Violence and Economic Complexity: Linking the Sophistication of the Productive Structure to the Cross-country Violence Conditions

Laís Fernanda da Silva de Souza[1]

Universidade Federal do Paraná

Resumo - Estudos têm enfatizado o papel da estrutura produtiva em influenciar as condições de paz e violência dos países, relacionando a ausência de diversificação econômica e a dependência em recursos naturais como as principais causas das guerras civis. Contudo, pesquisas dedicadas a entender a relação entre estrutura produtiva e a violência cotidiana são escassas e também reforçam os efeitos da dependência em recursos naturais, desconsiderando os impactos da produção de outros produtos nos níveis de violência dos países. Neste artigo, é analisada a relação entre o mix de produtos produzidos e exportados pelos países e as suas diferenças nas taxas de homicídios. O Índice de Complexidade Econômica (ECI, na sigla em inglês) é utilizado para capturar a sofisticação das capacidades produtivas dos países, fornecendo uma medida de comparação das diferenças nas oportunidades socioeconômicas disponíveis. A análise empírica usando dados em painel não-balanceado para 91 países entre 2000 e 2019 sugere que a sofisticação da estrutura produtiva primeiro aumentaria e, em seguida, diminuiria os homicídios, descrevendo uma relação em formato de U invertido entre complexidade econômica e violência. Embora ainda inconclusiva, esta pesquisa contribui para a compreensão de como a sofisticação econômica pode impactar o bem-estar da sociedade por meio de seus efeitos na violência.

Palavras-chave: Complexidade econômica; Violência; Homicídios; Diversificação econômica.

Abstract - Studies have emphasized the role of the productive structure in influencing the conditions of peace and violence in countries, placing the absence of economic diversification and dependence on few natural resources as the main causes of civil wars. However, research dedicated to understanding the relationship between productive structure and day-to-day violence is scarce and also reinforces the effects of natural resources' dependence, disregarding the impacts of the production of other products on countries' violence levels. In this article, I advance by exploring the connection between the mix of products produced and exported by countries and its differences in homicide rates. The Economic Complexity Index (ECI) is used to capture the sophistication of productive capabilities, providing us a measure for comparing the differences in socio-economic opportunities between countries. Empirical analysis with panel data from 91 countries between 2000 and 2019 suggests that sophistication of the productive structure would first increase and then decrease homicides, describing an inverted U-shaped relationship between economic complexity and violence. Although still inconclusive, this research contributes to understanding how economic sophistication impacts society's well-being through its effects on the prevalence of violence.

Keywords: Economic complexity; Violence; Homicides; Economic diversification.

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[1] Contact: lais.fssouza@ufpr.br

1. INTRODUCTION

For many countries, violence is not a temporary problem in an otherwise prosperous development path. Violence is a by-product of the development process that compromises human safety and dignity in many ways.

Many authors have attempted to explore the causes of the prevalence of violence. The economic literature on armed conflicts has highlighted the role of the productive structure on the risks of armed conflicts. This strand of the literature emphasizes that countries with poorly diversified economies and highly dependent on few primary resources are more prone to armed violence than diversified economies. Collier & Hoeffler (2004a) calculate the effect of commodities exports dependence on civil wars. The authors find that the relationship between primary commodities exports and civil wars is non-linear, with the risk of a civil conflict peaking when commodity exports reach 33% of GDP. At this level of dependence, the risk of an armed conflict reaches approximately 22%. In contrast, in a country that has not exported primary commodities, a civil war risk is only 1%. Dependence on commodity exports can make a country vulnerable to violence since natural resources are the main source of financing for armed conflicts (Bannon & Collier, 2003).

While there is a substantial body of evidence highlighting the impacts that the productive structure has on the risks of civil wars and conflicts between states, few studies are analyzing the effects that the productive structure has on a violent phenomenon even more recurrent than civil wars: homicides. Homicide is a phenomenon present to a greater or lesser degree in most societies. Only in 2019, homicides killed over 474,000 people around the world.

Studies dedicated to understanding the link between productive structure and the incidence of homicides focus on the effects that natural resources' dependence has on homicide rates. By analyzing data from 65 countries between 1890 and 1990, Baier & Baten (2017) demonstrate that high silver production contributes to increased violence, particularly in the presence of autocratic regimes. The authors find that highly dependence on mining resources not only increases the risks of civil wars but also raises the risk of everyday violence. Galeano (2012) stresses that the extraction of gold and silver in Latin America has been accompanied by violence since the colonization period. Berman et al. (2017) documented how the exploitation of areas rich in mineral resources in Africa by criminal groups has led to an escalation of violence across the continent.

The existing literature has been based mainly on simple aggregate measures of the productive structure's composition (e.g., the share of commodity exports regarding GDP) and has focused on the role of primary commodities exports to quantitatively assess the effects of the economic diversification on violence levels. However, by focusing only on the dependence on natural resources, the literature keeps the discussion open about the impacts of the production and export of other products on countries' violence conditions.

This research advances in relation to previous studies by postulating a relationship between the broader set of goods produced and exported by a country and its levels of violence. In particular, I argue that producing and exporting a greater diversity of sophisticated products is associated with lower homicide rates. To measure economic sophistication, I employ the Economic Complexity Index (ECI) as developed by Hausmann and Hidalgo. The ECI provides us a measure for comparing the differences in countries' productive capabilities and socio-economic opportunities. The emergence of new sophisticated products and economic activities contribute to qualitative changes in societies. Greater economic variety provides many social and economic possibilities to people, offers new occupational choices, better and well-paid jobs, access to networks of social and economic relationships that provide better social inclusion. All this favors the development of a place where violence is not a profitable choice. In this sense, economies moving

towards more complex productive structures provide the necessary conditions for a sustained violence reduction. Complex and integrated economies can reduce the economic benefits of violence, making it costly for the whole society.

