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Beyond Visible Factors: The Impact of Governance Quality on Homicide in Colombia's Three Major Cities

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Abstract

A large academic literature argues that socio-economic factors have effects on homicidal violence in regions and localities. However, Colombia seems to challenge this traditional view: despite socio-economic progress, its homicide rate has not significantly decreased. In pursuit of explanations for this phenomenon, factors related to governance quality appear to offer a potential explanation for the prevailing violence in the country. This perspective aligns with a research path that, while not extensively explored, has recently gained prominence, indicating a strong inverse relationship between governance quality and homicide levels. In the present study we investigate this hypothesis through an econometric analysis, utilizing data pertaining to local government quality and homicide rates, for the three principal cities of Colombia—Bogotá, Medellín, and Cali—during the period 2011-2021. Our findings show that both the investment rate in security and justice, and police performance—variables representing various aspects of governance quality—have a significant and inverse association with the homicide rates. These results suggest that research on crime should investigate the impact of governance quality on homicides at a local level.

Keywords: Homicides, Crime, Local Governance Quality, Colombia.

“Crime is contagious. If the government becomes a lawbreaker, it breeds contempt for law; it invites every man to become a law unto himself”

—Louis Brandeis

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1. Introduction

Between 2021 and 2022, Colombia's homicide rate remained above 25 homicides per 100,000 inhabitants. This high level of homicidal violence has led the country to be regarded as one of the most violent globally, ranking ninth among the countries with the highest number of homicides worldwide (Delcid et al., 2022).

This predicament is not a recent phenomenon. Historically, Colombia has consistently been spotlighted for its elevated violence levels, as evidenced by its persistently high homicide rates (Lozada & Guerrero, 2017). Moreover, within Latin America—acknowledged as one of the most violent regions worldwide—Colombia also stands out as one of the nations with the highest levels of violence within this context (Naranjo, 2023; El Heraldó, 2023).

A large body of research, exploring the determinants of homicide rates across various global territories, has predominantly focused on social and economic factors, such as inequality, poverty, and unemployment. These studies suggest that violence is symptomatic of a country's initial developmental stages, which diminishes as the nation experiences economic growth and improvements in social conditions (Crocí & Chainey, 2022, p. 1200). However, this theoretical framework finds contradiction in the Colombian context, where, despite notable advancements in socio-economic conditions over the years, violence levels have not seen a proportional decline (Junguito, n.d.).

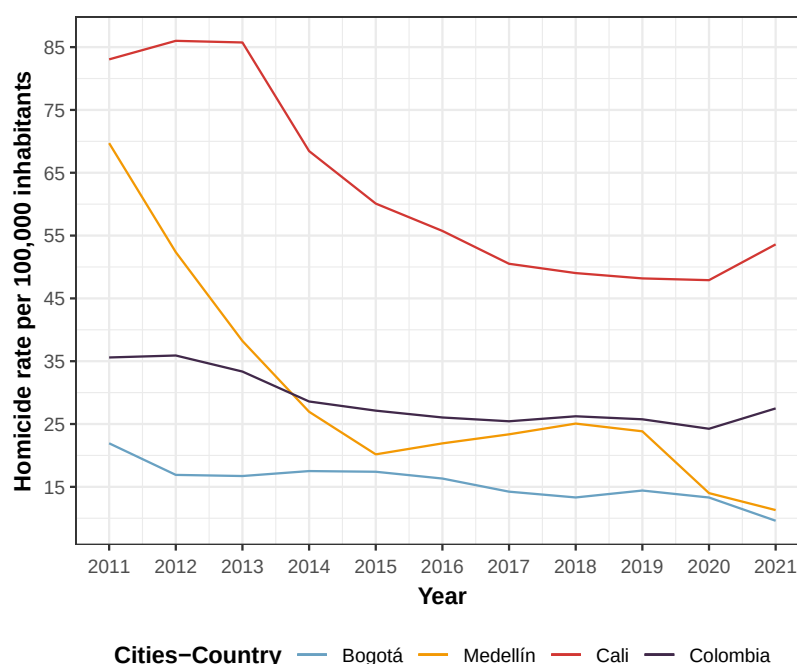
Nonetheless, before drawing hasty conclusions, a deeper analysis is warranted. As highlighted by Céspedes et al. (2020), most research that investigates levels of violence and criminality is developed at an aggregated national level, thereby generating a bias towards the national average, which subsequently dominates the way violence is theorized (p. 93). To overcome this bias, it is essential to explore the behavior of socio-economic variables, which are predominantly cited in academic literature as determinants of homicides, at a municipal level. This exploration might reveal that, despite the country seemingly advancing socio-economically on a broad scale, there exist municipalities that sustain high levels of homicides due to significant socio-economic challenges. These challenges prevent a reduction in their violence levels and, consequently, hinder a notable decrease in homicides nationwide.

In alignment with the aforementioned, a review was undertaken of the recent levels of homicidal violence in the country's three main cities: Bogotá, Medellín, and Cali.

These cities are not only the most populated within Colombia but are also situated in the departments of Cundinamarca, Antioquia, and Valle del Cauca respectively, which are the largest contributors to the nation's Gross Domestic Product (GDP), with each city being the primary contributor within their respective departments (El Tiempo, 2021; Sierra, 2023). Consequently, these cities exert a substantial impact on the country's social and economic levels, suggesting that their respective levels of homicidal violence have a pronounced influence on the national violence levels, especially when compared to smaller, less influential territories.

Figure 1 illustrates the homicide rates of the three cities, alongside the overall rate for Colombia. Confirming the assumption articulated in the previous paragraph, it is evident that Cali exhibits disproportionately high levels of violence compared to Bogotá and Medellín, and even the national average. This highlights the city as a key contributor to Colombia's sustained high homicide rates relative to other countries globally, perpetuating its classification among the world's most violent countries¹. This premise is further substantiated by the current recognition of Cali as Colombia's most violent city (El País, 2023a).

Figure 1: Homicide rate per one hundred thousand inhabitants of Colombia and its three main cities



Source: Own elaboration based on data from the National Institute of Legal Medicine.

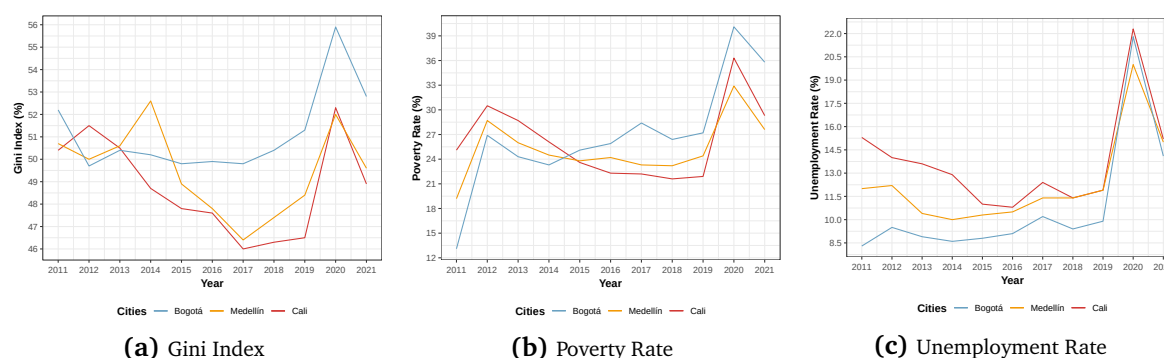
Given these findings, identifying the factors that have led to Cali's high homicide

¹For the period under review, 2011-2021, the average homicide rate in Colombia was 28.71 homicides per one hundred thousand inhabitants. Upon examining the cities, it is noted that Cali had an average rate of 62.57; meanwhile, the average rates for Medellín and Bogotá were 29.72 and 15.60, respectively.

rate becomes crucial, particularly considering that this situation has, to an extent, prevented the country from overcoming its reputation for violence. While prevailing analyses of homicide determinants might suggest socio-economic factors could explain Cali's high violence levels, a closer inspection is warranted. An analysis of socio-economic variables like poverty, inequality, and unemployment—which have been linked to homicides in various studies (Cole & Gramajo, 2009; Croci & Chainey, 2022; Van Dijk et al., 2021)—could reveal significant disparities between Cali and the cities of Medellín and Bogotá. These disparities might indicate that such factors have played a substantial role in shaping the current violent conditions in Cali.

In an effort to validate the previously discussed points, Figure 2 visually represents a comparative analysis of several socio-economic factors—namely poverty, inequality, and unemployment—across Bogotá, Medellín, and Cali. Intriguingly, the data does not fully align with the commonly held belief that socio-economic variables are the predominant drivers of homicide rates. A closer look at the Gini index (Figure 2(a)) reveals that Cali, despite possessing the highest homicide rate, generally demonstrates the lowest inequality gap among the trio of cities. Furthermore, the trends in poverty and unemployment rates (Figure 2(b) and 2(c)) do not exhibit significant divergences across the three cities, thereby not offering a clear socio-economic explanation for Cali's elevated levels of violence. Consequently, the inquiry persists: what variables have propelled Cali to exhibit a homicide rate that is not only elevated but also distinctly disparate from those observed in Bogotá and Medellín?

Figure 2: Socioeconomic factors of Colombia's three main cities



Source: Own elaboration based on data from DANE.

Notes: The peaks identified in the three graphs in 2020, for the three cities, are due to the COVID-19 pandemic, which had serious consequences at a health and socioeconomic level.

Several experts seem to pinpoint governmental factors as more pertinent in explaining the disparity in homicide rates between Cali and the other two cities. They argue that the primary reason both Medellín and Bogotá have gradually reduced their homicide rates is due to the diligence and dedication of their respective local governments. These governments have consistently and efficiently invested in both security and social promotion, in addition to implementing programs and strategies that have enabled them to enhance security within their territories and prevent violent situations (Goyret, 2018; Montoya, 2017; Llorente, 2005; El Tiempo, 2019).

In contrast, Cali has been noted for having a less committed government than those of Bogotá and Medellín, often criticized for its low social and security investment and the inefficiency of its public institutions (Garcés & Ledezma, 2017; El País, 2022; El País, 2023b). This situation seems to indicate that a potential reason explaining the identified homicide difference in these three cities, where Cali stands out for its high homicide rate, is governance quality. That is, the level of commitment, responsibility, and efficacy of governments in managing their resources along with designing and implementing public policies and strategies that allow them to fulfill their functions and objectives, primarily in response to the population's needs and demands.

