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Persistence in incarcerations: Global comparative evidence

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Persistence in Incarcerations: Global Comparative Evidence

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Persistence in Incarcerations: Global Comparative Evidence

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Abstract

Purpose - The purpose of this study is to assess how incarcerations persist across the world. The focus is on 163 countries for the period 2010 to 2015.

Design/methodology/approach - The empirical evidence is based on Generalised Method of Moments. In order to increase room for policy implications, the dataset is decomposed into sub-samples based on income levels, religious domination, openness to the sea, regional proximity and legal origins.

Findings - The following main findings are established. Incarcerations are more persistent in low income, Christian-protestant and Latin American countries while comparative evidence is not feasible on the basis of landlockedness and legal origins owing to unfavorable post-estimation diagnostic tests. Justifications for the comparative advantages and relevance of findings to theory-building in public economics are discussed.

Practical implications - First, income levels matter in the persistence of incarcerations because low income nations vis-à-vis their high income counterparts, have less financial resources with which to prevent and deal with events like terrorism, political instability and violence that lead to incarcerations. Second, the intuition for religious domination builds on the fact that liberal societies can be more associated with incarcerations compared to conservative societies. The main theoretical contribution of this study to the literature is that we have built on empirical validity to provide theoretical justification as to why categorizing countries on the basis of selected fundamental characteristics determine cross-country variations in incarcerations. Such evidence is important for theory-building in public economics.

Originality/value- It is important for policy makers to understand the persistence of incarcerations across nations because resources could be allocated to regions and countries, contingent on the relative importance of future incarceration tendencies.

JEL Classification: K42; P50

Keywords: Incarcerations; Global evidence; Persistence; GMM; Convergence; World

1. Introduction

The purpose of this study is to assess how incarcerations persist across the world. The positioning of the inquiry builds on two main trends in academic and policy circles, notably: the relevance of understanding drivers of incarcerations and gaps in the literature. The points are engaged in chronological order.

First, there are growing levels of incarcerations across the world on the one hand and on the other hand, increasing levels of government expenditure allocated to the funding of the underlying incarcerations. According to the Global Peace Index (GPI) (2016), over the past decades, whereas societal security and safety have been increasing, there has also been a substantial increase in government expenditure used to control and prevent violence, notably: incarcerations and policing. To put this point into perspective, the GPI report of 2015 maintains that more than thirteen per cent of the global Gross Domestic Product (GDP) is allocated to the prevention and fighting of violence (Anderson, 2015). Accordingly, about 14.3 trillion USD (representing approximately 13.4 per cent of global GDP) was devoted to this cause. The underlying cost is equivalent to the total annual output of Brazil, Canada, France, Germany, Spain and the United Kingdom (UK) (Asongu & Kodila-Tedika, 2017).

Second, the extant literature has failed to engage the persistence of incarcerations. The contemporary literature has fundamentally focused on *inter alia*: risk assessment in sentencing decisions as a remedy to mass incarceration (Kopkin et al., 2017); intersectional analysis on parallels between mass deportation and mass incarceration (Tanya, 2017); factors affecting the use of drug during incarceration (Rao et al., 2016); the role of legal origins in cross-country incarcerations (D'Amico & Williamson, 2015); whether restorative justice reduces incarceration (Wood, 2015); the incarceration of substantially traumatized adolescents (Mallet, 2015); factors of delinquency among incarcerated male juveniles (Olashore et al., 2017); nexus between public health, mass incarceration and inequality (Wilderman & Wang, 2017) and supporting strategies for children and families that are affected by parental incarceration (Kjellstrand, 2017).

