Fighting Terrorism: Empirics on Policy Harmonization

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Abstract

This paper models the feasibility of common policy initiatives against global terrorism, as well as timelines for their enforcement. The empirical evidence is based on 78 developing countries for the period 1984-2008. Employed terrorism dynamics are domestic, transnational, unclear and total terrorism. Absolute (or unconditional) and conditional catch-ups are modelled using Generalised Methods of Moments. We establish consistently that, the rate of catch-up is higher in domestic terrorism relative to transnational terrorism. The time to full catch-up required for the implementation of common policies without distinction of nationality is found to be in a horizon of 13.34-19.92 years for domestic terrorism and 24.67-27.88 years for transnational terrorism. Hence, from a projection date of 2009, in spite of decreasing cross-country differences in terrorists' attacks, there is still a long way to go before feasible common policy initiatives can be fully implemented without distinction of nationality. The paper is original by its contribution to the empirics of conflict resolution through decreasing cross-country differences in terrorism tendencies. Policy implications are discussed.

JEL Classification: C52; D74; F42; K42; O38
Keywords: Terrorism; Common policies; Development

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1. Introduction

The 2014 Global Terrorism Index (GTI, 2014, p. 13) has revealed that activities of terrorism have substantially increasing since the uprisings of the 2011 Arab Spring. Consistent with Asongu et al. (2015), post-Gaddafi Libya has become a failed State, with two rival governments jostling for authority and multiple rebel groups also dictating the law of the land. According to the account, the situation in Yemen has been deteriorating, principally because the government and rebels are currently engaged in a war for which they are respectively supported by Saudi Arabia and Iran. A fundamental cause of the political crisis has been the failure by government to deliver on its promises since the departure of President Ali Abdullah Saleh (Asongu & Nwachukwu, 2016). Escalation of attacks by the Boko Haram of Nigeria is substantially affecting neighbouring countries like Cameroon, Chad and Niger. Another example of the growing geopolitical nature of terrorists activities are the externalities from the fragile political situation in Iraq and the on-going crisis in Syria. Accordingly, the powerful Islamic State of Iraq and the Levant (ISIL) which now occupies more than a third of Iraq and half of Syria is now exerting externalities of terrorism across the globe. Some notable cases include: Sydney-Australian hostage crisis in December 2014; foiled Verviers-Belgium attacks of January 2015; failed February 2015 Australian attacks and the January 2015 Charlie Hebdo' attacks in Paris-France.

In light of the above, there is a growing scholarly focus on the effects of terrorism on macroeconomic variables. It has focused on inter alia: the impact of terrorism on foreign direct investment (FDI) (Abadie & Gardeazabal, 2008), nexuses between terrorists activities and economic development (Meierrieks & Gries, 2013; Choi, 2015), resource-wealth in the management of conflicts (Humphreys, 2005), the effect of terrorism on innovation (Koh, 2007) and the role of development assistance in reducing the potentially negative impact of terrorism on FDI (Bandyopadhyay et al., 2014; Efobi et al., 2015). This study is closest to the last current of the literature.

Another stream of the literature has been assessing channels by which political violence and terrorism can be mitigated. Some recently documented mechanisms have included: respect of the rule of law (Choi, 2010); education (Brockhoff et al., 2014) by means of bilingualism (Costa et al., 2008) and lifelong learning (Asongu & Nwachukwu, 2016); control of corruption being the most effective tool in the fight against crimes and conflicts (Asongu & Kodila-Tedika, 2016); strategies based on assessing terrorism attitudes (Gardner, 2007); the role of geopolitical fluctuations (Straus, 2012); military mechanisms (Feridun &

Shahbaz, 2010); press freedom and publicity (Hoffman et al., 2013) and external as well as internal transparency (Bell et al., 2014).

Unfortunately, as far as we have reviewed, the literature has failed to explore possibilities of policy harmonization against terrorism. We address this shortcoming by providing empirics from which horizons for common policy initiatives could be established. The intuition for the study is consistent with a recent study on predicting the Arab Spring (Asongu & Nwachukwu, 2015). Theoretical underpinnings for the empirics are also typically consistent with cross-country convergence studies that have been substantially assessed within the context of neoclassical growth models and recently extended to other economic development fields (Solow, 1956; Swan, 1956; Baumol, 1986; Barro, 1991; Mankiw et al., 1992; Barro & Sala-i-Martin, 1992, 1995; Fung, 2009 ; Mayer-Foulkes, 2010; Narayan et al., 2011; Bruno et al., 2012). Notable studies employing this intuition for common policies include: trajectories toward harmonizing intellectual property rights (IPRs) against software piracy (Asongu, 2013a; Andrés & Asongu, 2013); harmonizing policies for the fight against capital flight (Asongu, 2014a) and predicting the Arab Spring (Asongu & Nwachukwu, 2015).

Given the above, we are consistent with Costantini and Lupi (2005) and Narayan et al. (2011) in postulating that reporting facts based on intuition is a useful scientific activity even in the absence of a formal theoretical model. Accordingly, Applied econometrics should not be exclusively limited to either refuting or accepting existing theories. Consistent with underlying literature on harmonization common policies (Asongu, 2013a, 2014a), it is reasonable to postulate that the reduction of cross-country differences in terrorism activities imply the feasibility of common policies among sampled countries. Moreover, complete elimination of cross-country dispersions or differences means that the underlying feasible policies can be implemented without distinction of locality or nationality.

In light of the above, the contribution of this study to the literature is at least twofold. First, by employing a recent methodological innovation on the estimation of beta-convergence, it contributes to the empirics of conflicts resolution by means of common policy initiatives. Second, it contributes to the literature on fighting terrorism above by providing trajectories and tendencies by which countries can adopt common positions.

