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Abstract

Following the economic and political reforms of the 1990s, the Peruvian economy experienced two decades of exceptional growth in the 2000s. How was inequality affected by the strong growth performance of 2004-19? Which were the main factors associated with these inequality changes? The distribution of both income and consumption in Peru was highly unequal in 2004, with important geographic and regional differences. Since then, the degree of economic disparity decreased significantly associated with the exceptional growth of 2004–19. This decline in inequality was broad-based, yet it was not homogeneous across geographic areas, regions, or time. A correlate of this reduction in inequality has been a falling polarization. While wages and, to a lesser extent, government transfers accounted for most of the decline in income inequality, food prepared at home played a pivotal role in reducing consumption inequality, particularly in rural areas.

JEL Classification : O15, D31, E24
Keywords : Inequality, distribution, consumption, income, Peru.

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1 Introduction

The Peruvian economy has been one of the best performing emerging market economies over the last two decades. This strong performance resulted from the economic structural changes and peace process of the 1990s and the generally sound macroeconomic policies of the 2000s (Rossini and Santos, 2015). Output growth in 2000-19 exceeded two and a half times the average growth rates in the 1980s and 1990s while the inflation rate was in the low single digits. Simultaneously, the share of the population living on less than US$ 4 a day has dropped from more than 45 percent in 2000 to less than 25 percent (Cord et al., 2015), and the middle class expanded significantly (Stampini et al., 2016). As the periods of economic malaise and instability are long gone, the debate on how the benefits of economic growth are distributed has intensified (see, *inter alia*, Genoni and Salazar, 2015; Székely and Mendoza, 2016; Morley, 2017).

In this paper, we show that inequality and economic growth in Peru have been inversely related during the first two decades of the 21st Century.[1] The nature of this relationship is broad-based, as most Peruvians enjoyed the benefits from strong growth. We address the following interrelated questions. How did inequality evolve in Peru during the strong growth period from 2004 to 2019 (with an average real GDP growth rate of 5.2 percent)? Were the changes in inequality homogeneous across geographical areas, regions, and time? What were the main factors behind these changes?

There are two strands of literature that study the interaction between inequality and growth. First, there is substantial literature examining the association between inequality and long-run growth. In principle, the relationship between these two variables could either be positive or negative. Higher inequality resulting from granting economic incentives that promote innovation and human capital accumulation could be associated with faster long-run growth (see Romer, 1986; Benabou, 1996). Alternatively, higher inequality resulting from rent-seeking activities could be associated with reduced human capital accumulation and slower long-run growth (see Terrones, 1990; Benabou, 1996; Esteban and Ray, 2011). Inequality also reduces growth in economies with skill-biased technological change by decreasing investment in skills (Murphy and Topel, 2016). What does the data say about the association between inequality and long-run growth? The evidence in panel-country studies suggests that higher inequality is detrimental to long-run growth (see Berg et al., 2018).

Second, the literature that examines the association between inequality and growth in the short–run is relatively sparse and with mixed results. Some economists study how inequality moves with the business cycle. For instance, Dimelis and Livada (1999) find that inequality can be countercyclical –it falls during expansions and increases during contractions– in some major advanced economies such as the UK and the US, or can be procyclical –increases during expansions and falls during contractions –in other economies such as Italy and Greece. Similarly, Hacibedel et al. (2019) report cross–country evidence that inequality typically decreases during growth upswings but increases during growth slowdowns. Finally, Goderis and Malone (2011) examine how inequality is affected by commodity booms and find evidence that inequality temporarily declines immediately after a mineral or oil boom. In contrast, Loayza and Rigolini (2016) find that consumption inequality is higher in the districts that are

[1] The term inequality in economics usually refers to the uneven distribution of income, consumption, or wealth among the population of a country. These distributions generally reflect market outcomes, which are often altered by government redistributive policies.

more affected by the boom.