We now discuss the theoretical underpinnings for persistence in incarcerations. These theoretical foundations are consistent with recent literature on persistence within the banking sector (Stephan & Tsapin, 2008; Goddard et al., 2011); inclusive development (Asongu & Nwachukwu, 2017a) and knowledge economy (Asongu, 2017). Moreover, the underlying theoretical underpinnings are broadly in line with the literature on income convergence which has been considerably documented with the context of neoclassical growth estimations (Baumol, 1986; Barro, 1991; Mankiw et al., 1992; Barro & Sala-i-Martin, 1992, 1995). This

theoretical framework has also been recently extended to other development fields, notably: inclusive human development (Mayer-Foulkes, 2010; Asongu, 2014a) and financial market development (Narayan et al., 2011; Bruno et al., 2012; Asongu, 2013, 2014b, 2014c).

After the Keynesian era, new economic growth theories saw the light of day with momentum from the neoclassical revolution which enabled income convergence among nations. Conceptions of market equilibrium were articulated with absolute decrease in cross-country income disparities. Such income catch-up or convergence in the wealth of nations was established to be the result of free-market competition policies (see Mayer-Foulkes, 2010). Initial studies that concluded on the absence of convergence attributed the divergence to, among others: the possibility of multiple equilibria and differences in initial conditions of development (see Barro, 1991; Pritchett, 1997). On the contrary, there is another strand of the literature which argues that regardless of initial conditions of development, decreasing cross-country variations in income levels is feasible from the standpoint of countries' common steady-states or long run equilibria (Asongu & Nwachukwu, 2017a).

What is important to note from both schools for our study is the fact that both schools of thought agree on the criteria for establishing convergence or a cross-country decreasing tendency of differences in income levels. We build on these common criteria for establishing convergence because the purpose of this inquiry is not to take sides with either school, but to assess convergence in incarcerations across the world.

In the light of the underlying theoretical insights, this study investigates the persistence of incarcerations using global data. The notion of persistence in the study is understood in relation to how past observations in incarcerations affect future observations in incarcerations. From an empirical perspective, the hypothesis of persistence can be investigated with a dynamic estimation approach. Such a dynamic technique is the Generalized Method of Moments that has been employed in recent literature to investigate persistence in economic phenomena (Asongu & Nwachukwu, 2018; Asongu et al., 2018).

It is important for policy makers to understand the persistence of incarcerations across nations because resources could be devoted to regions and countries contingent on the relative importance of future incarceration tendencies. To this end, in order to increase room for policy implications, the dataset is decomposed into some sub-samples based on income levels, religious domination, openness to the sea, regional proximity and legal origins. The rest of the study is structured in the following manner. Section 2 discusses the data and methodology while the empirical results are presented in Section 3. Section 4 concludes with implications and future research directions.

2. Data and Methodology

2.1 Data

A sample of 163 nations in the world is examined with data for the period 2010 to 2015 from a plethora of sources, namely, the: Institute for Economics and Peace (IEP); Uppsala Conflict Data Program (UCDP) Battle-Related Deaths Dataset; Qualitative assessment by the Economic Intelligence Unit (EIU) analysts' estimates; United Nations Office on Drugs and Crime (UNODC) Surveys on Crime Trends and United Nations Committee on Contributions and the Operations of Criminal Justice Systems (CTS).

The dependent variable is the incarceration rate: the number of jailed persons per 100,000 people. It is important to note that the independent variable of interest with which persistence is established is the lagged dependent variable. Variables in the conditioning information set include: perceptions of criminality; security officers & polices; political instability; weapons imports; displaced persons and military expenditure. While these indicators are potential determinants of incarcerations (Mallet, 2015; Wood, 2015; D'Amico & Williamson, 2015; Rao et al., 2016 ; Kopkin et al., 2017 ; Olashore et al., 2017; Wilderman & Wang, 2017; Kjellstrand, 2017), the expected signs and effects are contingent on specific fundamental characteristics.