This scenario aligns with recent research that has identified that, in regions like Latin America, of which Colombia is a part, socio-economic factors do not seem to provide robust and consistent explanations for understanding the high level of homicides in the region. Instead, other factors, related to governmental quality, appear to provide a better explanation regarding the levels of homicides in the different territories of the region (Alda, 2017; Chainey et al., 2021; Croci & Chainey, 2022).

However, there is no academic research that has addressed this line of analysis at the local level in the country to corroborate the aforementioned argument concerning governmental quality as a determining factor in homicide levels. A justification for such a situation lies in the global research landscape, where the impact of governance quality on homicide levels has been overshadowed. Historically, the predominant focus has been on socio-economic determinants of homicides, with governmental quality factors only recently garnering increased attention (Cao & Zhang, 2016; Cole & Gramajo, 2009; Lappi-Seppala & Lehti, 2014). Consequently, advancements in this line of analysis have been primarily transnational, and subnational research is even scarcer (Céspedes et al., 2020; Croci & Chainey, 2022).

Considering this situation, the present research undertakes an exploratory analysis, both quantitative and qualitative, with the objective of validating that, at the municipal level in Colombia, the governance quality of local governments inversely impacts the homicide levels within their jurisdictions. In simpler terms, an enhancement in governance quality typically results in a reduction in the homicide rate. The cities chosen for this analysis are Cali, Medellín, and Bogotá, given their status as principal cities in Colombia with substantial influence on the nation. This selection is further underscored by the current scenario where Cali, despite having socio-economic factors not markedly different from Medellín or Bogotá, presents the highest homicide rate in the country.

Given the complex nature of analyzing governmental quality, which encompasses a multitude of factors and institutions, this study will strategically utilize three central variables, taking into account the available information for the three cities under consideration. These variables — 'Security and Justice Investment Rate', 'Fiscal Performance Index', and 'Police Performance Index' — represent diverse aspects related

to governance quality, as delineated by various authors reviewed in this research. It is crucial to articulate that, to substantiate the primary argument of this investigation, these variables must manifest in specific ways. Thus, the hypotheses for each variable will be delineated below, and, if validated, will serve to corroborate the central premise of this research concerning the impact of local governance quality on the homicide rate:

- An increase in the percentage of municipal investment in security and justice is significantly and inversely related to the homicide rates in the analyzed territories. In other words, higher investment in security and justice generally leads to a reduction in homicide rates.
- An increase in the Police Performance Index is significantly and inversely related to the homicide rates in the analyzed territories. Specifically, an improvement in police performance generally leads to a decrease in homicide rates.
- An increase in the Fiscal Performance Index is significantly and inversely related to the homicide rates in the analyzed territories. That is, an improvement in fiscal performance generally results in a decrease in homicide rates.

Through a panel data model, these variables will be evaluated for the three cities that are subjects of this study, in the most recent and broadest possible period, with the objective of determining the effect of these variables on the homicide rate and, consequently, the impact of governance quality on homicides.

Building upon the preceding context, this research provides various contributions. Broadly, it adds to the limited global literature concerning the impact of governmental quality on homicides, employing a subnational approach, which is even more scarcely explored. In the Colombian context, this work emerges as one of the first to examine the relationship between governmental quality and homicides, through an analysis centered on the country's three principal cities: Bogotá, Medellín, and Cali. This approach will allow for a more transparent understanding of the disparities in homicide rates across these territories and the reasons for Cali's notably high rate.

Moving forward, the organization of this research is as follows: Chapter 2 introduces the literature review, identifying advancements on this topic at both international and national levels. Chapter 3 explains and analyzes the data used in this research, and presents the applied methodology. Chapter 4 reveals the results from the econometric procedure. Chapter 5 discusses the results, with a focus on the three cities under investigation, aiming to better understand how these results, related to governance quality, correlate with the different homicide rates in each city. Finally, Chapter 6 presents the conclusions of the study, the limitations, and recommendations for future research.

2. Governance Quality and Homicidal Crime: International and National Evidence

Due to the limited academic development on the impact of governmental quality on homicides, and consequently, the lack of extensive literature examining this perspective from a theoretical standpoint, the literature review will center on the empirical analysis conducted by various researchers. These scholars have recognized the need to delve into and expand on this line of inquiry, and their empirical studies have validated this.

Secondly, in pursuit of their objectives, governments employ a myriad of methods and strategies, making the analysis of governmental quality a comprehensive and intricate process. Therefore, to streamline and focus the research, this chapter will highlight the general milestones in this research area, as well as the key approaches used and the challenges identified along the way.

Thirdly, governments collaborate with their respective institutions to achieve their goals. As such, studies examining the relationship between governmental quality and homicides must incorporate the performance of these agencies or institutions, as their efficacy directly impacts the quality of services provided by governments in line with their objectives. Given the vast number of governmental agencies, which makes it unfeasible to consider all of them, the literature review includes advancements identified in academic research concerning the performance of one particular agency: the police.

This choice was made for several reasons. To begin with, the police force is a common governmental institution in most countries worldwide, facilitating cross-border research. Furthermore, many authors referenced in this study recognize it as a pivotal institution in analyses centered on governmental quality and its effect on homicides, given its direct involvement with such crimes. Lastly, it is one of the few governmental agencies with accessible historical data pertinent to evaluating its performance in the three cities analyzed in this study. These reasons led to the selection of police performance as a key factor representing governmental quality in this research, making it crucial to ascertain the current state of academic research on its performance.

Finally, the latter part of this chapter delves into the development of studies on the impact of governance quality on homicides in Colombia. This focus aligns with the

primary objective of the present study, underscoring the need to understand the national landscape of this specific area of research. With these guidelines in place, the literature review is presented:

Most academic studies investigating the determinants of homicide rates have focused primarily on socioeconomic and demographic variables. As emphasized by Lappi-Seppala and Lehti (2014), along with Poveda (2012), these studies have aimed to understand the patterns and variations in homicide rates by relying on classical criminological theories and their subsequent developments. These theories span from Becker's foundational framework to later models such as strain theory, social disorganization theory, and theories related to deprivation, modernization, and development. These theoretical perspectives have guided the selection of predictors in empirical research, with a focus on variables like poverty, inequality, gender, education, youth demographics, Gross Domestic Product (GDP), racial diversity, population growth, and urbanization (Lappi-Seppala & Lehti, 2014; Soares & Naritomi, 2010).

While these conventional variables have provided valuable insights into the relationship between socioeconomic conditions and homicide rates, they have also limited the scope of inquiry by overshadowing other potentially significant factors. A notably neglected area is governance, particularly the quality of governmental institutions (Cao & Zhang, 2016).

Cole and Gramajo (2009) were among the first to address this gap in the literature. Their study sought to identify factors that could explain variations in homicide rates across different countries. Utilizing Ordinary Least Squares (OLS) regression models based on 2002 data for 91 countries, they included commonly cited variables associated with homicides, primarily those of a socioeconomic and demographic nature. Additionally, they incorporated the 'World Governance Indicator' (WGI), a composite metric developed by the World Bank to assess the quality of governance in public institutions.

Recognizing the inherent challenges in measuring governance quality, the WGI encompasses multiple dimensions such as rule of law, accountability, regulatory quality, political stability, and control of corruption. Cole and Gramajo (2009) included this variable, arguing that "in a well-functioning social system, efficient institutional mechanisms will both help to prevent crimes and prosecute them effectively when they occur. The quality of a country's government institutions should therefore have some relevance for crime rates" (p. 757). Their analysis revealed that most traditional socioeconomic and demographic variables lacked statistical significance, while the WGI variable was both significant and negatively correlated with homicide rates. This led them to suggest that prior cross-country research may have overlooked key variables, such as those related to governance quality.

Building on these seminal studies, a growing body of empirical research has been de-

veloped to both substantiate the relationship between governance quality and homicide rates and to broaden the analytical approaches to this subject.

For example, Lappi-Seppala and Lehti (2014) conducted a comprehensive study with the specific aim of identifying the various determinants that could influence homicide rates on a global scale. Their research covered 235 countries across six continents and spanned six decades, from 1950 to 2010. They categorized the variables under investigation into four main groups: socioeconomic, cultural, control and sanction mechanisms, and political factors. In relation to the latter, the authors make a pointed observation: “political factors receive surprisingly little attention in cross-national analyses of violent crime” (p. 178). Motivated by their belief in the critical role of stable and efficient governance in reducing violence, they included governance-related variables, ‘rule of law’ and ‘corruption’. Their findings underscore that governance quality is a primary determinant of violence levels, as supported by the statistical significance of these variables. This perspective diverges from earlier studies that placed greater emphasis on socioeconomic determinants, aligning more closely with the findings of Cole and Gramajo (2009).

A significant finding in various studies that confirm the relationship between governance quality and homicide rates is that political variables seem to offer a more nuanced understanding of the consistently elevated homicide rates in Latin America. This pattern is largely attributable to the region’s frequent unstable political conditions, contrasting with more developed regions. This insight provides a pathway to address a recurring issue specific to homicide determinant studies that include the Latin American region: while socioeconomic variables do offer some partial insights into the levels of homicides in the region, they generally fail to provide conclusive support for the primary findings of these studies (Cao & Zhang, 2016; Lappi-Seppala & Lehti, 2014; Van Dijk et al., 2021).

Furthering the discussion, scholars like Chainey et al. (2021), Alda (2017), and Croci and Chainey (2022) have delved deeper into this subject. Chainey et al. (2021) challenge the conventional academic stance that socio-economic progress invariably leads to reduced crime and violence levels. Contrary to this belief, Latin America, despite witnessing significant developmental strides, continues to grapple with alarmingly high homicide rates. This discrepancy is further highlighted by the observation that many transnational studies have predominantly focused on North American and European contexts, often sidelining Latin America, which leads to an incomplete understanding of the region’s unique dynamics. Indeed, while socio-economic variables like inequality and poverty have shown some influence in Latin America, their explanatory power has been modest compared to other regions (Chainey et al., 2021).

