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Globalization, Peace & Stability, Governance, and Knowledge Economy

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Globalization, Peace & Stability, Governance, and Knowledge Economy

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AGDI Working Paper

Research Department

Globalization, Peace & Stability, Governance, and Knowledge Economy

Voxi Amavilah, Simplice A. Asongu & Antonio R. Andrés

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Abstract

A previous analysis of the impact of formal institutions on the knowledge economy of 22 Middle-Eastern and Sub-Sahara African countries during the 1996-2010 time period concluded that formal institutions were necessary, but inadequate, determinants of the knowledge economy. To extend that study, this paper claims that globalization induces peace and stability, which affects governance and through governance the knowledge economy. The claim addresses one weakness of previous research that did not consider the effects on the knowledge economy of globalization. We model the proposition as a three-stage process in four hypotheses, and estimate each hypothesis using robust estimators that are capable of dealing with the usual statistical problems without sacrificing economic relevance and significance. The results indicate that globalization has varying effects on peace and stability, and peace and stability affect governance differently depending on what kind of globalization induces it. For instance, the effects on governance induced by globalization defined as trade are stronger than those resulting from globalization taken to be foreign direct investment. Hence, we conclude that foreign direct investment is not a powerful mechanism for stimulating and sustaining the knowledge economy in our sample of countries. However, since globalization-induced peace and stability have both positive and negative effects on governance simultaneously, we also conclude that while the prospect for knowledge economy in African countries is dim, it is still realistic and attainable as long as these countries continue to engage in the kind of globalization that does indeed induce peace and stability. We further conclude that there is a need for a sharper focus on economic and institutional governance than on general governance as one possible extension of this paper.

JEL Classification: I20; I28; K42; O10; O55

Keywords: Globalisation; Peace and Stability; Governance; Knowledge Economy¹

¹ Throughout this paper we use the terms “peace,” “stability,” and “peace and stability” interchangeably to mean “political stability”, or “No unmanageable violence.” In interactive interpretation, “peaceful stability” is the same thing as “stable peace”.

1. Introduction

This paper extends Andres, Asongu, and Amavilah's (2013) analysis of the impact of formal institutions through the enforcement of intellectual property rights (IPRs) on the knowledge economy (KE) of 22 Middle East and North African (MENA) and Sub-Sahara African countries of the 1996-2010 time period. The results of that study suggested that IPRs were necessary, but inadequate, determinants of the performance of the KE of the group of countries sampled, and that other factors were more likely responsible for observed outcomes. The current extension claims that *globalization induces peace and stability, which affects governance and through governance the performance of KEs*. The claim is important because it permits us to connect key concepts in economic development in testable ways, and to close an existing information gap in this area. Both the analytical model we develop and the outcomes of its implementation serve policy and further research in Sub-Saharan African countries where the information gap is presently deepest and widest as far as we can assess.

We put forward four testable hypotheses, employ the principal component analysis to minimize the concern for information redundancy, and finally apply an innovative three-stage regression technique to the hypotheses. In the first stage we associate political peace and stability (lack of violence) with trade and foreign direct investment (FDI) as measures of openness. In the second stage, stability influences three indicators of governance: general governance (GG), economic governance (EG), and institutional governance (IG). Finally, we relate stability and governance to various measures of KE such as education (Educatex), information and communication technologies (ICTex), innovation (Innovex), and economic incentives (Creditex). Subsequent analysis of the four hypotheses finds considerably measurable positive and negative correlations indicators of peace and stability and those of KE by way of governance. For instance, the first hypothesis is that *globalization-induced stability affects governance, which influences KE in terms of education*. The results reveal that in increasing order of relevance and significance, the

effects (3.94) of trade-induced stability on institutional governance are weakest, whereas trade-induced stability has the strongest impacts (26.66) on economic governance. The positive signs found are consistent with both intuition and the predictions of economic theory.

The second hypothesis holds that, *globalization-induced stability affects governance which influences KE represented by ICT*. The estimates that are significant have the expected signs, and are consistent with both commonsense and what economic theory predicts *a priori*. In this case the effects on institutional governance of the stability resulting from financial openness are strongest and positive (78.64) but they are lowest at 25.68 with respect economic governance. The impact on general governance of peace and stability resulting from financial openness fall in-between (27.12). Similarly, the third, hypothesis states that *globalization-induced stability affects governance, which influences KE measured as economic incentives*. In this particular case the significant estimates have mixed signs -- both negative and positive. However, while there are negative effects from FDI-related estimates, the impacts are positive for globalization-oriented estimates.

The fourth, and final, KE hypothesis suggests that *globalization-induced stability affects governance, which influences KE in terms of innovation (Table 11)*. Here the effects range from the low of -14.26 to the high of 23.95. Here, too, while trade related effects are positive, globalization oriented estimates are negative. The logical inference is that, relative to the effects of FDI-induced stability on governance, the effects of trade-related stability on governance have a more positive weight on innovation even though both are generally representations of globalization-induced stability. In other words, for this group of countries over this study period trade openness is a more effective mechanism for innovation than FDI openness.

This study steers clear of current discourses on KE² but nonetheless extends a growing stream of studies on achieving development with lessons from other countries with successful KE records (Wa Gĩthĩnji & Adesida, 2011; Fosu, 2013a; Nyarko, 2013a; Strulik et al., 2013; Zhu & Pearson, 2013; Gerritsen et al., 2013; Kocourek & Simanova, 2013; Tchamyou, 2014)³. The rest of the paper is organized as follows. The next section scans existing literature to highlight key relationships among globalization, peace and stability, governance, and the aspects of the KE. The section after that outlines very briefly the theoretical structure upon which the model implementation is founded. Empirical results and their implications for policy and further research are the subjects of the fifth section of the paper, while the sixth section concludes the paper.

2. Literature

The literature on each of the concepts of interest here is huge to even attempt to review, let alone do so coherently. In what follows we pair the concepts to stress specific relationships between them and to set the stage for modeling and estimating their interrelationships.

² To the best of our knowledge (Tchamyou, 2014), the bulk of the current KE literature focuses on, inter alia: broad discussions of the phenomenon (Rooney, 2005; Lin, 2006; Anyanwu, 2012); information & communication technologies (Butcher, 2011); education (Amavilah, 2009a; Ford, 2007; Weber, 2011; Wantchekon et al., 2014); institutional regime & economic incentives (Letiche, 2006; Cogburn, 2003; Andrés & Asongu, 2013); intellectual capital & economic development (Wagiciengo & Belal, 2012; Preece, 2013); innovation (Oyelaran-Oyeyinka & Sampath, 2007; Carisle et al., 2013); research & development (Sumberg, 2005; German & Stroud, 2007); indigenous knowledge systems (Lwoga et al., 2010; Raseroka, 2008); KE in the transformation of space (Moodley, 2003; Maswera et al., 2008); intellectual property rights (Lor & Britz, 2005; Zerbe, 2005; Andrés & Asongu, 2013; Myburgh, 2011; Andrés et al., 2014); and spatiality in the production of knowledge (Bidwell et al., 2011; Neimark, 2012).

³ From past experiences (Fosu, 2010, 2012, 2013a) has documented 'lessons and strategies on achieving development success'. These lessons are derived from: the emerging Asian giants of China & India (Yao, 2013; Singh, 2013; Santos-Paulino, 2013); East Asia & the Pacific Jomo & Wee, 2013; (Lee, 2013; Warr, 2013; Khan, 2013; Thoburn, 2013); sub-Saharan Africa (Lundahl & Petersson, 2013; Robinson, 2013; Subramanian, 2013; Naudé, 2013; Fosu, 2013b); Latin America & the Caribbean (Solimano, 2013; De Mello, 2013; Trejos, 2013; Cardoso, 2013; Pozo et al., 2013) and; North Africa & the Middle East (Drine, 2013; Looney, 2013; Nyarko, 2013b; Balamoune-Lutz, 2013).

2.1 Globalization, and Peace and Stability

The intuition of the proposition that globalization induces peace and stability, and thereby influences governance has been documented by Bonaglia, et. al (2001), Lalountas, et al (2011), and Asongu (2014). Bonaglia et al. (2001) found that globalization in terms of trade openness reduces corruption, which is an important aspect of governance. Lalountas et al. (2011) and Asongu (2014) have recently confirmed the positive role of globalization on governance both in developing nations and African countries. The findings make good sense; peace and stability between trading partners contribute to the positive role of trade openness on governance. Therefore it is valid to sustain that globalization induced peace and stability affects governance.

To the extent to which peace and stability means lack, or existence of manageable incidence, of violence, the link between peace and stability on the one hand and globalization on the other hand is apparent from another line of research. For instance, Dani Rodrik (1997) measures conflicts as latent frictions particular to any community relative to the institutional capability (quality) for managing such frictions. He represents globalization with external shocks transmitted as terms of trade through the mechanism of foreign trade. Rodrik's results show that for the developing countries both external shocks (globalization) and latent frictions (conflicts) have negative effects on economic growth, the former because of the poor quality of institutions and the latter because of declining terms of trade, or the so-called Singer-Prebisch hypothesis.

