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Article

Institutional strength, peacebuilding, and productive entrepreneurship: Exploratory analysis in Colombia

Verslas: Teorija ir praktika / Business: Theory and Practice

Provided in Cooperation with:

Vilnius Gediminas Technical University

Suggested Citation: Cortés-Sánchez, Julián David (2018) : Institutional strength, peacebuilding, and productive entrepreneurship: Exploratory analysis in Colombia, Verslas: Teorija ir praktika / Business: Theory and Practice, ISSN 1822-4202, Vilnius Gediminas Technical University, Vilnius, Vol. 19, pp. 88-102, <https://doi.org/10.3846/btp.2018.10>

This Version is available at:

<https://hdl.handle.net/10419/247930>

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INSTITUTIONAL STRENGTH, PEACEBUILDING, AND PRODUCTIVE ENTREPRENEURSHIP - EXPLORATORY ANALYSIS IN COLOMBIA

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Received 29 November 2017; accepted 06 March 2018

Abstract. After more than half a century of armed conflict, Colombia is moving towards a post-conflict period. National and regional strategies aimed to strengthen institutional capacities, promote productive entrepreneurship and reduce organized violence and crime, are crucial lines of action for the alleviation of current (and future) grievances among ex-combatants, and Colombian society in general. This study presents an exploratory analysis on institutional strength, peacebuilding, and productive entrepreneurship in Colombia. Three composite indices based upon international assessments or seminal studies were developed, namely: Institutional Strength Index; Building Peace Index (based on the Negative Peace Index and Positive Peace Index); and Productive Entrepreneurship Index. The results showed a significant correlation between Institutional Strength Index and Productive Entrepreneurship Index. Population is the variable with the most significant correlation with productive entrepreneurship, employment, GDP, industrial sophistication, innovation, crime and certain types of violence (sexual and domestic).

Keywords: institutions, peacebuilding, entrepreneurship, development studies, regional studies, Colombia.

JEL Classification: L26, O43, H56.

Introduction

The differences in long-term growth among and within nations are strongly influenced by institutions (Acemoglu et al. 2005, Acemoglu and Robinson 2008). Institutions are inclusive or extractive rules or norms that shape social, political, and economic interactions (Acemoglu and Robinson 2012, Hall and Taylor 1996, North 1991, Ostrom 1986, Scott 2004, Williamson 1985). In Colombia, institutions have been historically extractive (Acemoglu and Robinson 2012) producing two structural problems: 1) destructive entrepreneurship; and 2) armed conflict.

First, Baumol (1996) argued that inclusive institutions would generate productive entrepreneurship and extractive institutions would generate unproductive and destructive entrepreneurship. For instance, during 17th–18th centuries, Colombian municipalities wherein an extractive institution such as slavery was intensively enforced, continue to experience, until recent years, increased poverty, reduced school enrolment, low vaccination coverage, and reduced

provision of public goods (Acemoglu et al. 2012). Second, Collier and Hoeffler (2004) and Koubi et al. (2014) stated that the availability of renewable and non-renewable resources in a given territory has more explanatory power to determine the causes of civil wars, than grievances (e.g. inequality, lack of political rights, or ethnic and religious divisions). Nevertheless, illegal armed groups in Colombia (e.g. *Fuerzas Armadas Revolucionarias de Colombia* [FARC] or *Ejército de Liberación Nacional* [ELN]) emerged due to grievances caused by extractive institutions, such as restricted political participation (Nasi 2012). Until today, the effects of the armed conflict in Colombian people have been devastating: 218,094 deaths; 27,023 kidnappings; 1,982 massacres; and 6.9 million internally displaced persons (*Centro Nacional de Memoria Histórica* [National Center of History and Memory] 2013, UNHCR 2016).

In spite of those events, the days to come may hold a brighter but complex future though. Colombian government and the FARC, the oldest guerrilla movement in the

continent, signed a peace agreement after more than four years of negotiation; but Colombian voters rejected the referendum for peace which was proposed by the government to pursue citizens' endorsement. Currently, both government and congress are discussing strategies to enforce the peace agreement through a *fast-track* mechanism. As noted, peace-making, peacekeeping, and peace-building processes as everlasting and collective work in progress towards a desired future, are complex (Boutros-Ghali 1992, Lederach 1997) and need to include factors such as institutions and productive entrepreneurship (Lederach 1997, International Alert 2006, Mehlum et al. 2006) as crucial conditions to strengthen both peacebuilding processes and long-term growth (Rettberg et al. 2011).

To contribute to this historical moment from an empirical approach, the purpose of this study is to conduct a diagnosis in which institutional strength, peacebuilding and productive entrepreneurship are discussed 1) individually by means of a performance ranking on each topic, and 2) jointly by means of correlations. Also, this study aims to enrich the resources available for practitioners and scholars interested in key topics for (post)conflict countries/territories. To achieve this, three composite indices were constructed based upon international assessments or seminal studies, namely: 1) Institutional Strength Index; 2) Peace Building Index; and 3) Productive Entrepreneurship Index. After this introduction, we present an illustrative literature review. Next, the methodological strategy to elaborate the indices is presented. Then, the results are reported. Finally, the conclusions and limitations of the study are discussed.