To empirically test the hypothesis that greater economic complexity is associated with lower violence levels, panel regression analysis is used for homicide rate data from 91 countries between 2000 and 2019. The analysis rendered two different results, based mainly on the choice of the controls. First, when considering economic complexity with other proxies for social and economic opportunities (e.g., income, GDP growth rate, and schooling), the effect of economic complexity on homicide rates is susceptible to the inclusion of Gini as a measure of income inequality. The inclusion of the Gini coefficient makes ECI a positive predictor of homicide rates, though not always significant. Taking this initial find, suggestive of a positive relationship between economic complexity and homicides rates, it is considered whether ECI could impact violence in a non-linear way. For this purpose, a squared ECI term is included in the analysis. The pooled OLS regression results suggest that economic specialization towards more complex activities would first raise and then decrease homicide rates, describing an inverted U-shaped relationship between economic complexity and violence between countries. Although the squared ECI term is negatively associated with homicides, its significance is sensitive to the inclusion of the Gini coefficient. For the fixed-effects estimator, both signs of ECI and its squared term were opposite to those found in the pooled OLS regression. Second, when using economic complexity as the unique proxy for the available socio-economic opportunities (i.e., excluding income, GDP growth rate, and schooling), ECI results to be a negative and significant predictor on homicide rates, both in pooled OLS and fixed-effects regressions.

Together, these findings are not already conclusive regarding the relationship between violence and economic complexity. Despite that, this research aims to contribute to the economic complexity literature by exploring the impacts of economic sophistication on society's well-being through its effects on violence conditions. The remainder of the paper is structured as follows: Section 2 reviews the literature on the relationship between economic diversification and armed conflicts. Section 3 reviews the growing literature on the relationship between economic complexity and productive structure. Section 4 presents the arguments linking economic complexity and violence. Section 5 presents the data and methodology used in this research. Section 6 provides the results. Finally, Section 7 provides concluding remarks.

2. PRODUCTIVE STRUCTURE AND VIOLENCE

The economic literature has shown that poorly diversified economies with productive structures highly dependent on few natural resources exhibit higher levels of violence. The evidence stresses that the risk of civil wars is highly dependent on the share of a country's primary commodities exports. Collier & Hoeffler (2004a) research shows that the effect of primary commodity exports on the risk of a civil war is non-linear, with the risk of armed conflict peaking when commodity exports reach 33% of GDP. At this level of dependence, the threat of a conflict reaches 22%, while in a country that does not export primary commodities, the risk is only 1%. By analyzing the effects of different types of commodities, the authors show that at average values of primary commodities exports, non-oil commodity exports lead to the same effects on armed conflicts risks as oil exports.

While the circumstances that allow a civil war to break out are relatively rare and mainly present in poor and developing countries, homicides are a continuous phenomenon, present to a greater or lesser degree in most societies. In fact, most countries have homicide numbers above the 1000 battle deaths per year limit used as a criterion for civil wars (Collier & Hoeffler, 2004b).

Although homicides and civil wars often have different motivations, both imply a process where people deliberately kill others in the same society (Collier & Hoeffler, 2004b). Grossman (1999) argues

that there would be no clear distinction between common thieves and insurgents, by assuming that the main motivation for civil wars is not the rebels' political grievances but the greed motivated by the enrichment opportunities[2] . In this sense, both financially motivated homicides and civil wars can be considered a profit-generating industry. Therefore, it would be reasonable to assume that the incidence of homicides could be more or less explained by the determinants also used in the economic literature on civil armed conflicts.

In this regard, some authors have been investigating the relationship between homicides and economic diversification. Analyzing cross-country data from 1890 to 1990, Baier & Baten (2017). demonstrate that high silver dependence contributes to increased violence, particularly in the presence of autocratic regimes. The result found by the authors suggests that economies highly dependent on the extraction of minerals, such as silver, not only present greater risks of civil wars but also face risks of higher levels of daily violence. Galeano (2012) stresses that the extraction of gold and silver in Latin America has been accompanied by violence since the colonization period. Berman et al. (2017) documented how the exploitation of areas rich in mineral resources in Africa by criminal groups has contribute to an escalation of violence across the region.

In comparing the common socioeconomic determinants of armed conflicts and homicides, Collier & Hoeffler (2004b) finds similarities in some key economic variables as common causes, particularly GDP per capita and GDP growth. However, by analyzing the share of commodities exports as a determinant of homicide rates, the authors have not found a significant effect.

The existing literature has been based mainly on simple aggregate measures of the productive structure's composition (e.g., the share of commodity exports regarding GDP) and has focused on the role of primary commodities exports to quantitatively assess the effects of the economic diversification on violence levels. However, by focusing only on the dependence on natural resources, the literature keeps the discussion open about the impacts of the production and export of other products on countries' violence levels. Here, I employ the Economic Complexity Index developed by Hausmann and Hidalgo to explore the relationship between the broader set of goods produced and exported by a country and its violence conditions.

3. PRODUCTIVE STRUCTURE AND ECONOMIC COMPLEXITY

The recent development of measures of economic complexity has expanded our ability to quantify the sophistication and diversification of a country's productive structure. Those measures that during the 20th century were based mainly on simple quantitative approaches (i.e. the participation of agriculture, industry and services in the economy and in aggregate measures of diversification and concentration) have advanced with the introduction of the Economic Complexity Index, allowing us to capture nuances of product sophistication and differences in countries' industrial structure.

Hidalgo & Hausmann (2009) capture the complexity of the productive structure based on the concepts of an economy's diversity (the number of products a country exports with a revealed comparative advantage) and product ubiquity (the number of countries that export a certain product with revealed comparative advantage). According to this approach, a complex country is one that can produce a wide range of sophisticated and low-ubiquity products, i.e., goods that cannot be made by many countries, such as electric cars and microchips. In turn, less complex economies have a smaller diversity of productive capabilities, which are reflected in the production and export of less sophisticated and highly ubiquitous

[2] On the one hand, economic literature stresses the enrichment opportunities and greed as the main motivations behind civil wars. On the other hand, political science argue that conflicts are mainly motivated by grievances and political considerations of the rebels. For an in-depth discussion of motivations based on ``greed versus grievance", see Collier & Hoeffler (2004a).

goods, such as agricultural goods and textiles. Producing complex products requires not only the availability of large amounts of productive capabilities but also the ability to bring those capabilities together to create new technological goods and services (Hausmann et al., 2013). Next, we proceed to explore the theoretical connections between economic complexity and violence.

4. ECONOMIC COMPLEXITY AND VIOLENCE: WHAT IS THE LINK?

Recent studies have shown that different types of products are associated with different economic performance outcomes. Also, structural transformations towards the sophistication of products and services contribute to the future economic growth of countries (Hidalgo et al., 2007). However, within this process of structural changes, valuable social transformations may also occur, with improvements in people's living conditions (Hartmann, 2014). This has encouraged the use of the Economic Complexity Index to understand aspects of social well-being, highlighting the role of productive complexity in reducing income inequality (Hartmann, 2017), in creating jobs (Adam et al., 2019), and in improving the population's health conditions (Vu, 2020). In this article, I argue in favor of a connection between economic complexity and another dimension of social well-being: freedom from violence. Violence compromises human safety and dignity and brings suffering to people in many ways. In addition to lost lives and suffering, violence destroys human and physical capital, leads to distrustful clime for investment, weakens trust between people, and undermines learning processes among members of society which are the foundations for any sustainable development process.

