The last decade of social change in Barranquilla A.M.

Jorge Orozco   Universidad del Norte
Angela Granger   Universidad del Norte

Abstract

This paper delves deeper into the study of poverty to examine the impact of economic growth on reducing poverty in Barranquilla A.M. It uses the Shorrocks-Kolenikov decomposition methodology to analyze the effects of growth, redistribution, and inflation on poverty reduction. Additionally, it provides a socio-economic and productive structure characterization. The findings reveal that economic growth has been instrumental in alleviating poverty but has not been adequate to establish a stable middle class. Therefore, the paper underscores the importance of public policies to address challenges such as informality and low productive inclusion to overcome vulnerabilities.

1. Introduction

In 2012, the Barranquilla Metropolitan Area had a poverty incidence rate of 34.8% and an extreme poverty incidence of 4.9%. In other words, a decade ago, around one in three residents of Barranquilla did not have sufficient income to afford a basic household basket, although most of them did have access to at least the food portion of that basket. From that point onward, there was a significant decline in poverty incidence, reaching 24.9% in 2018, before slightly increasing to 25.6% prior to the pandemic. Unfortunately, due to the pandemic's impact, poverty incidence rose to 41.2% and 35.7% in 2020 and 2021, respectively (DANE, 2022). Despite the city reducing poverty at a faster pace than the national average (4% vs. 2%) and other major cities (1%), Barranquilla recorded the largest increase in poverty levels during the pandemic, with an absolute rise of 15.6%.

In this document, we delve into the analysis of the evolution of poverty and well-being in the metropolitan area of Barranquilla (hereinafter, Barranquilla A.M.), with the aim of providing a better understanding of these phenomena and offering relevant information for the design of social policies aimed at poverty alleviation. To this end, a detailed characterization of the changes in monetary poverty and the distribution across social classes between 2012 and 2021 is conducted.

Additionally, an analysis focused on well-being is carried out using tools such as Pen's Parade curves and TIP curves, and the factorial decomposition methodology of poverty into its components of economic growth, redistribution, and inflation effect is applied, following the proposal by Kolenikov and Shorrocks (2005). Finally, a balance of achievements and challenges is presented, summarizing the diagnosis of

social change in Barranquilla over the last decade.

For the decomposition, data from the Gran Encuesta Integrada de Hogares (GEIH) will be used, while for the characterization of poverty and economic growth, information from various sources, including the Micronegocios Survey (EMICRON), national accounts, monetary poverty, and multidimensional poverty, will be utilized. These data are considered open and have external validity, making them a useful tool for academic research. It is worth noting that this data is collected by the Departamento Administrativo Nacional de Estadísticas (DANE).

2. Literature review

The literature proposes several methodologies to isolate the effects of changes in poverty. Kakwani (1993) introduced a methodology in which the subcomponents driving changes in poverty are the exact sum of the growth effect (poverty-growth elasticity) and the redistribution effect (poverty-redistribution elasticity). However, Kakwani and Subbarao (1990) argue that poverty measures are non-linear. Consequently, the triangular relationship between growth, poverty, and redistribution is also non-linear. This means that an exact decomposition of these subcomponents is not possible, as a linear combination cannot be achieved if one component is non-linear. Kakwani and Subbarao (1990) argue that part of the change in poverty would remain unexplained, resulting in a residual that reflects the reciprocal interaction of the subcomponents on poverty change. Later, Datt and Ravallion (1992) introduced a new dynamic but inexact decomposition methodology, where the change in poverty is the sum of the growth effect, redistribution effect, and a residual term over any two periods. According to these authors, their methodology yields results that depend on the choice of the base year, and the residual term can be as large as the redistribution effect. This undermines the methodology's goal of clearly explaining changes in poverty.

Sánchez Torres (2015) applied various poverty decomposition methodologies to Colombia during the period 2002–2012, including Kakwani's approach. The study found that the reduction in poverty during this period was primarily driven by the growth effect, with the redistribution effect contributing almost nothing to the change in poverty. This is consistent with the fact that the Gini coefficient showed little variation, while average real income increased by 43%. Therefore, there is evidence to suggest that changes in poverty in Colombia are more closely associated with the growth effect than with the redistribution effect.

Kolenikov and Shorrocks (2005) proposed a decomposition methodology that addresses some of the issues present in previous methods and enhances the understanding of the results by incorporating marginal changes into the analysis. This study will apply their methodology, which is described in detail later.