Messer and Cohen (2006) demonstrate this link between globalization and conflicts using crop prices. They argue that by opening up markets to external forces, globalization has caused crop export price to increase and to fluctuate unpredictably. Price increases and unpredictable fluctuations led to food insecurity and thereby induced conflicts. In a related vein Susan Olzak (2011) observed that globalization, especially economic and cultural globalization, are associated with more deaths from internal armed ethnic conflicts. Sociocultural globalization increases ethnic conflicts, but reduces non-ethnic conflicts. The implication of this observation is that globalization

stimulates competition for scarce resources intra- ethnic, but it creates new understanding that diffuses frictions inter-ethnic. These results make perfect sense, but only because historically terms of trade have harmed developing countries. If terms of trade were favorable for developing countries, it would have been just as reasonable to hypothesize that trade-induced peace and stability can be as good as bad for governance.

Moreover, if one possible side-effect of globalization is to diffuse inter-ethnic conflicts, then it is not unreasonable for us to argue that under conditions of peace and stability it is not so clear that all conflicts would affect governance and KE negatively. The latency Rodrik observes suggests not the absence of conflicts but the success of peace and stability in keeping violence at bay.⁴ Tidwell and Lerche (2011) support us in arguing that globalization and conflicts are complex and inter-active, such that their partial and joint effects on economic performance are ambiguous. Such an argument is not without merit as not all conflicts are violent (disputed elections had occurred even in peaceful and stable economies, compare Bush v. Gore in the USA), and not all violent conflicts have necessarily bad consequences (think of overthrowing Hitler's Nazism). Moahi (2007) adds another perspective to this one. He describes a situation in which the spread of globalization and the growth of KE tend to lead to unbalanced power relations between developed and developing economies, and in the absence of appropriate IPRs, both globalization and conflicts harm indigenous knowledge and knowledge systems. Viewed slightly differently, the perspective suggests that globalization can lead to economic growth and yet harm the KE if it unbalances the relationship between governance and peace and stability. In such cases empirical studies are incorrect by invariably representing conflicts only with violent conflicts, even though it is understandable that the short-run impacts of violent conflicts are predictably large.

⁴ We are simply point out the facts here; not passing judgment on the goodness or badness of those facts. Compared to today, Saddam Hussain's Iraq was both latently violent and stable, and that "peace and stability" favor institutions of governance that supported the regime that was in power and through it whatever KE it was financing.

We accept that there is clearly a link between globalization and conflicts, but we are not entirely convinced of its nature, leaving testable the hypothesis that globalization determines peace and stability. The one question we would not pursue here, however, is what determines globalization itself. Even so, we know that to some globalization is simply a general-purpose technology like the internet. For most people, though, globalization is driven by many variables among them: technological changes, such as changes in ICT which made the exchange of ideas faster and cheaper to spread than before. The combined effect of newer technologies and larger scale, including network effects, have reduced transport and transactions costs so that goods and services move faster and over longer distances than even a decade ago. The processes of deregulation of resource ownership mean that property owners, most generally multinational companies, can now operate freely in any locality. Resources are also more mobile today than they were even 30 years ago; consider capital movement and human migrations. In addition, income remittances, freer foreign trade, location-specific labor costs and their implications for outsourcing and relocation of production facilities, concentration of entrepreneurial activity, and other instruments, all these influence globalization.⁵ Hence, it is not unreasonable to suppose that these representations of globalization affect peace and stability positively.

2.2 Governance and Conflicts v. Governance and Peace and Stability

Neo-liberal economists have tended to over-stress the negative relationship between governance and conflicts, representing it with variables like political instability and violence. The logic is that conflicts weaken the quality of institutions of governance. Weak institutions are then unable to manage latent frictions of the kind Dani Rodrik refers to, which in turn lead to even more severe conflicts. While such arguments are not without merit, they are nonetheless static and linear. They are linear for ignoring the effects of globalization on peace and stability. They are not dynamic

⁵ W.A. Lewis (1965) has long dubbed this phenomenon the “bunching together of investment,” and therefore economic activity.

because they fail to recognize the indirect effects through peace and stability of globalization on governance. In fact, it is not unreasonable to claim a direct link between globalization and governance as the brief literature below illustrates.

2.3 Governance and Globalization

Globalization affects governance indirectly through peace and stability by minimizing violent conflicts, but also directly. Culturally globalization spread new ideas, technologies, tools, attitudes, social networks, and these have direct effects on governance. There is some truth to the suggestion that the so-called Arab Spring has been a communications revolution that overthrew institutions of governance by Twitter, Facebook, and the like. Globalization allows for political integration. Many developing countries are sensitive to trade, remittance, FDI, aid, education, health, international law, diplomacy, all of which are aspects of globalization which individually and/or jointly influence governance.

Bonaglia, Braga de Macedo, and Bussolo (2001) built a simple, but informative model to show “how globalization improves governance.” The question the model asked was succinct: ‘Is there an effect of globalization on governance?’ The answer was a firm “yes” as the title of the paper implies. How did they come to that answer? Well, they specified variables that effect institutional change, and assessed whether or not such variables reduce corruption, measured by the International Credit Risk Guide as perceived corruption in government (cf. Acemoglu, Johnson, and Robinson, 2001). They found that high levels of measures of globalization like openness correlated with low levels of corruption, although mineral exports and in some cases trade liberalization worked against governance. In fact, there are forces of governance competing with those of conflict-regenerating climate change, but we intend to pursue that line of thought separately.

2.4 Globalization, Peace and Stability, Governance, and the KE

The connection between KE and governance is both most obvious, and most difficult to measure due to the lack of specificity with which to represent KE. For some KE is an economic activity like GDP; for others it is a measure of well-being such as GDP per capita, GDP per worker, or some other representations like the human development index (HDI). M.H. Khan (2007) is probably correct that correlation between the economic activity and governance since 1960s has meant two mutually exclusive things. Liberal economists tend to think of governance as “market-enhancing capabilities that reduce transaction costs and enable markets to work more efficiently, ... [whereas for] ... heterodox economists governance is the capacities to overcome entrenched market failures” (pp. 8-16). In this case saying governance is important to economic growth means two different outcomes. Regarding the former, economic growth happens when markets are efficient even if output remains unchanged; for the latter governance promotes economic growth only if it enhances productivity, i.e., it raises the standard of living measured conservatively as per capita income. Khan finds a statistically strong effect of governance as market-enhancing capabilities on economic growth for a sample of developed and developing countries, but no effect at all for African countries. An example of market-enhancing governance is evident from Bigsten and Durevall’s (2002) study which interchanges globalization and market integration so that global markets imply the ‘law of one price’ and deviations from that price are essentially taken as disrespecting markets, a punishable offense, they argue and offer Zimbabwe’s experience as example. However, it would seem then that governance as productivity-enhancing is a better model for African countries. It is also the mechanism S. Korea, Malaysia, and China used with stellar, and India and Latin America used with mixed, results. These outcomes suggest that the problem is in the implementation of productivity-enhancing governance (see Khan, p. 21, last paragraph).

Further evidence of the effects of governance on economic growth for African countries is in Fayissa and Nsiah (2010). Here governance, measured by the six world governance indicators, implies good governance, and good governance goes hand-in-hand with good institutions as economic growth drivers. The authors conclude that “good governance has a positive and significant impact on growth, regardless of the proxy used for governance” (p.14), and that low-income countries benefit more from good governance than high-income countries. This result may be reasonable because Kaufmann, Kraay, et. al. (2003, 2002a,b, 1999a,b) argue that good governance leads to economic growth, but in the case of “state capture”, economic growth does not lead back to further good institutions or good governance, which breaks the “virtuous circle” (cf. Khan, 2010). This result is also consistent with Alesina, Spolaore, and Wacziarg (2000) by which trade integrates, whereas politics disintegrates at the same time, so that performance depends on the net balance between ‘economic integration’ and ‘political disintegration.’ While reasonable, this conclusion is inconsistent with Qubria (2006), who, using the same indicators of governance, found that for Asian countries economic growth has been fastest in countries with low governance indicators. In other instances the inconsistency may be that measures of governance used are not exactly the same. Amavilah (2009b, 2009c, 2009d,) observes that the influence of governance on economic performance depends on how governance is measured. For example, using the six world governance indicators and the governance indicators assembled recently for African countries by Mo Ibrahim Foundation, one finds that although governance has a positive effect on economic growth on average, specific measures of governance differ, often in opposite directions. By the six indicators the “rule of law” constrains, but it promotes growth according to the MO Ibrahim’s indicators. Despite all of this it is clear that there is a relationship between governance and economic performance of KE.

However, many also suspect a direct relationship between economic activity and globalization besides the indirect one through peace and stability (lack of manageable conflicts). Axel Dreher (2003) looked at 123 countries over the 1970-2000 period and determined that globalization led to economic growth, even as it did not reduce poverty and/or income inequality. Political globalization had no major effect, and information flows had minimal effects. Economic globalization had strong effects, but such effects were conditional on the nature of global relations between developed and developing countries.

Amavilah (2008, 2009d) compared the effects of globalization, governance, physical and human capital, and unexplained technical change on the economic performance of Sub-Saharan African countries. Economic performance varied with measures of globalization and governance, suggesting that both governance and globalization are good for economic growth. However, it turns out that it is social globalization rather than economic globalization that is most beneficial. Similarly, on average the quality of institutions are important to economic performance, but, when disaggregated, different measures of institutional quality have different effects on performance. Thus, Amavilah's findings confirmed Dreher's results.