1. Literature review

Colombian armed-conflict has been intensively studied by local and international scholars, national and international NGOs, multilateral organisms, and the Colombian state itself. The following review is based upon peer-reviewed articles and technical reports. The interlocking-dialogue between institutions, peacebuilding and entrepreneurship fields in Colombia, have been both interdisciplinary and fertile. First, in the field of institutions, studies have analyzed 1) the relationship between Colombian economic elites and the two most dominant parties (i.e. Liberal and Conservador) and how they influenced both the doctrine and behavior of the armed forces and the policy making processes in the 1980s and 1990s (Avilés 2001); and 2) the quality of preexisting local institutions and their influence in both collective-resistance civilians and bargaining power to push back the expansion of armed actors in civil war times (Arjona 2016). Second, in both conflict and peacebuilding fields, a prolific literature have focused on studying 3) the role of NGOs in supporting resistance to violence and oppression (Alther 2006); 4) the role

of the state in the peace and paramilitary demobilization processes (Boudon 1996, Maher and Thomson 2011); 5) the understanding of peace by young and adult men and women (Sacipa et al. 2006), the negative effects of conflict in young people (Berents 2014) and children's rights (Cameron 2000, Cook et al. 2017); 6) the effects caused by the mining sector in both insecurity and human rights violations (McNeish 2017); 7) community peace initiatives (Uraba (Burnyeat 2013), San José de Apartadó (Naucke 2017), Samaniego and Las Mercedes (Idler et al. 2015)); and 8) peace and education (Diazgranados et al. 2014, Gomez-Suarez 2017). And third, in the field of entrepreneurship, researchers have analyzed 9) the role of innovative entrepreneurship in Colombian business cycles (Aparicio et al. 2016); 10) the effect of middle class entrepreneurship and income mobility (Mejía 2014); 12) the effect of social capital in incubating firms (Castro et al. 2014); and 13) the causal effect of armed-conflict on firms exit (Camacho and Rodríguez 2012). Additionally, there are several technical reports at the departmental level related to institutions (e.g. Transparencia por Colombia [Transparency for Colombia] 2004, 2005, 2008, 20013, 2015), peacebuilding and armed conflict (e.g. Departamento Nacional de Planeación DNP [National Planning Department] 2008–2016) and entrepreneurship (e.g. Global Entrepreneurship Monitor [GEM] 2010a, 2010b, 2010c, 2010d, 2010e, 2010f). Yet each field has been analyzed and discussed independently, a discontinuation that we addressed in the following sections.

2. Methodology

2.1. Sample

The sample consists in 23 out of 32 Colombian departments due to data availability, namely: complete information for the construction of using recent data. However, the sample represents more than 95% of the national Gross Domestic Product (GDP), 93% of the national population, 93% of the municipalities, and 66% of the national territory (Figure 1). In terms of political entity characterization, a department in Colombia is equivalent to a state in the United States of America, comparatively speaking. Table 1 presents the sample of departments, population, GDP in *pesos colombianos* (Colombian peso: COP\$) and GDP per capita (GDP-PC).

The data used in this study is available in the following link <https://goo.gl/uAN7sW> or QR code.





Figure 1. Departments included in the sample (grey colored)

2.2. Institutional Strength Index – ISI

Institutions are inclusive or extractive rules/norms that shape social, political, and economical interactions. The underlining definition of inclusive institutions has several similarities with the governance concept proposed by the United Nations and the World Bank's Worldwide Governance Indicators (WGI). The United Nations define governance as:

“[...] the degree in which a country's institutions and processes are transparent. Its institutions refer to such bodies as parliament and its various ministries. Its processes include such key activities as elections and legal procedures, which must be seen to be free of corruption and accountable to the people. A country's success in achieving this standard has become a key measure of its credibility and respect in the world' (United Nations n.d.).

The WGI assessed individual governance indicators for 215 economies over the period 1996–2014 (Langbein and Knack 2010, World Bank 2002). The World Bank elaborates six indices on six dimensions (Table 2).

Table 1. Sample of the department indication population, GDP, and GDP-PC

#	Department	Population	GDP COP\$	GDP-PC COP\$
1	Antioquia	6,378,129	\$ 92,714,000,000,000	\$14,536,000
2	Atlántico	2,431,994	\$ 27,177,000,000,000	\$11,175,000
3	Bolívar	2,073,009	\$ 30,875,000,000,000	\$14,894,000
4	Boyacá	1,274,619	\$ 20,118,000,000,000	\$15,784,000
5	Caldas	986,044	\$ 10,111,000,000,000	\$10,254,000
6	Caquetá	471,541	\$ 3,203,000,000,000	\$6,793,000
7	Cesar	1,016,527	\$ 12,924,000,000,000	\$12,714,000
8	Chocó	495,158	\$ 2,988,000,000,000	\$6,034,000
9	Córdoba	1,709,603	\$ 12,135,000,000,000	\$7,098,000
10	Cundinamarca & Bogotá	10,415,887	\$ 210,228,000,000,000	\$20,183,000
11	Huila	1,188,314	\$ 12,976,000,000,000	\$10,920,000
12	Guajira	1,140,542	\$ 7,749,000,000,000	\$6,794,000
13	Magdalena	1,247,529	\$ 9,237,000,000,000	\$7,404,000
14	Meta	943,073	\$ 40,899,000,000,000	\$43,368,000
15	Nariño	1,722,947	\$ 10,743,000,000,000	\$6,235,000
16	Norte de Santander	1,344,040	\$ 11,447,000,000,000	\$8,517,000
17	Putumayo	345,204	\$ 4,284,000,000,000	\$12,410,000
18	Quindío	562,118	\$ 5,303,000,000,000	\$9,434,000
19	Risaralda	946,630	\$ 10,123,000,000,000	\$10,694,000
20	Santander	2,051,022	\$ 53,024,000,000,000	\$25,852,000
21	Sucre	843,203	\$ 5,610,000,000,000	\$6,653,000
22	Tolima	1,404,255	\$ 15,370,000,000,000	\$10,945,000
23	Valle del Cauca	4,566,894	\$ 65,630,000,000,000	\$14,371,000
	Mean	1,980,795	\$ 29,342,086,957,000	\$ 12,742,000
	SD	2,288,043	\$ 45,372,387,813,000	\$ 8,226,000
	Max	10,415,887	\$ 210,228,000,000,000	\$ 43,368,000
	Min	345,204	\$ 2,988,000,000,000	\$ 6,034,000

Source: author's based on Atlas-Colombia 2014. The currency is *peso colombiano* (Colombian peso): COP\$ in current prices.