Hence, aligning with recent research emphasizing the importance of robust and effective governmental institutions in shaping social and economic conditions, Chainey et al. (2021) carried out an econometric study, employing a cross-sectional regres-

sion method, encompassing 39 nations, with 17 specifically from Latin America. Their objective was to validate the role of governance quality in the region's violence rates, using the World Bank's WGI indicator. Their findings underline the need for Latin America to enhance governance quality as a means to reduce its high homicide rates.

Alda (2017), and Croci and Chainey (2022) both validate the conclusions drawn by Chainey et al. (2021). Croci and Chainey (2022) sought to further investigate the relationship between homicides and institutional efficacy in Latin America using a different approach. Recognizing that most prior studies relied on ordinary least squares (OLS) regression and were, consequently, limited to a single cross-sectional analysis, they adopted a panel data econometric approach. Using a random effects model, they analyzed data from 2005 to 2017. Their findings, consistent with Chainey et al. (2021), emphasized the correlation between governance quality and homicide rates in the region. Separately, Alda (2017) focused on the years 1990-2009, employing a fixed effects model to investigate the potential influence of effective resource allocation—a metric of governance quality—on Latin America's homicide rates. His research affirmed the significance of this factor.

Another crucial consideration in the research on governance quality and its impact on homicide levels pertains to the specific variables employed. This issue is meticulously examined by Saleemi and Amir (2019). The authors contend that, while the link between governance quality and crime is apparent, there remains an ambiguity regarding the distinct attributes of governance quality that deter criminal activity. Specifically, the relationship between particular facets of governance quality and specific types of crimes remains undefined. To clarify this, Saleemi and Amir (2019) conducted a comprehensive study from 1984 to 2014 using panel data, applying both fixed and random effects models, and centered their analysis on Asian countries. Their aim was to pinpoint which specific governance quality factors influence different crime categories. The variables of interest they selected were straightforward indicators related to governance quality, such as corruption levels, investment profiles, and bureaucratic quality. This approach contrasts with other researchers who often resort to composite variables that encapsulate multiple governance quality factors into a single averaged index. Their findings affirmed that, in the context of homicides, the governance quality variables that held significance were 'investment profile', 'democratic accountability', and 'external conflict'.

The previously discussed information underscores the relationship between governance quality and homicide rates. However, it is imperative to acknowledge that governments depend on their respective institutions to fulfill their objectives. These institutions carry out specific tasks to help achieving the government's goals. In the realm of security and crime control, the police force stands as a pivotal governmental institution responsible for law enforcement and, consequently, ensuring the government's objectives related to security are met. Therefore, measuring police performance becomes a crucial variable when analyzing the effect of governance

quality on homicide rates across different territories (Croci & Chainey, 2022; Lappi-Seppala & Lehti, 2014).

Yet, as Pare (2014) points out, cross-sectional quantitative studies examining the relationship between police performance and homicide rates are limited. This fact is surprising “given the vast policing crime literature within specific countries, particularly the United States” (Pare, 2014, p. 254), as well as the role the police play in enforcing the law to provide security and protection to citizens. In view of this, the author suggests that one reason for this situation might be the lack of reliable data for comparing police quality across nations.

To address this, Pare (2014) initiated a study encompassing 77 countries, selected based on the availability of data concerning homicide rates and police performance. The metric for police performance was derived from a proxy indicator formulated by Van Dijk (2008). This indicator incorporated five variables: (1) Propensity to report crimes to the police; (2) Victim satisfaction with police services; (3) General contentment with the police; (4) Business sector’s trust in the police; and (5) Efficacy in resolving homicides. Utilizing a series of OLS regressions, Pare (2014) conclusively established a robust inverse relationship between police performance and homicide rates.

Several case studies support Pare’s (2014) findings. One such study was conducted by Ratton and Daudelin (2018) in Pernambuco, a historically violent state in Brazil. This state experienced a significant decrease in homicide rates between 2007 and 2013. Ratton and Daudelin (2018) investigated this phenomenon and, consistent with other researchers, attributed this period of declining violence to the implementation of a public security strategy named ‘Pacto pela Vida’ (PPV-PE). This approach was notable for its comprehensive focus on public security management at the state level and collaboration among various government agencies, with the state police at its core.

The authors highlight that the decline in Pernambuco’s homicide rates starkly contrasts with the rise in other northeastern Brazilian states during the same period, despite improvements in social indicators across the region. They contend that the marked reduction in homicides in Pernambuco was primarily a result of the state police’s adept implementation of deterrence strategies. These included structural changes within the police force, closer ties with the judiciary, and active engagement with civil society. Resources were allocated to enhance the investigative capabilities of the Civil Police, while the Military Police bolstered their presence in violence-prone areas. This strategy led to the protection of potential victims and the apprehension of perpetrators, thereby reducing the number of homicides (Ratton & Daudelin, 2018).

However, as Ratton and Daudelin (2018) point out, from 2014 onwards, there was a decline in the public security model and the integrated governance capacity of

the police. This decline was attributed to internal conflicts, a lack of engagement with civil society, issues within the police force, and a freeze on security spending. Additionally, there was a shift away from the original PPV-PE agenda by the central government. These factors gradually impacted the model's governance, ultimately leading to its failure and a resurgence in homicidal violence (Ratton & Daudelin, 2018).

Collectively, the analysis of the presented information emphasizes the significance of considering police performance-related variables as pivotal in explaining homicide rates, as well as their role as an indicator of governmental quality in public security management. Besides, this case study also serves as a general illustration of the importance of governmental quality in preventing and reducing homicide rates. This is further evidenced by the fact that one of the leading factors in the program's failure, and consequently, the rise in homicides, was the central government's deviation from the project's initial objectives, coupled with a reduction in the funds allocated for its operation.

Finally, given the present research's focus on examining the link between governance quality and homicide rates in Colombia's three principal cities (Bogotá, Medellín and Cali), a thorough examination of the existing literature within the Colombian framework is essential. This will help determine if it aligns with the broader context identified previously, which emphasized that this line of inquiry is still developing and has only recently gained prominence.

Poveda (2012) highlighted the need for research in Colombia that incorporated political factors linked to governance quality. He conducted an analysis of the influence of socio-economic factors on violence levels in the country's main cities from 1984 to 2006 using a dynamic panel data model. While the findings indicated that these socio-economic factors indeed impacted Colombia's violence levels, Poveda (2012) acknowledged that this research approach was conventional for studies aiming to identify the determinants of violence in the country. He stressed the importance of broadening the scope of such studies by integrating other analytical dimensions, such as political conditions. These would encompass variables related to governance quality, including corruption, characteristics of the criminal justice system, government expenditure on social development and security, performance of government institutions, among others. Following this logic, Ovallos and Guzmán (2019) proposed a model to measure police performance in Colombia, based on the observation that there is a dearth of research focusing on police performance in the country.

Expanding on the insights of Poveda (2012), Céspedes et al. (2020) took the analysis a step further by conducting an empirical study on the relationship between homicidal violence and the quality of governmental performance in Colombia from 2003 to 2014. Specifically, they argued that the quality of state institutions, not just their mere presence, is crucial in understanding the variations in homicide rates across different regions and over time in Colombia. Therefore, this factor must be consid-

ered as a central variable in explaining the heterogeneity in homicidal violence.

However, they highlighted a significant challenge in both national and international literature: a majority of studies examining variations in violence levels are conducted at an aggregated national level. Such an approach tends to overlook the heterogeneity of micro-territorial realities. Addressing this limitation, Céspedes et al. (2020) focused their analysis at the sub-national level, examining 1,102 municipalities. Their aim was to counter the dominant focus on national-level academic research and public policy design. To measure local governmental quality, they utilized the 'Integral Performance Index' (IDI), an index developed by the National Planning Department (DNP). This index was designed to assess state quality at the local level through mayorships.

Their research indicated that 75.53% of the variations observed in crime rates are explained at the municipal level. Furthermore, they identified a negative correlation between the quality of local governmental performance and the prevalence of homicidal violence. As a result, Céspedes et al. (2020) concluded that recent trends in homicide rates in the nation have been closely linked to a deficient and weak state at the municipal level. This was evident in two distinct aspects: geographically (occasional reductions in state presence, leaving spaces to other entities) and functionally (certain state entities failing to execute their roles and deliver services) (p. 114).

While Céspedes et al. (2020) provide compelling academic evidence of the nexus between governance quality and homicide rates in Colombia, they are among a limited number who approach this topic in the country. In this context, this line of research in Colombia remains limited, mirroring the findings in other regions, as noted by all the authors reviewed in this chapter. Therefore, this thesis aims to expand the scarce existing body of literature on this subject, particularly in Colombia. It presents a comprehensive analysis of the influence of governance quality on homicide rates at the municipal level, incorporating variables that serve as proxies to assess the quality of local governments and their affiliated institutions, focusing the analysis on the nation's three primary cities.

3. Data and Methodology

3.1 Data

The dependent variable for this study is the **homicide rate per 100,000 inhabitants**. Data for this variable were sourced from the National Institute of Legal Medicine and were subsequently log-transformed to normalize their distribution. This transformation technique is commonly employed by researchers who use this variable as the dependent measure in their studies (Alda, 2017; Cao & Zhang, 2016; Croci & Chainey, 2022).

The final model incorporates six independent variables, three of which serve as the primary or focal variables for this study. These focal variables act as indicators for assessing governance quality, thus enabling the empirical testing of the study's central argument: that municipal governance quality affects local homicide rates. Specifically, regions with effective governance are expected to experience lower levels of violence, particularly homicides. Conversely, poor governance is likely to exacerbate homicide rates. The remaining three variables serve as control variables. Below, both sets of variables are elaborated upon.

Focal Independent Variables

The concept of “governance quality” refers to the government’s ability to fulfill its obligations and objectives, particularly in providing services that foster the development and protection of its territories and citizens (Agnafors, 2013; OHCHR, n.d.). Given that one of the government’s primary objectives is citizen protection, variables that can assess the relationship between governance quality and homicide rates are of significant importance, since homicide is one of the most serious acts of violence (Herre et al., 2013).