The scope of the line of inquiry is developing countries because negative effects of terrorism are relatively more detrimental to developing nations than they are to advanced countries. For instance Gaibulloev and Sandler (2009) have shown that compared to developed countries which can easily absorb terrorism externalities without negative

economic consequences, developing countries lack the financial resources and environmental robustness needed to absorb underlying negative shocks. The rest of the study is organised as follows. Section 2 presents the intuition and linkage with theoretical underpinnings. The data and methodology are covered in Section 3. Section 4 discusses the empirical analysis. We conclude with Section 5.

2. Intuitions for the empirics and linkage with conflict resolution

2.1 Intuition for the empirics

In accordance with Asongu and Nwachukwu (2015) and Asongu (2014b), initial theories of growth that progressed with the re-emergence of neoclassical revolution after the fall of Keynesianism have facilitated the convergence process among nations. New economic growth theories which forecasted absolute convergence were founded with the extension of concepts of market equilibrium (Mayer-Foulkes, 2010). Therefore catch-up among nations was the product of 'free-market-competition' policies that favoured convergence processes. Initial studies on catch-up that established the presence of absolute divergence (or absence of catch-up) in per capita income (Barro, 1991) have withstood empirical scrutiny in the long-term (Pritchett, 1997). The bulk of studies are consistent with the position that, regardless of initial income levels, within the framework of an exogenous neoclassical growth model, there is convergence in income levels to each country's long-term equilibrium or to a common steady state. Conversely, the endogenous growth theory posits that convergence in income-levels is unfeasible for at least a twofold reason: disparities in initial endowments and the possibility of multiple equilibria.

In light of the above, the intuition for the present line of inquiry is in accordance with the income convergence literature that has recently been extended to other development fields. Studies based on convergence have been substantially documented in the context of neoclassical growth models, originally developed by the seminal works of Baumol (1986), Barro (1991), Mankiw et al. (1992) and Barro and Sala-i-Martin (1992, 1995). As highlighted in the introduction, the theoretical underpinnings (Solow, 1956; Swan, 1956) of the income catch-up literature have recently been applied to other areas of economic development. Accordingly, while there is some consensus on an income catch-up theory other branches of development do not yet have a catch-up theory carefully worked-out. Nonetheless, from common sense, there is naturally some form of catch-up in positive or negative development

indicators. Hence, there is a policy challenge for development studies to model corresponding changes in development dispersions.

This challenge has given birth to a growing stream of literature devoted to extending theoretical underpinnings of convergence to other development areas, namely in: financial markets (Narayan et al., 2011; Bruno et al., 2012; Asongu, 2013b), IPRs (Asongu, 2013a; Andrés & Asongu, 2013), illicit capital flight (Asongu, 2014a) and negative signals prompting political instability and violence like, bad governance, unemployment and chaotic inflation (Asongu & Nwachukwu, 2015). Therefore, the present line of inquiry is simply extending this stream of empirical literature on adopting common policies in the fight against negative economic signals. But before we engage these empirics, it is relevant to discuss how the intuitions for the empirics in Section 2.1 are linked to mechanisms of conflict resolution.

2.2 Intuition for terrorism catch-up and theoretical underpinnings of conflict resolution

The link between terrorism catch-up and theoretical underpinnings of conflict resolution is based on the intuition that, with reduction in cross-country dispersions in terrorist activities, sampled countries are more likely to adopt common conflict resolution policies because of declining differences in terrorism tendencies. Some of the conflict resolution mechanisms are articulated by the Social Control Theory of Black and Conflict Management Model of Thomas-Kilman. These theoretical underpinnings which are documented by Akinwale (2010, p. 125) have motivated recent literature on conflict resolution, notably on the fight against: political instability and non-violence (Asongu & Nwachukwu, 2016) and terrorism (Asongu et al., 2015).

The Conflict Management Model emphasises that strategic intentions that are most probable of revolving around a two-factor matrix (of cooperation and assertiveness) which when combined with collaboration yields five principal styles of conflict management, namely: accommodation, avoidance, collaboration, competition and compromise. The Social Control Theory on the other hand, posits that nexuses among groups, organisations and individuals considerably influence the exercise of one of five main social control instruments, notably: avoidance, negotiation, self-help, settlement and tolerance. This narrative is broadly consistent with literature on conflict management (Black, 1990; Thomas, 1992; Borg, 1992; Volkema & Bergmann, 1995).

The highlighted theoretical underpinnings are relevant to the present line of inquiry in the view that variables in the conditioning information set (or control variables) influence

conditional terrorism modelling. Accordingly, conditional catch-up in terrorism tendencies occurs if there are cross-country differences in the conditioning information set or determinants of terrorism. Such determinants either fuel or mitigate conditions for conflicts, political violence and terrorist activities. While we justify the choice of the conditioning information set used by the study in the section the fallows, the interested reader can find more insights into other factors in the wealth of literature on political instability and violence (Heyneman, 2002; Beets, 2005; Heyneman, 2008ab; Oreopoulos & Salvanes, 2009).

3. Data and methodology

3.1 Data

We employ terrorism data from Bandyopadhyay et al. (2014) and Efobi et al. (2015) on a panel of 78 developing countries for the period 1984-2008[2]. While the size of the sample is based on constraints in data availability, the choice of 2008 as end of year is to enable some timeline for a projection date. For instance Asongu and Nwachukwu (2015) in predicting the 2011 Arab Spring, have used the year 2006 as projection date. The data begins in 1984 because institutional variables from the International Country Risk Guide (ICRG, 2010) dataset are only available from this year. Consistent with Islam (1995) and Fung (2009) is it unlikely to find convergence using annual data because of business cycle or short-run disturbances may loom substantially. Hence, in order to address this concern, our data consists of three year averages or non-overlapping intervals.