Some arguments support the hypothesis that the complexity of the productive structure would be related to the countries' violence conditions. First, because the presence of different productive activities in the economy offers people different job opportunities. This is because the production of sophisticated goods (e.g., medical equipment and computers) tends to require a higher level of knowledge and productive capabilities than those found in simpler products (e.g., textiles and agriculture). The quality of an economy's productive capabilities increases not only the availability of jobs but also the quality of those opportunities, thus reducing the economic benefits of violence and broadening the prospects for social mobility. Under an anthropological analysis of the causes of violence, (Gaviria, 2000) states: *"What appears as the main driving force in most ethnographic studies is not so much the absence of reasonable economic opportunities as the absence of social mobility".* In other words, offering only reasonable economic conditions is not enough to prevent the spread of violence. By highlighting the role of sophistication in produced and exported goods, the economic complexity measures can provide relevant information about the quality of economic and social opportunities available in an economy that is not captured by aggregate development measures, such as aggregate indicators of employment and GDP per capita.

Second, the complexity of what is produced and exported reflects a country's ability to put together different available productive capabilities to create new products and services. The ability to combine different capabilities can only occur through the flow of knowledge made possible by social interactions between the members of the society. Therefore, the complexity of the productive structure reflects the people's ability to connect to networks of social and economic relations to produce increasingly complex goods and services (Hartmann et al. 2017). In this way, we can understand economic complexity as a proxy for social capital. The economic literature on the determinants of violence highlights that the lack of social capital is associated with the incidence of higher levels of violence in societies (Fajnzylber et al., 2000). Furthermore, poorly diversified export baskets would also be associated with other factors that increase the risks of violence, such as corruption, poor provision of public services and inadequate governance (Cox et al., 2015). The remainder of this research is dedicated to empirically test the relationship between the sophistication of the productive structure and violence for 91 countries from 2000 to 2019.

5. DATA AND METHODOLOGY

1.1 - Understanding the Drivers of Violence

According to World Health Organization (WHO), violence can appear in two distinct forms. The first is collective violence which occurs when a large group of people commits a violent act, such as civil wars and wars between states. The second is interpersonal violence, usually perpetrated by unorganized individuals, with homicide being the most prominent example. Scholars widely use homicide rates as an indicator of a countries' violence levels (Fajnzylber et al., 2002; Baier & Baten, 2017). WHO defines homicide rates as the number of deaths intentionally caused by another person per 100,000 inhabitants.

A countries' level of interpersonal violence depends on a variety of factors, ranging from social and economic characteristics to demographic and institutional factors. The choice of the explanatory variables in this research relies upon previous studies on violence developed in different fields, particularly economics, political science, and sociology.

i) Socio-economic Factors

The main explanatory variable is the Economic Complexity Index (ECI), available at the MIT Economic Complexity Observatory. This indicator is built from international trade data from United Nations (UN Comtrade) to measure the complexity of countries' productive structures. The complexity of a country's export can be understood as a proxy for the productive capabilities and opportunities available for people in a society. Higher levels of economic complexity may provide adequate conditions for violence reduction by broadening the socio-economic opportunities, thus reducing the benefits of violence while increasing its costs for the entire society. ECI's squared term is also included so we can explore if might be a non-linear relationship between economic complexity and violent crime.

The quantitative economic literature has also applied three other measures for the socioeconomic opportunities available in an economy: the average level of income, schooling, and the GDP growth rate. Schooling data are from the United Nations Development Program and are defined as the average number of years of education received by the population aged 25 or more. The expected effect is that increases in average years of schooling increase income derived from the legitimate labor market, thus increasing the economic opportunities' costs of violence. Also, GDP per capita in constant 2010 U.S. dollars and the annual percentage growth rate of GDP serve as a proxy for income opportunities and are often negatively associated with violent crime (Fajnzylber et al., 2002). The inequality in income distribution is also considered, as it has been associated with differences in homicide rates between countries. Fajnzylber et al. (2002) suggest a positive relationship between violence and inequality, as high levels of income inequality may weaken informal mechanisms of social cohesion responsible for inhibiting the spread of violence. Additionally, the share of the labor force without work is also included, so that we can analyze the effects of unemployment in the formal labor market on violence levels. The literature indicates that unemployment has, in general, a negative association with violence (Fajnzylber et al., 2002). The data on GDP per capita, its growth rate, the Gini coefficient, and unemployment rate are from the World Bank's Development Indicators.

ii) Demographic Factors

As measured by the World Bank statistics, the share of the total population living in urban areas is used as a demographic factor. The positive effects of urbanization on homicide rates are associated with the highest economic benefits of violence available in big cities than in small and rural areas (Glaeser & Sacerdote, 1999).

iii) Institutional Factors

Collier & Hoeffler (2004b) finds that civil wars and homicides rates exhibit a positive relationship, in which the incidence of civil conflicts temporarily increases homicide rates. The political stability variable

by the World Bank Governance Indicators (WGI) is used to consider the effects of a countries' political violence on violent crime. This indicator measures the absence of political violence and civil wars on a scale of approximately -2.5 to 2.5 in an ordinal ascendancy from weak to strong governance. Next, we proceed to explore the statistical connection between economic complexity and violence.

5.2 - Approach and Model Specification

To empirically test the hypothesis that countries moving towards more complex productive structures may provide the necessary conditions for a sustained decrease in violence levels, pooled OLS regression and fixed-effects estimator is used on data for 91 countries from 2000 to 2019. The sample of countries was selected according to a combination that considered their presence in each of the databases used in the study and only countries listed in all databases simultaneously were considered. The resulting sample contains 91 countries at different stages of socio-economic development (Appendix Table-A3 presents the list of countries included in the analysis). Also, due to the Gini's dataset sparseness, a 4-year average values for all variables from 2000 to 2019 is used. Thus, each panel uses average values for the periods of time 2000-2003, 2004-2007, 2008-2011, 2012-2015, and 2016-2019.

Because many of our explanatory variables have small temporal variations, it is unclear whether they vary sufficiently over the entire 20-year period to allow for reliable analysis. Typically, variables such as a countries' economic complexity, inequality and urbanization vary much more between countries than within a country over time. The pooled OLS cross-section regression is a method that allows us to make use of these variations between countries.