Table 2. WGI and definitions of its dimensions

Dimensions	Definition
Voice and Accountability Index	It captures perceptions of the extent to which citizens are able to participate in choosing their government, as well as freedom of expression, freedom of association, and free media
Government Effectiveness Index	It captures perceptions of the quality of public services, the quality of civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies
Control of Corruption Index	It 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 the state "capture" by elites and private interests
Rule of Law Index	It 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, police, and the courts, as well as the probability of crime and violence
Political Stability and Absence of Violence/Terrorism Index	It captures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism
Regulatory Quality Index	It captures perceptions of a government's ability to formulate and implement sound policies and regulations that permit and promote private sector development

Source: author's based on The World Bank 2002.

This data is not available for Colombia at the departmental level. Hence, to construct the Institutional Strength Index (ISI) two data sources were considered for each dimension, namely: 1) Departmental Transparency Index (DTI) and 2) Departmental Competitiveness Index (DCI). First, the DTI is a report published by Transparency for Colombia, the national chapter of Transparency International. The DTI uses two data sources:

- Primary: 1) on-line survey filled by public servants; 2) monitoring and analyses to public entities websites and 3) practice drills by public entities on right of petition and call-centers requests.
- Secondary: information requested directly to national public entities by Transparency for Colombia.

First, the DTI aims to increase the prevention of corruption in the public sector based on three factors (Transparency for Colombia 2015): 1) visibility, 2) institutional strength, and 3) control and sanction. A reflection was expected (i.e. equivalence) of three out of six WGIs by the DTI, respectively: 1) voice and accountability, 2) government effectiveness, and 3) control of corruption.

Second, the DCI aims to facilitate prioritization and formulation of productivity and development policies and to deliver evidence for decision-making processes in both public and private sectors (Centro de Pensamiento en Estrategias Competitivas [Think-Tank for Competitive Strategies] – CEPEC and Consejo Privado de Competitividad [Private Competitiveness Council] – CPC 2014). The DCI uses the same methodology as the World Economic Forum's (WEF) Global Competitiveness Index (GCI). The WEF defines competitiveness as: "[T]he set of institutions, policies, and factors that determine the level of productivity of a country" (Global Competitiveness Report 2010 chapter 1.1,

p. 4). The DCI uses, among other, secondary data, reports, and development plans, that are available in public entities, private associations and national NGOs websites. Two sub-domains of the DCI were considered to reflect the last three WGI dimensions: 1) institutions and 2) market efficiency. The sub-domain of institutions reflects the WGI on: 1) rule of law and 2) political stability and absence of violence/terrorism. The sub-domain of rule of law reflects the WGI on 3) regulatory quality.

Table 3 summarizes the WGI, the DTI, and the DCI components used to construct the ISI. Both DTI and DCI components have multiple indicators/measures. The sources of those indicators/measures are the same as mentioned above.

The following process was conducted for the ISI calculation:

- DTI: this index was configured on a scale of 0 to 100 (100 as the highest transparency score). It was divided by ten in order to homogenize the score with the DCI scale, which was also configured in a scale of 0 to 10.
- DCI: this index and its indicators and measures were configured on a scale of 0 to 10.
- Weight: there are six WGIs. Equal weight was assigned to each dimension (1/6 each):
 - As for the DTI, it reflects three of six dimensions, thus 50 % weight.
 - As for the security and justice indicator, it reflects two dimensions, thus 33% weight.
 - As for the market efficiency, it reflects one dimension, thus 17% weight.

Variables standardization: max-min standardization was implemented. This standardization allows keeping relative distance from each department. It was configured

Table 3. WGI and its equivalences on the DTI and DCI components used to construct the ISI

WGI	Source	Factor-equivalent	Indicator		Weight in the DTI	
Voice and accountability	DTI	Visibility	Public information dissemination		30%	
			Public administration dissemination			
			Budget and financial information dissemination			
			Citizenship procedures and public services dissemination			
Government effectiveness		Institutional strength	Anticorruption policies		40%	
			Planning management			
			Ethical behaviors policies			
			Hiring management			
			Human talent management			
			Fiscal control management			
Control of corruption		Control and sanction	System of requests, complaints, claims and suggestions		30%	
			Accountability			
	Social control					
	Institutional control					
Rule of law Political stability and absence of violence/ terrorism	DCI	Sub-domain	Indicator	Measures	Weight in the DCI	
		Institutions	Security and justice	Homicides rate		20%
				Kidnapping rate		
				Extortion rate		
				Judges/100.000 p.		
				Justice efficiency		
				Judges productivity		
				Access to alternative justice mechanism		
				Contract enforcement facility		
		Regulatory quality	Market efficiency	Goods market efficiency		Commercial openness
Establishment taxes						
Establishment start-up facility						
Number of yearly taxes payment						
Property registration facility						
Construction licenses facility						
Online licenses						
Labor market efficiency	Labor formality					
	Labor participation overall rate					
	Unemployment					
Financial market development	Labor gender gap					
	Underemployment					
	Financial market coverage					
	Banking index					
			Insurance coverage			
			Saving accounts balance			

Source: author's based on CEPEC and CPC 2014, Transparency for Colombia 2015, The World Bank 2002.

in a scale of 0 to 10 (10 as the highest institutional strength). The max-min standardization was calculated as follows:

$$\text{Institutional Strength Index} = 10 \cdot \left(\frac{\text{department indicator score} - \text{minimum sample score}}{\text{maximum sample score} - \text{minimum sample score}} \right) \quad (1)$$

Table 4 presents the ISI.

Caldas, Santander, Antioquia, Risaralda, and Tolima, were the top five departments with the highest ISI score (black colored). All located in the Andean region. The bottom five departments were Chocó, Caquetá, Putumayo, Guajira, and Sucre (grey colored). The average score is 6.47, thus, nine departments of the sample (39%) were below this score.

2.3. Building Peace Index – BPI

Peacebuilding processes could be understood as the “supportive foundation for sustaining the transformation from the existing reality to redefined relationships in a commonly defined future” (Lederach 1997: 117). A simple but restricted definition of peace is the absence of

war (Institute for Economics and Peace 2015). Although peace-studies pioneer Johan Galtung (1969) distinguished two extended concepts of peace: negative peace and positive peace (Figure 2). Negative peace refers to the absence of personal violence (Ho 2007). Positive peace refers to the absence of structural and cultural violence, understood as the structural disparities for the individuals’ potential to fulfill their own basic needs and their actual fulfillment (i.e. inequality, poverty, access to public goods) (Ho 2007).