Ariza and Retajac (2020) conducted a poverty decomposition study using the Kolenikov and Shorrocks (2005) methodology and data from the Misión para el Empalme de las Series de Empleo, Pobreza y Desigualdad (MESEP, 2012) provided by DANE. According to their findings, at the national level, for the period 2002–2018, the growth effect contributed 32.4 percentage points (p.p.) to poverty reduction, while the redistribution and inflation ef-

fects increased poverty by 1.7 p.p. and 8.0 p.p., respectively. This resulted in a total poverty reduction of 22.7%. However, the results for Barranquilla differ from the national trend. In this city, the redistribution effect contributed 9.8% to poverty reduction, while the other effects followed the same pattern as observed nationally.

To analyze in a more formal and detailed manner how economic growth has contributed to poverty reduction in Barran-

quilla, this study will employ the methodology used by Ariza and Retajac (2020) to decompose poverty changes over different periods. Additionally, it will include a characterization of both the city's productive structure and the evolution of poverty and economic growth. The aim is to identify vulnerabilities and propose relevant solutions to foster solid economic development in the Barranquilla metropolitan area.

3. Characterization and evolution of poverty in Barranquilla A.M.

**Figure 1.** *Evolution of GDP per capita and poverty in Barranquilla A.M.*
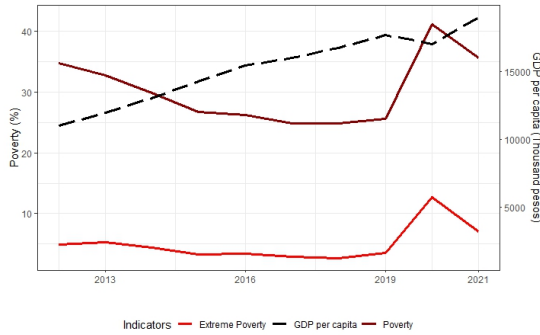
Figure 2. *Evolution of poverty in metropolitan areas*
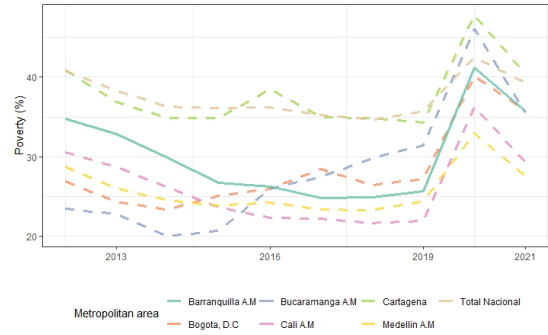
In 2012, both the incidence of monetary poverty and extreme poverty in the Barranquilla Metropolitan Area were significantly high, reaching 34.8% and 4.9%, respectively. Fortunately, over the years, a downward trend has been observed in both indicators. Additionally, GDP per capita showed steady growth from 2012 to 2018. The lowest point in poverty incidence was recorded in 2018, with 24.9% poverty and 2.7% extreme poverty, coinciding with the highest value in the time series of GDP per capita growth. However, this trend was reversed during the pandemic, though recovery was seen in 2021. Despite this, poverty remains a significant challenge for the city.

At the beginning of the decade, the Barranquilla Metropolitan Area (A.M.) and Cartagena exhibited a high incidence of monetary poverty compared to other metropolitan areas such as Bogotá, Bucaramanga, Cali, and Medellín, which will be used as reference cities. However, between 2012 and 2019, Barranquilla A.M. experienced a sustained reduction in poverty, positioning itself among the three cities with the lowest incidence of this indicator and distancing itself from Cartagena. Despite this progress, a significant increase in poverty was observed in Barranquilla A.M. in 2020, surpassing the levels of the other reference cities.

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Figure 3. *Evolution of GDP per capita (index) in metropolitan areas*
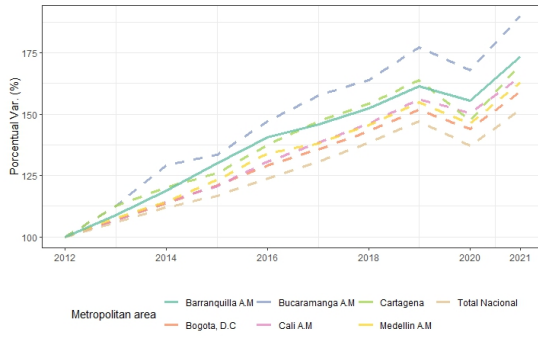
During the selected period, the per capita GDP of the Barranquilla Metropolitan Area experienced remarkable growth, with highly positive percentage variations. In fact, its growth rate was the highest compared to other metropolitan areas, reaching nearly 60% between 2010 and 2020. Only Bucaramanga matched this level of growth during the same period.