The dependent variables are terrorism dynamics, notably: domestic, transnational, unclear and total terrorism. The last indicator is the sum of the first-three. The interest of using a plethora of terrorism variables is to provide more room for policy options. The conditional information set for conditional convergence modelling entails: political globalisation, civil conflicts, inflation, exchange rate, foreign aid and GDP growth. The underlying variables documented as causes of the Arab Spring (Khandelwal & Roitman, 2012) have been employed in the prediction of the Arab Spring (Asongu & Nwachukwu, 2015)

[2] The adopted countries include: "Albania, Costa Rica, India, Namibia, Syria, Algeria, Cote d'Ivoire, Indonesia, Nicaragua, Tanzania, Angola, Dominican Republic, Iran, Niger, Thailand, Argentina, Ecuador, Jamaica, Nigeria, Togo, Bahrain, Egypt, Jordan, Pakistan, Trinidad and Tobago, Bangladesh, El Salvador, Kenya, Panama, Tunisia, Bolivia, Ethiopia, Lebanon, Papua New Guinea, Turkey, Botswana, Gabon, Libya, Paraguay, Uganda, Brazil, Gambia, Madagascar, Peru, Uruguay, Burkina Faso, Ghana, Malawi, Philippines, Venezuela, Cameroon, Guatemala, Malaysia, Saudi Arabia, Vietnam, Chile, Guinea, Mali, Senegal, Yemen, China, Guinea-Bissau, Malta, Sierra Leone, Zambia, Colombia, Guyana ,Mexico, South Africa, Zimbabwe, Congo, D. Republic, Haiti, Morocco, Sri Lanka, Congo Republic, Honduras, Mozambique and Sudan".

and as control indicators in the role of lifelong learning on political stability and non-violence (Asongu & Nwuchukwu, 2016). Accordingly, a recent stream of the literature has been premised on the use of foreign aid to fight terrorism (Bandyopadhyay et al., 2014; Bandyopadhyay & Younas, 2014). But the expected sign may also be different because increased levels of development assistance have been associated with growing political instability (Eubank, 2012). Political globalisation is linked with increased possibilities of conflicts (Lalountas et al., 2011). High inflation should intuitively be associated with political strife due to inter alia: diminishing purchasing power and (ii) reducing domestic investment because of a negative economic outlook. Internal or civil conflicts should logically increase the likelihood for terrorist activities. The definitions of the variables are provided in Table 1.

Table 1: Definition and source of variables

Variables	Signs	Definitions	Sources
GDP growth	GDPg	GDP growth rate (annual %)	Bandyopadhyay et al. (2014) and Efobi et al. (2015)
Infrastructure	LnTel	Ln. of Number of Telephone lines (per 100 people)	
Inflation	LnInflation	Ln. of Consumer Price Index (% of annual)	
Exchange rate	LnXrate	Ln. of Exchange rate (local currency per USD)	
Bilateral Aid	LnBilaid	Ln. of Bilateral aid, net disbursement (million USD)	
Multilateral Aid	LnMulaid	Ln. of Multilateral aid, net disbursement (million USD)	
Total Aid	LnTotaid	Ln. of Total aid, net disbursement (million USD)	
Domestic terrorism	Domter	Ln. of Number of Domestic terrorism incidents	
Transnational terrorism	Tranater	Ln. of Number of Transnational terrorism incidents	
Unclear terrorism	Unclter	Ln. of Number of terrorism incidents whose category in unclear	
Total terrorism	Totter	Ln. of Total number of terrorism incidents	
Political globalisation	LnPolglob	Ln. of Index of political globalisation	
Internal conflicts	Civcon	Index of internal civil conflicts	

GDP: Gross Domestic Product. WDI: World Development Indicators. Ln: Logarithm.

In Table 2, we provide the summary statistics of the variables. Some are transformed in logarithm to enable the comparison of means. Moreover, as we shall see in the methodology section below, the dependent variable in catch-up modelling should be defined in logarithm. We also notice that there is a substantial variation in the variables, implying we can be confident that significant estimated relationships would emerge.

Table 2: Summary statistics

	Mean	S.D	Minimum	Maximum	Obs
GDP growth	3.852	3.467	-10.933	17.339	612
Infrastructure (ln)	1.475	1.017	0.091	4.031	616
Inflation (ln)	2.414	1.384	-3.434	9.136	581
Exchange rate (ln)	2.908	3.870	-22.121	21.529	618
Bilateral Aid (ln)	5.181	1.286	0.765	8.362	602
Multilateral Aid (ln)	4.163	1.518	-1.249	7.105	600
Total Aid (ln)	5.550	1.276	0.800	8.495	608
Domestic terrorism (ln)	1.316	1.849	-1.098	6.038	405
Transnational terrorism (ln)	0.530	1.243	-1.098	4.143	353
Unclear terrorism (ln)	0.471	1.452	-1.098	4.454	224
Total terrorism (ln)	1.490	1.847	-1.098	6.168	451
Political globalisation (ln)	4.036	0.301	2.861	4.530	624
Internal conflicts	0.965	1.906	0	10	615

S.D: Standard Deviation. Obs: Observations.

The purpose of Table 3 is to limit issues of overparameterization and multicollinearity which have been highlighted in bold. We notice that terrorism and foreign aid indicators are respectively highly correlated among themselves. Therefore, we address the underlying issues by employing only total aid in the specifications. The concern is not relevant for the terrorism indicators because they are used exclusively as dependent variables.