This paper is related to this second strand of the literature, and makes three contributions to the burgeoning empirical literature on inequality in emerging markets and, in particular, Peru. First, it examines the main characteristics of income inequality and consumption inequality within a comprehensive and unified framework, using several inequality indicators that help assess the robustness of the main findings.[2] Second, it documents the changes in the degree of inequalities across geographic areas, regions, and over time, while exploring whether or not the inequality changes are related to economic growth.[3] Third, it analyzes the most important factors that are associated with the changes in income and consumption inequality.

There are several other studies that examine inequality in Peru, but with different approaches and emphasis than ours. For instance,Yamada et al. (2012) examine the role of public policies to reduce income inequality from 2004 to 2014. Paz and Urrutia (2015) and Robles and Robles (2016) document that increases in labor earnings explain poverty reduction, whereas a reduction in the returns to education helps explain the decrease in income inequality. Herrera (2017) and Winkelried and Torres (2019) studied poverty, social mobility, and inequality in Peru since the turn of the millennium, but examine inequality only in a cursory way. Lastly, Morley (2017) and Flachsbarth et al. (2018) provide a careful account of incomes and earnings in rural Peru.

We first show that economic disparities in Peru were high and pervasive in 2004, but decreased significantly by 2019. For instance, in terms of percentiles, the bottom half of the population accounted initially to one third of the income share of the top 10 percent; for consumption the ratio was $\frac{2}{5}$. By the end of the sample period, the bottom half of the income distribution amounted to $\frac{2}{5}$ ($> \frac{1}{3}$) of the share of the top 10 percent, and the bottom half of the consumption distribution spent some $\frac{1}{2}$ ($> \frac{2}{5}$) of the share of the top 10 percent. Similar conclusions are reached using the well-known Gini and Theil indices as these indicators showed a downward trend. Despite the significant reduction in economic disparities in the first two decades of the 21st Century, Peru remains among the top $\frac{1}{3}$ of unequal countries in the world.

Even though the reduction of inequality in Peru has been broad-based, the pace of disparity reduction across geographic areas and political regions varied significantly. As a result, the heterogeneous spatial pattern of inequality in the country changed further between 2004 and 2019. Inequality declined significantly more in the urban areas than in rural ones, particularly with regards to income. Moreover, disparities fell by much less in the Amazon than in the other geographical regions and this region became the most unequal one by 2019. Finally, inequality decreased in most but not all of the political regions (*Departamentos*), affecting their inequality rankings.

We provide evidence that the gains in disparity reduction were associated with strong economic growth. First, income and consumption growth have been inclusive, as their growth rates have been systematically higher for the bottom of their distributions than for the top. The declining inequality also correlates with falling polarization, which is attributed to a significant expansion of the middle class. Second, panel regression analysis for the political regions shows

[2] Income and consumption are the most studied variables in the inequality literature, albeit not always in a unified way (see Krueger and Perri, 2006). In general, income inequality and consumption inequality do not track each other. Wealth inequality, the third aspect of a country's overall inequality, also adjusts. In this study, we do not examine wealth inequality because of data limitations.

[3] Annual growth in Peru was positive in all the years of 2000-19. In a related study, the World Bank (2014) examines how inequality in Latin America could respond to an economic growth deceleration.

that there is a negative association between inequality indicators and regional growth, with income responding to grow faster than consumption.

Finally, we examine several factors that are associated with the two-decade decline in inequality. On the one hand, rising wages and, to a lesser extent, public transfers are the key factors contributing to the reduction of income inequality, particularly in urban areas. On the other hand, increasing food prepared at home and services helped reduce consumption inequality. Interestingly, food is an essential equalizing force in rural areas, while services play a mixed role, equalizing in the urban areas and unequalizing in the rural ones.