Last, but not least, Goklany (2002) for instance globalization improved the well-being of nations because it reduced hunger, infant mortality, and child labor, and increased life-expectancy. Ming-Chang Tsai (2006) adds that while average and political globalization have improved the well-being of nations, social and economic globalization have had either negative or positive but insignificant effects. Using HDI as a measure of national well-being Amavilah (2009b, 2009c) discovered that social globalization is important to the well-being of nations, but not nearly as much as material well-being, represented as real GDP per capita. Thus, we claim that the proper channel is in which globalization affects peace and stability, which determines governance, and governance influences the KE.

3. Putting Humpy-Dumpy Back Together Again – A Brief Theoretical Framework

As stated above, Andres, Asongu, and Amavilah (2013) studied the impact of formal institutions through the enforcement of IPRs on the KE of 22 MENA and Sub-Sahara African countries over the 1996-2010 time period. The results of that study suggested that IPRs were necessary, but inadequate, determinants of the performance, and that other factors are likely responsible for observed outcomes. We extend that study with the claim that *globalization induces peace and stability, which affects governance, and hence the performance of KE*. Such a claim is not without theoretical standing as it can be quantified as an augmented production function. Consequently, to derive estimates of the determinants of KE across countries, we start with a simple Solow (1957) function of conventional factors and forces of production (X) and the state of technology (A), i.e.,

$$Y_{it} = (X_{it}A_{it})^\alpha \exp(\mu_{it}), \quad (1)$$

where X is a vector of control variables including labor, human and physical capital. Next we let the state of technology evolves as $A_{it} = A_{i0} \exp(gt + \beta_i Z_{it})$ such that (1) becomes

$$Y_{it} = X_{it}^\alpha A_{i0}^\alpha \exp(\alpha gt + \beta_i Z_{it} + \mu_{it}). \quad (2)$$

For Z_{it} including Stability and Governance, (2) can be expressed as

$$Y_{it} = X_{it}^\alpha A_{i0}^\alpha \exp(\alpha gt + \alpha\beta_1 \text{Stability}_{it} + \alpha\beta_2 \text{Governance}_{it} + \mu_{it}). \quad (3)$$

Dividing both sides of (3) by some X_i and taking natural logs leads to the X-intensive form of (3) as:

$$y_{it} = a_{i0} + \alpha gt + \alpha x_{it} + \alpha\beta_1 \text{Stability}_{it} + \alpha\beta_2 \text{Governance}_{it} + \mu_{it}, \quad (4)$$

where $a_{i0} = \ln(A_{i0})$, $y_{it} = \ln(\frac{Y_{it}}{X_{jt}})$, $x_{it} = \ln(\frac{X_{it}}{X_{jt}})$, $i \neq j$. In the empirical part we set $\alpha gt = \xi_t$, and briefly provide the rationale. The remaining task is to implement (3), and it is to that we now turn.

4. Methodology and Data

To operationalize the theoretical model above, first we outline the methodology we follow and the data we use. Table 1 provides variable definitions and data sources, while Tables 2 and 3 present summary statistics and a correlation matrix, respectively.

Table 1: Definition of variables

Variables	Signs	Variable definitions	Sources
Panel A: Knowledge Economy			
Panel A1: Education			
Primary School Enrolment	PSE	School enrolment, primary (% of gross)	World Bank (WDI)
Secondary School Enrolment	SSE	School enrolment, secondary (% of gross)	World Bank (WDI)
Tertiary School Enrolment	TSE	School enrolment, tertiary (% of gross)	World Bank (WDI)
Education in KE	Educatex	First PC of PSE, SSE & TSE	PCA
Panel A2: Information & Infrastructure			
Internet Users	Internet	Internet users (per 100 people)	World Bank (WDI)
Mobile Cellular Subscriptions	Mobile	Mobile subscriptions (per 100 people)	World Bank (WDI)
Telephone lines	Tel	Telephone lines (per 100 people)	World Bank (WDI)
Information & Communication Technology (ICT) in KE	ICTex	First PC of Internet, Mobile & Tel	PCA
Panel A3: Economic Incentives			
Financial Activity (Credit)	Pcrbof	Private domestic credit from banks and other financial institutions	World Bank (FDSD)
Interest Rate Spreads	IRS	Lending rate minus deposit rate (%)	World Bank (WDI)
Economic Incentives in KE	Creditex	First PC of Pcrbof and IRS	PCA
Panel A4: Innovation			
Scientific & Technical Publications	STJA	Number of Scientific & Technical Journal Articles	World Bank (WDI)
Trademark Applications	Trademark	Total Trademark Applications	World Bank (WDI)
Patent Applications	Patent	Total Residents + Nonresident Patent Applications	World Bank (WDI)
Innovation in KE	Innovex	First PC of STJA, Trademarks and Patents	PCA
Panel B: Governance			
Panel B1: Economic Governance			
Government Effectiveness	GE	Government effectiveness (estimate): measures the quality of public services, the quality and degree of independence from political pressures of the civil service, the quality of policy formulation and	World Bank (WDI)

implementation, and the credibility of governments' commitments to such policies.

Regulation Quality	RQ	Regulation quality (estimate): measured as the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development.	World Bank (WDI)
Economic Governance	EG	First Principal Component of Government Effectiveness and Regulation Quality. The capacity of government to formulate & implement policies, and to deliver services.	PCA

Panel B2: Institutional Governance

Rule of Law	RL	Rule of law (estimate): captures perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, the courts, as well as the likelihood of crime and violence.	World Bank (WDI)
Corruption Control	CC	Control of corruption (estimate): captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as 'capture' of the state by elites and private interests.	World Bank (WDI)
Institutional Governance	IG	First Principal Component of Rule of Law and Corruption-Control. The respect for citizens and the state of institutions that govern the interactions among them	PCA

Panel B3: General Governance

General Governance	GG	First principal component of Political Stability, Voice & Accountability, Government Effectiveness, Regulation Quality, Rule of Law and Corruption-Control.	PCA
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Panel C: Globalization

Trade Openness	Trade	Exports plus Imports of Commodities (% of GDP)	World Bank (WDI)
Financial Openness	FDI	Gross Foreign Direct Investment (% of GDP)	World Bank (WDI)
Globalization	Global	Trade Openness + Financial Openness	Employed interactively during regressions

Panel D: Political Stability/No Violence (Dependent variable)

Political Stability	PolSta	Political stability/no violence (estimate):
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measured as the perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional and violent means, including domestic violence and terrorism. World Bank (WDI)

Panel E: Control Variables

Inflation	Infl	Consumer Price Index (Annual %)	World Bank (WDI)
Government Expenditure	Gov. Exp.	Government's Final Consumption Expenditure (% of GDP)	World Bank (WDI)
Economic Prosperity	GDPg	Gross Domestic Product (Annual %)	World Bank (WDI)
ICT Service Exports	ICTexp	ICT Service Exports (% of service exports, BoP)	World Bank (WDI)
Liquid Liabilities	Fdgd	Financial System Deposits (% of GDP)	World Bank (WDI)
Financial System Efficiency	FcFd	Financial System Credit on Financial System Deposits	World Bank (WDI)

WDI: World Bank Development Indicators. GDP: Gross Domestic Product. PC: Principal Component. PCA: Principal Component Analysis. Educatex is the first principal component of primary, secondary and tertiary school enrolments. ICTex: first principal component of mobile, telephone and internet subscriptions. Creditex: First PC of Private domestic credit and interest rate spread. PC: Principal Component. RL: Rule of Law. RQ: Regulation Quality. GE: Government Effectiveness. PS: Political Stability. CC: Control of Corruption. BoP: Balance of Payments.

Table 2: Summary statistics

	Mean	S.D	Min	Max	Obs.
Education (Educatex)	-0.075	1.329	-2.116	5.562	320
Information & Communication Technology (ICTex)	0.008	1.480	-1.018	8.475	765
Economic Incentives (Creditex)	-0.083	0.893	-4.889	2.041	383
Innovation (Innovex)	1.021	2.542	-0.770	8.859	102
Economic Governance (EG)	0.042	1.310	-3.276	3.376	598
Institutional Governance (IG)	-0.006	1.367	-4.196	3.310	622
General Governance (G.G)	0.105	2.075	-5.399	5.233	598
Political Stability/ No Violence	-0.557	0.958	-3.311	1.143	636
Trade Openness	77.853	39.698	17.859	275.23	719
Financial Openness (FDI)	4.221	8.451	-8.629	145.20	557
Inflation	57.556	955.55	-100.00	24411	673
Government Expenditure	4.392	12.908	-57.815	90.544	468
GDP growth	4.763	7.293	-31.300	106.28	759
ICT Service Exports	0.008	1.480	-1.018	8.475	765
Liquid Liabilities	0.251	0.214	0.001	1.054	567
Financial System Efficiency	0.755	0.423	0.137	2.606	567

S.D: Standard Deviation. Min: Minimum. Max: Maximum. Obs: Observations.