Table 3: Correlation Matrix (n=174, with uniform sample size)

GDPg	LnTel	LnInflation	LnXrate	LnBilad	LnMulaid	LnTotaid	LnDomter	LnTranater	LnUnclter	LnTotter	LnPolglob	Civcon	
1.000	0.058	-0.334	0.202	0.230	0.179	0.227	-0.094	0.015	-0.131	-0.077	0.117	-0.048	GDPg
	1.000	-0.039	0.080	-0.256	-0.504	-0.363	0.173	0.188	0.026	0.172	0.362	-0.248	LnTel
		1.000	-0.454	-0.287	-0.218	-0.297	0.066	0.107	0.029	0.057	-0.175	0.067	LnInflation
			1.000	0.102	0.116	0.127	-0.077	-0.016	-0.061	-0.070	0.161	-0.075	LnXrate
				1.000	**0.590**	**0.958**	0.110	0.042	0.068	0.118	0.277	0.190	LnBilaid
					1.000	**0.772**	-0.034	-0.131	0.015	-0.035	0.046	0.196	LnMulaid
						1.000	0.081	-0.001	0.064	0.087	0.252	0.206	LnTotaid
							1.000	**0.702**	**0.738**	**0.975**	0.249	0.457	Domter
								1.000	**0.597**	**0.789**	0.187	0.402	Tranater
									1.000	**0.810**	0.092	0.414	Unclter
										1.000	0.251	0.472	Totter
											1.000	-0.068	LnPolglob
												1.000	Civcon

GDPg: GDP growth rate. LnTel: Number of Telephone lines. LnXrate: Exchange rate. LnBilaid: Bilateral aid. LnMulaid: Multilater aid. LnTotaid: Total aid. LnDomter: Number of Domestic terrorism incidents. LnTranater: Number of Transnational terrorism incidents. LnUnclter: Number of terrorism incidents whose category in unclear. LnTotter: Total number of terrorism incidents. LnPolglob: Index of political globalisation. Civcon: Index of internal civil conflicts.

3. 2 Methodology

Following Asongu and Nwachukwu (2015) and Narayan et al. (2011), the *beta*-convergence approach adopted in these empirics is consistent with the underpinnings of recent catch-up literature. In essence, the estimation strategy is in accordance with the bulk of evidence on cross-country income convergence that have been examined within the framework of pioneering studies in classical growth models (Baumol, 1986; Mankiw et al., 1992; Barro & Sala-i-Martin, 1992, 1995).

According to Fung (2009), the two equations below denote the standard procedures for assessing conditional *beta*-convergence if $W_{i,t}$ is considered as strictly exogenous.

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = \beta \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (1)$$

$$\ln(Y_{i,t}) = a \ln(Y_{i,t-\tau}) + \delta W_{i,t-\tau} + \eta_i + \xi_t + \varepsilon_{i,t} \qquad (2)$$

Where $a = 1+ \beta$, $Y_{i,t}$ is the measure of the terrorism situation in country *i* at period *t*. τ is tau, $W_{i,t}$ is a vector of determinants of terrorism, η_i is a country-specific effect, ξ_t is a time-specific constant and $\varepsilon_{i,t}$ an error term. Consistent with the neoclassical growth model, a negative and statistically significant *beta* coefficient in Eq. (1) means that countries relatively close to their steady state in terrorism activities will experience a slowdown in terrorism activities known as conditional convergence (Narayan et al., 2011, p. 2773). In the same vein, as sustained by Fung (2009, p. 59), if $0 < |a| < 1$ in Eq. (2), then $Y_{i,t}$ is dynamically stable around the path with a trend growth rate similar to that of W_t and with a height relative to the level of W_t. Indicators contained in $W_{i,t-\tau}$ and the individual effects η_i are proxies for the long-term level *terrorism* is converging towards. In essence, the country-specific effect η_i measures other factors determining a country's steady state that are not captured by $W_{i,t-\tau}$.

According to Asongu and Nwachukwu (2015), conditions for catch-up as emphasized above are valid only if $W_{i,t}$ is strictly exogenous. In reality unfortunately, this is not the case because whereas components of $W_{i,t}$ (*political globalisation, civil conflicts, inflation, exchange rate, foreign aid* and *GDP growth*) influence terrorism, the reverse effect is also possible. As we have seen in the introduction, a stream of the literature has been devoted to

the effects of terrorism on macroeconomic variables. Consequently we are confronted with an issue of endogeneity because components of $W_{i,t}$ are correlated with the error term ($\varepsilon_{i,t}$).

In addition, country- and time-specific effects could be correlated with other variables in the model as is often the case when lagged endogenous indicators are introduced into the equations. A means of addressing this concern of the correlation between the lagged dependent variable and individual specific-effects involves suppressing the individual-effect by first differencing. Hence Eq. (2) becomes:

$$\ln(Y_{i,t}) - \ln(Y_{i,t-\tau}) = a(\ln(Y_{i,t-\tau}) - \ln(Y_{i,t-2\tau})) + \delta(W_{i,t-\tau} - W_{i,t-2\tau}) + (\xi_t - \xi_{t-\tau}) + (\varepsilon_{i,t} - \varepsilon_{i,t-\tau}) \qquad (3)$$

Unfortunately, Ordinary Least Squares (OLS) estimations still result in biased estimators because of the presence of correlations between the lagged dependent variable and the error term. Arellano and Bond (1991) have proposed the use of Generalized Methods of Moments (GMM) which exploits all the orthogonality conditions between the error term and the lagged endogenous variables. The procedure uses lagged levels of the variables as instruments in the differenced equation and lagged differences of the variables as instruments in the level equation, thus making-use of all the orthogonality conditions between the error term and the lagged dependent variables. We use both the *Difference* (Arellano & Bond, 1991) and *System* (Arellano & Bover, 1995) GMM techniques but, consistent with Bond et al. (2001, pp. 3-4)[3] we prefer the latter in cases of conflict of interests in results.