The remainder of this paper is organized as follows. In Section 2, we describe the data. In Section 3, we document some stylized facts about inequality in Peru, across geographic areas, regions, and time, and report several results on the link between growth and inequality from 2004 to 2019. In Section 4, we briefly review the Shorrocks (1982) and Lerman and Yitzhaki (1985) methods to decompose inequality indices into the contribution of constituents. Then, we identify the main sources associated with income and consumption inequality. Finally, in Section 5, we conclude.

2 The data

In this section, we discuss the dataset's main features, including whether one should pretreat the original data.

2.1 The database

The data come from the National Household Survey on Living Conditions (ENAHO). This survey is the official source to measure national poverty in Peru, and includes detailed information on income and consumption expenditure. The focus population is the set of rural and urban private dwellings of the country and their occupants. The survey has been collected and processed by the Peruvian National Institute of Statistics (INEI) since the mid-1990s, but a major methodological revision took place in 2004. Thus, the sample period in our analysis, 2004 to 2019, comprises the most extensive set of annual surveys that allow an intertemporal analysis of inequality in the first two decades of this century. The number of households interviewed grew from 19,502 in 2004 to 34,565 in 2019. All monetary variables are deflated using 2019 Lima (the capital city) prices. When required, we obtain complementary data from the Central Bank of Peru and the Ministry of Economy and Finance.

The real per capita income and the real per capita consumption are the two main variables of interest. These are obtained by dividing real total gross household income or real total household expenditure by the number of household members. Total income is equal to the sum of wages, public transfers, and other income. Wages include both employed, and self–employed labor income; public transfers comprise current transfers and a variety of public grants; and other income includes private transfers and income from other sources. Total consumption expenditure is the sum of food, services, apparel and personal care, and other consumption expenses. Food expenses only include home-prepared meals; services comprise expenses in health, education, transport, housing, and electricity; apparel and personal care consist of expenses on clothing, including for kids, and personal care; and other expenses include, among others, entertainment, consumption in restaurants, and durable goods expenses.

We also utilize variables that help split the sample into geographic areas, geographic regions,

and political regions. Regarding the geographic areas, the population is grouped by their residence area, i.e., whether households live in rural areas (countryside) or urban areas (towns or cities). In ENAHO, the urban areas include cities or towns with at least 100 clustered dwellings or district capitals. In contrast, the rural areas comprise towns with least than 100 dwellings or over 100 non–contiguous dwellings. Over time there has been net migration from the rural area to the urban one, reflecting less access to services (including health and education) and work opportunities in the former. Between 2007 and 2017 (the two census years in our sample), the urban population grew by 1.6 percent per year, and the rural population fell by 2.1 percent per year. Moreover, many of the Peruvian poor and extremely poor live in rural areas (see World Bank, 2017; INEI, 2019).

The geographic region variables refer to how geographic considerations split the Peruvian territory. There are four geographic regions: North, Center, South, and Amazon. Except for the Amazon, each region holds territories in both the Pacific coast and highlands. The main cities, including Lima, and the main production centers, are located in the North and Center regions. The South region includes the most important mining areas and tourist centers. Finally, the Amazon is the region with the lowest population density and economic activity.

In addition, the Peruvian territory is organized into 26 administrative regions since 2002. These regions overlap with the traditional 24 *Departmentos*, with the *Departmento* of Lima, in turn, divided into three subregions (Metropolitan, Callao, and provinces). In this study, we consider Lima as a single region, yielding a total of 24 regions. Some of the administrative regions have territories in more than one of the three geographical zones–coast, highlands, and jungle–comprising Peru.

We also split the sample into three sub-periods: 2004 to 2008, 2008 to 2013, and 2013 to 2019. Figure 1 summarizes critical macroeconomic information about these sub-periods. The first sub-period is characterized by strong economic growth fueled by favorable terms of trade, which allowed the creation of government transfers (conditional cash transfers and housing subsidies). The second sub-period is marked by the Great Recession and slow recovery in the advanced economies, which translates into weak terms of trade and a growth slowdown in the Peruvian economy. Despite these weaker economic conditions, public transfers expanded significantly. The third sub-period is characterized by an even weaker economic growth, a further deterioration in terms of trade, and a deceleration of the government transfers. This last sub-period also featured increased political turmoil due to the confrontation between the executive branch and Congress starting in mid–2016.