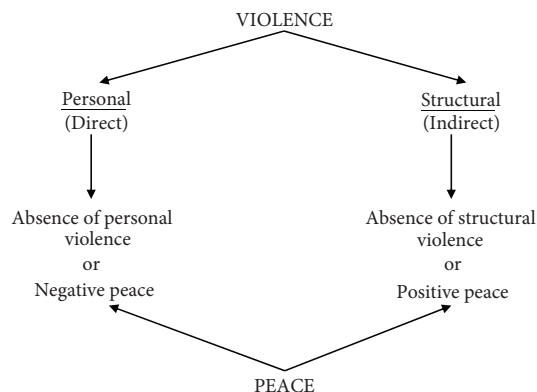


Figure 2. Extended concepts of violence and peace (source: Galtung 1969: 183)

Table 4. Calculation of the ISI

#	Departments	VA-GE-CC* (50%)	RL & PS-AV** (33%)	RQ*** (17%)	Scores weighted	ISI
1	Antioquia	8,24	5,19	5,01	6,69	9,49
2	Atlántico	5,73	4,69	3,84	5,07	5,60
3	Bolívar	5,86	4,16	3,54	4,91	5,21
4	Boyacá	7,11	5,35	4,22	6,04	7,94
5	Caldas	7,57	7,00	4,67	6,90	10,00
6	Caquetá	3,70	3,81	2,79	3,59	2,03
7	Cesar	5,78	5,88	3,54	5,44	6,49
8	Chocó	3,10	2,87	1,42	2,74	0,00
9	Córdoba	6,11	5,06	3,39	5,31	6,17
10	Cundinamarca & Bogotá	7,20	4,91	6,30	6,28	8,52
11	Huila	6,55	5,05	3,53	5,55	6,75
12	La Guajira	3,98	3,72	4,14	3,92	2,83
13	Magdalena	5,32	4,91	3,79	4,93	5,26
14	Meta	7,48	4,87	3,96	6,02	7,90
15	Nariño	6,40	6,58	3,16	5,92	7,65
16	Norte de Santander	6,95	4,51	2,99	5,48	6,58
17	Putumayo	4,27	3,41	2,91	3,76	2,44
18	Quindío	7,35	5,70	4,04	6,25	8,44
19	Risaralda	7,34	6,30	4,68	6,55	9,16
20	Santander	8,12	5,64	5,11	6,79	9,75
21	Sucre	4,97	5,76	2,70	4,86	5,08
22	Tolima	7,35	5,75	4,40	6,33	8,62
23	Valle del Cauca	7,44	3,87	3,60	5,61	6,90
					Min: 2,7	
					Max: 6,9	

Notes: * Voice and accountability, government effectiveness, control of corruption, ** Rule of law, political, stability and absence of violence/terrorism, *** Regulatory quality.

Source: author’s based on World Bank 2002, CEPEC and CPC 2014.

It is feasible to recognize, partly, the negative peace as the absence of organized violence. According to Wallensteen (Red Cross 2009) and Collier and Hoeffler (2004), there are four types of organized violence:

- Civil war (state-based): An internal conflict with at least 1.000 combat-related deaths per year. Both government forces and an identifiable rebel organization suffer at least 5% of these fatalities.
- Armed conflict (state-based): “the contested incompatibility that concerns government and/or territory where the use of armed force between two parties, of which at least one is the government of a state, results in at least 25 battle-related deaths in one calendar year” (e.g. Colombian state vs. FARC and ELN) (Department of Peace and Conflict Research 2014).
- Non-state conflict (non-state): “the use of armed force between two organized armed groups, neither of which is the government of a state, which results in at least 25 battle-related deaths in a year” (e.g. War between drug-cartels) (Department of Peace and Conflict Research 2014).
- One-sided conflict (one-sided): “the use of armed force by the government of a state or by a formally organized group against civilians which results in at least 25 deaths in a year” (e.g. *Falsos positivos*) (Department of Peace and Conflict Research 2014).

Considering the definitions above, five measurements for the Peace Building Index (PBI) were considered. Table 5 presents the events and the corresponding definitions in the Colombian setting.

The majority of organized violence events affect rural areas. Other categories of personal violence and insecurity

events caused by organized/common crime, sexual abuse, and domestic violence for both urban and rural contexts should be considered. Table 6 shows additional events considered for the PBI. At first glance, it would be feasible to associate the events and definitions in Table 5 with the negative peace concept. The events in Table 6 are related to positive peace, considering that Ching-Chi and Pugh (1993) meta-analysis established a strong association between poverty and income inequality (i.e. forms of structural violence) and violent crime (e.g. homicide, assault, rape, and robbery). Events and measures in Table 5 were used to construct the Negative Peace Index (NPI), whilst events and measures in Table 6 were used to construct the Positive Peace Index (PPI). The PBI is the sum of both indices, 50% each.

The following process was conducted to calculate the NPI:

- Measures related to number of terrorist attacks, people displaced by violence, deaths in conflict-related events, selected homicides, and massacres for each

Table 6. PBI – Events II

Events
Bank robbery
Automobile robbery
Cell-phone robbery
Theft to commercial establishments
Assaults
Residential burglary
Sexual assault
Domestic violence

Source: author's based on information of the National Ministry of Defense and National Police 2014.