As highlighted in the introduction, in order to improve room for policy implications, some fundamental characteristics are adopted, namely: (i) income levels (High income, Upper middle income, Lower middle income and Low income); (ii) religious domination (Christian with Catholic domination; Christian with Protestant inclination; Christian countries in which another Christian religion apart from Catholicism and Protestantism is dominant; Islam-dominated countries and Buddhist-oriented countries); (iii) openness to sea (Landlocked and Coastal countries); (iv) legal origins (English Common law, French Civil law, German Civil law, Scandinavian Civil law and Socialists countries) and (v) regions (South Asia; Europe & Central Asia; East Asia & the Pacific; Middle East & North Africa; sub-Saharan Africa; Latin America and North America). These fundamental features have been employed in recent comparative development literature (Narayan et al., 2011; Mlachila et al., 2016; Beegle et al., 2016; Asongu & Le Roux, 2017; Asongu & Nwachukwu, 2017b).

The categorization of the sample by legal origins builds on La Porta et al. (2008, p. 289) while classification by income groups is in accordance with the World Bank's stratification¹.

¹ There are four main World Bank income groups: (i) high income, \$12,276 or more; (ii) upper middle income, \$3,976-\$12,275; (iii) lower middle income, \$1,006-\$3,975 and (iv) low income, \$1,005 or less.

While Landlocked versus Coastal nations can easily be viewed from a World map, information on dominant religions is from the Central Intelligence Agency (CIA) World Fact Book (CIA, 2011). More details about the definitions of variables and corresponding sources are provided in Appendix 1 whereas the summary statistics and sampled countries are disclosed in Appendix 2. Appendix 3 provides the correlation matrix.

2.2 Methodology

2.2.1 Specification

The estimation strategy adopted in this study is the Generalised Method of Moments (GMM). The empirical approach is consistent with recent literature on the persistence of macroeconomic phenomena (Asongu & Nwachukwu, 2017a; Doyle, 2017). Moreover, five additional reasons motivate the choice of this empirical strategy. First, it is apparent that the numbers of countries are higher compared to the units of periodicity in each country. Hence, the $N(163) > T(6)$ condition for the employment of the GMM is met. Second, incarceration is by definition persistent because the correlation between incarceration and its first lag is 0.972, which is substantially higher than the rule of thumb threshold of 0.800 that is needed to establish persistence. Third, cross-country differences are not eliminated with the estimation approach because it is employed on a panel data structure. Fourth, endogeneity is addressed with the estimation procedure from two main perspectives. On the one hand, the instrumentation process is designed to account for simultaneity in the explanatory variables. On the other hand, the control for time-invariant omitted variables accounts for the unobserved heterogeneity. Fifth, biases that are inherent in the *difference* estimator are addressed with the *system* estimator.

The Roodman (2009a, 2009b) extension of Arellano and Bover (1995) is employed in this study because when compared with traditional GMM methods (*systems* and *difference* GMM approaches), it control for cross-sectional dependence and limits the proliferation of instruments (see Love & Zicchino, 2006; Baltagi, 2008; Asongu & Nwachukwu, 2016a; Boateng et al., 2018).

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

$$I_{i,t} = \sigma_0 + \sigma_1 I_{i,t-\tau} + \sum_{h=1}^6 \delta_h W_{h,i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \quad (1)$$

$$I_{i,t} - I_{i,t-\tau} = \sigma_1(I_{i,t-\tau} - I_{i,t-2\tau}) + \sum_{h=1}^6 \delta_h (W_{h,i,t-\tau} - W_{h,i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + \varepsilon_{i,t-\tau}, \quad (2)$$

where, $I_{i,t}$ represents incarcerations in country i at period t , σ_0 is a constant, W is the vector of control variables (criminality; security officers & polices; political instability; weapons imports; displaced persons and military expenditure), τ represents the coefficient of auto-regression which is one for the specification due to limited degrees of freedom, ξ_t is the time-specific constant, η_i is the country-specific effect and $\varepsilon_{i,t}$ the error term.

2.2.2 Identification and exclusion restrictions

It is important to devote space to clarifying identification and exclusion restrictions that are critical for a sound GMM specification approach. All explanatory indicators are considered to be endogenous explaining (i.e. predetermined or suspected endogenous) variables while the time-invariant variables are considered to be strictly exogenous. Recent empirical literature has employed a similar identification strategy (see Asongu & Nwachukwu, 2016b; Boateng et al., 2018). The process of identification is consistent with Roodman (2009b) because the author has argued that is not feasible for time invariant indicators to become endogenous after first difference².