The adopted GMM estimation strategy combines Equations (2) and (3). In the specification procedure, we apply the *two-step* GMM to account for heteroscedasticity in the residuals. This is essentially because; the *one-step* process is homoscedasticity-consistent. The hypothesis of the absence of autocorrelation in the residuals is very crucial because lagged regressors are to be used as instruments for the dependent indicators. Hence, the estimation substantially depends on the hypothesis that lags of the dependent variable and other independent regressors are valid instruments in the regression. We expect the first-order autocorrelation (AR [1]) of the residuals to be significant whereas the second-order correlation (AR [2]) to be insignificant. The latter which is more relevant is reported because

[3] "*We also demonstrate that more plausible results can be achieved using a system GMM estimator suggested by Arellano & Bover (1995) and Blundell & Bond (1998). The system estimator exploits an assumption about the initial conditions to obtain moment conditions that remain informative even for persistent series and it has been shown to perform well in simulations. The necessary restrictions on the initial conditions are potentially consistent with standard growth frameworks and appear to be both valid and highly informative in our empirical application. Hence we recommend this system GMM estimator for consideration in subsequent empirical growth research*". (Bond et al. 2001, pp. 3-4).

it measures the autocorrelation in difference. The Sargan overidentifying restrictions (OIR) test is employed to investigate the validity of instruments.

In line with Islam (1995, p. 323), yearly intervals are inappropriate for investigating catch-up because corresponding time intervals are too short. Therefore, in such brief time spans, short-term disturbances may loom substantially large. In this light, considering a 24 year period (1985-2008), we use three-year non-overlapping intervals (NOI)[4]. In addition to the justifications for the choice of NOI provided above, we discuss three more reasons for the choice of three-year NOI. First, while NOI with higher numerical values mitigate business cycle disturbances they also weaken the model. Motivated by the need to exploit as much time series properties as possible, three-year NOI are preferred to four/five-year NOI. Second, more degrees of freedom are required in conditional convergence modelling. Hence, a higher order of NOI will substantially limit the size of the conditioning information set. This is essential because in the presence of low degrees of freedom, a correspondingly lower number of control variables are required. This is based on the intuition that with constraints in degrees of freedom, the order of NOI bears an inverse relationship with the number of control variables employed. Third, from a heuristic perspective, visual analysis does not reveal substantial evidence of persistent short-term (business cycle) disturbances that justify higher NOI. The above three additional explanations have also been provided for the empirics of IPRs harmonization (Asongu, 2013a) and prediction of the Arab Spring (Asongu & Nwachukwu, 2015).

In order to examine the rate of diminishing differences in terrorism dynamics, we compute the implied rate of convergence by calculating $a/3$. Hence, we divide the estimated value of the lagged dependent variable by 3 because we have used three-year NOI to mitigate short-run disturbances. Hence, τ is equals to 3. The criterion employed to assess the presence of convergence is '$0 < |a| < 1$', which implies that the absolute value of the estimated lagged dependent variable is less than one but greater than zero. It also means that past differences exert a less proportionate impact on future variations, such that the left-hand-side of Eq. (3) is decreasing over time or countries moving toward equilibria.

Given the empirical dimension of this study, we devote some space to clarifying the adopted criterion for convergence. In a standard GMM approach, the estimated lagged value is a from which 1 is subtracted to obtain β (β= a-1). In this light, $\beta < 0$ is the information

[4] Accordingly, we have eight three-year non-overlapping intervals: 1985-1987; 1988-1990; 1991-1993; 1994-1996; 1997-1999; 2000-2002; 2003-2005 and 2006-2008.

criterion employed for *beta*-convergence. For the purpose of clarity and simplicity, *a* could be reported instead of β and the underlying information criterion ($0 < |a| < 1$) used to establish the presence of catch-up. This latter interpretation is consistent with recent convergence literature (Prochniak & Witkowski, 2012a, p. 20; Prochniak & Witkowski, 2012b, p. 23).

4. Empirical results

4.1 Presentation of results

This section investigates three principal issues: (1) assessment of diminishing dispersions (or presence of catch-up processes) in terrorism (domestic, transnational, unclear and total) dynamics; (2) computation of the rate of reduction in dispersions (rate of catch-up) and (3) determination of the time needed for the complete elimination of dispersions (time required for full catch-up). The first issue guides the empirics on the feasibility of a process based on similar conditions in the dependent variables across countries; the second determines the degree of similarity in the underlying conditions, whereas the third reflects the time required for the underlying similarities to be complete or dissimilarities to be indistinguishable across countries. In other words, while the presence of convergence implies that common cross-country policies can be adopted, the evidence of full convergence means that such policies can be implemented among sampled countries, without distinction of nationality.

Table 2 below summarizes overall findings presented while Tables 3 and 4 respectively presents, results for absolute (unconditional) and conditional catch-up. Absolute catch-up is estimated exclusively with the lagged endogenous variable as independent variable while conditional convergence is modelled with the control variables (or conditioning information set). In other words, the former is estimated in the absence of $W_{i,t}$: vector of determinants (*political globalisation, civil conflicts, inflation, exchange rate, foreign aid* and *GDP growth*) of the terrorism variables.

