

Years where decades happen:

A Comparative Static Analysis of Regional Welfare Disparities in Brazil

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Abstract

Since the late 1990s, Brazil has experienced some important economic developments such as a macroeconomic stabilization, the expansion of social programs and a sustained economic growth supported by favorable external factors. These transformations motivated extensive research on topics such as inequality and poverty, but there has been given less attention to welfare analysis per se. Since conventional metrics such as GDP, nominal income and expenditure often miss key dimensions of household well-being, this absence translates into a gap in the welfare economics literature.

This study contributes to this literature by constructing a spatially adjusted Welfare Index that addresses these limitations commonly associated with traditional metrics. We define a welfare-enhancing consumption bundle, apply equivalence scales to account for household composition and economies of scale and estimate a spatial price deflator using the weighted Country-Product Dummy (CPD) method, a hedonic regression approach widely used for regional Purchasing Power Parity adjustments to correct metropolitan price differentials for different locations.

Using microdata from the Household Budget Surveys (POF) for the years 2002–2003, 2008–2009 and 2017–2018, we employ First and Second-Order Stochastic Dominance tests and Growth Incidence Curves (GIC) to analyze welfare dynamics across time, regions and income brackets. We find significant welfare dispersion across metropolitan regions, highlighting how income disparities translate into welfare inequalities. In an intertemporal perspective, results indicate a first-order dominance relationship between periods, characterizing Pareto-improving growth that was strongly pro-poor. These dynamics exhibit high regional heterogeneity. To conclude, we perform some sensitivity analyses regarding different equivalence scales, deflation methods and consumption bundles. Through a robustness matrix and first-order dominance relations, we show that results are robust to different equivalence scales and deflation methods and are sensitive to the composition of the consumption bundle, which reinforces the importance of properly defining welfare indices to study welfare dynamics rigorously.

Keywords: Welfare economics; Stochastic dominance; Country-Product Dummy (CPD); Brazil.

JEL Codes: I31; R13; C43; D63.

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1 Introduction

Welfare economics occupies a central position in the economic debate as it investigates not only how to efficiently allocate goods and services but also which allocations are preferable among different distributions based on various criteria. This stance of going further than the classic Pareto optimality to evaluate well-being built an underlying relationship between welfare, poverty and inequality. This has led economists such as [Sen \(1976\)](#) and [Atkinson et al. \(1970\)](#) to construct measurements of poverty and inequality, respectively, grounded in the welfare literature; in fact, as [Blackorby and Donaldson \(1980\)](#) argue, such measurements inherently require a welfare framework to be constructed upon.

Given this intrinsic association among these concepts, the Brazilian case becomes particularly compelling. Brazil has witnessed a drastic decrease in the profound and historically persistent poverty and inequality that marked the 20th century during the second half of the 1990s and especially in the 2000s. As [Silveira-Neto and Azzoni \(2011\)](#) observe, this occurs as a product of hyperinflation control and the expansion of social programs, which prompted an economic growth more beneficial to the poorer population and, consequently, to the poorest regions, since poverty and inequality possess clear regional outlines within the country's context.

This promoted a range of works analyzing Brazilian poverty and inequality dynamics throughout the 21st century and its regional outcomes as a case study for developing nations. This present work contributes to the welfare literature by going beyond customary well-being metrics and empirically analyzing the heterogeneity of welfare gains in Brazil throughout the 21st century through a Welfare Index, focusing on both intertemporal and interregional particularities.

2 Methodology and Data

We construct a Welfare Index based on household consumption that accounts for a welfare-enhancing consumption bundle, household size and composition and the distinct price vectors faced by families in different locations. The construction of the welfare-enhancing consumption bundle largely follows the recommendations of [Mancini and Vecchi \(2022\)](#) by excluding non-utility-generating items and applies the equivalence scale based on [Cutler and Katz \(1992\)](#) to endogenize family composition and scale economies in household expenditure simultaneously. This constitutes a direct application of welfare analysis as proposed by [Deaton and Zaidi \(2002\)](#).

The main distinction between Deaton's Money Metric Utility (MMU) proposed in *Guidelines* and our Welfare Index lies in the use of an econometric estimator—the weighted Country-Product Dummy (CPD)—to account for spatial deflation, replacing the Paasche index. The weighted CPD has been extensively used to calculate regional price disparities and has presented, as discussed in [Laureti and Rao \(2018\)](#), many advantages that raise its status as a preferable spatial deflator, justifying its extensive use in the regional science to calculate international and national Purchasing Power Parity (PPP). This method yields a superior index number that satisfies desirable properties such as transitivity and base invariance and concomitantly applies an economically sound weighting via expenditure shares to control for heteroscedasticity and the economic relevance of each good.

The formula for the Welfare Index can be expressed as such: let households be indexed by h and each location by j , the Welfare Index can be written as:

$$\text{Welfare Index}_j^h = \frac{x_j^h}{e^{\eta_j}} \quad (1)$$

where x^h represents the household's welfare-enhancing equivalent consumption, which is deflated by the exponent of the estimated locational price differential (η_j) given that the weighted CPD is estimated on a logarithmic scale.