However, assessing governance quality involves a multitude of factors, making it impractical to rely on a single variable for measurement. This has led researchers to either use multiple variables for different factors or resort to composite variables. Factors considered in measuring governance quality include resource allocation, corruption control, investment profile, expenditures in social development and security, accountability, political stability, rule of law, fiscal management, and the quality and

efficiency of public and civil services¹ (Agnafors, 2013; Alda, 2017; Cao & Zhang, 2016; Cole & Gramajo, 2009; Croci & Chainey, 2022; Lappi-Seppala & Lehti, 2014; Poveda, 2012; Saleemi & Amir, 2019).

Based on this, a search was conducted for available variables in the three study cities—Bogotá, Medellín and Cali—over the same time period that could serve as indicators of local governance quality. This search led to the selection of the following focal variables:

- **Security and Justice Investment Rate (%)**: This variable indicates the percentage of each city's investment budget allocated to security and justice. The data is sourced from the National Planning Department (DNP) through the Unified Territorial Form Information System (SISFUT), and is available from 2011 to 2021. Notably, this variable is pivotal as it was one of the main ones that established the time frame for the study's analysis. It holds particular importance because it directly correlates with levels of violence, offering insights into how local governments prioritize and allocate resources towards security and justice.
- **Police Performance Index (%)**: When evaluating governance quality, it's crucial to consider the role of public institutions that help achieve institutional objectives. In the context of the rule of law, the police force stands as a key governmental institution. Therefore, assessing its performance becomes a critical factor when examining the relationship between governance quality and violence, specifically homicides (Castro et al., 2023; Croci & Chainey, 2022; Pare, 2014; Lappi-Seppala & Lehti, 2014). To this end, a variable was created to serve as a proxy for measuring police performance. This variable is defined as the annual percentage of police arrests for homicides relative to the total number of recorded homicides for that same year. Data for this variable was gathered from the National Police's crime statistics portal and the National Institute of Legal Medicine. The National Police's portal provides data starting from 2010, thereby, this variable also set the time frame for this study's analysis².
- **Fiscal Performance Index**: Calculated by the DNP, this index evaluates the performance of territorial entities based on six indicators, related to fiscal management: operational self-financing, debt service backing, dependence on na-

¹Efficiency refers to the ability to carry out an activity at the lowest possible cost, while efficacy measures whether the predefined objectives for the activity are being met (Bonney & Armijo, 2005).

²Given the absence of a universally accepted metric for assessing police performance, various scholars have developed their own indices. For example, Van Dijk (2008) formulated a police performance index grounded in five key components, serving either as a standalone tool or as a framework for crafting similar indices. Similarly, Ovallos and Guzmán (2019) introduced an index centered on three pillars: effectiveness, legitimacy, and legality. Both of these indices incorporate metrics for solving homicide cases and arrest rates, akin to the measure used in this study. However, the limited scope of available municipal-level police data precluded the inclusion of additional components suggested by these authors. Consequently, a more simplified measurement variable was employed, consistent with the method adopted by Castro et al. (2023).

tional transfers and royalties, own-resource generation, investment magnitude, and savings capacity. The index ranges from 0 to 100, with scores near zero indicating “deterioration” and those near one hundred indicating “sustainability”.

Another variable considered for this study is the ‘Municipal Performance Measurement’ (MDM), published by the DNP. This variable aims to measure, compare, and rank municipalities based on their management capabilities and developmental outcomes, taking into account their initial endowments³. This composite indicator measures overall governmental performance on a scale from zero to one hundred, where scores close to zero indicate poor performance and those close to one hundred indicate excellent performance. However, data for this variable is only available from 2016 onwards, which significantly limits the study’s analysis period. As a result, this variable was excluded from the primary analysis but will be included in an auxiliary regression to assess its impact on the homicide rates in the three cities under study.

Control Variables

As previously mentioned, a substantial body of research literature has established the nexus between violence and various socioeconomic and demographic determinants. These encompass factors such as poverty, unemployment, education, economic growth, inequality, population density, the proportion of young people in the population, among others. These factors are the primary focus of research on the determinants of homicide rates. Consequently, studies that primarily aim to examine the role of governance in homicide rates frequently incorporate these factors as control variables (Alda, 2017; Chainey et al., 2021; Cole & Gramajo, 2009; Croci & Chainey, 2022; Lappi-Seppala & Lehti, 2014; Pare, 2014; Van Dijk et al., 2021).

Furthermore, these socioeconomic and demographic determinants have been empirically validated to exert a significant impact on levels of violence within the Colombian context (Poveda, 2012). Based on these factors, several variables were extracted from these research categories, including inequality (Gini Index), monetary poverty (%), unemployment rate, population density, education (net secondary and middle school coverage rate), GDP per capita, and the percentage of young males.

To pinpoint which of these numerous variables would serve as the most effective controls in this study, a correlation matrix was employed. The aim was to identify variables that exhibited a strong correlation with the dependent variable—namely, the homicide rate. The analysis revealed that **GDP per capita** and the **net middle**

³Prior to the implementation of the “Municipal Performance Measurement” metric, the National Planning Department (DNP) had been disseminating an analogous index termed the ‘Internal Performance Index’. Nevertheless, the DNP ascertained that this earlier index was insufficient in fulfilling its designated objectives due to inherent structural limitations. More precisely, it lacked the capability to accommodate the diverse characteristics of territorial entities and failed to provide an accurate representation of their developmental progress. As a result, any data derived from this variable is deemed to be unreliable and is presently not recommended for scholarly use.

school coverage rate were most strongly correlated with homicide rates, with correlation coefficients of -0.87 and -0.56, respectively. Hence, these variables were selected as the control variables for the study and will be explained below.

- **GDP per capita:** Defined as the total economic output of a region divided by its population, serves as an indicator of the average economic well-being of individuals within the municipalities studied. Its data was obtained from the official websites of the mayoral offices for the cities examined.
- **Net middle school coverage rate (%):** the net middle school coverage rate provides insights into the proportion of age-appropriate students enrolled in the final two grades preceding higher education. Specifically, it denotes the ratio of students enrolled in the last two years of school who are of the appropriate age for that level (ranging between 15 and 17 years) to the total population within the suitable age range for that academic stage. This ratio is then multiplied by 100 to express it as a percentage. This metric serves as an indicator for evaluating a region's educational capacity and was sourced from the Educational Management Observatory.

Lastly, the study acknowledges the unprecedented global impact of **COVID-19**, which has been shown to cause a general decline in homicide rates nationally due to imposed movement restrictions (Alvarado et al., 2021). To account for this, a dummy variable representing the years 2020 and 2021 was introduced to capture the pandemic's effect.

3.2 Descriptive Analysis

Table 1 presents the descriptive statistics for the variables under study for all three cities combined, while Table 2 provides a city-specific breakdown. It is noteworthy that Cali recorded the highest homicide rate in the dataset, with 86 homicides per 100,000 inhabitants in 2012. In contrast, Bogotá registered the lowest rate in 2021, with 9.6 homicides per 100,000 inhabitants. When considering predictor variables, Cali consistently showed the lowest values for both the variables of interest and the control variables. Conversely, Medellín exhibited the highest values for two key variables of interest: the Security and Justice Investment Rate and the Fiscal Performance Index. This city also led in the control variable of Net Middle School Coverage Rate. That said, certain variables such as 'GDP per capita' and 'Police Performance Index' manifested high standard deviations, indicating a considerable range of variability and substantiating the decision for their subsequent transformation.

In addition to the minimum and maximum values of the variables presented in Tables 1 and 2, which have facilitated the identification of key elements as mentioned in the preceding paragraph, the examination of the mean and standard deviation of the focal variables across the three cities, which are shown in Table 2, reveals several interesting patterns. These findings offer valuable insights into potential determinants of their respective levels of homicidal violence.

Table 1: Descriptive statistics

Variable	Mean	Std. dev.	Min	Max
Homicide rate	35.96	23.9	9.60	86.00
Security and Justice Investment Rate (%)	2.77	1.44	0.97	5.70
Fiscal Performance Index	81.75	3.22	73.57	85.5
Police Performance Index (%)	46.61	15.1	20.09	82.64
Net middle school coverage rate (%)	50.27	6.28	38.34	59.69
GDP per capita	25250197	7315530	12159094	38537446

Source: Own elaboration based on data from respective sources.

Notes: Descriptive statistics are shown before any applied transformations

Table 2: Descriptive statistics by city

Bogotá	Mean	Std. dev.	Min	Max
Homicide rate	15.6	3.17	9.60	21.93
Security and Justice Investment Rate (%)	2.00	0.59	1.21	3.00
Fiscal Performance Index	83.09	3.16	74.03	85.32
Police Performance Index (%)	59.46	12.53	44.75	82.64
Net middle school coverage rate (%)	52.66	3.49	48.56	58.84
GDP per capita	29862500	5629052	21347503	38537446

Medellín	Mean	Std. dev.	Min	Max
Homicide rate	29.72	17.40	11.30	69.71
Security and Justice Investment Rate (%)	4.53	0.95	2.95	5.70
Fiscal Performance Index	83.24	1.36	81.15	85.5
Police Performance Index (%)	46.96	11.65	28.64	64.83
Net middle school coverage rate (%)	55.23	2.77	49.61	59.69
GDP per capita	28296702	5288027	20599982	37301563

Cali	Mean	Std. dev.	Min	Max
Homicide rate	62.57	15.57	47.9	86.00
Security and Justice Investment Rate (%)	1.78	0.56	0.97	2.5
Fiscal Performance Index	78.91	2.83	73.57	81.30
Police Performance Index (%)	33.41	7.85	20.09	47.62
Net middle school coverage rate (%)	42.93	3.68	38.34	50.30
GDP per capita	17591388	3670396	12159094	23652621

Source: Own elaboration based on data from respective sources.

Notes: Descriptive statistics are shown before any applied transformations

To begin with, Cali records the highest average homicide rate among the three cities during the study period, a trend that correlates with the patterns observed in Figure 1. Correspondingly, the city demonstrates the lowest mean values across the three focal variables representing the quality of municipal governance within this study: fiscal performance, police performance, and security investment. Furthermore, in the context of the control variables - GDP per capita and net middle school coverage rates - Cali also exhibits the lowest mean values when compared to Bogotá and Medellín.