2.2 To pretreat or not pretreat the survey data

There is a debate about how to pretreat the data from household surveys. It is well documented that household surveys and national accounts produce different per capita means, with the former being typically smaller than the latter (Deaton, 2005). These differences are the results of many factors, including different coverages, prices, periods, among others. Also, several studies have noted that household surveys suffer from income sub–reporting and self–exclusion of the top income households. Researchers have used a couple of methods to adjust the lower survey means with the national account means in the Peruvian case. Some allocate the difference to all income deciles assuming a log-normal distribution (see Mendoza et al., 2011; Yamada et al., 2012), while others assign the brunt of the difference to the highest income decile (Cruz Saco et al., 2018). The corrected Gini indices are higher than the original ones, but, with the exception of the latest, still show a downward trend in the 2000s and 2010s.

However, national accounts are often measured with even larger errors than household surveys (Deaton, 2005), and these amended indicators are not necessarily better than the original ones (see also Bourguignon, 2015). In Peru, the large size of the cash and underground economy complicates the national accounts usefulness as pre-treatment source even further.

In other studies, researchers combine household survey data with other administrative sources to address the tail problem noted above. For instance, the World Bank (2014) in an attempt to assess whether the reduction in inequality in Latin America in the 2000s was the result of the top tail reporting problems, complemented household survey data with tax administration information for a small number of countries in the region for which data was available. The study reports for these countries, there is virtually no correlation between the two inequality measures obtained from household surveys or tax data. This, together with both sources providing incomplete information about inequality, makes the conclusions dependent on the source one utilizes. When mixing survey with administrative sources, they find that while the Gini coefficients increase in magnitude, their trend is similar to that of the original Gini. There are, however, important questions about the usefulness of tax administration data as a complement for household surveys as there is no correspondence between these two sources, which has a bearing on the sampling framework for the upper tail.

This paper utilizes the household survey data without correcting for the top tail problem. Other researchers have also followed this route, both for cross-country inequality and poverty studies (see Ferreira et al., 2013; Cord et al., 2015; Stampini et al., 2016) and for examining the Peruvian living conditions (see Paz and Urrutia, 2015; Herrera, 2017; Morley, 2017; World Bank, 2017; Flachsbarth et al., 2018; INEI, 2019). The survey data, however, presents other challenges, such as the presence of dirty or imperfect data. Several factors explain this problem, including data coding or transcription errors and lack of reliable self–employment income data, among others (Cowell and Litchfield, 1999). There are two methods utilized in the literature to address this problem: trimming and winsorizing. The former method trims from the dataset a selected percentage (say 1 percent) of the top and bottom data tail, so the main features of the distribution of the trimmed variables change, but the median remains unchanged. The latter method is related to the former, but the extreme values are replaced by the top (bottom) 1 % threshold values. Most of the winsorized variables' distribution features, except for the tails, remain the same as those of the original data, including their median value. Notably, the Gini and Theil indicators from trimmed data are generally smaller than those from winsorized data. We utilize this latter method in order not to change the values of the inequality indicators by much. We perform this task by year and population sub-groups. It is important to note that this study's main qualitative findings do not significantly change when we utilize the original survey data (see Appendix).

3 Inequality, growth, and polarization

We now document some facts about inequality in Peru and study the link between inequality and economic growth in the first two decades of this Century. Towards this objective, we construct several inequality indicators, including the Gini coefficient and Theil index. These indicators are Lorenz consistent and, therefore, are useful to make robust inequality

comparisons over time and across regions.[4] We also examine the ratio of the income (expense) share of the bottom-earner (spender) 20% to that of the top 20%. Finally, we study the evolution of polarization over these two decades.