However, when analyzing Barranquilla's per capita GDP from a different perspective, it becomes evident that the city had the lowest per capita GDP among all metropolitan areas during the analyzed period (see Figure 4). While growth has been consistent, Barranquilla remains the city with the lowest per capita GDP, despite being one of the fastest-growing in percentage terms.

Figure 4. *Evolution of GDP per capita in metropolitan areas*
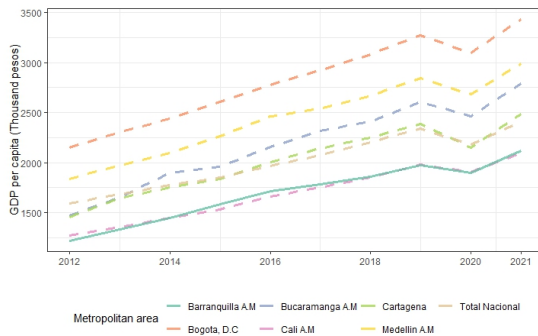
Considering the above, it can be observed that during the 2012–2018 period, monetary poverty in Barranquilla experienced a significant reduction, alongside positive economic growth that outpaced that of other major cities. However, this decline in poverty did not translate into an increase in the middle class within the metropolitan area, as evidenced Figure 5.

Figure 5. *Social class analysis of poverty in metropolitan areas*
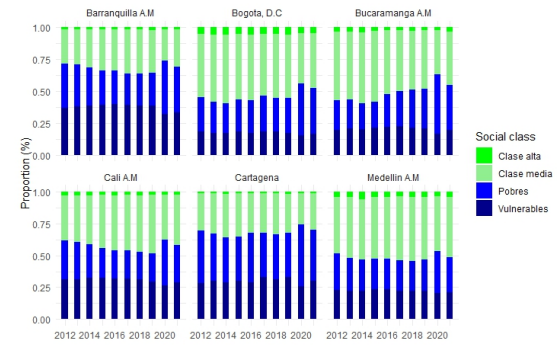
The metropolitan area of Barranquilla, along with Cartagena, registers the highest distribution of vulnerable populations over the years, in contrast to other cities where a greater proportion of middle-class individuals can be observed. Specifically, in Barranquilla, poor and vulnerable social classes make up more than 60% of the total population, and this composition has remained stable, with an increase in the vulnerable class and a reduction in the poor. However, there was a slight reduction in the poor population until 2019, after which this proportion experienced a considerable increase, even surpassing the levels seen at the beginning of the decade in 2012. It is evident that the rise in the proportion of poor people is due to individuals who were previously considered middle class or vulnerable experiencing a significant income reduction because of COVID-19, thus falling below the poverty threshold.
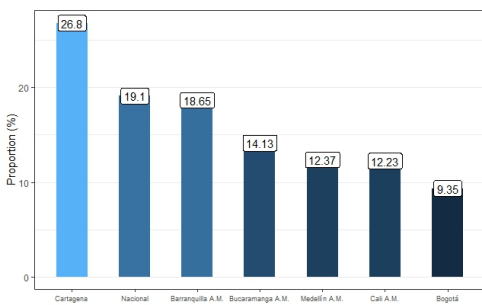
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Table 1: Social class Analysis (%)

Distribution social class - 2021				
Metropolitan area	Poors	Vulnerable	Middle class	High Class
Barranquilla A.M.	35,7	33,7	29,1	1,5
Bogotá	35,8	16,7	42,9	4,7
Bucaramanga A.M.	35,5	19,5	41,9	3,2
Calí A.M.	29,3	28,6	39,6	2,6
Cartagena	40,4	29,9	28,4	1,3
Medellín A.M.	27,6	21	47,2	4,3

In other words, there is an unestablished middle class and many people who are not considered poor but have an income range fragile enough that, in the face of external shocks affecting their income, they could fall back into poverty.