Conversely, Medellín distinguishes by exhibiting the highest standard deviation in the homicide rate, a phenomenon which can be attributed to the substantial variability in its homicide rate, oscillating from elevated levels to considerably lower ones, as depicted in Figure 1. As anticipated, given the city's behavior concerning its homicide rate, Table 2 unveils that Medellín has the highest average rate of investment in security and justice throughout the study period. This factor likely played a significant role in the notable reduction of its homicide rate.

Lastly, Bogotá exhibits the lowest average homicide rate among the three cities, along with the least variance. This trend aligns with the pattern observed in Figure 1, where Bogotá consistently maintains the lowest rate among the three cities and the national average. Furthermore, the capital city displays the highest mean value for police performance, a factor that arguably contributes to the sustained low and controlled homicide rate.

Table 3: *Correlation Matrix for Homicide Analysis*

	Homicide rate	1	2	3	4	5
1. Fiscal Performance Index	-0.62**					
2. Security and Justice Investment Rate	-0.31	0.44				
3. Police Performance Index	-0.80**	0.47*	-0.02			
4. Net middle school coverage rate	-0.56**	0.60**	0.55**	0.33		
5. GDP per capita	-0.87**	0.48*	0.47*	0.54*	0.60**	
6. Covid	-0.22	0.03	0.10	-0.07	0.23	0.37*

Source: Own elaboration based on data from respective sources.

Notes: ** and * denote significance at 1% and 5% levels respectively.

On the other hand, Table 3 shows the correlation matrix of the variables. Notably, two variables of interest—Fiscal Performance Index and Police Performance Index—manifested significant negative correlations with the homicide rate, evidenced by coefficients of -0.62** and -0.80**, respectively. This observation is congruent with the study's hypotheses and corroborates the majority of findings from previously reviewed research. However, the Security and Justice Investment Rate and Covid variables did not exhibit significant correlations. Additionally, the presence of correlations among the independent variables indicated a potential issue of multicollinearity.

Nevertheless, it is imperative to note that this is a preliminary analysis and not the conclusive study. To derive definitive findings, the regression analysis has to be conducted, taking into account the observations and potential issues identified in this preliminary stage.

3.3 Model

Croci and Chainey (2022) highlight that “to date, most studies that have examined if a relationship exists between homicide and institutional effectiveness have used ordinary least squares (OLS) regression” (p. 1203). Therefore, the authors advocate for an investigative approach that transcends the limitations of a singular cross-sectional analysis by encompassing multiple time periods. To this end, the present study deploys a panel data regression methodology. This analytical technique facilitates a longitudinal analysis, thereby enabling the examination of diverse phenomena over multiple time periods.

The three most commonly used techniques for panel data analysis are pooled OLS estimation, fixed effects model, and random effects model. For this research, the fixed effects model was deemed most appropriate as it accounts for unobserved time-invariant heterogeneity (Alda, 2017). In the context of this study, this methodology enables the capture of city-specific characteristics that influence the homicide rates in each respective territory.

However, to confirm the suitability of the chosen model, various tests were conducted. Both the Hausman Test ($p < 0.01$) and the F Test for Individual and/or Time Effects ($p < 0.01$) confirmed that the fixed effects model was the most appropriate for this research. Subsequently, a natural logarithm transformation was applied to all predictor variables, except for the COVID-19 variable, which is a dummy variable, and the rate of investment in security and justice, due to its small values. This transformation aimed to normalize the scale of the predictor variables, some of which had significantly higher values compared to others, and to facilitate the interpretation of the results. The main model specification is as follows:

$$\ln(Hom_{i,t}) = \alpha_i + \beta_1 \cdot Sec_{i,t} + \beta_2 \cdot \ln(Fiscal_{i,t}) + \beta_3 \cdot \ln(Pol_{i,t}) + \beta_4 \cdot \ln(GDPp_{i,t}) + \beta_5 \cdot \ln(Edu_{i,t}) + \beta_6 \cdot COVID_t + \varepsilon_{i,t}$$

where $Hom_{i,t}$ represents the homicide rate per 100,000 inhabitants for city i in period t , α_i represents the fixed effect of city i ⁴, $Sec_{i,t}$ is the rate of investment in security and justice for city i in period t , $Fiscal_{i,t}$ is the fiscal performance index for city i in period t , $Pol_{i,t}$ is the police performance index for city i in period t , $GDPp_{i,t}$ is the per capita Gross Domestic Product for city i in period t , $Edu_{i,t}$ is the net middle school coverage rate for city i in period t , $COVID_t$ is the dummy variable for the years when COVID-19 was present in the study, and $\varepsilon_{i,t}$ is the error term.

⁴Specifically, this factor represents unobservable variables that are constant over time but can vary between the units of analysis and affect the dependent variable.

4. Results

Three regression analyses were conducted in this study. The first is the primary regression, which utilized the variables examined in Section 3.1 of chapter 3. The second is a robustness analysis that included additional cities to verify the stability of the primary regression results¹. The third is an auxiliary regression that incorporated the ‘Municipal Performance Measurement’ variable into the analysis of the three main cities. As discussed in Chapter 3 (Section 3.1), although this variable is of interest because it aims to capture the performance level of municipal governments in a single composite variable, it was not included in the primary regression due to its limited data availability spanning from 2016 to 2021.

Table 4 presents the results of the regression analysis examining the relationship between the governance quality indicators and the homicide rate. The analysis of column 2, pertaining to the primary regression (Model 1), shows that both the ‘Security and Justice Investment Rate’ and the ‘Police Performance Index’ stand out as statistically significant, exhibiting a strong negative association with homicide rates. Furthermore, the adjusted R^2 value reveals that the predictor variables account for 81% of the homicide rate variability across the analyzed cities—Bogotá, Medellín and Cali. This result confirms the majority of the hypotheses outlined in Chapter 1, and corroborates existing academic literature on governance quality’s impact on homicide rates. Upon examining the coefficients of these focal variables, it is revealed that, *ceteris paribus*, a one-percentage-point increase in the Security and Justice Investment Rate typically results in a average 6.8% reduction in the homicide rate. Likewise, a 1% rise in the Police Performance Index is generally associated with an average 0.68% decrease in the homicide rate, assuming all other variables are held constant.

In terms of control variables, both the GDP per capita and the COVID-19 dummy variable demonstrated statistical significance and exhibited an inverse relationship with the homicide rate, corroborating empirical findings from existing studies (Alda, 2017; Alvarado et al., 2021; Croci & Chainey, 2022; Poveda, 2012). The interpretation of the coefficients reveals that, all else being equal, a 1% increase in GDP per capita is generally associated with an approximate 0.6% decline in the homicide rate. In a similar vein, holding other variables constant, the COVID-19 pandemic led to an expected 41.1% reduction in the homicide rate when compared to the pre-

¹For this model, the cities included in the analysis are Bogotá, Medellín, Cali, Pereira, Cúcuta, and Cartagena.

pandemic period.

Table 4: Fixed effects regression models

	Model 1 <i>Homicide rate (log)</i>	Model 2 <i>Homicide rate (log)</i>	Model 3 <i>Homicide rate (log)</i>
Fiscal Performance Index (log)	1.303	-0.292	-0.141
Security and Justice Investment Rate	-0.068**	-0.126**	0.027
Police Performance Index (log)	-0.675**	-0.588**	-0.669*
Net middle school coverage rate (log)	0.992	0.574	1.020
GDP per capita (log)	-0.610**	-0.134**	-1.384*
Covid (1)	-0.411**	-0.387*	-0.397**
Municipal Performance Measurement (log)			0.672
R^2	0.86	0.55	0.85
<i>Adjusted</i> R^2	0.81	0.46	0.68
<i>F</i> statistic	23.74**	11.17**	6.36**

Source: Own elaboration.

Notes: ** and * denote significance at 1% and 5% levels respectively. 'Covid(1)' serves as a dummy variable, where a value of 1 indicates the presence of COVID-19, and a value of 0 indicates its absence. Models 1 and 2 have been adjusted by employing robust standard errors, utilizing the Arellano method to address autocorrelation issues. The time frame for Models 1 and 2 spans from 2011 to 2021. However, the time frame for Model 3 is limited to 2016-2021 due to the availability of data on the 'Municipal Performance Measurement' variable.

Complementing this analysis, the fixed effects corresponding to the cities under study were quantified as follows: 7.40 for Cali, 6.94 for Medellín, and 6.48 for Bogotá. These values essentially act as a baseline homicide rate for each city, reflecting the unique social, economic, and political factors that are not captured by the other variables in the model. For instance, a fixed effect of 7.40 for Cali suggests that, all else being equal, Cali starts with a higher baseline homicide rate compared to Medellín and Bogotá. This observation aligns with Cali's historical patterns of violence, which, as evidenced by its current homicide rates, remain unresolved to a significant extent. These fixed effects allow for a more nuanced understanding of how each city's unique conditions interact with the predictor variables to influence the homicide rate.

Finally, although the second model exhibits a reduced R^2 value of 46%, it reaffirms the findings of the primary model. Specifically, it retains the statistical significance and directional consistency for both the key variables and the control variables that were significant in the primary model. In contrast, Model 3 did not yield similar results; its focal variable, 'Municipal Performance Measurement', did not attain statistical significance. This absence of significance may be attributed to the limited availability of data, thus precluding any definitive conclusions.

It should be noted that, upon performing the regressions for this analysis, a series of model validation tests were executed. For the primary model, the Jarque-Bera Test affirmed the data's normal distribution ($p > 0.05$), while the Breusch-Pagan test negated the presence of heteroscedasticity ($p > 0.05$). Additionally, the Variance Inflation Factor (VIF) remained below the threshold of 5 for all variables, thereby

eliminating concerns of multicollinearity. However, the Durbin-Watson test identified autocorrelation issues ($p < 0.05$)². To address this, the data were adjusted using robust standard errors, specifically employing the Arellano method . The second model yielded similar validation test results, necessitating similar autocorrelation adjustments³. Conversely, Model 3, featuring the 'Municipal Performance Measurement' variable, exhibited no validation issues, thus requiring no adjustments. Lastly, The F-statistic for all three models indicates overall significance.