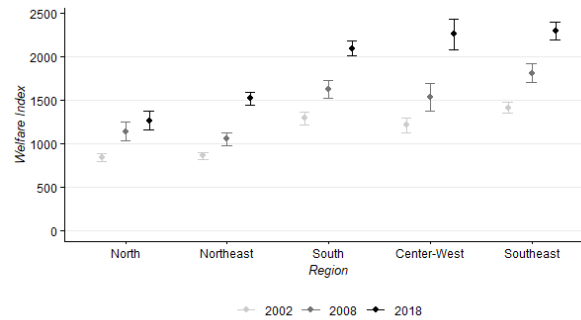
This framework allows us to estimate the welfare distribution at both national and regional levels, enabling the use of comparative static tools such as First-Order Stochastic Dominance (*FOD*), Second-Order Stochastic Dominance (*SOD*), and Growth Incidence Curves (*GIC*) to examine intertemporal and interregional welfare dynamics.

We utilize microdata from the Household Budget Surveys (POF) for the years 2002–2003, 2008–2009 and 2017–2018 to construct our household's welfare-enhancing equivalent consumption¹. The price vector used for estimation, covering 12 metropolitan regions across all Brazilian macro-regions, is derived from a market price survey provided by the Institute for Applied Economic Research (IPEA) for the reference year 2018.

3 Results

Our findings reveal a substantial welfare inequality across regions. The North/Northeast axis, that historically exhibits lower income levels, also presents the lowest estimated welfare levels, a disparity that persists even after accounting for the lower price levels faced by their populations. In contrast, the South/Southeast axis presents welfare levels 2.26 to 2.54 times greater than poorer metropolitan regions. The visualization of these results is available in figure 1:

Figure 1 – Estimated Welfare Index by region



We also find that although regional disparities have decreased through an earning viewpoint, these inequalities remain persistent and even marginally increasing when a well-being approach is adopted.

From an intertemporal perspective, the data indicates a consistent real welfare growth throughout the 21st century. Analyzing the entire distribution, we find that this growth occurred across all income brackets, establishing a first-order stochastic dominance relationship between the distributions of each subsequent period. This configuration characterizes a Pareto-improving dynamic for the timespan, as shown in Figure 2:

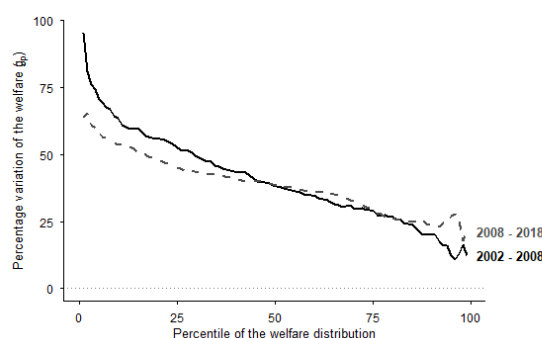
¹ All expenditures were inflated to 2018 prices via the National Consumer Price Index (INPC).

Figure 2 – First-Order Stochastic Dominance



Beyond observing the existence of welfare gains, it is possible to understand how these gains are distributed by employing the Growth Incidence Curve (GIC) technique. The downward slope of the curve indicates that the welfare growth was higher for the poorest population segments, depicting a strongly pro-poor growth in both the 2002–2008 and 2008–2018 periods. Figure 3 presents these results:

Figure 3 – Growth Incidence Curve



The magnitude of these gains differs significantly as reveals a second-order stochastic dominance examination. The monetary magnitude of welfare changes in annualized terms indicate that the 2000s (2002–2008) experienced not only a sharper pro-poor inclination but also a total welfare growth approximately 30% higher than that of the 2010s (2008–2018).

In addition, we analyze in depth regional peculiarities since national distributions and averages may mask a significant spatial heterogeneity across the territory. By applying the same analytical framework to each metropolitan region, we perform a disaggregated analysis revealing that while the pro-poor trend is generalized, the intensity of gains drastically alters across regions and periods. Some richer regions, such as São Paulo and Rio de Janeiro, present neutral growth curves and even declining welfare for their richest income brackets in the latter period, while poorer regions seem to display a strictly negative monotonic relationship.

Finally, sensitivity analyses are conducted using first-order stochastic dominance and a robustness matrix to verify the consistency and stability of these results. Findings indicate that the main conclusions are robust to different specifications of equivalence scales and spatial deflation methods. However, results such as the marginally increased regional inequality and first-order dominance between periods are sensitive to the definition of the consumption bundle, which reinforces the argument for constructing a specific welfare-enhancing bundle to accurately analyze welfare dynamics.

4 Conclusion

This study concludes that welfare dynamics in Brazil throughout the 21st century were characterized by a generalized Pareto-like growth for all income brackets. While growth was strictly positive for the entire distribution at a nationwide scope, it was substantially greater for the poorest, particularly during the 2000s (2002–2008), with more moderate pro-poor trends persisting into the subsequent decade.

These results at a national scale can be complemented by a significant spatial heterogeneity for regional outcomes. Our findings highlight that despite the generalized improvement, the structural welfare gap between the historically wealthier South/Southeast axis and the North/Northeast remains constant and even marginally increased. This suggests that the convergence often observed in nominal income earnings has not translated into a convergence of household well-being when spatial price differentials and consumption patterns are properly accounted for. It is also perceivable that growth patterns exhibit significant variation across different regions and time frames, confirming the relevance of the spatial component for the welfare determinants.

From a methodological standpoint, the main conclusions of this work remained unchanged with the usage of different equivalence scales and spatial deflation, but were sensitive to the construction of a welfare-enhancing consumption bundle. This sensitivity analysis, therefore, reinforces the insufficiency of usual well-being proxies and emphasizes the importance of filtering non-utility-generating expenditures to accurately evaluate population well-being.

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