As concerns exclusion restrictions, given the identification process, the selected strictly exogenous variables affect the outcome variable (or incarcerations) exclusively through the predetermined or suspected endogenous variables. In addition, the underlying exclusion restriction assumption is valid if the alternative hypothesis corresponding to the Difference in Hansen Test (DHT) for instrument exogeneity is rejected. Put in other words, incarcerations are elucidated by the strictly exogenous variables exclusively via predetermined mechanisms or variables.

In the light of the above insights, in the findings that are reported in Section 3, the exclusion restriction assumption is valid if the alternative hypothesis related to the DHT which is connected to instrumental variables (IV) (year, eq.(diff)) is rejected. It is particularly worthwhile to note that this process of confirming exclusion restrictions is consistent with the standard IV approach. Accordingly in the standard framework, a rejection of the null hypothesis related to the Sargan Overidentifying Restrictions (OIR) test is an implication that the strictly exogenous variables do not affect the outcome variables exclusively through the

² Hence, the procedure for treating *ivstyle* (years) is 'iv (years, eq(diff))' whereas the *gmmstyle* is employed for predetermined variables.

predetermined mechanisms or suspected endogenous variables (see Beck et al., 2003; Asongu & Nwachukwu, 2016c).

3. Empirical results

The empirical results are presented in Table 1 and Table 2. While the findings of Table 1 correspond to income levels, religious domination and openness to sea, those of Table 2 are focused on legal origins and regions. In the two tables, the last column corresponds to the full sample whereas prior columns disclose findings corresponding to the fundamental characteristics. Four principal information criteria are employed to assess the validity of GMM models³. In light of these criteria, some specifications are not valid because they fail to pass the post-estimation diagnostic tests, namely: Europe & Central Asia; sub-Saharan Africa and French civil law countries. Specifications pertaining to these fundamental features are consistently invalid because the null hypotheses of the Arellano and Bond autocorrelation test in differences are rejected. Note should be taken of the fact that the validity of models is a necessary but not a sufficient condition for establishing persistence. In what follows, we discuss the information criteria.

The following requirements should be met before persistence is established: the estimated lagged incarceration variable should be significant on the one hand and meet the convergence criterion on the other hand. The criterion for convergence is that the absolute value of the estimated lagged dependent variable should be within the interval of zero and one. More insights into this criterion are apparent in recent literature on convergence (Fung, 2009, p. 58; Asongu, 2013). It is important to note that in the standard GMM procedure, the estimated lagged dependent variable is reported and then one is subtracted from the coefficient to obtain beta ($\beta = a - 1$). Within this framework, the information criterion for convergence is $\beta < 0$. Furthermore, the estimated lagged dependent variable can be disclosed directly and an alternative criterion (" $0 < \text{lagged value} < 1$ ") is employed to establish convergence (see Prochniak & Witkowski, 2012a, p. 20; Prochniak & Witkowski, 2012b, p. 23; Asongu & Nwachukwu, 2016d, p. 459).

³ "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 is also 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). Also see Tchamyou and Asongu (2017).

Table 1: Persistence in incarcerations with income levels, religious domination and landlockedness