This chapter presents several key insights. Within the framework of our study, the Security and Justice Investment Rate and the Police Performance Index emerged as focal variables that showed a significant inverse relationship with homicides. This relationship was further reinforced when more cities were included in the analysis, as showcased in Model 2 of Table 4.

However, the Municipal Performance Measurement, despite being identified as a potential key variable, faced challenges due to limited data availability. This constraint, pertaining to the short timeframe, affected not only this variable but also the majority in Model 3, in contrast to the other two models, as shown in Table 4.

To provide a more comprehensive understanding of these findings and to explore the potential interactions between the focal variables, additional models were developed, which can be found in the appendix of this study (Chapter 7). Table 5 presents the outcomes of the models for each of the focal variables, while Table 6 displays the results of the models incorporating diverse interactions between pairs of focal variables. The results displayed in these tables will be discussed below.

In the first place, in Model 3, presented in both Tables 5 and 6, the Municipal Performance Measurement (MDM) did not achieve statistical significance, nor did any of the focal variables. Furthermore, the F-statistic for all instances of Model 3 displayed a reduced significance when compared to the other two models. This observation validates the previously mentioned limitation: the brief model period from 2016 to 2021 restricts significant findings for the MDM and other focal variables. Consequently, the subsequent analysis will predominantly focus on Models 1 and 2 from both tables.

Regarding the Fiscal Performance Index, both Tables 5 and 6 align with the results of the complete data models presented in Table 4. Table 5 reveals non-significance for the variable in both Model 1 and 2. Additionally, as shown in Table 6, its interaction with the other two focal variables, the Police Performance Index and Security and Justice Investment Rate, did not achieve significance. This suggests, within this study's framework, that the impact of both variables on homicide rates is unaffected by the Fiscal Performance Index. For this context, it appears that the Fiscal Perfor-

²To further validate the outcomes of the initial validation tests, supplementary and parallel tests were conducted, thereby reinforcing the results disclosed in the study.

³In this particular model, the Variance Inflation Factor (VIF) did not exceed 2 for any of the variables, thereby bolstering the conclusion that multicollinearity issues are not present.

mance Index decisively does not have a substantial influence on homicide rates.

Similarly, findings related to the Security and Justice Investment Rate in Table 5 and 6 also align with the central results of this study. From Table 5, while Model 1 did not indicate significance for this variable, Model 2, with a wider city sample, showcased its inverse significance, consistent with results in Table 4. Furthermore, examining its interaction with the Police Performance Index in Table 6 unveils intriguing outcomes. Both Model 1 and 2 from Table 6, displaying the interaction between these two variables, indicate a significant negative relationship. This suggests that the impact of police performance on homicide rates lessens as investment in security increases. This outcome, although seemingly counterintuitive, gains clarity upon deeper scrutiny.

In this study, police performance is measured by the ratio of homicide-related arrests to total homicides in the designated area. As security and justice investment increases, it strengthens the relevant institutions, leading to a significant reduction in violence. In such an environment, with violence mitigated due to enhanced security measures, the relative importance of police performance, specifically in terms of arresting homicide offenders, might be reduced. Essentially, a more robust security infrastructure can preemptively deter or prevent violent acts, reducing the reliance on post-incident police actions. Instances of this dynamic are evident in countries like Iceland, Norway, Monaco, and New Zealand. These nations, ranked among the world's safest, have police forces that often patrol unarmed or lack military forces entirely due to minimal external threats (Laguna, 2020; National Geographic, 2022).

Lastly, the Police Performance Index exhibited significant outcomes in both Models 1 and 2 of Table 5, aligning with the findings of Table 4. Furthermore, its interaction with the Security and Justice Investment Rate exhibited statistical significance, as delineated above.

To summarize, these findings not only validate the results from Table 4, discussed earlier in this chapter, but also offer new insights, especially concerning the interplay between focal variables. Given that governmental performance encompasses multiple factors, exploring their interactions also remains pivotal.

5. Discussion

The obtained results affirm the core argument of this research, aligning seamlessly with outcomes from various scrutinized authors, which indicates that the governance quality within a territory indeed influences its homicide rate. From a theoretical standpoint, this can be articulated by recognizing that when public entities are perceived as inefficient, people might withdraw their support. This not only weakens prevailing controls but also tarnishes the government's legitimacy. Furthermore, a government that enforces its rules with equity and stability reinforces the belief that everyone will consistently adhere to them. In contrast, ineffective entities might project an impression that not everyone is bound by the same rules, thereby incentivizing non-compliance. Such a scenario can alter citizens' expectations and behaviors, with homicide emerging as one of the most violent responses to the negative perception engendered by governmental institutions (Crocì & Chainey, 2022, p. 1211).

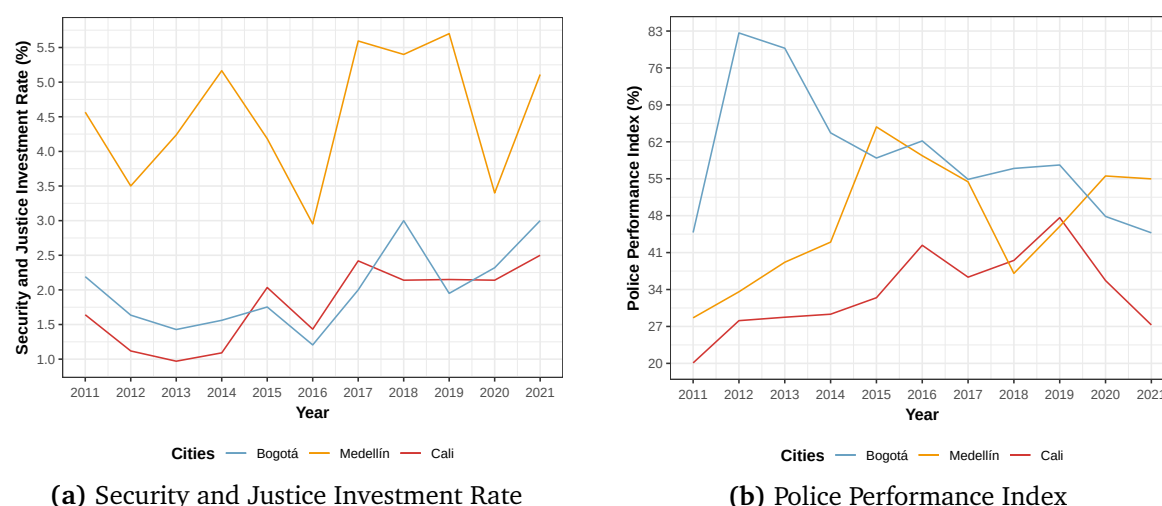
In a specific representation of governmental quality, three focal variables were utilized in this study: Fiscal Performance Index, Security and Justice Investment Rate, and Police Performance Index. The outcomes, delineated in Chapter 4, revealed that two out of the three variables under consideration yielded significant results, which were in agreement with the initial hypotheses made about them, formulated based on their anticipated behavior to support the core argument of this study.

The Security and Justice Investment Rate obtained a value of -0.068^{**} , indicating that, *ceteris paribus*, a one-percentage-point increase in the Security and Justice Investment Rate typically results in an average 6.8% reduction in the homicide rate. This outcome validates the first hypothesis articulated in Chapter 1 of this work, which posits that higher investment in security and justice generally leads to a reduction in homicide rates. Additionally, this result also corroborates the assertions made by several authors analyzed in the study, such as Alda (2017), and Saleemi and Amir (2019), who suggested that increasing investment capacity in key sectors, like criminality and justice, can enable governments to implement more efficient policies and solutions with the aim of mitigating homicide levels; that is, the greater the governments' ability to allocate resources efficiently, the greater the reduction in homicide levels. "This finding confirms the unexplored hypothesis that there is a strong link between government performance and lower homicide levels" (Alda, 2017, p. 446).

On the other hand, the Police Performance Index recorded a value of -0.675^{**} , which indicates that, *ceteris paribus*, a 1% enhancement in the Police Performance Index is generally associated with an average 0.68% decline in the homicide rate. This outcome substantiates the second hypothesis presented in Chapter 1 of this study, which posits that an improvement in police performance generally leads to a decrease in homicide rates. Additionally, this finding also validates the assertions made by several authors analyzed in this research, who indicated that law and order is one of the primary sectors overseen by the government. Within this, the police force emerges as one of the principal institutions tasked with achieving the objectives of this sector, one of which is the prevention of violence and apprehension in the face of violent acts such as homicides. Consequently, the better the police force performs in achieving its objectives, the fewer the instances of homicide (Pare, 2014). Therefore, the police force is a key governmental institution for measuring the level of government quality and its relationship with the homicides occurring in a territory (Crocì & Chainey, 2022; Lappi-Seppala & Lehti, 2014).

Figure 3 allows for an examination of the behavior of the variables under discussion within the three cities analyzed in this research: Bogotá, Medellín, and Cali. Through this figure, it is possible to identify that the behavior of these variables aligns coherently with the homicide levels present in the cities, which were outlined in Figure 1 in the introduction of this study. Subsequently, a concise analysis of the differences found in these variables for the three cities is conducted, aiming to comprehend these disparities and their linkage with the homicide rate more clearly.

Figure 3: Security and Justice Investment Rate and Police Performance Index in Colombia's three main cities



Source: Own elaboration based on data from the DNP, the National Police's crime statistics portal, and the National Institute of Legal Medicine.

During the nineties, Cali, Medellín, and Bogotá experienced high levels of homicides. However, Cali and Medellín were notably prominent in this regard as both cities were most impacted by drug trafficking, being the locations of the country's

two largest drug cartels: the Medellín Cartel and the Cali Cartel. The operations and conflicts between these cartels, along with the involvement of other actors such as guerrillas and paramilitaries, caused Medellín to reach rates of around 390 homicides per one hundred thousand inhabitants during this decade, and Cali around 124 homicides per one hundred thousand inhabitants. In contrast, Bogotá, which did not have such a strong presence of drug cartels or illegal armed groups, reached average rates of 80 homicides per one hundred thousand inhabitants at its peak during the same period. This situation led both Medellín and Cali to be considered some of the most dangerous cities globally during that time (Guerrero-Velasco et al., 2021).