Table 5. PBI– Events and Definitions – I

Events	Definition
Terrorist attacks	Random attacks using explosives against public spaces with a high devastation or lethality potential.
Internally displaced by violence	“All people forced to migrate within the national territory, abandoning their place of residence or habitual [...] economic activities because their lives, physical integrity, security, or personal freedom have been made vulnerable or were directly threatened due to any of the following situations: internal armed conflict, internal disturbances and tensions, generalized violence, massive human rights violations, infractions of international humanitarian law, or other circumstances emanating from the abovementioned situations that cause potential or actual drastic alterations in public order” (National Congress 1997)
Deaths in conflict-related events	Civilians and combatants killed in conflict actions caused by the violation of the principle of proportionality in the use of force, the use of illicit means and methodologies, and the prevalence of <i>military necessity</i> over the humanitarian principle.
Selected homicides	Intended homicide of three individuals or fewer in defenseless conditions by actors of the armed conflict occurred at the same time, in the same place, and following the same procedures
Massacres	Intended homicide of at least four individuals in defenseless conditions by actors of the armed conflict occurred at the same time, in the same place, and following the same procedures. These homicides are executed in the presence of others as a terror act

Source: author's based on data of National Center of History and Memory 2013, *Congreso Nacional de la República de Colombia* [National Congress] 1997.

department were consulted. The sources were the National Center of History and Memory (terrorist attacks, deaths in conflict-related events, selected homicides, and massacres) for 2012, and *Unidad de Víctimas* (National Victims Unit) (people displaced by violence) for 2014.

- Variables standardization: each measure was standardized into a 100.000/habitants scale according to the following formula:

$$\text{Negative Peace Measure (NPM)} \frac{100.000}{\text{habs}} \text{scale} = \left(\frac{\text{NPM}}{\text{department's population (2014)}} \right) \cdot 100.000. \quad (2)$$

Source: Crime and violence indicators of the Organization of American States 2011.

- Variables standardization: inversed max-min standardization was implemented. This standardization allows keeping relative distance from each department. It was configured in a scale of 0 to 10. Inversed max-min standardization was calculated as follows:

$$\text{NPM} \frac{100.000}{\text{habs}} \text{inversed max_min standardization} = 10 - \left(\frac{\text{NPM} / 100.000 \text{habs} - \text{minimum sample score}}{\text{maximum sample score} - \text{minimum sample score}} \right) \cdot 10. \quad (3)$$

- Weight: five events were considered. Equal weight was assigned to each dimension (1/5 each).
- Variables standardization: after the weighted sum of each max-min standardized negative peace measure max-min standardization was implemented (as in Equation 1).

Table 7 shows the NPI.

Table 7. Calculation of the NPI

#	Departments	Total					100.000/habs.					Inversed max-min standardized (1/5 each)					Weighted	NPI	
		T*	D**	Dth***	H****	M*****	T	D	Dth	H	M	T	D	Dth	H	M			
1	Antioquia	85	30.967	2	15	15	85	485,5	0	0,2	0,2	0	8,6	9,8	9,1	5,5	6,6	4,9	
2	Atlántico	2	819	0	1	0	2	33,7	0	0	0	9,8	10	10	9,8	10	9,9	10	
3	Bolívar	8	8.248	1	14	0	8	397,9	0	0,7	0	9,1	8,9	9,6	7,5	10	9	8,6	
4	Boyacá	3	635	0	2	0	3	49,8	0	0,2	0	9,6	9,9	10	9,4	10	9,8	9,8	
5	Caldas	4	1.258	0	1	0	4	127,6	0	0,1	0	9,5	9,7	10	9,6	10	9,8	9,8	
6	Caquetá	28	13.756	6	2	0	28	2.917,20	1,3	0,4	0	6,7	1,3	0	8,4	10	5,3	2,9	
7	Cesar	9	3.949	0	1	0	9	388,5	0	0,1	0	8,9	8,9	10	9,6	10	9,5	9,4	
8	Chocó	18	16.633	0	10	0	18	3.359,10	0	2	0	7,9	0	10	2,5	10	6,1	4,1	
9	Córdoba	0	10.059	0	5	0	0	588,4	0	0,3	0	10	8,3	10	8,9	10	9,4	9,3	
10	Cundinamarca & Bogotá	9	1.842	0	3	0	9	17,7	0	0	0	8,9	10	10	9,9	10	9,8	9,8	
11	Huila	4	8.622	0	3	0	4	725,6	0	0,3	0	9,5	7,9	10	9,1	10	9,3	9	
12	La Guajira	45	4.079	0	3	0	45	357,6	0	0,3	0	4,7	9	10	9	10	8,5	7,9	
13	Magdalena	3	7.334	0	1	0	3	587,9	0	0,1	0	9,6	8,3	10	9,7	10	9,5	9,4	
14	Meta	62	4.548	0	25	4	62	482,3	0	2,7	0,4	2,7	8,6	10	0,1	1,9	4,7	1,9	
15	Nariño	70	32.181	3	36	9	70	1.867,80	0,2	2,1	0,5	1,8	4,5	8,6	2,2	0	3,4	0	
16	Norte de Santander	55	8.743	1	36	0	55	650,5	0,1	2,7	0	3,5	8,1	9,4	0	10	6,2	4,3	
17	Putumayo	76	7.924	0	0	0	76	2.295,50	0	0	0	1,1	3,2	10	10	10	6,8	5,3	
18	Quindío	1	807	0	3	0	1	143,6	0	0,5	0	9,9	9,6	10	8	10	9,5	9,4	
19	Risaralda	0	1.838	0	3	0	0	194,2	0	0,3	0	10	9,5	10	8,8	10	9,7	9,6	
20	Santander	3	2.030	0	14	0	3	99	0	0,7	0	9,6	9,8	10	7,5	10	9,4	9,2	
21	Sucre	0	2.611	0	1	0	0	309,7	0	0,1	0	10	9,1	10	9,6	10	9,7	9,7	
22	Tolima	13	10.923	0	1	0	13	777,9	0	0,1	0	8,5	7,7	10	9,7	10	9,2	8,9	
23	Valle del Cauca	16	59.074	0	4	8	16	1.293,50	0	0,1	0,2	8,1	6,2	10	9,7	6,6	8,1	7,2	
							Min	0	17,7	0	0						Min	3,4	
							Max	85	3.359,1	1,3	2,7	0,5					Max	9,9	

Notes: *T: Terrorist attacks, **D: Displaced by violence, ***Dth: Deaths in conflict-related events, **** H: Selected homicides (#victims), ***** M: Massacres (#victims).