Table 3: Correlation Analysis

PolSta	Governance			Globalization		Control Variables						Knowledge Economy				PolSta
	EG	IG	GG	Trade	FDI	Inflation	Gov.Exp	GDPg	ICTexp	Fdgdg	FcFd	Educatex	ICTex	Creditex	Innovex	
1.000	0.644	0.765	0.804	0.303	0.044	-0.061	0.011	0.046	-0.230	0.422	0.038	0.293	0.377	-0.305	0.284	PolSta
	1.000	0.875	0.943	0.071	-0.100	-0.113	0.038	0.057	-0.318	0.583	0.321	0.463	0.405	-0.643	0.679	EcoGov
		1.000	0.957	0.173	0.007	-0.090	0.069	-0.013	-0.287	0.669	0.189	0.462	0.443	-0.579	0.505	InstGov
			1.000	0.148	-0.034	-0.099	0.048	0.033	-0.270	0.608	0.239	0.435	0.435	-0.606	0.574	G.Gov
				1.000	0.452	0.022	-0.049	0.125	-0.106	0.250	-0.149	0.304	0.321	0.059	-0.078	Trade
					1.000	0.011	0.125	0.197	-0.034	0.044	-0.154	0.042	0.145	0.119	-0.099	FDI
						1.000	-0.139	-0.057	-0.088	-0.053	-0.076	-0.089	0.002	0.152	-0.226	Inflation
							1.000	0.103	-0.032	-0.061	-0.009	0.035	-0.023	0.039	-0.037	Gov.Exp
								1.000	-0.148	-0.101	-0.067	0.003	-0.048	0.132	-0.117	GDPg
									1.000	-0.278	-0.056	-0.422	-0.149	0.137	-0.277	ICTexp
										1.000	0.053	0.673	0.797	-0.675	0.508	Fdgdg
											1.000	-0.038	0.069	-0.634	0.878	FcFd
												1.000	0.697	-0.541	0.652	Educatex
													1.000	-0.551	0.508	ICTex
														1.000	-0.945	Creditex
															1.000	Innovex

PolSta: Political Stability. EG: Economic Governance. IG: Institutional Governance. GG: General Governance. Trade: Trade Openness. FDI: Foreign Direct Investment. Gov. Exp: Government Expenditure. GDPg: GDP growth. ICTexp: ICT Service Exports. Fdgdg: Financial System Deposits (Liquid Liabilities). FcFd: Financial System Efficiency (Financial System Credit on Financial System Deposits). Educatex: Educational Index. ICTex: ICT index. Creditex: Economic Incentives. Innovex: Innovation Index.

4.1 Testable Hypotheses

We use three main steps to substantiate the proposition that globalization induces peace and stability, which in turn affects governance, and hence the KE. The first-stage addresses *globalization-induced peace & stability*, where stability is defined as political stability/no violence, and is instrumented with globalization. The instrumentation process we propose produces three main outcomes: *trade-induced stability*, stability induced by *financial openness*,⁶ and *globalization-induced stability*.

In the second-stage, *governance* is instrumented with *globalization-induced stability* obtained from first-stage regressions. Nine outcomes emerge from this exercise: *economic governance* as a function of *trade-induced stability*; *economic governance* as determined by stability that is induced by *financial openness*; *economic governance* as a function of *globalization-induced stability*; *institutional governance* driven by *trade-induced stability*; *institutional governance* as affected by stability based on *financial openness*; *institutional governance* as caused by *globalization-induced stability*; *general governance* as a function of *trade-induced stability*; *general governance* as influenced by stability resulting from *financial openness*, and finally *general governance* as a function of *globalization-induced stability*.

The third-stage of the estimation process deals with the KE-governance relationship. The entire estimation process reduces to the following four testable hypotheses:

Hypothesis 1: *Globalization induced stability affects governance which influences KE in terms of education.*

Hypothesis 2: *Globalization induced stability affects governance which influences KE in terms of ICT.*

⁶ We have dropped *de juré* capital openness (KAOPEN) in preference for the *de facto* (Foreign direct investment) measurement because the former has a substantially lower standard deviation.

Hypothesis 3: *Globalization induced stability affects governance which influences KE in terms of economic incentives.*

Hypothesis 4: *Globalization induced stability affect governance which influences KE in terms of innovation.*

4.2 Principal Component Analysis

A substantial body of recent literature documents constituent elements of the Knowledge Economy Index (KEI) components may be correlated with one another, see, eg., Asongu (2013a,b, 2014b) and Andrés et al (2014). Thus we address the issues of degrees of substitution and mitigate concerns related to overparameterization (and multicollinearity). Therefore, we employ principal component analysis (PCA) to address concerns over information redundancy. PCA is a widely used statistical method that consists of reducing a set of highly correlated variables into a smaller set of uncorrelated indicators called principal components (PCs) that reflect a substantial portion of information in the initial dataset. After the process, we employ the Kaiser (1974) and Jolliffe (2002) criterion for the retention of common factors. They have recommended the retention of PCs with an eigenvalue that is greater than the mean or one. The retained eigenvalues reflect eigenvectors that denote a significant proportion of the initial information or total variability.

4.2.1 Knowledge Economy Indicators

Table 4 displays the first PCs: education (*Educatex*), information and communication technology (*ICTex*) innovation (*Innovex*) and economic incentives (*Creditex*). From the table we notice consistently that the corresponding eigenvalues are greater than one, reflecting a significant amount of overall information retained: about 65%, 73%, 91% and 65% for education, ICTs, innovation and economic incentives, respectively.

Table 4: Principal Component Analysis (PCA) for Knowledge Economy Indicators

Knowledge Economy dimensions		Component Matrix (Loadings)			First PC	Eigen Value	Indexes
Education	School Enrolment	PSE 0.438	SSE 0.657	TSE 0.614	0.658	1.975	Educatex
Information & Infrastructure	ICTs	Internet 0.614	Mobile 0.584	Telephone 0.531	0.730	2.190	ICTex
Innovation System	Innovation	STJA 0.567	Trademarks 0.572	Patents 0.592	0.917	2.753	Innovex
Economic Incentive	Economic Incentive	Private Credit -0.707	Interest rate Spread 0.707		0.656	1.313	Creditex

P.C: Principal Component. PSE: Primary School Enrolment. SSE: Secondary School Enrolment. TSE: Tertiary School Enrolment. PC: Principal Component. ICTs: Information and Communication Technologies. Educatex is the first principal component of primary, secondary and tertiary school enrolments. ICTex: first principal component of mobile, telephone and internet subscriptions. STJA: Scientific and Technical Journal Articles. Innovex: first principal component of STJA, trademarks and patents (resident plus nonresident). Creditex: first principal component of private domestic credit and interest rate spread.

4.2.2 Governance Indicators

The need to minimize potential redundancy of information also applies to the governance indicators. Here we limit the concept of governance to the economic and institutional dimensions of governance only, because the political aspect of governance (political stability/no violence) is used already in the first-phase of the modeling process as apparent from the problem statement. First we obtain a *general governance* (GG) composite indicator, and then decompose it further into its economic (*government effectiveness* and *regulation quality*) and institutional (*corruption-control* and *rule of law*) dynamics. *Economic governance* (EG) is defined as the ability of government to formulate and implement policies that are conducive to economic activity as well as delivery of needed commodities. *Institutional governance* (IG) denotes the respect for citizens and the state of institutions that govern the interactions among them as well between the people and their government (Andrés et al., 2014). The Kaiser (1974) and Jolliffe (2002) criterion discussed in the preceding section is used here as well for the retention of common factors. As shown in Table 5 below, GG has an eigenvalue of 3.438 and reflects approximately 85% of information in the four governance variables (*regulation quality*, *government effectiveness*,

corruption-control, rule of law); EG represents more than 90% of variability with 1.812 as eigenvalue; and IG has a 1.871 eigenvalue representing about 93.5% of information.

Table 5: Principal Component Analysis (PCA) for Governance (Gov)

Principal Components	Component Matrix(Loadings)				Proportion	Cumulative Proportion	Eigen Value
	RQ	GE	RL	CC			
First PC (G.G)	0.478	0.514	0.514	0.493	0.859	0.859	3.438
Second PC	0.786	-0.006	-0.149	-0.601	0.078	0.938	0.314
Third PC	0.392	-0.567	-0.385	0.614	0.033	0.971	0.132
First PC (EG)	0.707	0.707	---	---	0.906	0.906	1.812
Second PC	-0.707	0.707	---	---	0.093	1.000	0.187
First PC (IG)	---	---	0.707	0.707	0.935	0.935	1.871
Second PC	---	---	-0.707	0.707	0.064	1.000	0.128

PC: Principal Component. RL: Rule of Law. RQ: Regulation Quality. GE: Government Effectiveness. CC: Control of Corruption. GG (General Governance): First PC of RQ, GE, RL & CC. EG (Economic Governance): First PC of RQ & GE. IG (Institutional Governance): First PC of RL & CC.

4.3 Estimation Technique

In light of our central claim that globalization induces peace and stability and thereby affects governance, which in turn affects KE, we adopt a three-stage step-wise empirical approach, utilizing an instrumental variable panel fixed effects estimation strategy. It is important to highlight that this strategy because it is consistent with our problem statement in that it requires the instruments to be strong, but not necessarily valid. In other words, we are more concerned with the strength of the instruments than we are with their validity for two main reasons. First, while the intuition underpinning the problem statement is strong, it has not yet been generalized into a theory. As far as we can deduce from the literature we reviewed, this is the first paper to critically engage such empirics – contrary to the common saying we admit the first cut may not be the deepest cut. Second, the problem statement by definition is not concerned about instrument validity. For instance, the first-stage that is concerned with *globalization induced stability* does not require us to prove that globalization is valid in inducing peace and stability, but that it is strong in doing so (inducing peace and stability). Hence, while the validity of globalization as an instrument for peace and stability may consolidate the intuition for the empirics, it is not an absolutely

necessary condition to validate the transition to stage-two of the estimation process. The strength of the instruments is confirmed by the overall validity of the specifications according the Fisher statistic.