	Dependent Variable: Incarcerations											
	Income Levels				Religious Domination					Openness to sea		Full Sample
	HI	UMI	LMI	LI	CC	CP	CO	Islam	Bhu	LL	NLL	Sample
Constant	0.427***	0.265	0.534***	0.034	0.096	0.137	0.157	0.890***	0.937	-	0.463**	0.581**
Incarcerations (-1)	(0.004)	(0.295)	(0.000)	(0.526)	(0.530)	(0.228)	(0.888)	(0.000)	(0.294)	(0.018)	(0.010)	(0.010)
	0.879***	0.876***	0.741***	0.996***	1.000***	0.978***	0.824***	0.463***	0.855***	1.034**	0.890**	0.861***
Crime	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
	-0.067**	-0.026	-0.037	0.007	0.084**	-0.003	-2.121	0.004	-0.003	0.074**	-	-
Security Officers & Police	(0.016)	(0.431)	(0.349)	(0.589)	(0.013)	(0.785)	(0.124)	(0.879)	(0.980)	(0.004)	(0.024)	(0.003)
	-0.109***	0.009	-	0.006	-0.055	0.023**	0.452**	-0.049	-0.087	0.037*	0.007	-0.0002
Political Instability	(0.000)	(0.742)	(0.000)	(0.359)	(0.112)	(0.016)	(0.031)	(0.142)	(0.327)	(0.090)	(0.748)	(0.994)
	0.114***	-0.040	-0.038	-0.014*	-	0.003	0.885*	0.031	-0.120	-	-0.035	-0.014
Weapons import	(0.000)	(0.145)	(0.322)	(0.094)	(0.002)	(0.805)	(0.083)	(0.313)	(0.440)	(0.000)	(0.226)	(0.623)
	-0.020*	0.023	0.493***	-	0.080***	-0.033	0.242	0.017	-0.097	-0.009	-	-0.040*
Displaced persons	(0.061)	(0.184)	(0.000)	(0.005)	(0.001)	(0.200)	(0.397)	(0.636)	(0.388)	(0.752)	(0.022)	(0.057)
	0.036	0.039***	0.009	0.017**	0.044	0.007	0.493	-0.068**	-0.004	-0.006	0.069**	0.058**
Military Expenditure	(0.513)	(0.005)	(0.740)	(0.019)	(0.120)	(0.354)	(0.290)	(0.038)	(0.957)	(0.689)	(0.047)	(0.033)
	0.039	0.043	0.006	0.008	-0.029	-	0.407	0.065**	0.061	0.028*	-0.009	-0.001
AR(1)	(0.184)	(0.151)	(0.867)	(0.302)	(0.261)	(0.002)	(0.443)	(0.037)	(0.720)	(0.054)	(0.689)	(0.957)
	(0.036)	(0.100)	(0.095)	(0.227)	(0.000)	(0.084)	(0.176)	(0.048)	(0.030)	(0.034)	(0.023)	(0.004)
AR(2)	(0.834)	(0.358)	(0.336)	(0.223)	(0.490)	(0.306)	(0.707)	(0.404)	(0.185)	(0.107)	(0.215)	(0.110)
Sargan OIR	(0.002)	(0.022)	(0.082)	(0.142)	(0.029)	(0.817)	(0.007)	(0.155)	(0.120)	(0.332)	(0.008)	(0.028)
Hansen OIR	(0.226)	(0.647)	(0.421)	(0.462)	(0.739)	(0.981)	(1.000)	(0.783)	(1.000)	(0.736)	(0.356)	(0.648)
DHT for instruments												
(a) Instruments in levels												
H excluding group	(0.350)	(0.465)	(0.202)	(0.387)	(0.384)	(0.980)	(0.936)	(0.368)	(1.000)	(0.216)	(0.071)	(0.122)
Dif(null, H=exogenous)	(0.220)	(0.651)	(0.608)	(0.480)	(0.818)	(0.885)	(1.000)	(0.874)	(1.000)	(0.928)	(0.769)	(0.943)
(b) IV (years, eq (diff)) H excluding group	(0.392)	(0.783)	(0.662)	(0.754)	(0.671)	(0.594)	(0.994)	(0.661)	(1.000)	(0.564)	(0.536)	(0.613)
Dif(null, H=exogenous)	(0.116)	(0.232)	(0.118)	(0.094)	(0.621)	(1.000)	(1.000)	(0.776)	(0.921)	(0.863)	(0.147)	(0.511)
Fisher	247.40***	224.92	101.93	2115.49	328.65	4963.03	75.25	16.55***	443.78	2161.06	158.57	68.38***
	***	***	***	***	***	***	***	***	***	***	***	
Instruments	31	31	31	31	31	31	31	31	31	31	31	31
Countries	43	36	46	38	54	26	14	49	13	34	129	163
Observations	215	180	230	190	270	130	70	245	65	170	645	815