Formally, the following model is tested:

$$Y_{it} = \alpha + \beta X'_{it} + u_{it} \quad 5.1$$

Where the subscripts *i* e *t* denote the country and time period, respectively; α is the intercept; Y_{it} is the dependent variable and denotes the homicide rate per 100,000 inhabitants; X'_{it} contains the explanatory variables; β is the corresponding vector of coefficients to be estimated and u_{it} is the error term.

However, we know that for each country there is a myriad of explanatory variables that affect violence in unmeasured ways. These omitted differences suggest OLS estimation may be biased. A fixed effects estimator – OLS applied to the fixed effects model – can deal with this cross-sectional heterogeneity and address omitted variables problems by including different intercepts for each country. The fixed effects estimator models the presence of different intercepts by putting a dummy for each country while omitting the intercept. Therefore, OLS including all these dummies should care against the bias discussed previously[3].

The fixed effects' estimation procedures consist of subtracting from each countries' observations the average of the values for all observations on an explanatory variable for that country. Kennedy (2008) describes the transformation for fixed effects estimator in a very comprehensive fashion. According to him, if we average each observation of the *i*th country over the *t* periods for which there are data on this country we have:

$$\overline{Y}_{it} = \alpha + \beta \overline{X'}_{it} + \overline{u}_{it} \quad 5.2$$

By subtracting Equation 5.2 from Equation 5.1 we get:

$$Y_{it} - \overline{Y}_{it} = \beta\left(X'_{it} - \overline{X'}_{it}\right) + (u_{it} - \overline{u}_{it}) \quad 5.3$$

[3] A Hausman test was applied to test if the random effects estimate is unbiased. With a p-value = 0.01927, the null is rejected so that the fixed-effects estimator is preferred than the random effects.

Such that the intercept was eliminated. Running a OLS estimation of $Y_{it}^{*} = Y_{it} - \overline{Y}_{it}$ on $X_{it}^{*} = X'_{it} - \overline{X'}_{it}$ yields the fixed-effects estimator. The following section employs pooled OLS regression and fixed-effects estimator to explore how economic complexity and other socio-economic and political variables correlates with homicide rates.

6. RESULTS

In this section, unbalanced panel data is used to explore the relationship between economic complexity and violence and to test its robustness by including a variety of controls [4].

6.1 - The Effects of Economic Complexity and Income on Violence

Table 6.1 shows pooled OLS and fixed-effects panel regression results on the relationship between economic complexity and homicide rates and compares the relationship between ECI and homicides rates with the relationship between homicide rates and GDP per capita. The pooled OLS results explore whether changes in economic complexity (Column 1) or GDP per capita (Column 2) are associated with variations in homicides rates between countries. Column 3 includes both variables. The fixed-effects results explore temporal variations in economic complexity and GDP per capita within a country over time (Column 4-6). Both economic complexity and GDP per capita show a negative relationship with homicide rates. However, the relationship between economic complexity and homicide rates is stronger between countries than the cross-country relationship between GDP per capita and homicide rates (adjusted R^2 of 0.153). Unlike, fixed-effects regressions point out a relatively larger impact of GDP per capita on a countries' violence levels over time.

Table 6.1 - Pooled OLS and fixed-effects regressions using only ECI and GDP per capita as explanatory variables

	Dependent variable: Homicide rate					
	Pooled OLS			*Fixed-Effects*		
	(1)	(2)	(3)	(4)	(5)	(6)
ECI	-6.036***		-3.740***	-4.673***		-1.759**
	(0.458)		(0.528)	(0.824)		(0.687)
Ln (GDP pc)		-3.775***	-1.937**		-7.530***	-6.924***
		(0.247)	(0.272)		(0.327)	(0.102)
Constant	12.044***	43.110***	28.516***			
	(0.433)	(2.371)	(2.335)			
Observations	256	256	256	256	256	256
R^2	0.156	0.147	0.172	0.060	0.190	0.197
Adjusted R^2	0.153	0.144	0.166	-0.394	-0.201	-0.197
F Statistic	46.920*** (df = 1; 254)	43.805*** (df = 1; 254)	26.298*** (df = 2; 253)	10.968*** (df = 1; 172)	40.405*** (df = 1; 172)	21.041*** (df = 2; 171)

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors in parenthesis. Elaborated by the author.

6.2 - Restricted Model

ECI, income level, schooling, and GDP growth rate are all explanatory variables that pretend to measure the socio-economic opportunities available in an economy. Also, as shown in the Appendix Table-

[4] All models were estimated by correcting standard errors for serial and cross-sectional correlation and heteroscedasticity, if any.

A2, ECI, GDP per capita, and schooling are highly correlated (. Because the effects of each of these variables are hard to disentangle, and they might be proxying the same effect (of available socio-economic opportunities), we next exclude GDP per capita, GDP growth rate, and schooling from the analysis, using ECI as our unique proxy for socio-economic opportunities.

Table 6.2 shows a restricted pooled OLS regression in which GDP per capita, GDP growth and schooling are not included. The models regress homicide rate against economic complexity, income inequality, unemployment, urban population, and the likelihood of politically motivated violence. Column 1 includes all variables. Columns 2-7 exclude each variable to explore their contribution to the full model. In all models, ECI is a significant and negative predictor of homicide rates. Unemployment and political stability present a negative sign but not always significant; income inequality and urbanization are positive and significant predictors of homicide rates. Although significant, the semi partial correlation of ECI – the difference in adjusted R^2 between the full model and the one in which only ECI is excluded – is null, meaning that economic complexity does not contribute to explain the variance of the model. This is also virtually true for all other explanatory variables, except for the Gini (the sharpest drop in adjusted is observed when Gini is removed).