3.1 Inequality was relatively high in 2004 and has fallen since then

In 2004 inequality in Peru was slightly below the average of Latin America, one of the world's most unequal regions,[5] but was much higher than the OECD average (Gasparini et al., 2011). The 2004 Gini and Theil indices for income were 46.9 and 38.8, respectively; for consumption, they were 38.2 and 25.1. Lastly, the bottom-earner half received one third of the share of the top 10 percent, and the bottom-spender half expended slightly more than $\frac{2}{5}$ the share of the top 10 percent. Behind these figures were the relatively high and widespread poverty levels existing in this country (Herrera, 2017). Peru's per capita GDP was US$2,417 in 2004.

Regardless of the indicator, income and consumption inequality have experienced a significant reduction from 2004 to 2019. Figure 2 shows the evolution of inequality indicators during this period. The Gini and Theil indices show a downward trend, yet the reduction in inequality has not been homogenous. The Gini coefficient for income and consumption fell in 14 and 12 percent, respectively. Likewise, the Theil indices for income and consumption fell by 29 and 25 percent, respectively. Lastly, the income and consumption shares of the bottom 20% relative to those of the top 20% show an upward trend, highlighting the critical gains from the relatively poor. These ratios rose in 2004–19 by 28 and 15 percent, respectively. The reduction in income inequality is broadly consistent with that documented by Yamada et al. (2012), Herrera (2017); and INEI (2019) for shorter sample periods. As noted by World Bank (2017), poverty and extreme poverty were reduced sharply in most of this period. Peru's per capita GDP is estimated at US$7,020 in 2019.

The inequality indicators are highly persistent, which indicates that reducing these disparities is a challenge for policymakers. The first-order autocorrelation coefficients for the income inequality and consumption inequality indicators exceed 0.8, whereas the partial autocorrelation functions of these indicators decay to zero gradually.[6] Moreover, the income and consumption-based inequality indicators are highly correlated, their contemporaneous correlation coefficients being near 1. This suggests that a reduction in Peru's income disparities passed through consumption disparities, possibly reflecting that households cannot fully insure against income shocks, as they do not have full access to insurance and credit markets.

The fall in inequality, however, has not been evenly paced. Table 1, top panel, reports the inequality changes over the whole period and three sub-periods of analysis. The most significant reduction in inequality, which represents between 45 and 53 percent of the total drop, took place between 2008 and 2013. Paradoxically this period coincided with the Great Recession and its aftermath. In contrast, the smallest inequality reduction, amounting to between 15 to

[4] These indicators range from 0 to 1, however, in the presentation we multiply them by 100. To be Lorenz consistent, and indicator must satisfy the following four principles (Foster and Lustig, 2019): symmetry, population invariance, scale invariance, and transfer. If there are two Lorenz curves and one of them lies to the right and below the other one, then the Gini (Theil) indicator of the rightmost curve should be higher.

[5] According to the World Bank's LAC equity lab (`www.worldbank.org/en/topic/poverty/lac-equity-lab1`), the average income Gini coefficient was 54.1 for Latin America and 49.9 for Peru in 2004. These are statistics for non-winsorized data.

[6] We do not perform unit root tests for these inequality indicators because of the limited time span of our sample. Ghoshray et al. (2020) examine inequality persistence for a large sample of countries, including Peru, from 1984 to 2015.

19 percent of the total decline, took place either in the first or third sub-period, depending on the variable of interest. The bottom 20% consumption share ratio to the top 20% fell in 2004–2008, and then rose in the other two sub-periods, particularly so from 2008 to 2013.