Consequently, in the 2000s, after both cartels were neutralized through the assassination or capture of their leaders, and various armed groups were weakened, both cities found themselves in a vulnerable situation. The previous period had destroyed the culture and deteriorated the social structure of their respective territories. Although the cartels and various groups had been dismantled or weakened in both cities, as a result, the phenomenon of organized crime and delinquent groups consolidated more robustly in their respective territories than in other cities (Guerrero-Velasco et al., 2021; Goyret, 2018).

Given this situation, Medellín initiated a transformation process to control and rectify the violent culture left behind by that era, reflected by the high homicide rates. Achieving this goal required high levels of security investment in the municipality, as reflected in Figure 3(a), which has enabled investment in technology and innovation to facilitate the investigation and capture of criminals, as well as prevent situations that incite violence; increase the presence and improve the training of the police force and other security and justice systems; improve and maintain the different infrastructures related to the law and order sector; among other improvements. This high level of investment in security, which has established the city as one of the highest investors proportionally in this sector, has enabled the municipality to transition from being one of the world's most dangerous to a model in reducing homicides (Montoya, 2017; Goyret, 2018). As a result, this explains why Medellín has, on average, the highest rate of investment in security among the three cities, as evidenced in Table 2.

In contrast, Cali has not adopted a strategy as aggressive as Medellín in terms of security investment, as noted in Figure 3(a), since, throughout the entire period analyzed, its security investment rate is significantly lower than that of Medellín, and even slightly lower than Bogotá's security investment rate¹, which is a city that historically has not had such pronounced problems with drug trafficking and the presence of illegal military groups compared to Cali and Medellín. This scenario is criticized by various analysts and policy experts, who argue that the municipality's deficient security investment is a relevant factor that has contributed to Cali being considered the most violent city in Colombia due to its high homicide rate, currently

¹For the study period, 2011-2021, Cali's average security and justice investment rate was 1.8%, whereas Medellín exhibited an average rate of 4.5% (over double), and Bogotá, 2%.

ranking in the top 50 of the world's most violent cities² (El País, 2023a).

This behavior, referring to a low level of investment compared to other cities, like Medellín and Bogotá, is not only evident for the period studied in this research. As evidence, 2006 was one of the years in which, allegedly, a high investment was made in security in Cali, with a total investment of \$33,000 million. However, that same year, Medellín, which has similar demographic characteristics to Cali, invested almost double, according to the budgets presented each year by the mayors to the Municipal Council (Garcés & Ledezma, 2017, p. 310). Additionally, in the current year, 2023, this trend continues, as the municipality's security budget was reduced by 23% compared to last year (2022), going from almost 84 billion, a budget that was already considered insufficient, to 64 billion. This decision has been heavily criticized since the city continues to have one of the highest homicide and insecurity rates in the country, and despite this, its budget for security and justice is lower than that of Bogotá, Medellín, Barranquilla, and even Bucaramanga (El País, 2022).

This trend demonstrates that Cali has a serious problem, which is that, in general, it is the capital that invests the least in security proportionally. Almost all the capitals, specifically the other three largest ones (Medellín, Bogotá, and Barranquilla), generally invest a higher percentage of their budget on security than Cali does (Diario Occidente, 2023; Guerrero-Velasco et al., 2021).

In the policing context, Cali does not stand out positively either. As depicted in Figure 3(b), Cali generally demonstrates inferior police performance compared to Medellín and Bogotá, indicating that the police force is not as adept at clarifying homicides and apprehending perpetrators for such crimes in comparison to the other two cities. Both Medellín and Bogotá have worked to achieve this result, as, during the study period, the police in both cities had an average performance above 50%, unlike Cali³.

To overcome and control the period of excessive violence in Medellín, the local government has heavily leaned on its police force, investing in technology and investigative reinforcements to facilitate the work of the public force, enhancing its efficiency, and increasing its presence across all municipal territories, primarily in the most vulnerable areas. Moreover, innovative strategies for conflict resolution with non-violent police intervention have been applied. Additionally, various local leaders have maintained an union in terms of their policies and projects, ensuring a clear and constant horizon in terms of investment and training to strengthen the public force, and perpetuating security programs that have yielded positive results (Goyret, 2018; Montoya, 2017; Castrillón, 2023; Arboleda, 2023).

Bogotá, on the other hand, has implemented similar strategies at the police level.

²Specifically, Cali holds the 32nd position in the ranking of the most violent cities worldwide.

³For the study period, 2011-2021, the average police performance rate in Cali was 33%, while in Medellín it was 47%, and in Bogotá, 59%.

The country's capital is recognized for successfully maintaining its homicide rate notably low compared to other major cities, allowing it to remain below the national average. It must be acknowledged that the city had a less complex situation to manage its territorial violence compared to Medellín and Cali, as it was not as heavily impacted by drug trafficking and extralegal military groups as the other two cities. This has helped the city achieve the lowest average homicide rate among the three cities, along with the least volatility, as observed in Table 2. However, despite that, it has encountered their own significant homicidal violence issues, which were prominent in the 90s, necessitating the city to implement an efficient allocation of resources and policy continuity to keep the homicide rate under control.

The capital's mayorships have undergone a continuous improvement process in inputs, strategies, and training of the police forces. Among these improvements are the strengthening of the operability and equipment of the uniformed personnel, increased police presence, renewal of police vehicles, modernization of the communication system, improvement of police infrastructure, acquisition of equipment for intelligence and criminal investigation, connectivity (IoT), various training programs, and strategies for police attention to vulnerable or violence-prone areas (El Nuevo Siglo, 2019; El Nuevo Siglo, 2023; El Tiempo, 2019; Llorente, 2005). This explains why, on average, the city exhibits the highest police performance, as evidenced in Table 2.

Although Cali has also made improvements and investments in its police system, it has not been as efficient and continuous compared to Medellín or Bogotá. For instance, in 2018 it was criticized that Cali had proportionally fewer police officers compared to its total number of inhabitants; while other cities, with violence and crime rates significantly lower than Cali, such as Popayán, Bucaramanga, or Tunja, had a much higher rate (Cruz, 2018).

Despite the mayor's office said that measures would be taken to increase police presence in the city and invest in infrastructure improvements, strategies, technology, and innovation; the current situation reflects that the efforts have not been sufficient, since, by 2023, Cali's police reinforcement continues to be insufficient considering its level of inhabitants and security problems. Additionally, this public institution presents other problems, such as significant structural deficiencies in different buildings, such as the CAI and police stations; deficit in quality surveillance elements, and low technological investment, as evidenced by the fact that 60% of the municipality's surveillance cameras are damaged (El País, 2022; Diario Occidente, 2023; El País, 2023b).

Lastly, another issue that the city presents is its incapacity to coordinate security policies during different governance periods. Although this is a problem that municipalities in Colombia generally have; Medellín and Bogotá have managed to have better coordination regarding security policies and the necessary resources for it compared to Cali. As Riascos (2015) states, in Cali there has been a lack of maturity for the

creation and continuity of security policies among the different local governments, as well as certain improvisation; and there is no correct feedback, monitoring, and evaluation of the violence situation and the implemented public policy, which prevents effective and continuous coordination between local governments regarding how to combat violence and the necessary resources for it.

This, consequently, affects the correct police performance in the territory, since, practically, every four years new plans are devised and the previous ones are discarded, according to the interest of the current leader, which prevents the correct development, maturity, and transcendence of the implemented strategies to mitigate violence and the not correct assignment of resources or necessary training to the involved institutions, such as the police (El País, 2022; Garcés & Ledezma, 2017; Soares & Naritomi, 2010).

The preceding analysis substantiates three crucial points. First, indeed, governance quality is a significant factor in reducing homicide rates. Second, the ‘Security and Justice Investment Rate’ and the ‘Police Performance Index’ serve as suitable proxy variables for measuring the governance quality of local governments, as was argued by several authors analyzed, since both factors are managed by the mayoral offices and, as corroborated in Chapter 4, influence the homicide levels in the territories. Lastly, as analyzed in this chapter, these factors indicate that Cali has the lowest level of governance quality, compared to that of Medellín or Bogotá, which substantially explains its exceedingly high homicide rate.

It is imperative to acknowledge that the development of this chapter does not intend to argue that Medellín or Bogotá are cities with exemplary governance quality and that they have fully resolved their violence issues, since, as observed in Figure 1, they still have homicide issues within their territories, and, as shown in Figure 3, the variables representing their governmental quality in this study exhibit substantial variability, similar to those of Cali. However, the fact that they maintain homicide levels significantly lower than Cali, and generally exhibit better investment in security and justice as well as better police performance, does reflect a superior governmental performance in addressing their violence issues compared to Cali, and consequently, a higher quality governance.

For Cali, this outcome implies the necessity to enhance its governmental performance through the deployment of strategies or policies that are more aggressive, efficient, and targeted than those enacted by Medellín, or even Bogotá. This also entails enhanced coordination among successive mayoral offices, since, as elucidated, its history with drug trafficking and extralegal military groups has left a legacy and violent culture which has decomposed Cali’s society, and, unlike Medellín, has not been able to progress in its reparation. Consequently, presently, akin to the scenarios in the eighties and nineties, the predominant driver of homicides in the territory continues to be drug trafficking and criminal groups (Semana, 2023; Roa, 2023).

6. Conclusion

The primary aim of this research was to validate the correlation between governance quality and homicide rates in Colombia, focusing on the three major cities: Bogotá, Medellín, and Cali. Through a comprehensive panel data analysis, this goal was achieved, substantiating that, at the municipal level in Colombia, the quality of local governments inversely affects homicide rates; that is, the higher the governmental quality at the local level, the lower the homicide rate within their jurisdictions. The decision to conduct the analysis at a municipal level, rather than on a transnational scale comparing Colombia with other countries, was made because, in agreement with Céspedes et al. (2020), analyzing nations in an aggregated manner has the drawback of concealing or ignoring micro-territorial heterogeneity within countries. Therefore, while macro-level studies are useful in identifying global structural differences and affirming the universality of the results obtained, this study opted to navigate the research within Colombia's domestic context.