Table 6.2: Pooled OLS regression models excluding average income, GDP growth and schooling

	Dependent variable: Homicide rate					
	(1)	(2)	(3)	(4)	(5)	(6)
ECI	-1.191***		-4.647***	-1.023***	-0.767**	-1.465***
	(0.351)		(0.386)	(0.336)	(0.320)	(0.313)
Gini	0.899***	0.950***		0.929***	0.930***	0.950***
	(0.129)	(0.125)		(0.140)	(0.128)	(0.107)
Unemployment	-0.173*	-0.152	-0.429***		-0.146	-0.159
	(0.097)	(0.095)	(0.051)		(0.102)	(0.108)
Urbanization	0.043***	0.022**	0.148***	0.033***		0.030***
	(0.010)	(0.010)	(0.014)	(0.011)		(0.010)
Political Stability	-1.144*	-1.435**	-4.811***	-1.029	-0.859	
	(0.632)	(0.559)	(0.667)	(0.634)	(0.610)	
Constant	-25.388***	-26.724***	5.463***	-27.221***	-24.153***	-26.513***
	(4.181)	(4.093)	(0.806)	(4.835)	(4.317)	(3.593)
Observations	256	256	256	256	256	256
R^2	0.383	0.380	0.242	0.380	0.381	0.381
Adjusted R^2	0.371	0.371	0.229	0.370	0.371	0.371
F Statistic	31.065*** (df = 5; 250)	38.529*** (df = 4; 251)	19.982*** (df = 4; 251)	38.464*** (df = 4; 251)	38.655*** (df = 4; 251)	38.573*** (df = 4; 251)

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors in parenthesis. Elaborated by the author.

Table 6.3: Fixed-effects panel regression excluding average income, GDP growth and schooling

	Dependent variable: Homicide rate					
	(1)	(2)	(3)	(4)	(5)	(6)
ECI	-2.123**		-3.529***	-2.160***	-2.143***	-2.403***
	(0.548)		(0.702)	(0.527)	(0.609)	(0.521)
Gini	0.323***	0.369***		0.327***	0.366***	0.350***
	(0.085)	(0.090)		(0.092)	(0.086)	(0.072)
Unemployment	0.013	0.028	0.058		-0.004	0.033
	(0.031)	(0.030)	(0.042)		(0.034)	(0.027)
Urbanization	-0.177***	-0.177***	-0.235***	-0.175**		-0.185***
	(0.037)	(0.036)	(0.027)	(0.037)		(0.048)
Political Stability	-1.988***	-2.102***	-2.324***	-2.008***	-2.068***	
	(0.640)	(0.602)	(0.731)	(0.603)	(0.739)	
Observations	256	256	256	256	256	256
R^2	0.187	0.176	0.139	0.187	0.168	0.163
Adjusted R^2	-0.234	-0.243	-0.300	-0.227	-0.256	-0.263
F Statistic	7.716*** (df = 5; 168)	9.050*** (df = 4; 169)	6.804*** (df = 4; 169)	9.692*** (df = 4; 169)	8.514*** (df = 4; 169)	8.221*** (df = 4; 169)

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors in parenthesis. Elaborated by the author

Through a fixed-effects panel regression, Table 6.3 explores whether changes in a countries' economic complexity are associated with changes in homicides rates over time. ECI also shows a negative and significant association with homicide rates.

6.3 - Full Model Results

The eight pooled OLS regression models in Table 6.4 explore whether economic complexity is associated with changes in homicides rates between countries (Column 1), also controlling for the impacts that income (Column 2), the annual percentage growth rate of GDP (Column 3), income inequality (Column 4), the share of the labor force without work (Column 5), the mean years of schooling (Column 6), the percentage of the total population living in urban areas (Column 7), and the likelihood of politically motivated violence (Column 8) also have on homicide rates. By adding the variables one by one, we can explore the impacts of the inclusion of each variable on the significance and signal of ECI, our main explanatory variable. As shown, solely ECI is a negative and significant predictor of homicide rates (Column 1). Adding income level and its growth rate (Column 2-3) do not change the negative association and significance of ECI on homicides while providing some additional explanatory capacity to the model.

However, the picture changes when we include income inequality in the analysis (Column 4). The inclusion of the Gini coefficient changes the ECI's signal, making economic complexity a positive predictor of homicide rates. Gini's addition also gives us the highest increase in adjusted R^2 (from 0.164 to 0.378). Adding unemployment (Column 5) makes ECI completely lose its significance. Moving to Column 6, the inclusion of schooling gives back some significance to an already positive ECI. Adding unemployment (Column 5) makes ECI completely lose its significance. Moving to Column 6, the inclusion of schooling gives back some significance to an already positive ECI. Also, the inclusion of the schooling variable slightly declines the explanatory power of the model. At this point, only GDP per capita and Gini coefficient held significance with their respective expected signs. Adding urbanization (Column 7) gives the model more explanatory capacity although maintaining ECI as a positive and significant predictor of violence levels. In Column 8, we see that the inclusion of the political stability variable does not change the signals and significance of the coefficients, although it slightly worsens the model.

Table 6.4: Pooled OLS regression results

	Dependent variable: Homicide rate							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ECI	-6.036***	-3.740***	-3.821***	0.555**	0.395	0.536*	0.644*	0.645*
	(0.458)	(0.528)	(0.564)	(0.264)	(0.364)	(0.312)	(0.335)	(0.332)
Ln (GDP pc)		-1.937***	-2.068***	-1.565***	-1.541***	-1.447***	-2.593***	-2.560***
		(0.272)	(0.300)	(0.189)	(0.225)	(0.368)	(0.222)	(0.176)
GDP growth			-0.182**	-0.152	-0.202	-0.189	-0.170	-0.173
			(0.080)	(0.191)	(0.241)	(0.228)	(0.221)	(0.211)
Gini				0.967***	0.949***	0.937***	0.841***	0.836***
				(0.121)	(0.110)	(0.088)	(0.078)	(0.097)
Unemployment					-0.145	-0.137	-0.183**	-0.185**
					(0.122)	(0.114)	(0.086)	(0.079)
Schooling						-0.137	-0.406	-0.398
						(0.260)	(0.268)	(0.282)
Urbanization							0.137***	0.137***
							(0.010)	(0.010)
Political Stability								-0.150
								(0.614)
Constant	12.044***	28.516***	30.394***	-12.628**	-10.819**	-10.073***	-2.210	-2.365*
	(0.433)	(2.335)	(2.682)	(5.078)	(4.217)	(3.156)	(1.792)	(1.412
Observations	256	256	256	256	256	256	256	256
R^2	0.156	0.172	0.173	0.387	0.390	0.390	0.403	0.403
Adjusted R^2	0.153	0.166	0.164	0.378	0.377	0.375	0.386	0.384
F Statistic	46.920*** (df = 1; 254)	26.298*** (df = 2; 253)	17.624*** (df = 3; 252)	39.689*** (df = 4; 251)	31.919*** (df = 5; 250)	26.522*** (df = 6; 249)	23.934*** (df = 7; 248)	20.861*** (df = 8; 247)

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors in parenthesis. Elaborated by the author.