The following are the three-stages of the estimation strategy:

First-stage regression:

$$Stability_{it} = \gamma_0 + \gamma_1(Trade)_{it} + \gamma_2(FDI)_{it} + \xi_t + v_{it}, \quad (5)$$

where Stability represents Political Stability/No violence, Trade is for trade openness, FDI is Foreign Direct Investment as represented by Financial Openness, and ξ_t is a time-specific constant added to account for the fixed effects.

Second-stage regression:

$$Governance_{it} = \beta_0 + \beta_1(TradeStab)_{it} + \beta_2(FDIStab)_{it} + \beta_3(GlobStab)_{it} + \xi_t + \varepsilon_{it} \quad (6)$$

where Governance entails general governance (GG), economic governance (EG), and institutional governance (IG), TradeStab stands for trade- induced political stability, FDISta represents political stability induced by financial openness, and GlobStab is globalization-induced political stability.

Third-stage regression:

$$\begin{aligned} KE_{it} = & \alpha_0 + \alpha_1(EGTradeStab)_{it} + \alpha_2(EGFDIStab)_{it} + \alpha_3(EGGlobStab)_{it} \\ & + \alpha_4(IGTradeStab)_{it} + \alpha_5(IGFDIStab)_{it} + \alpha_6(IGGlobStab)_{it} \\ & + \alpha_7(GGTradeStab)_{it} + \alpha_8(GGFDIStab)_{it} + \alpha_9(GGGlobStab)_{it} + \alpha_j X_{it} + \xi_t + \omega_{it} \end{aligned} \quad (7)$$

where *KE* is represented by education (*Educatex*), ICTs (*ICTex*), innovation (*Innovex*) and economic incentive (*Creditex*), and *X* is a vector of control variables that include *government expenditure, economic growth, inflation, liquidity liabilities, financial system efficiency and ICT service exports*. Note that it would seem (7) does not include the conventional factors of

production like labor and human and physical capital. However, these are implied by the “economic growth” variable.

Also note that vector or error terms, μ_{it} , in (1)-(4) is now explicated in (5)-(7) as v_{it} , ε_{it} and ω_{it} respectively. In a Solow (1957) production function framework $\xi_t = \alpha g t$ is a Hicks neutral Solow constant (residual) acting as a placeholder for exogenous technical change, and since $A_{it} = \exp(gt)$, such that its rate of growth is g . Our modest innovation is that KE is augmented by globalization-induced peace and stability and governance such that $A_{it} = (A_{i0} \exp(gt + \beta_i Z_{it}))^\alpha$. In that case the rate of technical change is $\alpha(g + \eta_i), \eta_i = \frac{d[\beta_i Z_{it}]}{dt} \neq 0$.

The first-stage of the estimation process entails regressing the proxies of *political stability* on the globalization indicators (separately & jointly) and then saving the fitted values for the second-stage regressions. Doing so, results in three main instrumented variables as detailed above, which are then employed in the second stage as instrumental variables.⁷ In the second-stage, governance indicators are regressed on the fitted values from first-stage to obtain governance dynamics affected by globalization induced stability. Nine main variables are obtained after the second-stage regression⁸. The third-stage uses the fitted values from the second-stage to assess the hypotheses underpinning the study. In all stages, regressions are consistent with

⁷ IVTradeStab: Trade Openness induced stability. IVFDIStab: Financial Openness induced stability.. IVGlobStab: Globalization induced stability.

⁸ IVEGTradeStab: Economic governance (EG) affected by Trade openness (Trade) induced stability (Stab). IVEGFDIStab: Economic governance (EG) affected by financial openness (FDI) induced stability (Stab). IVEGGlobStab: Economic governance (EG) affected by Globalisation(Glob) induced stability(Stab). IVIGTradeStab: Institutional governance (IG) affected Trade openness (Trade) induced stability (Stab). IVIGFDIStab: Institutional governance (IG) affected by Financial openness (FDI) induced stability (Stab). IVIGGlobStab: Institutional governance (IG) affected by Globalization (Glob) induced stability (Stab). IVGGtTradeStab: General governance (GG) affected by Trade openness (Trade) induced stability (Stab). IVGGFDIStab: General governance (GG) affected by Financial openness (FDI) induced stability (Stab). IVGGGlobStab: General governance (GG) affected by Globalization (Glob) induced stability (Stab).

Heteroscedasticity and Autocorrelation Consistent (HAC) standard errors and time fixed effects. A correlation analysis is employed to assess the degree of substitution of the fitted values obtained from second-stage regressions to mitigate overparameterization and/or multicollinearity issues that could substantially bias the signs of estimated coefficients.

We investigate a panel of 53 African countries with data from African Development indicators of the World Bank for the period 1996-2010, or roughly 795 observations. We limit the scope of the investigation to that period because the data for the political stability indicator is only available from 1996 onwards. Moreover, in the estimations we control for: *inflation*, *government expenditure*, *per capita economic prosperity*, *ICT service exports*, *liquid liabilities* and *financial system efficiency*. The choice of these control variables is consistent with Andrés et al. (2014). With the exception of inflation, we generally expect the control variables to drive KE. However, it should be noted that the expected signs are neither predictable nor known *a priori*, because the KE dimensions have distinct characteristics. For instance, *per capita economic growth* may not have the same effect on education and innovation, and least not across all countries all the time. Moreover, the presence of substantial surplus liquidity issues documented in African financial literature (Saxegaard, 2006; Asongu, 2014c) could change the expected sign of *financial efficiency* and *liquid liabilities* on *economic incentives* (credit availability). As shown in Panel E of Table 1 above, the variables and their corresponding data are clearly labeled and expressed appropriately. For example, inflation is annual percentage; ratios bank deposits for financial efficiency are ratios; per capita economic prosperity is GDP growth rate adjusted for population growth; exports are % of service exports from Balance of Payments (ICT service exports); and government expenditure and liquid liabilities are time-dynamics of current GDP.

5. Empirical Results

Following below we present the estimation results by stage, and then discuss their implications for policy and further research before we conclude.

5.1 First- and second-stage instrumentations

Table 6 below is concerned with the first- and second-stage regressions. Panel A tackles the instrumentation process whereas Panel B provides a further test for the strength of the instruments. While the procedure for testing the strength of instruments could be limited to the information criterion in Panel A (Fisher statistic) as documented in Beck et al. (2003) and Andrés & Asongu (2013), we have gone a step further to provide evidence on the strength of instruments in Panel B, because of the specific character of the problem we are addressing. Contrary to the mainstream literature, the instrumentation process is not based on Ordinary Least Squares (OLS), because the instruments are neither strong nor valid using the OLS estimator. Therefore, we substitute the basic OLS for a robust panel fixed effects procedure that would generate results with appealing information criteria on the strength of the instruments (Adjusted R^2 and Fisher statistics). As discussed above, the globalization induced political stability fitted values are employed as instrumental variables in the second-stage regressions to obtain the dynamics that determine governance.

Table 6: First and second-stage regressions (Instrumentation with panel HAC fixed effects).

Panel A: Instrumentation												
	First-stage regressions			Second-stage regressions								
	Dependent variable:			Dependent variable: institutional and economic governance								
	Globalization-induced			Governance affected by Globalization induced conflicts								
	Political Stability/No violence			Economic Governance			Institutional Governance			General Governance		
Constant	-0.574***	-0.416***	-0.532**	0.542	1.495	-0.144	3.297	0.714	0.151	2.635	1.574	0.048
	(0.000)	(0.000)	(0.010)	(0.855)	(0.271)	(0.813)	(0.372)	(0.736)	(0.840)	(0.554)	(0.433)	(0.954)
Trade	0.0004	---	0.001	---	---	---	---	---	---	---	---	---
	(0,822)		(0.537)									
FDI	---	0.001	-0.001	---	---	---	---	---	---	---	---	---
		(0.840)	(0.789)									
IVTradeStab	---	---	---	0.872	---	---	5.909	---	---	4.819	---	---
				(0.878)			(0.384)			(0.575)		
IVFDIStab	---	---	---	---	2.929	---	---	0.956	---	---	2.774	---
					(0.413)			(0.850)			(0.600)	
IVGlobStab	---	---	---	---	---	-1.520	---	---	-0.476	---	---	-1.410
						(0.346)			(0.791)			(0.528)
Adjusted R ²	0.809	0.807	0.812	0.894	0.910	0.909	0.899	0.915	0.914	0.910	0.928	0.927
Fisher	48.292***	41.82***	40.28***	92.74***	97.45***	90.95***	98.29***	104.0***	97.43***	111.5***	124.6***	115.6***
Obs	567	440	419	542	418	397	554	430	409	542	418	397
Countries	51	45	45	50	44	44	51	45	45	50	45	44

Panel B: Testing the Strength of the instruments												
Constant	0.0000	0.0000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)	(1.000)
Instrument	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
	(0.822)	(0.840)	(0.534)	(0.878)	(0.413)	(0.346)	(0.384)	(0.850)	(0.791)	(0.575)	(0.600)	(0.528)
Ajusted R ²	0.809	0.807	0.812	0.894	0.910	0.909	0.899	0.915	0.914	0.910	0.928	0.927
Fisher	48.292***	41.82***	41.28***	92.74***	97.45***	90.95***	98.29***	104.0***	97.43***	111.5***	124.6***	115.6***
Obs	567	440	419	542	418	397	554	430	409	542	418	397
Countries	51	45	45	50	44	44	51	45	45	50	45	44