However, it is important to conduct an analysis beyond individual incomes using the Multidimensional Poverty Index (MPI), which provides a more comprehensive perspective on the poverty phenomenon within Barranquilla's population. The city-level MPI data is available only for the year 2018. Figure 6 shows the percentage of multidimensionally poor households by city.

Figure 6. *Multidimensional Poverty Index in metropolitan areas*

lowest incidence of monetary poverty in 2018, the opposite is true for multidimensional poverty.

The component driving the high multidimensional poverty index in the municipalities that make up the metropolitan area of Barranquilla is informal employment[2], which accounts for an average of 80% across the different municipalities. Additionally, there is a high percentage in the components of low educational attainment, economic dependency rate, and lack of health insurance coverage.

Given the above, it can be said that the evolution of monetary poverty in the city had been positive, as prior to the pandemic, Barranquilla was one of the cities with the lowest levels of monetary poverty. However, this reduction in poverty, primarily driven by an increase in income, was not accompanied by a decrease in the vulnerable and poor population classes, nor by a reduction in the levels of deprivations affecting these poor and vulnerable individuals.
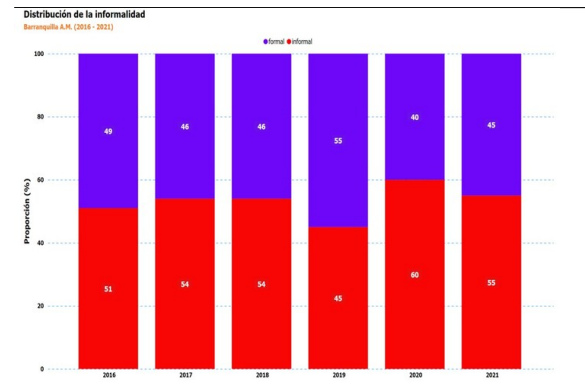
Figure 7. *Distribution of informality*

Among the six main cities, Barranquilla and Cartagena had the highest incidence of multidimensional poverty in 2018, both well above the national average. At this point, the contrast between the two dimensions of poverty is truly striking. While Barranquilla was one of the cities with the lowest incidence of monetary poverty in 2018, the opposite is true for multidimensional poverty.

In 2021, approximately 60% of the employed population worked in the informal sector. Among them, 23.14% belonged to the poor social class, 14.38% were vulnerable, and 21.69% were middle class. (See Figure 8) This concentration of informality within the poor, vulnerable, and part

of the middle class has remained relatively unchanged in the city over the years.

Figure 8. *Social class analysis of labor in Barranquilla A.M*
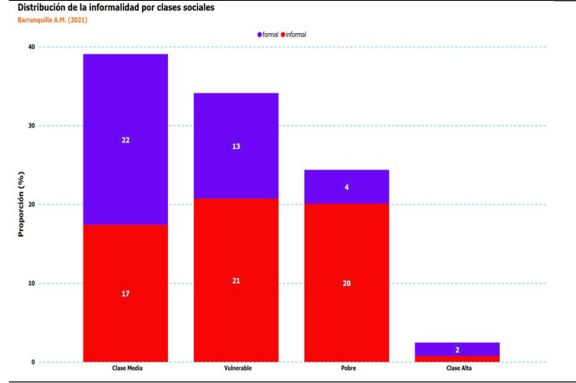
The middle and upper social classes, on the other hand, are characterized by being relatively distant from conditions of vulnerability, both in terms of monetary and multidimensional poverty, as they possess occupations and/or capital assets that provide them with stable self-sufficiency. For this reason, the goal of social policies is to transform the vulnerable and poor classes into a consolidated middle class, which is why various targeted programs and public policies are implemented. Thus, the main deprivation affecting the population of Barranquilla is informality, which is concentrated on the poor and vulnerable populations.