The results presented in Table 6.4 point out that the initial hypothesis of higher levels of economic complexity leading to a decreasing in violence may not hold when confronted against data. Considering that, next we explore whether economic complexity could have a non-linear association with violence by including a squared ECI term.

Table 6.5: Pooled OLS regression including squared ECI as explanatory variable

	Dependent variable: Homicide rate							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ECI	-5.144***	-2.936***	-3.019***	0.870**	1.000***	1.251***	1.312***	1.310***
	(0.642)	(0.548)	(0.602)	(0.414)	(0.324)	(0.340)	(0.393)	(0.387)
ECI^2	-0.828**	-0.769***	-0.765**	-0.311	-0.642***	-0.701***	-0.656***	-0.654***
	(0.331)	(0.279)	(0.301)	(0.308)	(0.164)	(0.191)	(0.174)	(0.178)
Ln (GDP pc)		-1.917***	-2.046***	-1.557***	-1.519***	-1.387***	-2.528***	-2.501***
		(0.304)	(0.327)	(0.192)	(0.239)	(0.393)	(0.248)	(0.193)
GDP growth			-0.180*	-0.152	-0.215	-0.199	-0.179	-0.181
			(0.093)	(0.187)	(0.236)	(0.226)	(0.219)	(0.209)
Gini				0.964***	0.939***	0.921***	0.827***	0.823***
				(0.123)	(0.109)	(0.085)	(0.077)	(0.096)
Unemployment					-0.185	-0.178	-0.221***	-0.223***
					(0.121)	(0.117)	(0.084)	(0.077)
Schooling						-0.189	-0.453	-0.446
						(0.273)	(0.276)	(0.291)
Urbanization							0.136***	0.136***
							(0.010)	(0.010)
Political Stability								-0.126
								(0.605)
Constant	12.446***	28.717***	30.578***	-12.447**	-9.941**	-8.832***	-1.106	-1.240
	(0.465)	(2.450)	(2.763)	(5.191)	(4.195)	(2.997)	(1.833)	(1.408)
Observations	256	256	256	256	256	256	256	256
R^2	0.158	0.174	0.176	0.388	0.391	0.391	0.405	0.405
Adjusted R^2	0.152	0.164	0.162	0.376	0.376	0.374	0.385	0.383
F Statistic	23.821*** (df = 2; 253)	17.732*** (df = 3; 252)	13.366*** (df = 4; 251)	31.673*** (df = 5; 250)	26.644*** (df = 6; 249)	22.793*** (df = 7;248)	20.978*** (df = 8; 247)	18.573*** (df = 9; 246)

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors in parenthesis. Elaborated by the author.

The pooled OLS regressions in Table 6.5 regress homicide rate against economic complexity and its squared term, a country's average income, GDP growth rate, income inequality, unemployment, mean years of schooling, urbanization, and political stability. In Column 1, both ECI and its squared term alone have a negative and significant association with the homicide rates. The addition of income level and GDP growth (Column 2-3) do not change the ECI's and its squared term significance and signals. However, when controlling for income inequality (Column 4), ECI becomes a positive predictor of homicides while its squared term becomes completely non-significant, although holding its negative sign. The inclusion of unemployment (Column 5) restores the squared term's significance. Adding schooling, urbanization, and political stability (Columns 6-8) remain ECI positive and its squared term as a negative, both significant predictors of homicide rates.

Table 6.6 shows the results for a fixed-effects estimator. Here, we explore the impacts of economic complexity and its squared term on homicide rates within a country compared to controls such as income level and its growth rate, income inequality, unemployment, schooling, urbanization, and the political violence variable.

Table 6.6: Fixed-effects panel regression including squared ECI as independent variable

	Dependent variable: Homicide rate								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ECI	-2.565*		-3.066**	-2.683*	-3.108*	-2.572	-2.354	-2.521	-2.552*
	(1.543)		(1.483)	(1.398)	(1.727)	(1.564)	(1.490)	(1.538)	(1.355)
ECI^2	1.013*		0.864	1.062*	1.161*	1.022*	1.206*	0.898	0.830*
	(0.593)		(0.634)	(0.563)	(0.662)	(0.596)	(0.635)	(0.607)	(0.482)
Ln (GDP pc)	-3.855***	-4.151***		-4.418***	-4.429***	-3.412***	-5.955***	-3.172***	-4.370***
	(1.291)	(1.134)		(1.315)	(1.331)	(1.270)	(0.656)	(1.035)	(1.118)
GDP growth	0.093**	0.100**	0.125***		0.109***	0.107***	0.098**	0.103***	0.092**
	(0.036)	(0.041)	(0.044)		(0.039)	(0.035)	(0.042)	(0.037)	(0.046)
Gini	0.135**	0.171**	0.176***	0.155**		0.131**	0.147**	0.139**	0.173***
	(0.061)	(0.075)	(0.066)	(0.060)		(0.062)	(0.068)	(0.066)	(0.063)
Unemployment	-0.036***	-0.037***	0.041	-0.076***	-0.025*		-0.060***	-0.015	-0.021
	(0.013)	(0.013)	(0.025)	(0.015)	(0.015)		(0.020)	(0.009)	(0.017)
Schooling	-0.765***	-0.756***	-1.130***	-0.779***	-0.795**	-0.790***		-0.709**	-0.583*
	(0.290)	(0.280)	(0.206)	(0.271)	(0.312)	(0.300)		(0.292)	(0.298)
Urbanization	0.086**	0.074*	0.008	0.104**	0.092**	0.072*	0.049		0.063
	(0.042)	(0.044)	(0.026)	(0.043)	(0.042)	(0.037)	(0.054)		(0.057)
Political Stability	-2.381***	-2.350***	-2.518***	-2.377***	-2.525***	-2.358***	-2.104***	-2.327***	
	(0.500)	(0.454)	(0.446)	(0.511)	(0.535)	(0.519)	(0.499)	(0.501)	
Observations	256	256	256	256	256	256	256	256	256
R^2	0.278	0.268	0.264	0.272	0.271	0.277	0.262	0.275	0.245
Adjusted R^2	-0.123	-0.124	-0.138	-0.125	-0.127	-0.117	-0.141	-0.120	-0.167
F Statistic	7.009*** (df = 9; 164)	8.698*** (df = 7; 166)	7.383*** (df = 8; 165)	7.697*** (df = 8; 165)	7.658*** (df = 8; 165)	7.903*** (df = 8; 165)	7.309*** (df = 8; 165)	7.824*** (df = 8; 165)	6.686*** (df = 8; 165)

Notes: *p<0.1; **p<0.05; ***p<0.01. Standard errors in parenthesis. Elaborated by the author.