In order to assess the validity of the models and therefore the catch-up hypotheses, we performs two tests, namely: (1) the Arellano and Bond test for autocorrelation that examines the null hypothesis of the absence of autocorrelation and (2) the Sargan test that investigates the overidentification restrictions. Accordingly, the latter test assesses whether underlying instruments are uncorrelated with the error term in the main equation and its null hypothesis is the absence of endogeneity (or strict exogeneity of the instruments as a group). We also

report the Wald statistics for the joint significance of estimated coefficients. We notice overwhelmingly that for most of the estimated models: (1) the null hypotheses for the AR(2) and Sargan tests are not rejected and (2) the null hypothesis of the Wald statistics is rejected. We also ensure that the rule of thumb needed to avoid the proliferation of instruments is respected in almost all the models. In other words, for most specifications, the number of instruments is less than the number of cross-sections.

In light of the empirical dimension of this paper, it is relevant to devote space to clarifying how the values of catch-up rates and corresponding time to full convergence are computed. Given an estimated coefficient for an initial lagged value of 0.629 that is significant with no autocorrelation in the residuals and has valid instruments: (1) the catch-up rate is 20.90% ([0.629/3]*100) and (2) the length of time needed for full catch-up is 14.35 years (300%/20.90%). Therefore 14 years and approximately 128 days are needed to achieve 100% catch-up for an estimated initial value of 0.629 that is consistent with the information criterion: $0 < |a| < 1$.

A summary of results is presented in Table 4. It is based on Tables 5-6. Whereas the left-hand-side of Table 4 presents results for the Difference GMM, the right-hand-side shows findings for the System GMM. The findings of the latter are relatively more significant than those of the former. Panel A synthesises the findings of absolute convergence (AC), while Panel B shows those of conditional convergence (CC). Results of CC are further sub-divided into specification categories for robustness purposes. As we have seen above, in event of conflict of interest between the Difference and System GMM estimators, we shall give preference to the System estimation. Moreover, it is logical to also give preference to Panel B2 of CC which has incorporated more control variables because the conditioning of CC on more control variables is more feasible or close to reality.

The following findings can therefore be established with respect to: (i) System GMM results and (ii) the second specification of CC. First, while the other terrorism dynamics consistently reveal significant results, the finding for unclear (total) terrorism is not significant for CC (AC). Second, irrespective of catch-up dynamic, the rate of catch-up is higher for domestic terrorism relative to transnational terrorism. (1) Full AC can be achieved between 12.34 and 24.67 years (yrs) with corresponding catch-up rates of 24.30% and 12.16% per annum (pa) for domestic and transnational terrorism respectively. (2) Full CC can be achieved between 19.92 and 27.88 years (yrs) with corresponding catch-up rates of 15.60% and 10.76% pa for domestic and transnational terrorism respectively. Third, it follows from the third point

above that from a projection date of 2009, common policies against domestic terrorism can be adopted within a horizon of 13.34-19.92 yrs while those on transnational terrorism within 24.67-27.88 yrs.

Table 4: Summary of results

	Difference GMM				System GMM			
Panel A: Absolute Convergence (AC)								
	LnDomter	LnTranster	LnUnclter	LnTotter	LnDomter	LnTranster	LnUnclter	LnTotter
AC?	No	Yes	No	Yes	Yes	Yes	Yes	No
Rate of AC	na	7.86%	na	20.96%	24.30%	12.16%	16.96%	na
Years to AC	na	38.16Yrs	na	14.31Yrs	12.34Yrs	24.67Yrs	17.68Yrs	na
Panel B: Conditional Convergence (CC)								
Panel B1: Specification 1								
	LnDomter	LnTranster	LnUnclter	LnTotter	LnDomter	LnTranster	LnUnclter	LnTotter
CC?	No	No	No	Yes	Yes	Yes	No	Yes
Rate of CC	na	na	na	13.60%	18.2%	8.96%	na	15.50%
Years to CC	na	na	na	22.05Yrs	16.48Yrs	33.48Yrs	na	19.35Yrs
Panel B2: Specification 2								
	LnDomter	LnTranster	LnUnclter	LnTotter	LnDomter	LnTranster	LnUnclter	LnTotter
CC?	Yes	Yes	No	Yes	Yes	Yes	No	Yes
Rate of CC	15.96%	9.80%	na	14.26	15.06%	10.76%	na	14.03%
Years to CC	18.79Yrs	30.61Yrs	na	21.03Yrs	19.92Yrs	27.88Yrs	na	21.38Yrs

Yes: Significant evidence of Catch-up. No: insignificant evidence of Catch-up. AC: Absolute Catch-up. CC: Conditional Catch-up. Rate of AC: Rate of Absolute Catch-up. Rate of CC: Rate of Conditional Catch-up in years. FAC: Full Absolute Catch-up. FCC: Full Conditional Catch-up. LnDomter: Number of Domestic terrorism incidents. LnTranater: Number of Transnational terrorism incidents. LnUnclter: Number of terrorism incidents whose category in unclear. LnTotter: Total number of terrorism incidents.

Table 5: Absolute Convergence

	Difference GMM				System GMM			
	LnDomter	LnTranster	LnUnclter	LnTotter	LnDomter	LnTranster	LnUnclter	LnTotter
Initial	**0.067*** **	**0.236***	0.223	**0.629*** **	**0.729*** **	**0.365*** **	**0.509*** **	**0.700*** **
	(0.000)	**(0.099)**	(0.431)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.009)**	**(0.000)**
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	(0.085)	**(0.140)**	**(0.655)**	**(0.712)**	**(0.105)**	**(0.195)**	**(0.358)**	**(0.699)**
OIR	**(0.578)**	**(0.341)**	**(0.691)**	**(0.201)**	**(0.285)**	**(0.174)**	**(0.589)**	(0.083)
Wald	**12.945*** **	**2.717***	0.618	**16.528*** **	**54.420*** **	**5.193** **	**6.756*** **	**43.989*** **
Instruments	27	27	27	27	34	34	34	34
Countries	62	54	32	71	62	54	32	71
Observations	226	182	91	268	288	236	123	339

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. LnDomter: Number of Domestic terrorism incidents. LnTranater: Number of Transnational terrorism incidents. LnUnclter: Number of terrorism incidents whose category in unclear. LnTotter: Total number of terrorism incidents.Initial: Lagged dependent variable. AR(2): Second Order Autocorrelation test. OIR: Sargan Overidentifying Restrictions test.. Wald: Wald statistics for joint significance of estimated coefficients. P-values in bracket. 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(2) tests and; b) the validity of the instruments in the Sargan OIR test.