***, **, *: 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. HI: High Income countries. UMI: Upper Middle Income countries. LMI: Lower Middle Income countries. LI: Low Income countries. CC: Christian countries with Catholic domination. CP: Christian countries with Protestant domination. CO: Christian countries in which another Christian religion apart from Catholicism and Protestantism is dominant. Islam: Islam-dominated countries. Bhu: Buddhism dominated countries. LL: Landlocked countries. NLL: Not Landlocked countries.

Table 2: Persistence in incarcerations with regions and legal origin dynamics

	Dependent Variable: Incarcerations												
	Regions							Legal origins					
	SA	ECA	EAP	MENA	SSA	LA	NA	Eng.	Frch.	Ger.	Scand.	Social.	Full Sample
Constant	omitted	-0.062 (0.832)	0.279 (0.572)	0.370 (0.281)	0.090 (0.292)	0.521*** (0.007)	n.a	0.197* (0.068)	0.496*** (0.005)	0.827 (0.138)	na	na	0.581** (0.010)
Incarcerations (-1)	0.485	0.851***	1.087***	0.806***	0.969***	0.992***		0.939***	0.917***	0.772***			0.861***
Crime	(0.324) 0.546	(0.000) 0.147**	(0.000) -0.025	(0.000) -0.024	(0.000) -0.024	(0.000) -0.040		(0.000) -0.008	(0.000) -0.063**	(0.000) 0.089			(0.000) -
Security Officers & Police	(0.327) omitted	(0.024) 0.001	(0.588) -0.035	(0.590) -0.062**	(0.461) 0.049***	(0.466) 0.016		(0.629) 0.001	(0.044) 0.008	(0.492) -0.125*			(0.003) -0.0002
Political Instability	-0.719	(0.977) -0.048	(0.366) 0.082*	(0.049) 0.052	(0.001) -0.029**	(0.612) 0.013		(0.930) -0.019	(0.790) -	(0.083) 0.070***			(0.994) -0.014
Weapons import	(0.302) omitted	(0.459) 0.036	(0.051) 0.013	(0.513) 0.018	(0.045) -0.027*	(0.846) -0.022		(0.249) -0.011	(0.008) -0.017	(0.649) -0.019			(0.623) -0.040*
Displaced persons	-0.272	(0.457) 0.178***	(0.686) -0.174	(0.552) -0.008	(0.055) 0.033**	(0.667) -0.040		(0.450) 0.020**	(0.645) 0.046	(0.804) -0.164			(0.057) 0.058**
Military Expenditure	(0.416) 0.747	(0.002) -0.044	(0.601) -	(0.812) 0.043	(0.010) -0.002	(0.155) -0.194**		(0.044) -0.0001	(0.182) 0.016	(0.373) 0.057			(0.033) -0.001
AR(1)	(0.376)	(0.056)	(0.219)	(0.033)	(0.025)	(0.009)		(0.017)	(0.039)	(0.100)			(0.004)
AR(2)	(0.386)	(0.079)	(0.520)	(0.486)	(0.081)	(0.360)		(0.611)	(0.097)	(0.217)			(0.110)
Sargan OIR	(0.607)	(0.000)	(0.102)	(0.538)	(0.013)	(0.485)		(0.004)	(0.007)	(0.014)			(0.028)
Hansen OIR	(1.000)	(0.556)	(0.995)	(0.996)	(0.471)	(0.914)		(0.505)	(0.924)	(0.994)			(0.648)
DHT for instruments													
(a) Instruments in levels													
H excluding group	(1.000)	(0.401)	(0.209)	(0.840)	(0.138)	(0.282)		(0.432)	(0.410)	(0.336)			(0.122)
Dif(null, H=exogenous)	(1.000)	(0.586)	(1.000)	(0.992)	(0.767)	(0.993)		(0.500)	(0.978)	(1.000)			(0.943)
(b) IV (years, eq (diff)) H excluding group	(1.000)	(0.581)	(0.968)	(0.995)	(0.255)	(0.649)		(0.270)	(0.869)	(0.951)			(0.613)
Dif(null, H=exogenous)	(1.000)	(0.376)	(0.996)	(0.722)	(0.960)	(1.000)		(0.981)	(0.762)	(1.000)			(0.511)
Fisher	1805.22 ***	255.99 ***	280.79 ***	150.75 ***	336.10 ***	963.40 ***		595.43 ***	94.54 ***	28.67 ***			68.38***
Instruments	31	31	31	31	31	31		31	31	31			31
Countries	8	48	18	20	44	23		50	87	20			163
Observations	40	240	90	100	220	115		250	435	100			815