Source: author's based on data from National Center of History and Memory 2013, National Victims Unit 2014, *Departamento Administrativo Nacional de Estadística DANE* [National Statistics Department] 2014.

Atlántico, Boyacá, Caldas, Cundinamarca and Bogotá, and Sucre were the top five departments with the highest NPI score. The bottom five departments were Nariño, Meta, Caquetá, Chocó, and Norte de Santander. The average score is 7.4, thus, eight departments of the sample (34%) were below this score.

The following process was conducted to calculate the PPI:

- Measures related to bank robbery, automobile robbery, cell-phone robbery, theft to commercial establishments, assaults, residential burglary and theft, sexual assault, and domestic violence were consulted for each department. The source was the National Ministry of Defense and National Police for 2014.
- Each measure was standardized into 100,000/inhabitants scale (2).
- Variables standardization: inversed max-min standardization was implemented. It was configured in a scale of 0 to 10 (3).

- Weight: eight events were considered. Equal weight was assigned to each dimension (1/8 each).
- Variables standardization: after the weighted sum of each inversed max-min, max-min standardization was implemented (1).

Table 8 shows the PPI calculation.

Huila, Bolívar, Córdoba, Nariño, and Putumayo were the top five departments with the highest PPI score. The bottom five departments were Meta, Risaralda, Quindío, and Guajira. The average score is 6.72, thus, nine departments of the sample (39%) were below this score. Table 9 presents the BPI. The following process was conducted to calculate the BPI:

- Weighting: the BPI is the weighted sum of the NPI and the PPI. Both were weighted as 50%.
- Variables standardization: max-min standardization was implemented (1).

Table 8. PPI Calculation

#	Departments	Inversed min-max standardized (1/8 each)								Weighted	PPI
		BR*	AR**	CR***	CER****	A ^	HR^^	SA^^^	DV^^^^		
1	Antioquia	8,03	3,73	7,29	7,1	7,37	9,74	9,89	7,27	7,55	8,49
2	Atlántico	0,31	6,55	2,41	7,71	3,64	8,91	5,04	7,25	5,23	5,16
3	Bolívar	6,21	9,64	7,82	8,56	8,83	9,97	8,87	8,84	8,59	9,99
4	Boyacá	7,53	9,48	7,15	6,46	5,85	6,01	6,26	3,03	6,47	6,94
5	Caldas	10	9,15	4,77	9,02	2,97	8,31	6,05	8,37	7,33	8,17
6	Caquetá	10	9,38	4,62	4,75	5,08	3,69	6,89	7,02	6,43	6,88
7	Cesar	6,91	6,74	6,76	7,91	4,95	8,78	10	10	7,76	8,78
8	Chocó	10	10	7,32	10	7,67	4,08	5,44	9,21	7,96	9,08
9	Córdoba	7,24	9,71	7,8	7,78	8,03	8,8	8,28	9,3	8,37	9,66
10	Cundinamarca & Bogotá	3,51	4,32	5,45	4,65	1,72	7,08	9,88	6,61	5,4	5,41
11	Huila	10	10	10	9,04	10	10	0,8	8,97	8,6	10
12	La Guajira	5,87	9,12	3,41	5,58	3,43	3,98	0,03	3,48	4,36	3,92
13	Magdalena	7,48	9,51	5,1	5,99	7,47	8,52	6,95	7,62	7,33	8,17
14	Meta	0	8,31	0	1,97	0	0	0,02	2,79	1,64	0
15	Nariño	9,09	6,77	7,25	9,07	6,99	9,37	8,46	8,66	8,21	9,43
16	Norte de Santander	10	7,39	7,37	6,91	6,79	8,59	4,36	1,98	6,67	7,23
17	Putumayo	10	9,5	6,98	7,43	8,98	7,59	4,83	8,54	7,98	9,11
18	Quindío	7,2	8,12	0,16	1,77	0,06	0,64	4,57	9,11	3,96	3,33
19	Risaralda	6,68	7,23	4,64	0	2,23	5,49	0	0,93	3,4	2,53
20	Santander	8,47	9,44	4,17	5,5	1,21	6,65	0,66	0	4,51	4,13
21	Sucre	8,14	9,77	2,58	8,92	3,55	7,5	4,2	7,83	6,56	7,07
22	Tolima	8,88	8,81	4,37	4,82	4,3	4,15	7,61	6,4	6,17	6,51
23	Valle del Cauca	7,93	0	4,56	6,7	1,69	8,39	4,21	5,04	4,81	4,56
									Min	1,64	
									Max	8,6	

Notes: *BR: Bank robbery, **AR: Automobile robbery, ***CR: Cell-phone robbery, ****TCE: Theft to commercial –establishments, A^: assaults, RB^^: Residential burglary, SA^^^: Sexual assault, DV^^^^: Domestic violence.

Sources: author's based on data of the National Ministry of Defense and National Police 2014, DANE 2014.

Table 9. BPI Calculation

#	Departments	PPI	NPI	Weighted (50% each)	BPI
1	Antioquia	8,49	4,90	6,69	6,70
2	Atlántico	5,16	10,00	7,58	7,73
3	Bolívar	9,99	8,60	9,29	9,73
4	Boyacá	6,94	9,82	8,38	8,66
5	Caldas	8,17	9,77	8,97	9,36
6	Caquetá	6,88	2,89	4,88	4,58
7	Cesar	8,78	9,35	9,07	9,47
8	Chocó	9,08	4,09	6,59	6,57
9	Córdoba	9,66	9,27	9,47	9,93
10	Cundinamarca & Bogotá	5,41	9,78	7,59	7,74
11	Huila	10,00	9,05	9,52	10,00
12	La Guajira	3,92	7,89	5,90	5,77
13	Magdalena	8,17	9,41	8,79	9,14
14	Meta	0,00	1,92	0,96	0,00
15	Nariño	9,43	0,00	4,72	4,39
16	Norte de Santander	7,23	4,30	5,77	5,61
17	Putumayo	9,11	5,29	7,20	7,28
18	Quindío	3,33	9,37	6,35	6,29
19	Risaralda	2,53	9,61	6,07	5,97
20	Santander	4,13	9,17	6,65	6,64
21	Sucre	7,07	9,73	8,40	8,69
22	Tolima	6,51	8,88	7,69	7,86
23	Valle del Cauca	4,56	7,25	5,91	5,77
			Min	0,96	
			Max	9,52	

Source: author's based on the Negative Peace Index (Table 7) and the Positive Peace Index (Table 8).