Notably, the position of the 2004 and 2019 Lorenz curves confirms the robustness of these findings. In the top panel of Figure 3, we report the income and consumption Lorenz curves for 2004 and 2019, including their 95% confidence bands. The 2019 Lorenz curves lie above and to the left of the 2004 ones, indicating that the 2019 distribution Lorenz dominates the 2004 distribution.[7] Thus, the 2019 distribution is more egalitarian than its corresponding 2004 distribution. The generalized Lorenz curves reported in the bottom panel of Figure 3 show the income (consumption) equality gains that Peruvians have achieved over time. These curves combine information on the average income (consumption) levels (given by the height of the curve) and the degree of income (consumption) inequality (given by the convexity of the curve). The farther north the generalized Lorenz curve is from the horizontal axis, the higher the welfare of individuals. Thus welfare increased monotonically from 2004 to 2019.

Regarding the centile information, we find that both income and consumption experienced positive growth across deciles. However, growth was not homogenous as the relatively poor benefited more than the relatively rich. Both income growth and consumption growth rates for the bottom deciles are much higher than those for the middle and top deciles, particularly in the case of income (Figure 4). Consistently with findings in Genoni and Salazar (2015), there is no doubt that these critical growth gains enjoyed by the bottom percentiles were instrumental in bringing down inequality. However, the reduction in inequality across percentiles has not been homogeneous over time. From 2004 to 2008, when real GDP growth was robust, both income and consumption growth of the bottom and top deciles fell behind the growth observed in other deciles, particularly those in the middle of the distribution; in contrast, from 2008 to 2013 and 2013 to 2019, when real GDP growth slowed, the bottom deciles experienced substantial growth gains vis–à–vis the rest of the deciles, particularly the top ones.

3.2 Inequality has decreased in urban and rural areas

In 2004, the degree of economic disparities was higher in urban areas than in rural ones. The income (consumption) based Gini coefficient at 42.6 (34.4) was some 5 (10) percent higher in the urban areas than in the rural ones. Moreover, the lower-earner (spender) half income (consumption) share ratio relative to that of the top 10 percent was 6 (7) percent lower in the urban area than in the rural ones. Real per capita income or consumption in the urban areas were more than twice that in the rural ones.

The middle and bottom panels of Table 1 report the changes in inequality in both urban and rural areas. There are three critical takeaways from this table. First, income inequality in the urban areas fell substantially more than in rural ones. As a result, urban areas that started with higher income inequality in 2004 finished in a tie with rural areas (Figure 5, leftmost panels). Second, consumption inequality fell in rural areas by slightly more than in urban ones. As a result, urban consumption disparities widened more than those in the rural ones (Figure 5, rightmost panels). Third, the pace of inequality reduction in the urban and rural areas varied across time. In the urban areas, inequality fell in the three sub-periods, with most of the income (consumption) inequality reduction taking place in 2008/2013 (2004/2008). In the rural areas, inequality first rose in 2004/2008 before falling in 2008/2019, with most of the

[7] To avoid cluttering the charts, we have not included the Lorenz curves for the 2008 and 2013 distributions. When placed all the curves together, one finds a sequential dominance by the most recent years.

inequality reduction concentrated between 2013 and 2019.

The reduction in inequality in the urban and rural areas is validated by the evolution of income and consumption growth by percentiles. Figure 6 shows that both income and consumption growth in these two areas is higher for the bottom percentiles than for the top ones during 2004/2019. When examining the growth curves by sub-periods, we find the following. In the urban areas, the income growth curves showed a downward trend in all sub-periods, particularly during 2008/2013. In contrast, the consumption growth curves showed a downward trend only in 2008/2013 and were mostly flat in the other sub-periods. In rural areas, all growth curves showed an upward trend in 2004/2008, suggesting that growth was not inclusive in this sub-period. However, this pattern reversed in the following two sub-periods as growth for the lower percentiles is higher than those experienced by the top ones, particularly in 2013/2019.