This decision proved notably positive, since not only substantiated the influence of governmental quality on homicide rate at the local level, but also allowed the identification of key factors that have contributed to the disproportionate difference in Cali's homicide rate compared to Bogotá and Medellín, as analyzed in Chapter 5. This outcome validates that "both governance and region are important in predicting a nation's homicide rate. . . . Omitting any one of the variables would result in model misspecification and in a significant reduction of explained variance" (Cao & Zhang, 2016, p. 14).

For the development of this research, three proxy variables were utilized, which were intended to measure various factors associated with the governmental quality of local governments, namely 'Fiscal Performance Index', 'Security and Justice Investment Rate', and 'Police Performance Index'. Of the three variables, the latter two yielded significant results. However, it is vital to remember that governmental quality encompasses various scenarios beyond these, as elucidated throughout this research. Hence, future research in this line of analysis should incorporate more variables, explore other cities, and span different periods, thereby enabling the identification of other aspects where different local governments in Colombia are lacking and the potential solutions to address these issues. This approach aims to diminish violence levels across various territories within the country, contributing to a comprehensive reduction in the nation's violence levels without diminishing the unique contributions and challenges of individual territories.

On the other hand, it is crucial to highlight that the findings of this study do not imply that socioeconomic variables, which have predominantly been central determinants of homicide levels, lack relevance in the levels of homicidal violence in Colombia. Rather, it underscores that, alongside them, the governmental aspect wields similar or, potentially, greater influence as a determinant of the homicide rate. This is substantiated by various authors who argue that governance quality exerts both a direct and indirect impact on the homicide level, given that it also influences socioeconomic variables such as unemployment and poverty through various facets, including its level of investment in social promotion, job creation capacity, development of social programs, and attention to vulnerable areas, among others (Crocì & Chainey, 2022; Saleemi & Amir, 2019; Van Dijk et al., 2021).

This work addressed aspects of governmental quality directly focused on reducing violence levels, such as investment in security and justice, and police performance. Consequently, it would be fitting for future research within this same line of analysis in the country to include factors of governmental quality that are not directly aligned with security provision, like those previously mentioned, and to see if they also have an effect on homicide rates at the municipal level.

This research confronted several challenges. First, as explained previously, the multifaceted nature of governmental quality involves a variety of metrics. Considering this, indices like the ‘National Anti-Corruption Index’ (INAC) and the ‘Social Progress Index’ (IPS), which capture other aspects of governmental quality at the local level, were of keen interest. However, their limited data history — with INAC available only from 2019 and IPS from 2016 — precluded their incorporation. Consequently, variables with a longer data availability were prioritized for the study’s timeframe and analysis. Separately, a common challenge inherent to non-experimental studies like this one is the potential bias from omitted variables. Such biases can pose difficulties in confidently establishing causality. Yet, as research in this area expands, particularly at the local level, the results can be strengthened. This progression resonates with the patterns observed in transnational studies, as they continuously reaffirm similar findings (Crocì & Chainey, 2022; Pare, 2014).

Despite the challenges mentioned, this research has yielded meaningful results. The study effectively identified the influence of governmental quality on homicide rates across various Colombian territories. Moreover, according to the investigation conducted, this research serves as one of the first studies to apply this analytical approach within the Colombian context. By employing a panel data model that encompasses diverse subjects and spans different time periods, the study provides insights into previously underexamined areas. These challenges, rather than detracting from the research, emphasize the existing gaps in research on crime and homicidal violence in the country and the numerous opportunities for subsequent research endeavors. Consequently, this study lays the groundwork for future investigations aimed at identifying the governmental quality factors that are determinants

of levels of homicidal violence in Colombia.

In addition to including more cities, variables, or different periods; another aspect to consider in future research is the analysis in smaller territories, such as communes or neighborhoods, since even within the municipalities, acts of violence are concentrated in certain areas (FIP, 2017). This would allow for more precise identification of key areas where governments should focus their efforts. An additional useful approach would be to analyze the impact of governmental quality on other types of violence or crime in the country, such as sexual violence, kidnappings, thefts, etc.

All of these ideas for future research, stemming from this study, would generate valuable results, which could guide necessary policies and efforts to reduce violence levels in Colombia, as well as identify key areas where efforts should be intensified. However, for this to occur, assistance from both national and local governments is requisite, consistently publishing and organizing all their information to ensure it is easily and clearly accessible, thereby facilitating the creation of variables regarding their performance. Furthermore, initiatives or projects that assist in obtaining robust variables, employing the same methodology across the country's different municipalities, are needed, which would eliminate one of the challenges of cross-territorial analyses: the availability of the same variables for different territories. If these conditions are not met, advancing in this line of analysis in the country will be difficult. Nevertheless, the development of recent variables such as the INAC and the IPS, or initiatives like "Ciudades Como Vamos", seem to indicate that these conditions are materializing, and that more robust research regarding the impact of governance quality on the country's violence levels will be feasible in the future.

7. Appendix

Table 5: Models by focal variable

	Model 1 <i>Homicide rate (log)</i>	Model 2 <i>Homicide rate (log)</i>	Model 3 <i>Homicide rate (log)</i>
Fiscal Performance Index (log)	0.0045	-0.50	-0.07
Net middle school coverage rate (log)	1.89**	1.17	1.32
GDP per capita (log)	-0.99**	-0.12	-0.75
Covid (1)	-0.38**	-0.45*	-0.37**
Municipal Performance Measurement (log)			0.23
<i>R</i> ²	0.74	0.35	0.64
<i>AdjustedR</i> ²	0.68	0.24	0.38
<i>F statistic</i>	19.06**	7.52**	3.53*
	Model 1 <i>Homicide rate (log)</i>	Model 2 <i>Homicide rate (log)</i>	Model 3 <i>Homicide rate (log)</i>
Security and Justice Investment Rate	0.035	-0.10**	0.10
Net middle school coverage rate (log)	1.82**	1.42	1.40
GDP per capita (log)	-1.072**	-0.10	-1.57*
Covid (1)	-0.36**	-0.40*	-0.33**
Municipal Performance Measurement (log)			0.57
<i>R</i> ²	0.75	0.37	0.71
<i>AdjustedR</i> ²	0.69	0.28	0.51
<i>F statistic</i>	19.42**	8.40**	4.94*
	Model 1 <i>Homicide rate (log)</i>	Model 2 <i>Homicide rate (log)</i>	Model 3 <i>Homicide rate (log)</i>
Police Performance Index (log)	-0.55**	-0.56**	-0.72
Net middle school coverage rate (log)	1.17**	0.55	0.96
GDP per capita (log)	-0.76**	-0.15**	-1.22**
Covid (1)	-0.4**	-0.40	-0.41**
Municipal Performance Measurement (log)			0.59
<i>R</i> ²	0.84	0.49	0.84
<i>AdjustedR</i> ²	0.8	0.41	0.73
<i>F statistic</i>	34.27**	13.66**	10.85*

Source: Own elaboration.

Notes: ** and * denote significance at 1% and 5% levels respectively. 'Covid(1)' serves as a dummy variable, where a value of 1 indicates the presence of COVID-19, and a value of 0 indicates its absence. Models have been adjusted by employing robust standard errors, utilizing the Arellano method to address autocorrelation issues when necessary. The time frame for Models 1 and 2 spans from 2011 to 2021. However, the time frame for Model 3 is limited to 2016-2021 due to the availability of data on the 'Municipal Performance Measurement' variable.

Table 6: Interaction models between focal variables

	Model 1	Model 2	Model 3
	<i>Homicide rate (log)</i>	<i>Homicide rate (log)</i>	<i>Homicide rate (log)</i>
Police Performance Index (log)	-0.021	-0.09	-1.02
Security and Justice Investment Rate	-0.88	0.95	-0.32
Police*Security	-0.24**	-0.28**	-0.09
Net middle school coverage rate (log)	0.90	0.35	0.95
GDP per capita (log)	-0.68**	-0.10**	-1.36*
Covid (1)	-0.35**	-0.31**	-0.42**
Municipal Performance Measurement (log)			0.76
<i>R</i> ²	0.90	0.65	0.85
<i>AdjustedR</i> ²	0.87	0.58	0.68
<i>F statistic</i>	37.08**	16.85**	6.49*

	Model 1	Model 2	Model 3
	<i>Homicide rate (log)</i>	<i>Homicide rate (log)</i>	<i>Homicide rate (log)</i>
Police Performance Index (log)	17.50	3.89	-96.91
Fiscal Performance Index (log)	16.06	3.65	-87.58
Police*Fiscal	-4.10	-1.01	21.82
Net middle school coverage rate (log)	1.06	0.45	1.02
GDP per capita (log)	-0.94**	-0.14**	-1.21**
Covid (1)	-0.37**	-0.42**	-0.46**
Municipal Performance Measurement (log)			0.10
<i>R</i> ²	0.86	0.50	0.88
<i>AdjustedR</i> ²	0.82	0.40	0.75
<i>F statistic</i>	27.58**	9.05**	8.52*

	Model 1	Model 2	Model 3
	<i>Homicide rate (log)</i>	<i>Homicide rate (log)</i>	<i>Homicide rate (log)</i>
Security and Justice Investment Rate	-0.72	-11.95**	15.24
Fiscal Performance Index (log)	-0.45	-4.65**	6.64
Security*Fiscal	0.17	2.69	-3.41
Net middle school coverage rate (log)	1.82*	1.05	1.67
GDP per capita (log)	-1.05**	-0.10**	-2.09**
Covid (1)	-0.36**	-0.40**	-0.35**
Municipal Performance Measurement (log)			0.62
<i>R</i> ²	0.75	0.46	0.77
<i>AdjustedR</i> ²	0.67	0.35	0.51
<i>F statistic</i>	11.97**	7.75**	3.88*

Source: Own elaboration.

Notes: ** and * denote significance at 1% and 5% levels respectively. 'Covid(1)' serves as a dummy variable, where a value of 1 indicates the presence of COVID-19, and a value of 0 indicates its absence. Models have been adjusted by employing robust standard errors, utilizing the Arellano method to address autocorrelation issues when necessary. The time frame for Models 1 and 2 spans from 2011 to 2021. However, the time frame for Model 3 is limited to 2016-2021 due to the availability of data on the 'Municipal Performance Measurement' variable.

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