The results for fixed-effects estimations invert the signals between ECI and its squared term in relation to the pooled OLS regression. In all regressions, ECI turns negative while its squared term becomes positive (although not all coefficients are significant). Also, political stability and schooling become significant and negative predictors of homicide rates in the fixed-effect estimator context.

7. CONCLUSION

The relationship between productive structure and violence is widely studied in the economic literature on civil armed conflicts and wars between states. Evidence highlights that the absence of diversification of the productive structure associated with high dependence on natural resource exports is related to greater risks of civil wars (Collier & Hoeffler, 2004a; Bannon & Collier, 2003). Motivated by these results, some scholars argue about the relationship between the composition of the productive structure and the levels of day-to-day interpersonal violence, with homicides being the most prominent example. The results found suggest that economies highly dependent on mineral extraction (for example, silver, gold, and diamonds)

not only present greater risks of civil wars but also face high levels of homicides (Baier & Baten, 2017). However, by focusing only on the effects of dependence on natural resources, the existing literature keeps the discussion open about the impacts of the production and export of other products on countries' levels of violence.

This article advances in relation to previous studies by postulating a relationship between the broader set of goods produced and exported by a country and its violence levels. In particular, it is argued that exporting a greater diversity of complex products is related to lower homicide rates. Complex and integrated economies can expand and improve the opportunities available to people, thus reducing the economic benefits of violence and broadening the prospects for social mobility. The Economic Complexity Index (ECI) developed by Hausmann and Hidalgo is used to capture economic sophistication, providing us a measure for comparing the differences in productive capabilities and socio-economic opportunities available to people. We statistically explored the connection between economic complexity and violence using unbalanced panel data for 91 countries from 2000 to 2019.

The analysis rendered two different results, largely based on the choice of the controls. First, when solely using economic complexity as the unique proxy for available socio-economic opportunities (i.e., excluding income, GDP growth rate, and schooling), ECI results to be a negative and significant predictor on homicide rates. Second, when considering economic complexity with other proxies for socio-economic opportunities (e.g., average income, GDP growth rate, and schooling), the effect of economic complexity on homicide rates becomes susceptible to the inclusion of Gini as a measure of income inequality. Including the Gini coefficient makes ECI a positive predictor of homicide rates, though not always significant. Taking this initial find, suggestive of a positive relationship between economic complexity and homicides rates, we next considered whether ECI could impact violence in a non-linear way. For this purpose, we have included a squared ECI term. The pooled OLS regression results have suggested that economic sophistication towards more complex activities would first raise and then decrease homicide rates, describing an inverted U-shaped relationship between economic complexity and violence between countries. Although the squared ECI term is negatively associated with homicides, its significance is sensitive to the inclusion of the Gini coefficient. For the fixed-effects estimator, both signs of ECI and its squared term were opposite to those found in the pooled OLS regression.

Together, these findings are not already conclusive and provide more questions than answers regarding the connection between a country's economic complexity and its violence status. First, there is little to choose between the variants of the models. All models have low explanatory power with an adjusted R^2 of at most 0.386 (Table 6.4) or lower ─ or even negative, as in the case of the fixed-effects estimations. Furthermore, the small differences in adjusted R^2 raise the question of which model is statistically preferred, i.e., what model can be accepted or rejected in favor of the other. Another concern relies on searching an alternative income inequality dataset besides the one obtained from the World Bank statistics. Since many values are missing, the number of observations with complete data is radically reduced. Also, the ambiguity of the empirical results about whether economic sophistication would have a positive, negative, or even both effects on violence levels requests a broader literature review to accommodate studies on ambiguous impacts of economic diversification on social well-being (Hartmann, 2014) and on harmful effects of industrialization and modernization on violence levels (Durkheim, 1893; Merton, 1968).

Despite the limitations and still inconclusive results, this research aims to contribute to economic complexity literature by exploring the effects of economic sophistication on society's well-being through its effects on violence levels. In addition, this research could also be placed in the context of the empirical findings on the determinants of homicide rates.

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APPENDIX

Table A1 – Descriptive summary statistics

	Year	Mean	Std. Dev	Min	Median	Max	N Valid	% Valid
Homicide rate	2000-2003	9.48	13.80	0.59	5.09	98.30	364	100
Homicide rate	2004-2007	9.17	13.15	0.44	4.64	70.61	364	100