3.1 Vulnerability, informality and microbusinesses

Figure 9. *Distribution of employment by size of company and self-employment*
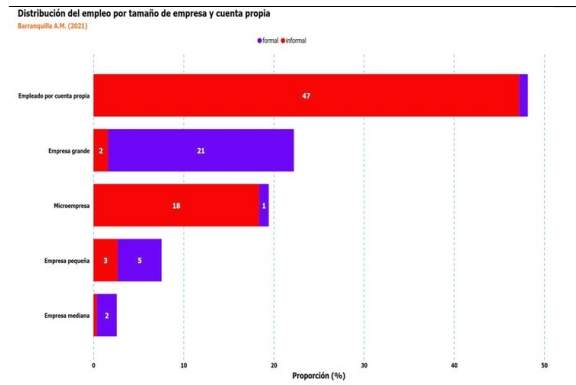

Informality is a phenomenon closely linked to poverty and vulnerability, as people in these conditions lack access to stable and quality employment in the formal sector. This is reflected in the high number of self-employed workers and employees in small businesses operating informally, as shown in Figure 9.

To address the vulnerability of productive exclusion, it is essential to focus policies on the city's productive apparatus, which is largely composed of microbusinesses. However, there are differing perspectives on the role of these microbusi-

nesses within the productive structure of the economy. While some argue that these businesses contribute to the scourge of informality and market fragmentation, perpetuating low wages and low productivity Eslava et al. (2021), other authors contend that a significant proportion of microbusinesses do not fall under the category of subsistence but rather serve as potential vehicles for reducing poverty and informality Angulo (2022).

It is important to highlight that Figure 10 presents relevant data on the distribution of microbusinesses in the city and their contribution to the local economy.

Figure 10. *microbusiness owners by social class*
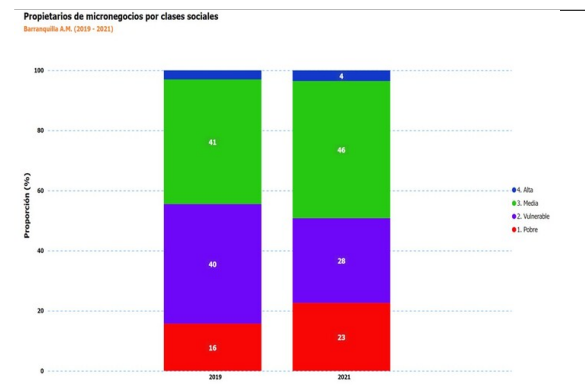
4. Methodology of poverty welfare analysis

The analysis of well-being in relation to poverty will begin by presenting the "Pen's Parade" curves proposed by Jan Pen in 1971. This visual statistical tool allows us to observe the evolution of income distribution at two points in time and determine which period reflects a higher level of well-being for the population in question.

The "Pen's Parade" curves are constructed using household per capita income on the vertical axis, while the horizontal axis represents the cumulative proportion of the population ordered from lowest to highest income, in percentiles. The purpose of the analysis is to observe the distribution of each curve at different moments to identify which one reflects a higher level of well-being and who benefits (whether the poor or the rich), depending on the shape of the curve and the distance between them.

Subsequently, a poverty concentration analysis will be conducted using TIP curves, also known as Poverty gap curves. These curves, formulated by Jenkins and Lambert (1997), are a graphical tool that represents the three dimensions of poverty: incidence, intensity, and inequality. To construct these curves, the per capita income of the target population, their ranking from lowest to highest, and three FGT poverty indicators are required.

According to GONZÁLEZ and GARCÍA-VÉLEZ (2019), the interpretation of the TIP curve begins by analyzing the Y-axis, which represents the cumulative proportion of poverty, while the X-axis shows the incidence of poverty. It is important to note that the curve provides information about inequality (the severity of poverty), which is shown in the curvature of the graph, intensity, reflected in the maximum height of the curve, and incidence, which is found at the point where the curve becomes completely horizontal.

The usefulness of this analysis lies in testing the dominance property of the TIP curve. A TIP curve is said to dominate another if it is always above the other across the entire cumulative population distribution. In other words, if the TIP curve for year A is always above the TIP curve for year B, the TIP curve for year A dominates the other, indicating that for any poverty line, the level of poverty concentration will be greater in curve A.

To conclude the analysis, a decomposition will be carried out to determine the influence of the mentioned factors in the metropolitan area of Barranquilla. The importance of this decomposition lies in the ability to quantify the effect of economic growth on poverty reduction in a specific region and thereby determine its role in this process.