Huila, Cordoba, Bolívar, Cesar, and Caldas were the top five departments with the highest PBI score. The bottom five departments were Meta, Nariño, Caquetá, Norte de Santander, and Guajira. The average score is 7.13, thus, eleven departments of the sample (47%) were below this score.

2.4. Productive Entrepreneurship Index – PEI

The concept of productive entrepreneurship was based on Schumpeter's (1942) ideas. The key mechanism for economic development is *creative destruction*. This process is both continuously disturbed and boosted by the actions of entrepreneurs through new combinations, such as: 1) the introduction of new products/services, or its improvement in terms of quality, 2) a new production method, 3) new markets, 4) new sources of suppliers, and 5) the (re)organization of an industry. When it happens as a cascading process, thus, it generates *creative destruction* (Klimek et al. 2012). Table 10 shows the two measures considered to construct the Productive Entrepreneurship Index (PEI), namely: employments/number of establishments; and sector complexity.

The following process was conducted to calculate the PEI:

- Measures related with employment/number of establishments and sector complexity were consulted for each department. The main source was Atlas-Colombia for 2014.
- Variables standardization: max-min standardization was implemented. It was configured in a scale of 0 to 10 (1).
- Weight: two measures were considered. Equal weight was assigned to each measure (1/2 each).
- Variables standardization: after the weighted sum of each standardized max-min productive entrepreneurship measure, max-min standardization was implemented (1).

Table 11 presents the PEI.

Table 10. The PEI: measures and definitions

Measurement	Definition
Employments/Number of establishments	The number of legal establishments registered on the chambers of commerce is not a good proxy of productive entrepreneurship. Among other aspects, these establishments must generate legal employment. Albeit, in several departments a higher number of registered establishments generate less employment than expected (e.g. Cundinamarca and Bogotá have 232.226 establishments while Valle del Cauca has 65.000, although the employment/number of establishments coefficient in Valle del Cauca is 12.27 whilst in Cundinamarca and Bogotá it is 11.73).
Sector Complexity Index	This index calculates the amount of capabilities required by a specific sector to operate. This measure considers all productive sectors generating employment, included the service and public sectors. A sector is <i>complex</i> if it requires a high level of <i>productive know-how</i> , where many individuals with highly specialized knowledge work in large companies. This index was proposed and elaborated by Atlas-Colombia (2014)

Source: author's based on Atlas-Colombia 2014.

Table 11. Calculation of the PEI

#	Departments	Employment/ Establishments	Sector Complexity Index	Max-Min standardized		Weighted	PEI
				Emp/Estab	Sector Complexity Index		
1	Antioquia	11,58	0,81	8,81	9,57	14,48	9,57
2	Atlántico	10,22	0,54	6,44	5,71	9,43	5,66
3	Bolívar	9,95	0,48	5,97	4,86	8,34	4,82
4	Boyacá	6,63	0,45	0,20	4,43	5,03	2,25
5	Caldas	8,19	0,56	2,91	6,00	7,95	4,52
6	Caquetá	7,60	0,2	1,88	0,86	2,30	0,14
7	Cesar	7,72	0,18	2,09	0,57	2,12	0,00
8	Chocó	10,66	0,14	7,21	0,00	4,10	1,54
9	Córdoba	7,56	0,25	1,83	1,57	2,98	0,67
10	Cundinamarca & Bogotá	11,73	0,84	9,06	10,00	15,03	10
11	Huila	7,76	0,28	2,16	2,00	3,58	1,13
12	La Guajira	8,58	0,18	3,59	0,57	2,87	0,58
13	Magdalena	7,26	0,23	1,29	1,29	2,43	0,24
14	Meta	9,98	0,25	6,02	1,57	5,08	2,30
15	Nariño	8,10	0,25	2,75	1,57	3,45	1,03
16	Norte de Santander	6,51	0,36	0,00	3,14	3,64	1,18
17	Putumayo	9,52	0,19	5,22	0,71	3,82	1,32
18	Quindío	8,13	0,37	2,81	3,29	5,19	2,38
19	Risaralda	8,05	0,57	2,67	6,14	7,98	4,54
20	Santander	7,65	0,45	1,97	4,43	5,92	2,94
21	Sucre	6,62	0,29	0,18	2,14	2,73	0,48
22	Tolima	6,66	0,31	0,26	2,43	3,06	0,73
23	Valle del Cauca	12,27	0,77	10	9	14,50	9,59
	Max	12,27	0,84		Max	15,03	
	Min	6,51	0,14		Min	2,12	

Source: author's based on Atlas-Colombia 2014.

Cundinamarca and Bogotá, Valle del Cauca, Antioquia, Atlántico, and Bolívar were the top five departments with the highest PEI. The bottom five departments were Cesar, Caquetá, Magdalena, Sucre, and Guajira. The average score is 2.94, thus, 15 departments of the sample (65%) were below this score.

3. Results and discussion

Table 12 shows the correlation between the ISI, the BPI, and the PEI.

There was a significant correlation ($p < 0.05$) between the ISI and the PEI. In a second look, population had a significant correlation ($p < 0.01$) with: 1) PEI; 2) GDP; 3) market efficiency (i.e. an ISI sub-domain (Table 3)); and 4) measures considered for the PPI (i.e. bank robbery, automobile robbery, cell-phone robbery, et seq.). In contrast, the BPI showed no correlation with ISI or PEI.