Homicide rate	2008-2011	9.37	14.75	0.35	4.53	83.56	364	100
Homicide rate	2012-2015	8.36	13.74	0.25	4.10	87.54	364	100
Homicide rate	2016-2019	7.82	13.47	0.00	3.34	86.27	364	100
Homicide rate	All periods	8.84	13.79	0.00	4.15	98.30	1820	100
ECI	2000-2003	0.34	0.95	-2.29	0.28	2.41	348	95.60
ECI	2004-2007	0.36	0.94	-1.64	0.34	2.48	357	98.08
ECI	2008-2011	0.36	0.93	-2.08	0.35	2.39	364	100
ECI	2012-2015	0.40	0.89	-1.83	0.39	2.37	364	100
ECI	2016-2019	0.40	0.91	-1.73	0.36	2.36	364	100
ECI	All periods	0.37	0.92	-2.29	0.35	2.48	1797	98.74
ECI^2	2000-2003	1.02	1.28	0.00	0.48	5.79	348	95.60
ECI^2	2004-2007	1.00	1.21	0.00	0.47	6.16	357	98.08
ECI^2	2008-2011	1.00	1.17	0.00	0.51	5.69	364	100
ECI^2	2012-2015	0.94	1.10	0.00	0.48	5.63	364	100
ECI^2	2016-2019	0.99	1.16	0.00	0.49	5.57	364	100
ECI^2	All periods	0.99	1.18	0.00	0.48	6.16	1797	98.74
Ln (GDP pc constant10 US$)	2000-2003	8,74	1.48	5.41	8.64	11.34	360	98.90
Ln (GDP pc constant10 US$)	2004-2007	8.89	1.46	5.40	8.82	11.42	360	98.90
Ln (GDP pc constant10 US$)	2008-2011	8.98	1.42	5.43	9.01	11.42	360	98.90
Ln (GDP pc constant10 US$)	2012-2015	9.06	1.38	5.43	9.13	11.41	360	98.90
Ln (GDP pc constant10 US$)	2016-2019	9.13	1.37	5.34	9.23	11.43	360	98.90
Ln (GDP pc constant10 US$)	All periods	8.96	1.43	5.34	8.96	11.43	1800	98.90
GDP growth (% annual)	2000-2003	3.80	3.86	-17	3.78	26.42	363	99.73
GDP growth (% annual)	2004-2007	5.78	3.87	-5.81	5.32	34.47	364	100
GDP growth (% annual)	2008-2011	2.70	4.95	-17.67	2.96	19.68	360	98.90
GDP growth (% annual)	2012-2015	2.91	3.57	-20.60	2.79	25.18	360	98.90
GDP growth (% annual)	2016-2019	2.90	2.34	-8.10	2.91	10.82	360	98.90
GDP growth (% annual)	All periods	3.62	3.98	-20.60	3.51	34.47	1807	99.29
Gini	2000-2003	41.54	10.36	23.80	40.10	61.60	141	38.74
Gini	2004-2007	37.99	9.40	24.40	35.10	59.50	217	59.62
Gini	2008-2011	36.68	8.23	23.70	34.70	55.50	230	63.19
Gini	2012-2015	36.59	7.57	24	35.70	53.50	240	65.93
Gini	2016-2019	36.54	7.67	24.20	35.75	53.90	190	52.20
Gini	All periods	37.59	8.72	23.70	35.70	61.60	1018	55.93
Unemployment	2000-2003	8.25	5.94	0.57	6.60	36.69	364	100
Unemployment	2004-2007	7.35	5.47	0.52	6.34	37.25	364	100
Unemployment	2008-2011	7.39	5.22	0.31	6.40	33.76	364	100
Unemployment	2012-2015	7.65	5.83	0.17	6.21	31.02	364	100
Unemployment	2016-2019	6.42	4.35	0.11	5.18	25.41	364	100
Unemployment	All periods	7.41	5.42	0.11	6.14	37.25	1820	100
Years of schooling	2000-2003	8.31	2.78	1.50	8.80	12.80	357	98.08
Years of schooling	2004-2007	8.79	2.87	1.60	9.20	13.60	363	99.73
Years of schooling	2008-2011	9.18	2.86	1.60	9.50	13.80	364	100
Years of schooling	2012-2015	9.55	2.75	2.40	9.95	14.10	364	100
Years of schooling	2016-2019	9.84	2.72	2.70	10.20	14.20	364	100
Years of schooling	All periods	9.14	2.85	1.50	9.50	14.20	1812	99.56
Urbanization	2000-2003	62.11	20.27	8.25	62.30	100	364	100
Urbanization	2004-2007	63.28	20.09	9.14	64.61	100	364	100
Urbanization	2008-2011	64.47	19.96	10.12	66.84	100	364	100
Urbanization	2012-2015	65.62	19.83	11.19	67.96	100	364	100
Urbanization	2016-2019	66.58	19.61	12.39	68.40	100	364	100
Urbanization	All periods	64.39	19.99	8.25	66.83	100	1820	100
Political Stability	2000-2003	0.03	1.01	-2.37	0.16	1.76	273	75
Political Stability	2004-2007	-0.04	0.92	-2.52	-0.04	1.62	364	100

Political Stability	2008-2011	-0.03	0.90	-2.21	-0.04	1.46	364	100
Political Stability	2012-2015	0.00	0.89	-2.97	0.05	1.53	364	100
Political Stability	2016-2019	0.01	0.86	-2.92	0.09	1.62	364	100
Political Stability	All periods	-0.01	0.91	-2.97	0.04	1.76	1729	95

Notes: Descriptive summary statistics for all indicators and all decades' intervals. Elaborated by the author.

Table A2 - Correlation matrix for all indicators

	Homicide rate	ECI	ECI^2	Ln (GDP pc constant10 US$)	GDP growth (% annual)	Gini	Unemployment	Years of schooling	Urbanization	Political Stability
Homicide rate	1	-0.410	-0.330	-0.390	0.080	0.580	-0.120	-0.510	-0.090	-0.380
ECI	-0.410	1	0.760	0.770	-0.250	-0.580	0.070	0.700	0.440	0.590
ECI^2	-0.330	0.760	1	0.610	-0.180	-0.470	-0.150	0.490	0.260	0.510
Ln (GDP pc constant10 US$)	-0.390	0.770	0.610	1	-0.280	-0.450	0.070	0.630	0.610	0.650
GDP growth (% annual)	0.080	-0.250	-0.180	-0.280	1	0.140	-0.200	-0.180	-0.210	-0.190
Gini	0.580	-0.580	-0.470	-0.450	0.140	1	-0.100	-0.660	-0.090	-0.500
Unemployment	-0.120	0.070	-0.150	0.070	-0.200	-0.100	1	0.130	0.100	0
Years of schooling	-0.510	0.700	0.490	0.630	-0.180	-0.660	0.130	1	0.420	0.580
Urbanization	-0.090	0.440	0.260	0.610	-0.210	-0.090	0.100	0.420	1	0.370
Political Stability	-0.380	0.590	0.510	0.650	-0.190	-0.500	0	0.580	0.370	1

Note: Elaborated by the author.

Table A3: Countries included in the analysis

Albania	Algeria	Argentina	Australia	Austria	Azerbaijan	Bahrain
Belarus	Belgium	Bolivia	Bosnia and Herzegovina	Brazil	Bulgaria	Burundi
Canada	Chile	Colombia	Costa Rica	Cote d'Ivoire	Croatia	Cyprus
Czechia	Denmark	Dominican Republic	Ecuador	El Salvador	Estonia	Finland
France	Georgia	Germany	Greece	Guatemala	Guinea	Honduras
Hungary	Indonesia	Ireland	Israel	Italy	Jamaica	Japan
Jordan	Kazakhstan	Kenya	Kuwait	Latvia	Lebanon	Lithuania
Madagascar	Mauritius	Mexico	Moldova	Mongolia	Morocco	Myanmar
Netherlands	New Zealand	Nicaragua	Nigeria	North Macedonia	Norway	Panama
Paraguay	Peru	Philippines	Poland	Portugal	Qatar	Romania
Russia	Rwanda	Serbia	Sierra Leone	Singapore	Slovakia	Slovenia
South Korea	Spain	Sweden	Switzerland	Syria	Tanzania	Thailand

Trinidad and Tobago	Turkey	Uganda	Ukraine	United States	Uruguay	Zimbabwe

Note: Elaborated by the author.