To perform the decomposition, the poverty indices proposed by Foster et al. (1984) will be used as a reference. First, the parameters are defined as follows: $y = (y_1, y_2, \ldots, y_n)$ represents the household income vector, $z > 0$ is the poverty line, and $g_i = z - y_i$ denotes the income shortfall for each household. Additionally, the following functions are introduced: $q = q(y; z)$, which represents the total number of poor households, and $n = n(y)$, the total number of households. Thus, the poverty index can be defined as the ratio between income and a certain poverty threshold for the subgroups that are logically below that threshold, as follows:

$$FGT(\alpha) = \frac{1}{N} \sum_{i=1}^{q} (1 - \frac{y_i}{z_i})^{\alpha} \qquad (1)$$

Thus, if $\alpha = 0$, the indicator provides information about the proportion of poverty in a given territory.

Now, with all the elements defined, the methodology proposed by Kolenikov and Shorrocks (2005)) will be used as a reference to achieve the decomposition. Defining P as the poverty indicator to be considered, this can be situated at a time t, as follows: $P_t = FGT_t = P(y_t, L_t, Z)$ where: y_t = nominal per capita income, L_t = Lorenz curve, Z = poverty line.

Then, the change in the indicator between any two time periods can be specified as: $\Delta P = P(y_1, L_1, Z_1) - P(y_0, L_0, Z_0)$ which allows the indicator to be decomposed into its effects as follows: I) Growth effect when the change in the Lorenz curve is held constant: $P(y_1, L_0, Z_0) - P(y_0, L_0, Z_0)$, II) Redistribution effect when the change in nominal income is held constant: $P(y_1, L_1, Z_0) - P(y_1, L_0, Z_0)$

It can be observed that the third component remains constant in both effects; this is known as the residual effect, as described by Datt and Ravallion (1992). To address this, Kolenikov and Shorrocks (2005) propose dividing real per capita income by the mean income and the poverty line at the regional level, which acts as a deflator for income associated with a monetary poverty line. This reflects the behavior of prices in a given territory, as follows: $P = \bar{P}(L, \frac{\mu}{z})$.

Additionally, the use of the Shapley value is proposed to address the problem of selecting a base category and the limitations found in previous methodologies. The Shapley value method consists of proportionally assigning a weight relative to the total of the indicator to be decomposed. Then, the n possible combinations of that factor are performed, imagining that it is excluded from the indicator. By sequentially eliminating the combinations, the final value obtained represents the marginal contribution of the selected factor.

5. welfare analysis results

The welfare analysis was conducted using the previously proposed methodology for four selected periods, aiming to observe the gradual evolution of each indicator: 2012–2014, 2014–2016, 2016–2018, and 2019–2021.

Figure 11 shows that the curve for the year 2012 reflects the lowest level of welfare for the city of Barranquilla, while the curves for subsequent years shift upward, as expected. The curve for 2018, which represented the highest welfare for the population, dominates over the others. In contrast, the curve for 2021 lies below the 2018 curve, indicating a decline in the population's welfare.
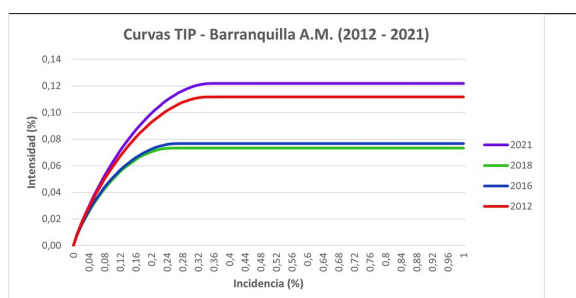
Figure 11. *Pen's Parade curves*
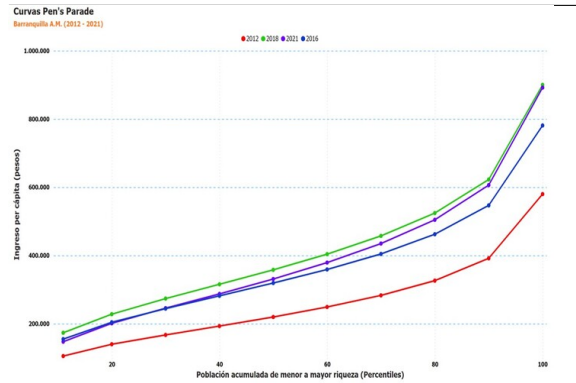
Additionally, these curves reveal that the impact on the welfare of Barranquilla's population was not uniform across all percentiles but disproportionately affected those in the lower-income percentiles.

