Violent Demonstrations	---	---	---	**0.053***	0.030	**0.087****	---	---	---
				(0.029)	(0.020)	**(0.039)**			
Incarcerations	---	---	---	-0.045	**-0.070*****	-0.015	---	---	---
				(0.039)	**(0.025)**	(0.021)			
Death from internal conflicts	---	---	---	---	---	---	0.024	**0.134*****	-0.005
							(0.028)	**(0.040)**	(0.013)
UNPKF	---	---	---	---	---	---	-0.002	0.002	0.004
							(0.010)	(0.013)	(0.011)
AR(1)	[0.016]	[0.007]	[0.147]	[0.011]	[0.007]	[0.138]	[0.018]	[0.006]	[0.150]
AR(2)	[0.327]	[0.309]	[0.218]	[0.301]	[0.838]	[0.257]	[0.280]	[0.506]	[0.207]
Sargan OIR	[0.000]	[0.002]	[0.000]	[0.000]	[0.000]	[0.000]	[0.003]	[0.000]	[0.000]
Hansen OIR	[0.552]	[0.105]	[0.493]	[0.795]	[0.383]	[0.497]	[0.881]	[0.092]	[0.755]
DHT for instruments									
(a)Instruments in levels									
H excluding group	[0.500]	[0.578]	[0.352]	[0.889]	[0.042]	[0.299]	[0.832]	[0.426]	[0.494]
Dif(null, H=exogenous)	[0.510]	[0.052]	[0.547]	[0.570]	[0.896]	[0.600]	[0.748]	[0.062]	[0.762]
(b) IV (years, eq (diff)) H excluding group	[0.356]	[0.128]	[0.434]	[0.759]	[0.195]	[0.382]	[0.883]	[0.101]	[0.636]
Dif(null, H=exogenous)	[0.883]	[0.224]	[0.525]	[0.576]	[0.941]	[0.667]	[0.537]	[0.252]	[0.724]
Fisher	**49.70*****	**79.86*****	**33.14*****	**56.00*****	**48.83*****	**24.09*****	**70.13*****	**165.25*****	**16.61*****
Instruments	31	31	31	31	31	31	27	27	27
Countries	163	99	72	163	99	72	163	99	72
Observations	815	476	339	815	476	339	815	476	339

***,**,*: significance levels at 1%, 5% and 10% respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. M: Median. M=3. "( )" are standard errors while "[ ]" are p-values.

Table 5: Drivers of access to weapons (Second main sets of specifications)

	Dependent variable: Access to Weapons								
	Fourth Set of Specification			**Fifth Set of Specification**			**Sixth Set of Specification**		
	Full Sample	Access ≤M	Access >M	Full Sample	Access ≤M	Access >M	Full Sample	Access ≤M	Access >M
Constant	**0.325****	0.038	**0.988***	0.007	0.068	**1.693***	0.200	0.079	**1.587***
	(0.155)	(0.203)	**(0.250)**	(0.119)	(0.124)	**(0.193)**	(0.210)	(0.231)	**(0.264)**
Access to weapons (-1)	**0.862***	**0.917***	**0.600***	**0.960***	**0.896***	**0.493***	**0.800***	**0.787***	**0.538***
	(0.042)	**(0.051)**	**(0.046)**	**(0.033)**	**(0.057)**	**(0.057)**	**(0.055)**	**(0.059)**	**(0.060)**
Criminality	---	---	---	---	---	---	**0.079***	0.055	0.049
							(0.047)	(0.038)	(0.047)
Security Officers & Police	-0.001	-0.003	**0.071****	-0.027	0.022	0.021	-0.017	-0.002	**0.062***
	(0.025)	(0.027)	**(0.032)**	(0.028)	(0.025)	(0.023)	(0.043)	(0.052)	**(0.035)**
Homicides	**-0.060***	-0.019	0.022	---	---	---	---	---	---
	(0.032)	(0.030)	(0.032)						
Incarcerations	0.001	0.011	0.001	---	---	---	---	---	---
	(0.030)	(0.036)	(0.029)						
Conflict Intensity	**0.108***	**0.084***	**0.142***	---	---	---	---	---	---
	(0.024)	**(0.020)**	**(0.034)**						
Conflict Fought	0.003	0.006	-0.017	---	---	---	---	---	---
	(0.028)	(0.030)	(0.026)						
Political Instability	---	---	---	**0.053***	0.017	**0.106***	---	---	---
				(0.029)	(0.029)	**(0.026)**			
Weapons import	---	---	---	**-0.038****	-0.030	**-0.051***	---	---	---
				(0.018)	(0.018)	**(0.017)**			
Weapon export	---	---	---	0.002	0.0003	0.012	---	---	---
				(0.005)	(0.006)	(0.012)			
Displaced persons	---	---	---	0.011	0.037	**0.071***	---	---	---
				(0.032)	(0.037)	**(0.017)**			
Military Expenditure	---	---	---	**0.060****	0.042	-0.005	**0.077****	0.088	0.005
				(0.030)	(0.046)	(0.025)	**(0.033)**	(0.070)	(0.025)
Political Terror	---	---	---	---	---	---	-0.029*	0.005	**-0.060****
							(0.016)	(0.025)	**(0.029)**
Terror Impact	---	---	---	---	---	---	**0.076****	**0.053***	**0.085***
							(0.031)	**(0.027)**	**(0.026)**
UNPKF	0.003	0.008	0.001	-0.008	0.001	-0.012	---	---	---
	(0.008)	(0.009)	(0.011)	(0.009)	(0.012)	(0.011)			
AR(1)	[0.019]	[0.005]	[**0.115**]	[0.026]	[0.007]	[**0.165**]	[0.025]	[0.009]	[**0.174**]
AR(2)	**[0.232]**	**[0.625]**	**[0.189]**	**[0.240]**	**[0.271]**	**[0.159]**	**[0.334]**	**[0.367]**	**[0.341]**
Sargan OIR	[0.006]	[0.005]	[0.004]	[0.000]	[0.002]	[0.000]	[0.000]	[0.002]	[0.000]
Hansen OIR	**[0.736]**	**[0.395]**	**[0.473]**	**[0.932]**	**[0.559]**	**[0.368]**	**[0.645]**	**[0.345]**	**[0.448]**
DHT for instruments									
(a)Instruments in levels									
H excluding group	**[0.785]**	**[0.103]**	**[0.395]**	**[0.531]**	**[0.371]**	**[0.683]**	**[0.465]**	**[0.133]**	**[0.345]**
Dif(null, H=exogenous)	**[0.561]**	**[0.739]**	**[0.488]**	**[0.958]**	**[0.671]**	**[0.223]**	**[0.643]**	**[0.605]**	**[0.491]**
(b) IV (years, eq (diff)) H excluding group	**[0.828]**	**[0.183]**	**[0.257]**	**[0.828]**	**[0.385]**	**[0.392]**	**[0.727]**	**[0.168]**	**[0.512]**
Dif(null, H=exogenous)	**[0.295]**	**[0.991]**	**[0.958]**	**[0.953]**	**[0.866]**	**[0.328]**	**[0.324]**	**[0.893]**	**[0.301]**
Fisher	**50.46***	**112.3***	**38.97***	**93.92***	**109.54***	**65.96***	**44.11***	**27.16***	**14.16***
Instruments	31	31	31	35	35	35	27	27	27
Countries	163	99	72	163	99	72	163	99	72
Observations	815	476	339	815	476	339	815	476	339