IVTradeStab: Trade Openness induced stability. IVFDIStab: Financial Openness induced stability.. IVGlobStab: Globalization induced stability. *, **, ***: significance levels at 10%, 5% and 1% respectively. HAC: Heteroscedasticity and Autocorrelation Consistent

Table 7: Correlation matrix

(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	
1.000	0.996	0.996	0.902	0.890	0.891	0.974	0.965	0.965	IVEGTradeStab (1)
	1.000	0.999	0.915	0.906	0.904	0.977	0.974	0.974	IVEGFDIStab (2)
		1.000	0.913	0.902	0.903	0.976	0.972	0.973	IVEGGlobStab (3)
			1.000	0.995	0.995	0.975	0.980	0.979	IVIGTradeStab (4)
				1.000	0.999	0.967	0.977	0.976	IVIGFDIStab (5)
					1.000	0.967	0.977	0.977	IVGGlobStab (6)
						1.000	0.996	0.996	IVGGTradeStab(7)
							1.000	0.999	IVGGFDIStab (8)
								1.000	IVGGGlobStab (9)

IVEGTradeStab: Economic governance (EG) affected by Trade openness (Trade) induced stability (Stab). IVEGFDIStab: Economic governance (EG) affected by financial openness (FDI) induced stability (Stab). IVEGGlobStab: Economic governance (EG) affected by Globalisation(Glob) induced stability(Stab). IVIGTradeStab: Institutional governance (IG) affected Trade openness (Trade) induced stability (Stab). IVIGFDIStab: Institutional governance (IG) affected by Financial openness (FDI) induced stability (Stab). IVGGlobStab: Institutional governance (IG) affected by Globalization (Glob) induced stability (Stab). IVGGtTradeStab: General governance (GG) affected by Trade openness (Trade) induced stability (Stab). IVGGFDIStab: General governance (GG) affected by Financial openness (FDI) induced stability (Stab). IVGGGlobStab: General governance (GG) affected by Globalization (Glob) induced stability (Stab).

5.2 Third-stage instrumentation: Addressing multicollinearity and overparameterization

Before engaging in the third-stage regressions to analyze the main hypotheses underpinning the study, it is relevant to examine multicollinearity and overparameterization issues in the fitted values from second-stage regressions that may influence the expected signs. As shown in Table 7 there is a substantial degree of substitution among fitted values obtained from the second-stage instrumentation processes. Hence, the third-stage specifications would employ the instrumented values independently across specifications.

5.3 Third-state regressions: Investigating the four hypotheses

The results for the KE Hypothesis 1 that *globalization-induced stability affects governance which influences KE in terms of education* are reported in Table 8 below. The hypothesis is consistently validated across specifications. The positive sign is consistent with both intuition and the predictions of economic theory. In increasing order of relevance and significance the effects (3.94) of trade-induced stability on institutional governance are weakest, whereas trade-induced stability has the strongest impacts (26.66) on economic governance. Other cases fall between the two extremes. These include: general governance from trade-induced

stability (4.828); economic governance from financial openness induced stability (8.400); general governance from financial-openness-induced stability (8.870); and institutional governance from financial-openness-induced stability (25.71).

Table 8: Effects on Education (*Educatex*) with panel HAC panel fixed effects

	Dependent variable: <i>Educatex</i> (Third-Stage Regressions)								
Constant	-21.05* (0.072)	-7.889** (0.030)	-1.449 (0.000)	-2.615 (0.104)	-23.56** (0.026)	2.374 (0.272)	-4.962* (0.087)	-11.63** (0.028)	3.302 (0.298)
IVEGTradeStab	26.66* (0.068)	---	---	---	---	---	---	---	---
IVEGFDIStab	---	8.400** (0.024)	---	---	---	---	---	---	---
IVEGGloStab	---	---	0.737 (0.406)	---	---	---	---	---	---
IVIGTradeStab	---	---	---	3.937* (0.068)	---	---	---	---	---
IVIGFDIStab	---	---	---	---	25.71** (0.024)	---	---	---	---
IVIGGlobStab	---	---	---	---	---	-1.956 (0.361)	---	---	---
IVGGTradeStab	---	---	---	---	---	---	4.828* (0.068)	---	---
IVGGFDIStab	---	---	---	---	---	---	---	8.870** (0.024)	---
IVGGGlobStab	---	---	---	---	---	---	---	---	-2.109 (0.361)
Inflation	0.005 (0.671)	0.004 (0.357)	0.005** (0.013)	0.005 (0.671)	0.004 (0.357)	0.004 (0.465)	0.005 (0.671)	0.004 (0.357)	0.004 (0.465)
Gov. Expenditure	0.006** (0.028)	0.003 (0.303)	-0.002 (0.152)	0.006** (0.028)	0.003 (0.303)	0.002 (0.413)	0.006** (0.028)	0.003 (0.303)	0.002 (0.413)
GDP pcg	-0.009 (0.232)	-0.008 (0.481)	0.005 (0.506)	-0.009 (0.232)	-0.008 (0.481)	0.001 (0.888)	-0.009 (0.232)	-0.008 (0.481)	0.001 (0.888)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.936	0.946	0.985	0.936	0.946	0.944	0.936	0.946	0.944
Fisher	58.21***	63.71***	200.57***	58.21***	63.71***	60.87***	58.21***	63.71***	60.87***
Countries	31	28	28	31	28	28	31	28	28
Observations	149	125	125	149	125	125	149	125	125

IVEGTradeStab: Economic governance (EG) affected by Trade openness (Trade) induced stability (Stab). IVEGFDIStab: Economic governance (EG) affected by financial openness (FDI) induced stability (Stab). IVEGGloStab: Economic governance (EG) affected by Globalisation(Glob) induced stability(Stab). IVIGTradeStab: Institutional governance (IG) affected Trade openness (Trade) induced stability (Stab). IVIGFDIStab: Institutional governance (IG) affected by Financial openness (FDI) induced stability (Stab). IVIGGlobStab: Institutional governance (IG) affected by Globalization (Glob) induced stability (Stab). IVGGtTradeStab: General governance (GG) affected by Trade openness (Trade) induced stability (Stab). IVGGFDIStab: General governance (GG) affected by Financial openness (FDI) induced stability (Stab). IVGGGlobStab: General governance (GG) affected by Globalization (Glob) induced stability (Stab). Gov. Government. GDPpcg: GDP per capita growth. *, **, ***: significance levels at 10%, 5% and 1% respectively. HAC: Heteroscedasticity and Autocorrelation Consistent.

KE Hypothesis 2 in Table 9 holds that *globalization-induced stability affects governance, which influences KE in terms of ICT*. The estimates that are significant have the expected signs and are consistent with both commonsense and theoretical predictions. In this

case the effects on institutional governance of the stability resulting from financial openness are strongest and positive (78.64) but they are lowest at 25.68 with respect economic governance. The impact on GG from the stability induced by financial openness falls in-between (27.12) the two.

Table 9: Effects on ICT (ICTex) with panel HAC panel fixed effects

	Dependent variable: <i>ICTex</i> (Third-Stage Regressions)								
Constant	-40.98 (0.202)	-24.28*** (0.007)	7.313 (0.103)	-4.573 (0.241)	-61.02*** (0.006)	18.318 (0.117)	-9.203 (0.219)	-32.98*** (0.006)	9.940 (0.109)
IVEGTradeStab	46.329 (0.198)	---	---	---	---	---	---	---	---
IVEGFDIStab	---	25.68*** (0.006)	---	---	---	---	---	---	---
IVEGGloStab	---	---	-7.174 (0.127)	---	---	---	---	---	---
IVIGTradeStab	---	---	---	6.842 (0.198)	---	---	---	---	---
IVIGFDIStab	---	---	---	---	78.64*** (0.000)	---	---	---	---
IVIGGloStab	---	---	---	---	---	-22.89 (0.127)	---	---	---
IVGGTradeStab	---	---	---	---	---	---	8.390 (0.198)	---	---
IVGGFDIStab	---	---	---	---	---	---	---	27.12*** (0.000)	---
IVGGGloStab	---	---	---	---	---	---	---	---	-7.732 (0.127)
Inflation	0.011 (0.465)	0.022 (0.113)	0.025 (0.116)	0.011 (0.465)	0.022 (0.113)	0.025 (0.116)	0.011 (0.465)	0.022 (0.113)	0.025 (0.116)
Gov. Expenditure	0.002 (0.636)	0.006** (0.044)	0.010** (0.039)	0.002 (0.636)	0.006** (0.044)	0.010** (0.039)	0.002 (0.636)	0.006** (0.044)	0.010** (0.039)
GDP pcg	-0.051*** (0.000)	-0.077*** (0.000)	-0.058*** (0.000)	-0.051*** (0.000)	-0.077*** (0.000)	-0.058*** (0.000)	-0.051*** (0.000)	-0.077*** (0.000)	-0.058*** (0.000)
ICTservicesexport	0.102*** (0.006)	0.100** (0.010)	0.085** (0.025)	0.102*** (0.000)	0.100** (0.010)	0.085** (0.025)	0.102*** (0.006)	0.100** (0.010)	0.085** (0.025)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.777	0.817	0.809	0.777	0.817	0.809	0.777	0.817	0.809
Fisher	20.95***	25.21***	23.94***	20.95***	25.21***	23.94***	20.95***	25.21***	23.94***
Countries	28	27	27	28	27	27	28	27	27
Observations	201	185	185	201	185	185	201	185	185

IVEGTradeStab: Economic governance (EG) affected by Trade openness (Trade) induced stability (Stab). IVEGFDIStab: Economic governance (EG) affected by financial openness (FDI) induced stability (Stab). IVEGGlobStab: Economic governance (EG) affected by Globalisation(Glob) induced stability(Stab). IVIGTradeStab: Institutional governance (IG) affected Trade openness (Trade) induced stability (Stab). IVIGFDIStab: Institutional governance (IG) affected by Financial openness (FDI) induced stability (Stab). IVIGGloStab: Institutional governance (IG) affected by Globalization (Glob) induced stability (Stab). IVGGtTradeStab: General governance (GG) affected by Trade openness (Trade) induced stability (Stab). IVGGFDIStab: General governance (GG) affected by Financial openness (FDI) induced stability (Stab). IVGGGloStab: General governance (GG) affected by Globalization (Glob) induced stability (Stab). Gov. Government. GDPpcg: GDP per capita growth. *,**,***: significance levels at 10%, 5% and 1% respectively. HAC: Heteroscedasticity and Autocorrelation Consistent.