***, **, *: 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. Eng: English Common Law countries. Frch: French Civil Law countries. Ger: German Civil law countries. Scand: Scandinavian Civil law countries. Social: Socialists countries. ECA: Europe & Central Asia. EAP: East Asia & the Pacific. MENA: Middle East & North Africa. SSA: sub-Saharan Africa. LA: Latin America. NA: North America. Eng: English Common Law countries. Frch: French Civil Law countries. Ger: German Civil law countries. Scand: Scandinavian Civil law countries. Social: Socialists countries. na: not applicable because of issues in degrees of freedom.

Given these insights, for two sub-samples that meet the information criteria for persistence, the sub-sample with a higher estimated value is acknowledged to reflect a higher degree of persistence in incarcerations. The magnitude of estimated lagged value is relevant because it reflects how past values of incarcerations affect future values of incarcerations. This is essentially because from a comparative perspective, higher estimated lagged values imply that future values of incarcerations are more proportionately affected by past values of incarcerations. The following findings can be established. First, incarcerations are more persistent in low income countries compared to their higher income counterparts. Second, in Christian-protestant countries, the persistence of incarcerations is more apparent vis-à-vis

their counterparts with other dominant religions. Third, it is difficult to assess comparative evidence from the criterion related to landlockedness because the estimated lagged value for the Landlocked sub-sample does not meet the information criteria required for the establishment of convergence. Fourth, incarcerations are most predominant in Latin American countries. Fifth, a comparative assessment is not feasible on the basis of legal origins because the French civil sample does not pass post-estimation diagnostic tests: autocorrelation is present in the residuals after estimation.

4. Concluding implications and future research direction

The purpose of this study is to assess how incarcerations persist across the world. The focus is on 163 countries for the period 2010 to 2015. The empirical evidence is based on Generalised Method of Moments. In order to increase room for policy implications, the dataset is decomposed into some sub-samples based on income levels, religious domination, openness to the sea, regional proximity and legal origins. The following main findings are established. Incarcerations are more persistent in low income, Christian-protestant and Latin American countries while comparative evidence is not feasible on the basis of landlockedness and legal origins owing to negative post-estimation diagnostic tests. In what follows, we provide justifications for the comparative advantages and discuss attendant policy implications.

We first discuss the relevance of fundamental characteristics from which feasible comparison could not be established. First, legal origins are important in incarcerations because compared to French civil law countries, Common law nations are less associated with incarcerations. This difference is for a plethora of reasons, notably: in Common law tradition, the accused is not jailed until proven guilty, which is contrary to French civil law where a simple accusation leads to the incarceration of the accused. This narrative is broadly consistent with the relevance of legal origins in comparative economic development (La Porta et al., 1998, 1999; Beck et al., 2003; Agbor, 2015). Second, as concerns landlockedness, there is an institutional cost of being closed from the sea (Arvis et al., 2007; Asongu & Le Roux, 2017). Such an institutional cost is the additional time it takes to transport by land (i.e. through a neighboring coastal country), equipments needed for national security and broader economic development. Accordingly, transport by air is more expensive than transport by sea. It is also reasonable to postulate that institutional malfunctioning could be associated with higher levels of institutional violations and by extension the number of incarcerations.