Figure 12. *TIP curves*

The analysis of Poverty Concentration Curves (TIP) is an effective tool for evaluating the evolution of poverty conditions in the city of Barranquilla. In 2012, the curve exhibits a notable curvature, suggesting high inequality among the poor, and ranks second in height, indicating high levels of poverty intensity and incidence. However, in the following years, there is a significant improvement in poverty conditions, evidenced by a reduction in the curve's height, a decrease in its curvature, and a lower poverty incidence. Nonetheless, by 2021, the poverty concentration curve is worse than in 2012. Additionally, a slowdown in the reduction of poverty concentration is observed between 2012 and 2018.

Figure 13. *Shorrocks decomposition 2012 - 2014*
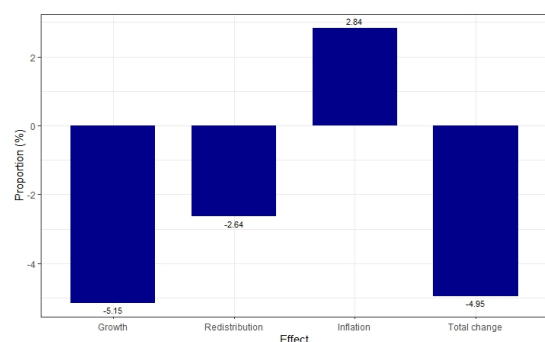
During the 2012–2014 period, the incidence of poverty decreased due to the combined effect of economic growth, which contributed 5.15 percentage points, and redistribution, which added 2.64 percentage points. However, inflation acted as a negative factor, offsetting the poverty reduction by 2.64 percentage points. Overall, these factors resulted in a net reduction in monetary poverty of 4.95%. During this period, the city's economic growth had a positive impact on improving the conditions of the poor.

Figure 14. *Shorrocks decomposition 2014 - 2016*
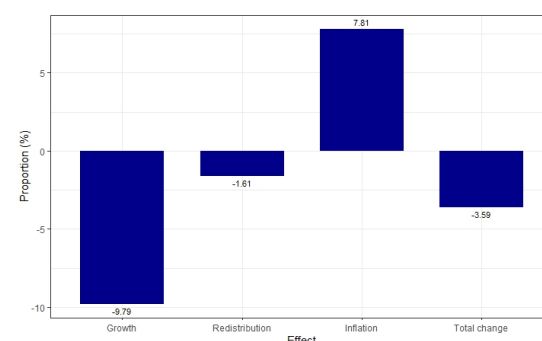
During the 2014–2016 period, the incidence of poverty declined, with economic growth playing a leading role, accounting for 9.79% of this reduction. Redistribution also contributed, though to a lesser extent, with only 1.61%. On the other hand, inflation remained a significant factor driving poverty, with an impact of 7.81%. Overall, there was an improvement in the vulnerability of the poor during this period, resulting in a 3.59% reduction in monetary poverty.

Figure 15. *Shorrocks decomposition 2016 - 2018*
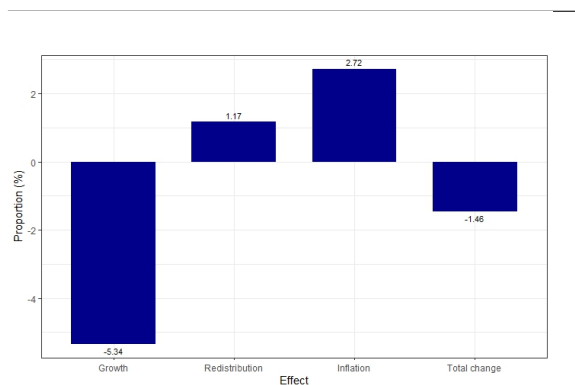
During the 2016–2018 period, the city's economic growth was the sole factor contributing to a reduction in poverty, with an impact of 5.34 percentage points. However, redistribution and inflation worked in the opposite direction, contributing 1.17 and 2.72 percentage points, respectively. This raises whether the city's transfer programs had reached their limit in effectively reducing poverty. Despite these challenges, the net effect was positive, resulting in a 1.46% reduction in poverty, indicating that this period also benefited the vulnerable population.