Hypothesis 3, presented in Table 10, states that *globalization-induced stability affects governance, which influences KE in terms of economic incentives*. The significant estimates

have mixed signs -- both negative and positive. While there are negative effects from FDI related estimates, the impacts are positive for globalization oriented estimates.

The positive values related to globalization induced stability are highest in regard to IG (2.33) and lowest with respect to EG (0.731), with GG falling in-between (0.788). In absolute terms, on the other hand, the negative effects of FDI-related estimates are highest in IG (-5.51) and lowest in economic governance (-1.80). GG from FDI-induced stability is in-between (-1.90). The negative effect of FDI could be explained by the fact that, contrary to trade-related activities, FDI itself is weakly associated with the issues of surplus liquidity in African financial institutions. Trade is a mutual exchange of comparative advantages; FDI flows easily when the risk-free rate of return is higher in the destination location (country) than it is in the home (source) country. In other words, while trading activities are most likely to involve borrowing from domestic banks mainly, because domestic economic operators are actively engaged, FDI activities involve foreign banks as main financial players. In this sense FDI should have limited positive impact on peace and stability, and could have a negative effect if it is driven by politics – a good example for Alesina and coauthors’ (2000) case that while trade integrates, politics disintegrates.

Table 10: Effects on Economic incentives (*Creditex*) with panel HAC panel fixed effects

	Dependent variable: <i>Creditex</i> (Third-Stage Regressions)								
Constant	3.894* (0.092)	3.030*** (0.000)	0.483 (0.298)	1.505*** (0.001)	6.308*** (0.000)	-0.939 (0.439)	1.809*** (0.007)	3.813*** (0.000)	0.142 (0.819)
IVEGTradeStab	-3.562 (0.218)	---	---	---	---	---	---	---	---
IVEGFDIStab	---	-1.802** (0.017)	---	---	---	---	---	---	---
IVEGGloStab	---	---	0.731* (0.089)	---	---	---	---	---	---
IVIGTradeStab	---	---	---	-0.526 (0.218)	---	---	---	---	---
IVIGFDIStab	---	---	---	---	-5.517** (0.017)	---	---	---	---
IVIGGloStab	---	---	---	---	---	2.334* (0.089)	---	---	---
IVGGTradeStab	---	---	---	---	---	---	-0.645 (0.218)	---	---
IVGGFDIStab	---	---	---	---	---	---	---	-1.903** (0.017)	---
IVGGGloStab	---	---	---	---	---	---	---	---	0.788*

									(0.089)
Inflation	-0.0009 (0.591)	-0.0004 (0.831)	-0.0005 (0.847)	-0.0009 (0.591)	-0.0004 (0.831)	-0.0005 (0.847)	-0.0009 (0.591)	-0.0004 (0.831)	-0.0005 (0.847)
Gov. Expenditure	0.001 (0.174)	0.0001 (0.902)	0.0001 (0.870)	0.001 (0.174)	0.0001 (0.902)	0.0001 (0.870)	0.001 (0.174)	0.0001 (0.902)	0.0001 (0.870)
GDPpcg	0.0008 (0.662)	0.002 (0.457)	0.001 (0.705)	0.0008 (0.662)	0.002 (0.457)	0.001 (0.705)	0.0008 (0.662)	0.002 (0.457)	0.001 (0.705)
Liquid liabilities	-1.731*** (0.000)	-1.944*** (0.000)	-1.956*** (0.000)	-1.731*** (0.000)	-1.944*** (0.000)	-1.956*** (0.000)	-1.731*** (0.000)	-1.944*** (0.000)	-1.956*** (0.000)
Financial efficiency	-1.158*** (0.000)	-1.236*** (0.000)	-1.267*** (0.000)	-1.158*** (0.000)	-1.236*** (0.000)	-1.267*** (0.000)	-1.158*** (0.000)	-1.236*** (0.000)	-1.267*** (0.000)
Time Effects	Yes								
Adjusted R ²	0.975	0.980	0.980	0.975	0.980	0.980	0.975	0.980	0.980
Fisher	261.09***	306.20***	304.37***	261.09***	306.20***	304.37***	261.09***	306.20***	304.37***
Countries	24	20	20	24	20	20	24	20	20
Observations	211	172	172	211	172	172	211	172	172

IVEGTradeStab: Economic governance (EG) affected by Trade openness (Trade) induced stability (Stab). IVEGFDIStab: Economic governance (EG) affected by financial openness (FDI) induced stability (Stab). IVEGGlobStab: Economic governance (EG) affected by Globalisation(Glob) induced stability(Stab). IIVIGTradeStab: Institutional governance (IG) affected Trade openness (Trade) induced stability (Stab). IIVIGFDIStab: Institutional governance (IG) affected by Financial openness (FDI) induced stability (Stab). IIVIGGlobStab: Institutional governance (IG) affected by Globalization (Glob) induced stability (Stab). IIVGGtTradeStab: General governance (GG) affected by Trade openness (Trade) induced stability (Stab). IIVGGFDIStab: General governance (GG) affected by Financial openness (FDI) induced stability (Stab). IIVGGGlobStab: General governance (GG) affected by Globalization (Glob) induced stability (Stab). Gov. Government. GDPpcg: GDP per capita growth. *,**,***: significance levels at 10%, 5% and 1% respectively. HAC: Heteroscedasticity and Autocorrelation Consistent.

The fourth, and final, KE hypothesis states that *globalization-induced stability affects governance, which influences KE in terms of innovation (Table 11). Here the effects range from the low of -14.26 to the high of 23.95*. While trade-related effects are positive, globalization-oriented estimates are negative. The positive impacts for EG are highest at 23.95, followed by GG at 4.33, and last by IG at 3.53. With regard to the negative effects, globalization-induced peace stability the largest negative effect (-14.26) on IG. EG responds least (-4.47) negatively to globalization-induced peace and stability, whereas similar effect of -4.82 on GG lie in-between. The logical inference is that, relative to FDI, trade-associated peace and stability has a weight on the KE as represented by innovation (Innovex). In other words, as globalization trade openness is a more effective mechanism for the innovation aspect of KE than FDI.

Table 11: Effects on Innovation (Innovex) with panel HAC panel fixed effects

Dependent variable: <i>Innovex</i> (Third-Stage Regressions)									
Constant	-17.197* (0.071)	-2.687 (0.773)	4.258** (0.048)	-1.785 (0.101)	-5.721 (0.782)	9.251* (0.062)	-3.745* (0.075)	-3.400 (0.777)	5.449* (0.053)
IVEGTradeStab	23.948* (0.072)	---	---	---	---	---	---	---	---
IVEGFDIStab	---	2.934 (0.790)	---	---	---	---	---	---	---
IVEGGloStab	---	---	-4.471* (0.078)	---	---	---	---	---	---
IVIGTradeStab	---	---	---	3.536* (0.072)	---	---	---	---	---
IVIGFDIStab	---	---	---	---	8.980 (0.790)	---	---	---	---
IVIGGloStab	---	---	---	---	---	-14.26* (0.078)	---	---	---
IVGGTradeStab	---	---	---	---	---	---	4.336* (0.072)	---	---
IVGGFDIStab	---	---	---	---	---	---	---	3.098 (0.790)	---
IVGGGloStab	---	---	---	---	---	---	---	---	-4.819* (0.078)
Inflation	0.006 (0.288)	0.015** (0.029)	0.010 (0.239)	0.006 (0.288)	0.015** (0.029)	0.010 (0.239)	0.006 (0.288)	0.015** (0.029)	0.010 (0.239)
Gov. Expenditure	0.001 (0.153)	0.006* (0.055)	0.004* (0.066)	0.001 (0.153)	0.006* (0.055)	0.004* (0.066)	0.001 (0.153)	0.006* (0.055)	0.004* (0.066)
GDP pcg	0.003 (0.698)	0.016 (0.321)	0.008 (0.425)	0.003 (0.698)	0.016 (0.321)	0.008 (0.425)	0.003 (0.698)	0.016 (0.321)	0.008 (0.425)
Liquid Liabilities	2.411* (0.080)	2.943 (0.130)	2.548* (0.086)	2.411* (0.080)	2.943 (0.130)	2.548* (0.086)	2.411* (0.080)	2.943 (0.130)	2.548* (0.086)
Time Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R ²	0.976	0.974	0.974	0.976	0.974	0.974	0.976	0.974	0.974
Fisher	164.98***	134.93***	139.05***	164.98***	134.93***	139.05***	164.98***	134.93***	139.05***
Countries	13	11	11	13	11	11	13	11	11
Observations	81	65	65	81	65	65	81	65	65