***,**,*: significance levels at 1%, 5% and 10% respectively. DHT: Difference in Hansen Test for Exogeneity of Instruments Subsets. Dif: Difference. OIR: Over-identifying Restrictions Test. The significance of bold values is twofold. 1) The significance of estimated coefficients and the Wald statistics. 2) The failure to reject the null hypotheses of: a) no autocorrelation in the AR(1) & AR(2) tests and; b) the validity of the instruments in the Sargan and Hansen OIR tests. M: Median. M=3. " ( )" are standard errors while "[ ]" are p-values.

4. Concluding implications and future research directions

This study has investigated the determinants of and persistence in access to weapons using a global sample of 163 countries for the period 2010 to 2015. The empirical evidence is based on Generalised Method of Moments (GMM). Hysteresis in access to weapons is consistently more apparent in countries with below-median levels of access to weapons, compared to their counterparts with above-median levels in access to weapons. The hysteresis hypothesis within

this context is the propensity of past values of access to weapons to influence future values of access to weapons. Factors that consistently drive access to weapons are: perceptions of crime; criminality; conflict intensity; political instability; military expenditure; violent demonstrations and terrorism. The effects of these drivers are contingent on the level of access to weapons.

The motivation for articulating initial levels of the outcome indicator is that blanket policies on determinants of and persistence in access to weapons may be ineffective, unless they are contingent on existing levels of access to weapons and therefore tailored distinctly across countries with high and low initial levels of access to weapons. In what follows, we discuss some policy measures that can be implemented to reduce/mitigate access to weapons.

In order to manage access to weapons efficiently, the following are some measures that can implemented by governments of sampled countries. (i) First and foremost, policies should be data-driven such that measures are contingent on empirically-grounded evidence. (ii) Given the contingency of determinants of and hysteresis in "access to weapons", on initial levels of access to weapons, it is relevant to focus on "hot spots" and "hot people" given that access to weapons is likely to be contingent on, *inter alia*: young factions of the population, poor neighborhoods, the less educated and specific periods of the day. (iii) Measures devoted to reducing and mitigating access to weapons should encompass joint efforts devoted to addressing strained nexuses between the police and the community, especially in regions that are most affected by crimes, violence and access to weapons. The intuition for this policy prescription is that the lack of trust in the police may push members in a community to increase their access to weapons in order to better secure themselves and protect their property. (iv) It is also important to improve law and order within the framework of how investigations into (and subsequently the prosecution of) those without the right to possess weapons are executed. Furthermore, policing in the light of reducing the proliferation of

weapons should be more focused on preventive measures, especially with reference to gang-related conflicts and international homicides. (v) Access to weapons can also be prevented by focusing on the identified characteristics that are critical in driving the phenomenon. Future studies can focus on country-specific studies in order to provide findings with more targeted policy implications.

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