As previously stated, Baumol (1996) and Acemoglu and Robinson (2012) argued that inclusive institutions such as private property rights and incentives for entrepreneurial activities boost long-term growth. The strongest institutions were identified in the Andean region departments, thus, institutional strength allocation is shaped as a center-periphery structure. The causal effect is historical. For instance, whilst in regions where extractive institutions (i.e.

Table 12. Correlation between ISI, BPI, and PEI

			Correlations		
Indices	Mean	SD	ISI	BPI	PEI
ISI	6,4	3	1		
BPI	7,1	2	0,015	1	
PEI	2,9	3	0,414*	-0,037	1

Source: author's calculated by means of SPSS.

slavery) were implemented centuries ago for minerals extraction (i.e. Pacific region: Nariño, Valle del Cauca, Cauca and Chocó) currently disclose high poverty and low school enrolment, vaccination coverage and public goods provision (Acemoglu et al. 2012), regions with no mineral abundance (e.g. Santander) had to bolster and incentivize other economic activities such as the handicrafts sector (Cepeda and Meisel 2013). Currently, Santander has the highest GDP per capita. The relationship between institutions and entrepreneurship has also been discussed in several transnational studies. Based on data from 42 countries, Estrin and colleagues (2013) stated that growing entrepreneurs benefit from property rights enforcement and a smaller government (i.e. absence of cumbersome regulatory institutions that increase transaction cost), but are constrained by corruption, an informal and extractive institution. By studying high-impact Schumpeterian entrepreneurs, Henrekson and Sanandaji (2014) argued that countries with higher income, higher trust, lower taxes, more venture capital investment, and lower regulatory burdens have higher rates of high-impact entrepreneurship. To our knowledge, there are few studies on the relationship between institutional strength and productive entrepreneurship in Colombia in recent years (see Cepeda and Meisel (2013) and GEM 2013 for technical reports). Therefore, we considered these findings as an exploratory contribution to both fields.

Regarding the relationship between population and creative destruction growth, Jones and Romer (2009) found that innovation as the result of coming up with new ideas is proportional to population. Also, Bettencourt et al. (2007) found a supralinear effect whereby new patents were granted in larger urban areas that show increasing returns due to the creative thinking activity contrasted with the population size. In Colombia, the top five departments with the highest population produced 84% of all the patents registered during 2005–2014 (*Observatorio Colombiano de Ciencia y Tecnología OCyT* [Colombian Observatory of Science and Technology] 2015). In the Colombian peer-reviewed literature, Galvis (2015) recently found an association between demographic growth and economic growth (i.e. savings: public goods, education, health and sanitation) during 1985–2012. We added evidence to this discussion from the productive entrepreneurship perspective (i.e. employments/number of establishments, and sector complexity). Regarding the relationship between population and crime, Bettencourt et al. (2010) found that cities are the centers of innovation and wealth, but also, the centers of crime, both approximately at the same degree (Goldstone 2002, Nolan 2004). In Colombia, the demographic and economic development previously discussed by Galvis (2015) also came with the intensification of crime in the main cities. As the urbanization process have not been organized and millions of displaced persons have been migrating to cities, the capacity

of cities to keep up with an increasing demand for public services, safety and formal economic opportunities for low-skilled workforce, is insufficient (Gaviria and Pagés 2002). We added evidence to those claims by considering several modalities of crime and other type of violence (i.e. sexual assaults and domestic violence).

Additionally, the data showed no correlation between BPI and ISI nor PEI, which can be discussed in a more specific sense. For instance, we found a negative (−0.2) non-significant correlation between the PPI (one of the BPI components) and the PEI. Among the departments analyzed, those of Guajira, Quindío, Risaralda, Santander and Meta scored among the bottom five in the PPI. Four out of five of those same departments, figured into the top ten of the PEI. Seeing that, those departments with a higher rate of occurrence of events such as robbery, sexual assault and domestic violence, also figured into the top ten of sector complexity and job creation. Nevertheless, these observations were not consistent with those previously stated on the relationship between population and creative destruction (Bettencourt et al. 2010) given that just Santander, with ≈2 million inhabitants, was above the population mean of ≈1.9 million; the population mean of the rest of departments mentioned in this instance was just ≈0.6 million.

Further studies would seek to: 1) conduct a deeper analysis on historical background (i.e. longitudinal data) for each region; 2) include all departments in the sample; and 3) consider other variables to comprehend the intuitive but absent relationship between institutional strength and peacebuilding, and peacebuilding and productive entrepreneurship.

Conclusions

In Colombia, institutions have been historically extractive, producing destructive entrepreneurship and armed conflict. In this study, we conducted a multi-departmental diagnosis in which institutional strength, peacebuilding and productive entrepreneurship were conjointly discussed. The results showed a significant correlation between institutional strength and productive entrepreneurship, and between population and productive entrepreneurship, GDP, market efficiency and measures contemplated in the PPI. Strong and inclusive institutions encourage the creation of formal jobs property rights and market efficiency. This was consistently found in departments from the Andean region, where the majority of the main cities are located. New opportunities in the main cities and armed conflict intensification boosted rural-urban migration, but the inability of an organized city planning constrains the public goods coverage and safety, and adequate formal employment opportunities, as the organized/common crime is searching for new members looking for every day essentials.

Beyond the findings supported by (inter)national peer-reviewed literature and technical reports, this study: 1) contributes to the few studies on the relationship between institutional quality and productive entrepreneurship in recent years; and 2) added more detailed evidence and support to the studies related to population and economic-innovation development and population, crime and violence, in the Colombian context.

Finally, as this exploratory analysis used composite indices and correlations, results cannot be interpreted as cause-effect conclusions: correlation does not imply causality. This limitation could be addressed by solving problems related to reverse causality and omitted variable, and gathering and discussing data produced from different disciplines and methodologies to enrich comparative analyses.

Acknowledgments

Thanks to both reviewers and their suggestions to improve this manuscript.

Funding

This study was not funded.

Contribution

This study was conducted by the lead-author himself.

Disclosure statement

The author have no conflict of interest to declare.

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