IVEGTradeStab: Economic governance (EG) affected by Trade openness (Trade) induced stability (Stab). IVEGFDIStab: Economic governance (EG) affected by financial openness (FDI) induced stability (Stab). IVEGGlobStab: Economic governance (EG) affected by Globalisation(Glob) induced stability(Stab). IVIGTradeStab: Institutional governance (IG) affected Trade openness (Trade) induced stability (Stab). IVIGFDIStab: Institutional governance (IG) affected by Financial openness (FDI) induced stability (Stab). IVIGGlobStab: Institutional governance (IG) affected by Globalization (Glob) induced stability (Stab). IVGGtTradeStab: General governance (GG) affected by Trade openness (Trade) induced stability (Stab). IVGGFDIStab: General governance (GG) affected by Financial openness (FDI) induced stability (Stab). IVGGGlobStab: General governance (GG) affected by Globalization (Glob) induced stability (Stab). Gov. Government. GDPpcg: GDP per capita growth. *,**,***: significance levels at 10%, 5% and 1% respectively. HAC: Heteroscedasticity and Autocorrelation Consistent.

Most of the significant control variables have the expected signs. First, government expenditure improves education. Second, ICT services and government expenditure have a positive incidence on ICT. Third, the negative relationship between the financial indicators and economic incentives confirm the predictions of economic theory as documented by the literature on the surplus liquidity issues in African financial institutions (Saxegaard, 2006).

5.4 Further discussion, policy implications and future research directions

Unlike previous studies which found globalization and governance to either have negative or positive effects on KE, ours show that globalization-induced peace and stability can have positive and negative effects on governance and KE in African countries at the same time, depending on how both globalization and governance are defined. In addition the effects are of varying strengths. One may interpret such findings as meaning that the ambitions for KE of these countries are dim, but also realistic and achievable as long as the countries continue to engage in the kind of globalization that enhances peace and stability and hence governance. The results are particularly encouraging because the positive impacts outweigh the negative ones, so that the multi-polar nature of both is consistent with the ongoing debates on globalization in general (Henry, 2007; Rodrik & Subramanian, 2009).

Given that the motivation of this paper is to extend Andrés's et al. (2014) conclusion that formal institutions of governance has affected negatively KE in 22 SSA and MENA countries, the use of additional instrumental variables of globalization, and peace and stability has revealed opposite effects. The new findings confirm the conclusion of the previous study that governance is a necessary, but not a sufficient condition, for KE in these countries during the study time period. However, the current results shed additional light on previous conclusions as they depend on whether or not globalization induces the peace and stability underlying governance. A major policy implication is that for African KEs to benefit substantially from globalization, the latter must improve the kind of 'peace & political stability' needed to initiate the positive role of governance in KE. The implication raises some concern because, relative to other world regions, Africa has had low levels of political stability (Asongu, 2014d). First, in North Africa, for example, the Arab Spring of 2011 is not yet completely over, besides the fact that it remains debatable whether or not it has created

conditions favorably to peace and stability even in the long term. Such outcome is primarily because the manner in which democracy (another requirement for peace and stability) is conceived and defined has been modified in Egypt on several occasions in the last two years alone. The political transition in Tunisia is failing to honour the terms of its social contract because of increasing political assassinations and social disruptions. Without a social contract the provision of public goods and services, including peace and stability, remains inefficient. In Libya, the law of the land since the ouster of Gaddafi is still, to a great extent, determined by the rebels who have neither joined the central government nor accepted to disarm – a very good example of rebels without a meaningful social cause. Second, in SSA the situation in South Sudan, which has just marked the third independence anniversary, remains a serious challenge to the international community, thereby clogging performance channels from globalization to peace-stability to governance and to KE. Third, the outlook is equally unclear for the Central African Republic and other areas, which have continued to be fertile grounds for political conflicts and violence over the last two decades, or longer. These conflicts have worked against effective governance thereby affecting KE by preventing globalization-induced peace and stability. More emphatically, the situation for African countries is particularly serious because out of the nine cases of complete societal breakdown known to recent history, seven have been witnessed on the continent: Burundi, Somalia, Sudan, Liberia, Sierra Leone, Zaire/Congo and Angola. The exceptions are Afghanistan and Syria.⁹

⁹ Instability has dominated the African political landscape for nearly five decades. More recently a few conflicts that have impeded progress in the region include inter alia, a series of aborted coup d'états between 1996-2003, the 2004-2007 Bush war, and the 2012 to present 'Séléka/Anti-balaka' conflicts in the CAR; the 2007/2008 post-election crises in Kenya, politico-economic strife in Zimbabwe and increasing determination of the Boko Haram to destabilize Nigeria; Burundi (1993-2005); Sierra Leone (1991-2002); Angola (1975-2002); Chad (2005-2010); Liberia (1999-2003); the Darfur crisis of Sudan; waves of conflicts in the Democratic Republic of Congo; Côte d'Ivoire with a 2002-2007 civil war followed political crisis in 2011 and; Somalia where the Al-Shabab militant group has just been defeated after over 20 decades of civil war.

We make one thing clear. Our stance in this paper, as in all our other work on this topic, is not about whether or not there is a predisposition for violence and instability in African countries. Very far from it! Our concern is that having instability where institutions for governance are exogenous and deficient is a considerable challenge for the growth of KE. The stylized facts above have shown that Africa's goal of building KEs is seriously being hampered by political violence and instability. Hence, in order to reverse the trend of the continent's low overall index of KE, which fell between 2000 and 2009 according to Anyanwu (2012), it is essential for policy to focus on improving conditions for peace & stability.

On the lighter side of things, there are fruitful pathways which African countries can exploit. For one, the negative effects of FDI estimates on economic incentives coupled with the positive weight of trade openness as a proxy for globalization on innovations are appealing as one KE pathway in these countries. This result is consistent with the surplus liquidity issues in African financial institutions documented by Saxegaard (2006). Hence, the negative effect on governance of FDI-induced stability is not unexpected, because FDI activities mainly involve foreign operators and financial institutions, often working hand-in-hand with local political elites – the 'capture state' phenomenon. Trade activities generally involve domestic financial institutions and economic operators. It follows easily then that FDI entails less domestic financial intermediation than trade openness. Second, trade openness is potentially a more appealing mechanism for innovation than FDI because it is more inclusive and less restrictive than the latter which is mostly both resource- and technology-intensive.

Finally, the results suggest a number of interesting future research directions, among them the following three. First, it would be interesting to use alternative measurements of globalization and peace & stability to test (confirm or disconfirm) the current hypotheses. The model in this paper assumed away all bi-directional causations. A second line for research

would be to explore deeper the linkages running from KE to globalization instead of the other way around. This may include a reverse exposition of *globalization-induced conflicts* or conflict-induced globalization as starting points. A third promising vein for mining is to integrate this current research into the opportunities opened up by the work of Hsiang, et. al. (2011, 2013) on climate-induced conflicts and to link both to globalization, governance and KE in developing countries.

6. Concluding Remarks

The research which this paper extends found relatively weak or negative impacts on KE of formal institutions of governance, and it concluded that formal institutions are necessary, but inadequate, determinants of KE in SSA and MENA countries. It suggested that other factors probably drive KE in this group of countries, and issued a call for further investigations into the issues. This study is a response to that call.

One key limitation of the previous research is that it did not consider the effects on KE of globalization either directly or indirectly through governance. In this paper we claim that globalization induces peace and stability, and the latter influence governance, which then affects KE. We model the claim as a three-stage process in four testable hypotheses, and estimate each hypothesis using robust estimators, which are capable of dealing with the usual statistical problems without sacrificing economic relevance and significance. The empirical evidence generated by the estimations show clearly that globalization has varying effects on peace and stability, and that the latter affects governance differently depending on what kind of globalization induces it. The analysis has many potential implications for both policy and research as discussed in the preceding section above.

A number of conclusions jump out from the analysis, including the following three. One, because the effects on governance induced by globalization defined as trade are stronger

than those resulting from globalization taken to be FDI, we conclude that FDI is not a powerful mechanism for stimulating and sustaining KE in this group of countries. Two, since globalization-induced peace and stability have both positive and negative effects on governance simultaneously, we conclude that the prospect for KE in African countries is dim, but still realistic as long as these countries continue to engage in the kind of globalization that does indeed induce peace and stability.

Improving peace and stability independent of globalization is another way to KE, but it is currently difficult, given weak or absence of institutions and ongoing conflicts. However, in situations where such conflicts are due to the distribution of either resources or the outputs resources produce, we conclude that there is a need for a sharp focus on economic and institutional governance than on general governance, which conventional economic theory has overemphasized. This suggests many possible extensions of this study. One would examine the effects of climate-induced conflicts on globalization-induced peace and stability, and the impacts of the latter on KE via governance. However, whereas we feel confident about the directions for future research, we caution against careless interpretation of this study for policy purposes.

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