Figure 16. *Shorrocks decomposition 2019 - 2021*
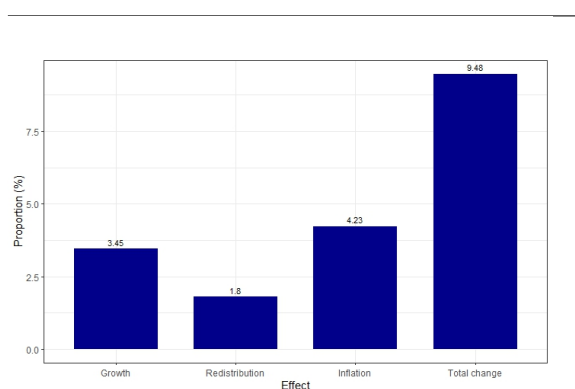
Finally, during the 2019–2021 period, all three factors—growth, redistribution, and inflation—contributed to an increase in poverty, with inflation and economic growth having the most significant impact. Unfortunately, this period was unfavorable for the poor population, as monetary poverty rose substantially, reaching 9.48%.

In conclusion, while the city's economic growth has played a key role in reducing poverty, largely due to a dynamic labor market, it is important to note that this labor market is predominantly composed of informal jobs. This suggests a trend toward labor market dynamism driven by informality, which has not effectively reduced poverty levels in the city.

A clear indicator of this phenomenon is that Barranquilla has experienced significant economic growth compared to other cities, implying that the labor market dynamism has contributed to poverty reduction. However, the high level of informality in this labor market suggests that such dynamism has not been sufficient to achieve meaningful reductions in poverty levels. Despite Barranquilla appearing to regain its economic growth trajectory following the impact of COVID-19, similar progress in poverty reduction has not been achieved.

6. Conclussions

The contribution of economic growth in Barranquilla to poverty reduction during the 2012–2021 period was generally positive, except for the 2019–2021 period, when a significant increase in monetary poverty was observed. The decomposition analysis revealed that all factors positively contributed to the rise in poverty during this period.

From the characterization conducted, it is evident that favorable conditions for the city of Barranquilla lead to poverty reduction, benefiting a large portion of the population. However, this poverty reduction shows a certain fragility due to the existence of an unestablished middle class, which is affected by high levels of informality. Informality has become a key obstacle to the economic and social development of the city's residents. In this sense, economic growth has been described as poorly successful, as it has failed to achieve effective productive and social inclusion.

Although Barranquilla has experienced economic growth in recent years, it is important to note that this growth has been slower compared to other cities in the country. This situation is largely attributable to high levels of informality, which significantly affect household living conditions. Informality is a latent vulnerability in the city's development, limiting its ability to create formal jobs and increase productivity in key economic sectors. This issue highlights the urgent need to effectively address informality in Barranquilla to foster sustainable economic growth and improve the living conditions of its residents.

The microbusinesses in Barranquilla, which are mostly operated by poor or vulnerable populations, reflect the fragility of the local economy. These businesses face specific challenges in terms of financing, reasons for establishment, and technical and technological limitations, which hinder their economic growth and, consequently, their potential to drive the city's economic development.

Despite the challenges faced by microbusinesses in Barranquilla, it is important to emphasize that some of them have the potential to become engines of change for the city's productive apparatus. These stronger and more robust microbusinesses could play a key role in increasing productive and social inclusion, thereby helping to overcome the persistent poverty in the city.

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7. Appendix

Table 2: dimensions of multidimensional poverty index - Barranquilla A.M

Dimension	Barranquilla	Soledad	Galapa	Puerto Colombia	Malambo
illiteracy	5,2	5,8	8,1	5,2	10,6
low educational attainment	29,0	31,4	40,1	23,4	44,2
school non-attendance	5,0	5,4	7,7	3,0	6,5
school backwardness	16,1	15,9	14,3	13,6	23,0
Barriers to access to services	2,4	3,1	2,8	2,6	3,0
child labor	0,6	0,6	0,5	0,5	0,7
Economic dependency ratio	29,7	36,0	40,5	28,6	41,3
informal labor	84,6	86,1	85,0	80,7	88,5
No health insurance	20,1	19,5	17,4	18,5	17,6
barriers to health	3,0	2,9	1,3	2,0	5,0
without access to potable water	1,0	1,5	3,3	4,7	6,2
Inadequate excreta disposal	2,1	10,3	12,9	6,5	14,3
inadequate floors	1,4	1,1	2,6	2,3	3,0
inadequate walls	1,5	0,5	3,4	2,7	1,8
overcrowding	13,5	12,5	17,8	11,7	16,7