Most of the significant control variables in Table 6 have the expected signs. As we have projected in the Data section, political globalisation, civil conflicts and inflation are very likely to create an atmosphere conducive to, political instability and violence which eventually directly or indirectly breed terrorists' activities.

Table 6: Conditional Convergence

	Difference GMM				System GMM			
Panel A: Specification 1								
	LnDomter	LnTranster	LnUnclter	LnTotter	LnDomter	LnTranster	LnUnclter	LnTotter
Initial	**0.562*** **	0.241	0.201	**0.408*** **	**0.546*** **	**0.269***	0.262	**0.465*** **
	(0.000)	(0.106)	(0.472)	**(0.005)**	**(0.000)**	**(0.084)**	(0.234)	**(0.000)**
Constant	0.029	**0.524** **	−0.314	0.117	−2.480	**−2.391***	**−3.679***	**−3.501***
	(0.904)	**(0.018)**	(0.344)	(0.645)	(0.108)	**(0.053)**	**(0.085)**	**(0.066)**
Political globalisation	−0.400	−0.562	−0.078	0.019	**0.823** **	**0.724** **	**1.035***	**1.088** **
	(0.722)	(0.393)	(0.961)	(0.983)	**(0.046)**	**(0.029)**	**(0.085)**	**(0.028)**
Civil Conflicts	**0.249*** **	**0.142*** **	0.092	**0.360*** **	**0.240*** **	**0.143*** **	**0.230*** **	**0.313*** **
	(0.001)	**(0.005)**	(0.313)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**	**(0.000)**
Inflation	0.117	0.014	0.009	0.115	0.048	0.034	−0.055	0.082
	(0.142)	(0.848)	(0.940)	(0.104)	(0.265)	(0.439)	(0.528)	(0.192)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	**(0.166)**	**(0.305)**	**(0.497)**	**(0.603)**	**(0.286)**	**(0.321)**	**(0.245)**	**(0.616)**
OIR	(0.022)	**(0.327)**	**(0.695)**	**(0.271)**	**(0.337)**	**(0.277)**	**(0.821)**	**(0.251)**
Wald	**11.70** **	**13.332*** **	1.324	**43.88*** **	**151.50*** **	**50.52*** **	**85.83*** **	**232.64*** **
Instruments	25	30	30	30	37	37	37	37
Countries	60	52	32	67	60	52	32	67
Observations	217	176	91	254	277	228	123	321
Panel B: Specification 2								
	LnDomter	LnTranster	LnUnclter	LnTotter	LnDomter	LnTranster	LnUnclter	LnTotter
Initial	**0.479*** **	**0.294***	0.236	**0.428*** **	**0.452*** **	**0.323***	0.308	**0.421*** **
	(0.007)	**(0.085)**	(0.329)	**(0.005)**	**(0.001)**	**(0.064)**	(0.265)	**(0.000)**
Constant	0.007	**0.490***	−0.261	0.282	**−3.134***	−1.821	−3.518	**−3.787** **
	(0.979)	**(0.083)**	(0.535)	(0.278)	**(0.058)**	(0.140)	(0.264)	**(0.045)**
Political globalisation	−0.266	−0.661	0.248	−0.145	**0.874***	0.515	0.915	**1.061** **
	(0.830)	(0.377)	(0.887)	(0.877)	**(0.057)**	(0.120)	(0.187)	**(0.043)**
Civil Conflicts	**0.211** **	**0.142** **	0.073	**0.395*** **	**0.269*** **	**0.157*** **	**0.222*** **	**0.330*** **
	(0.031)	**(0.019)**	(0.418)	**(0.000)**	**(0.000)**	**(0.000)**	**(0.002)**	**(0.000)**
Inflation	0.129	0.049	−0.109	**0.142** **	0.057	0.059	−0.058	0.102
	(0.105)	(0.574)	(0.557)	**(0.018)**	(0.361)	(0.210)	(0.505)	(0.141)
Exchange Rate	−0.045	−0.059	−0.116	**−0.139** **	**0.055***	0.027	0.038	0.018
	(0.557)	(0.310)	(0.360)	**(0.046)**	**(0.064)**	(0.338)	(0.526)	(0.598)
Foreign Aid	0.250	0.208	0.188	0.151	0.119	−0.001	0.047	0.051
	(0.189)	(0.173)	(0.581)	(0.438)	(0.293)	(0.981)	(0.776)	(0.594)
GDP growth	−0.011	0.026	−0.059	0.013	−0.009	0.037	−0.046	0.010
	(0.662)	(0.302)	(0.317)	(0.615)	(0.677)	(0.193)	(0.280)	(0.721)
Time effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AR(2)	**(0.190)**	**(0.882)**	**(0.504)**	**(0.477)**	**(0.331)**	**(0.463)**	**(0.218)**	**(0.607)**
OIR	**(0.524)**	**(0.420)**	**(0.675)**	**(0.412)**	**(0.349)**	**(0.191)**	**(0.812)**	**(0.209)**
Wald	**33.649*** **	**17.294** **	5.325	**66.171*** **	**188.20*** **	**48.688*** **	**53.425*** **	**213.52*** **
Instruments	33	33	33	33	40	40	40	40
Countries	60	52	32	67	60	52	32	67
Observations	212	169	90	247	272	221	122	314