3.3 Inequality has fallen in all geographic regions, but not in all political regions

The levels of inequality varied significantly across geographic and political regions in 2004. Disparities were more severe in the South, Center and North than in the Amazon (Figure 7). The inequality levels in the most unequal geographic region exceeded those of the least unequal ones by over 5 percent (Gini) and 12 percent (Theil). There were also important disparities across the political regions. The five least unequal regions based on income are Madre de Dios, Tumbes, Lambayeque, Ancash, and Tacna. In contrast, the five most unequal regions are Huánuco, Huancavelica, Amazonas, Loreto, and Ucayali. These rankings slightly change when considering consumption. Ica and Moquegua replace Lambayeque and Ancash in the former list, while La Libertad and Cuzco replace Huancavelica and Amazonas in the latter. The Gini (Theil) coefficient for the most unequal political region exceeded the corresponding coefficient for the least unequal one by over 40 (130) percent.

Between 2004 and 2019, inequality fell at different rates across the four geographic regions and the 24 political regions. The North and Center regions experienced the most significant drop in inequality, particularly in income inequality. In contrast, income and consumption inequality barely fell in the Amazon region. As a result of these changes, this latter region was the most unequal one in 2019, followed by the South (North) when using income (consumption) inequality indicators. Likewise, inequality fell in most political regions (remarkably Ica, Ucayali, Huancavelica, Arequipa, Lambayeque, and Pasco) but increased or did not change in a few of them (namely Loreto, Ayacucho, Cajamarca, Madre de Dios, and Junín).

The timing of the reduction of inequalities in the geographic regions also differs across sub-periods (Table 2).[8] The Center region reduced inequality from 2004 to 2008 and from 2008 to 2013. However, more than half of the inequality reduction in this region took place from 2008 to 2013. After experiencing an increase in inequality from 2004 to 2008, both the Amazon and South regions trimmed inequality during the 2008 to 2013 and 2013 to 2019 sub-periods. Lastly, the lion's share of inequality reduction in the North region took place from 2013 to 2019. The evolution of the yearly distribution of the various inequality indicators for the Peruvian political regions is shown in the boxplots of Figure 8. Clearly, the median values of the inequality indicators for the political regions increased from 2004 to 2007/2008 and then fell from 2008/2009 to 2019, particularly from 2008/2009 to 2014. Moreover, the inequality

[8] For brevity, the changes in the Theil index are not reported but are available upon request. Similarly to Table 1, the qualitative conclusions obtained with the Theil index are almost identical to those reached by the Gini index.

indicators' variability has changed over time, they initially widened in 2004/2008 and narrowed subsequently.

The lists of the most unequal and most equal political regions in 2019 differ from those of 2004. The five most unequal regions in terms of income are now Loreto, Cajamarca, San Martin, Ayacucho, and Huánuco. In comparison, the five least unequal regions are Ica, Tumbes, Lambayeque, Ucayali, and Arequipa. When considering consumption, La Libertad replaces Ayacucho on the former list, and Pasco and Huancavelica replace Lambayeque and Arequipa on the latter list. The case of Ucayali stands out because it ranked among the five most unequal political regions in 2004, experienced a substantial inequality reduction from 2004 to 2019, and became one of the most egalitarian regions in 2019. This experience contrasts with those of other political regions in the highlands and the jungle, where no critical inequality reduction is observed.

The income growth and consumption growth curves show a downward trend in all geographic regions, except the Amazon, during 2004/2019 (Figure 9). The growth curves, however, show important differences over time. Growth in 2004/2008 was high in all regions; however, it went from pro-poor in the Center (negative slope) to pro-rich in the South and Amazon (positive slope). Growth slowed down in 2008/2013 and was consistently pro-poor in all regions, particularly in the South. Finally, growth in 2013/2019 significantly slowed down in all regions but remained pro-poor in the North and Amazon regions.

3.4 Is the decline in inequality associated with economic growth?

The stylized facts documented beg the following important question. Can the reduction in inequality in Peru be associated with economic growth? We provide next a broad-brush examination of the association between inequality and growth during 2004/2019.