We now justify the relevance of significant comparisons. First, income levels matter in the persistence of incarcerations because low income nations vis-à-vis their high income counterparts have less financial resources with which to deal with events like terrorism (Gaibullov & Sandler, 2009), political instability and violence that lead to incarcerations. Moreover, beyond the reactionary approach, higher income countries also have more financial resources with which to engage in proactive efforts in view of preventing activities associated with violence, political instability and incarcerations.

Second, the intuition for religious domination builds on the fact that liberal societies can be more associated with incarcerations compared to conservative societies. Recent literature has documented the importance of religious-orientation in comparative development (see Asongu & Nwachukwu, 2017b). As shown in the findings, countries dominated by Protestant Christianity may be experiencing more incarcerations because of the Protestant ethic which may be associated with a higher propensity to strikes and civil unrests. According to Weber (2002) (first published in 1930), the Protestant ethic influences people to adopt modes of conduct that are contrary to mainstream thinking and by extension, violate the some established rules in society.

Beyond understanding how policy makers can leverage on the established connections between fundamental characteristics and incarcerations, it is important to note that since the established evidence of persistence is contingent on the conditioning information set (or control variables), policy makers can decrease or increase the established drivers (in the conditioning information set) in order to ultimately limit persistence in incarcerations. Such policy relevance of factors in the conditioning information set is not blanket (or one size fits all) but contingent on fundamental characteristics. Overall, the analysis and corresponding implications for policy are contingent on the variables used in the conditioning information set.

The main theoretical contribution of this study to the literature is that we have built on empirical validity to provide theoretical justification as to why categorizing countries on the basis of selected fundamental characteristics determine cross-country variations in incarcerations. Such evidence is important for theory-building in public economics because applied econometrics should not be exclusively limited to the acceptance or rejection of existing theories (Naryan et al., 2011; Constatini & Lupi, 2005).

Future studies can build on these insights to extend knowledge on how growing rates of incarcerations can be reduced on the one hand and on the other hand, on what countries

with high rates of incarcerations can learn from their counterparts with lower rates of incarcerations.

Appendices

Appendix 1: Definition of variables

Variables	Definition and sources of variables
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
Violent crime	Level of violent crime 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
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

Uppsala Conflict Data Program (UCDP). The Institute for Economics and Peace (IEP). The Economic Intelligence Unit (EIU). United Nations Peacekeeping Funding (UNPKF). GDP: Gross Domestic Product. The International Institute for Strategic Studies (IISS).

Appendix 2: Summary statistics and countries

Panel A: Summary statistics					
Variables	Mean	Standard dev.	Minimum	Maximum	Obsers
Incarcerations	2.194	0.889	1.150	5.000	978
Political instability	2.545	1.030	1.000	5.000	978
Displaced people	1.348	0.872	1.000	5.000	978
Violent crime	2.768	1.136	1.000	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
Weapon imports	1.489	0.868	1.000	5.000	978

Panel B: Sampled countries (163)

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.

Appendix 3: Correlation matrix (uniform sample size: 978)

Pol. Insta.	Displ. P.	Crime	S O & P	Military	W. Imports	Incarcerations	
1.000	0.336	0.479	0.042	0.336	-0.238	-0.140	Pol. Insta.
	1.000	0.235	0.036	0.291	-0.058	-0.105	Displ. P
		1.000	-0.122	-0.027	-0.386	-0.116	Crime
			1.000	0.215	0.140	0.279	S O & P
				1.000	0.236	0.093	Military
					1.000	0.044	W. Imports
						1.000	Incarcerations

Pol. Insta: Political Instability. Displ. P: Displaced Persons. Crime: Violent crime. S O & P: Security Officers & Police. Military: Military Expenditure. W. Imports: Weapons Imports.

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