***, **, and * indicate significance at 1%, 5% and 10% levels respectively. LnDomter: Number of Domestic terrorism incidents. LnTranater: Number of Transnational terrorism incidents. LnUnclter: Number of terrorism incidents whose category in unclear. LnTotter: Total number of terrorism incidents. Initial: Lagged dependent variable. AR(2): Second Order Autocorrelation test. OIR: Sargan Overidentifying Restrictions test.. Wald: Wald statistics for joint significance of estimated coefficients. P-values in bracket. 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(2) tests and; b) the validity of the instruments in the Sargan OIR test.

4.2 Further discussion of results, policy implications and caveats

In accordance with the recent stream of literature that has extended the theoretical underpinnings of income convergence to other development areas, it is important to clearly articulate the context of AC and CC before discussing the results (Asongu, 2013a; Narayan et al., 2011; Asongu & Nwachukwu, 2015). AC is primarily the basis for common initiatives, factors or policies, among others: economic unions and the adoption of common currency. Meanwhile, the framework on which this study is aligned extends well beyond monetary/economic unions to common terrorism policies across countries. Therefore AC implies that countries share some fundamental characteristics in relation to terrorism activities (e.g the mere occurrence of terrorism), such that differences across countries are only in terms of initial levels of terrorism. In this light, the absence of AC in the total terrorism panel for the System GMM specifications may be traceable to differences in such initial levels. Conversely, evidence of AC in terrorism implies that beyond the constraint of dissimilar initial conditions among sampled developing countries, common fundamental factors that exist have led countries with low-levels of terrorism to be catching-up their counterparts of higher levels.

On the other hand, CC illustrates the type of catch-up where-by the country's equilibrium in the long-run or steady state depends on institutional and structural features that are fundamental to currency/economic unions. Hence, when sampled countries distinguish themselves in terms of determinants of terrorism, conditional catch-up is likely to occur. Therefore if sample countries differ in the structural and institutional features that explain terrorism, some form of catch-up is likely to take place. In this vein, conditional catch-up depends on the conditioning information set or variables we choose and empirical test. While we have employed five macroeconomic variables, some empirics have been limited to two variables (e.g Bruno et al., 2012). It follows that in terrorism dynamics (domestic, transnational and total) for which CC has been established to be apparent, sampled countries have differences in the employed conditioning information set (political globalisation, civil conflicts, inflation, exchange rate, foreign aid and GDP growth). Conversely, as for unclear terrorism for which we have established no evidence of CC, consistent with Asongu and Nwachukwu (2015), sampled countries with unclear terrorism could instead be converging to a lower equilibrium. Overall, the catch-up process implies that common policies are feasible across sampled countries.

We have also established that irrespective of catch-up dynamic, the rate of catch-up is higher for domestic terrorism relative to transnational terrorism. This implies that feasibility

of common policies against domestic terrorism is higher relative to common initiatives against transnational terrorism. In other words, the rates of domestic terrorism in countries with initially low levels of domestic terrorism are growing faster than in the corresponding tendency for transnational terrorism.

The time for full catch-up required for the implementation of common policies without distinction of nationality has also been established to be in a horizon of 13.34-19.92 years for domestic terrorism and 24.67-27.88 years for transnational terrorism. The implication of this is that from a projection date of 2009, there is still a long way to go for the implementation of common policy initiatives. Hence, while such initiatives are feasible now, the adoption process would take quite some time. The process can be facilitated by improving cross-country institutional and structural characteristics that are inhibiting the convergence process.

Before we conclude, it is important to point-out a few caveats to the empirics. In essence, using econometrics to achieve beyond accepting or refuting existing theories is not without risks. Nonetheless, as we have clearly articulated in the motivation of the study, there is a growing strand of literature extending the theoretical underpinning of catch-up in income to other development areas. As Miller and Upadhyay (2002) and Apergis et al. (2010) have documented, differences in initial conditions and multiple equilibria are recurrent shortcomings of the beta catch-up modelling approach.

5. Conclusion and further directions

This paper models the feasibility of common policy initiatives against global terrorism, as well as timelines for their enforcement. The empirical evidence is based on 78 developing countries for the period 1984-2008. Employed terrorism dynamics are domestic, transnational, unclear and total terrorism. Absolute (or unconditional) and conditional catch-ups are modelled using Generalised Methods of Moments. We establish consistently that, the rate of catch-up is higher in domestic terrorism relative to transnational terrorism. The time to full catch-up required for the implementation of common policies without distinction of nationality is found to be in a horizon of 13.34-19.92 years for domestic terrorism and 24.67-27.88 years for transnational terrorism. Hence, from a projection date of 2009, in spite of decreasing cross-country differences in terrorists' attacks, there is still a long way to go before feasible common policy initiatives can be fully implemented without distinction of nationality. This conclusion is in line the 2014 Global Peace Index report "*Many macro*

factors have driven the deterioration in peace over the last seven years including the continued economic repercussions of the Global Financial Crisis, the reverberations of the Arab Spring, and the continued spread of terrorism. As these effects are likely to continue into the near future; a strong rebound in peace is unlikely" (Arnet, 2014).

Given that terrorism activities also depend on revolutionary tendencies that are spreading across nations, an interesting future research direction could be to employ alternative instruments like spatial econometrics in order to incorporate diffusion and spill over effects.

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