We build a yearly panel regression model of inequality and real GDP growth for the 24 political regions during the 2004/2019 period. With this model, we investigate whether there is a linear association between the different measures of inequality and regional growth. In particular, we postulate the following linear dynamic equation between these two variables.

$$I_{i,t} = \rho I_{i,t-1} + \sum_{j=0}^{k} \beta_j \text{Growth}_{i,t-j} + \tau_t + \alpha_i + \varepsilon_{i,t}\,, \tag{1}$$

where $I_{i,t}$ is the level of each of the inequality indicators for political region i and period t, $\text{Growth}_{i,t-j}$ is the real GDP growth rate for political region i in period $t–j$, τ_t is a time effect, α_i is the political region fixed effect, and $\varepsilon_{i,t}$ is the error term. This error term is assumed to present standard properties.

There are two quantities that are functions of the regression coefficients β_j $(j = 0, 1, \ldots, k)$ and ρ that summarize the dynamic relation between $Growth_{i,t}$ and I_{it}:

$$\text{LRM} = \frac{\beta_0 + \beta_1 + \cdots + \beta_k}{1-\rho} \qquad \text{and} \qquad \text{ML} = \frac{\beta_1 + 2\beta_2 + \cdots + k\beta_k}{\beta_0 + \beta_1 + \cdots + \beta_k} + \frac{\rho}{1-\rho}\,. \tag{2}$$

LRM is the long-run multiplier and measures the effect on income (consumption) inequality of a sustained change in regional GDP growth. Second, ML is the mean lag that measures the average delay in the transmission of growth shocks to inequality.

Table 3 presents the estimations of equation (1) and for the quantities in (2) for various structures. In particular, we consider a distributed lag model that sets $\rho = 0$ and $k = 3$, and

an autoregressive distributed lag model also with $k = 3$ and ρ estimated freely. Unreported results with other values for k render similar estimates for LRM.

The estimates of LRM and ML are not only statistically significant but are also robust to the dynamic specification and the inequality indicator of analysis. The LRM is about -0.07 for the case of the Gini index and closer to -0.10 for the Theil index. The ML is smaller for income inequality, with estimates between 1.50 and 1.75 years, and larger for consumption inequality, with estimates between 2.00 and 2.75 years.

In summary, this regression analysis suggests that a sustained increase in economic growth is associated with a significant decrease in the regional inequality indices, with income disparities narrowing faster than consumption ones.

3.5 Polarization has fallen while the middle-class expanded

It has been recognized that having a large middle-class is essential for both political stability and development. For instance, some argue that highly fragmented economies tend to be more prone to social conflicts (Esteban and Ray, 2011). Moreover, economies with large middle-classes generally enjoy higher per–capita income and welfare (Easterly, 2001). Has the middle-class in Peru expanded or contracted during 2004/2019?

To address this issue, we utilize the polarization index advanced in Foster and Wolfson (2010). This index, which belongs to bipolarization measures, utilizes the median to separate the population into two groups. Notably, this index does not depend on a specific range. The polarization index rises when the deviations from the median increase either through a higher spread or larger extremes. More importantly, the middle–class size is inversely related to the magnitude of the polarization index: when the polarization index rises, the middle–class hollows out.[9]

Polarization in Peru was high at the beginning of this Century. The 2004 income and consumption polarization indices were 44.7 and 33.3, respectively. Peru's polarization was slightly higher than the average polarization in Latin America in the early 2000s (see Gasparini et al., 2008). Polarization in this region is higher than that of the OECD countries. Peru's middle-class was slightly smaller than that of the average country in the region.

Since then, polarization in Peru has fallen. Figure 10 portrays the income and consumption polarization indices for 2004/2019. Two key messages stand out from this figure. First, the polarization indicators in 2019 are significantly smaller than those in 2004: the income and consumption indices fell by 17.8 and 11.5 percent during this period. Figure 11 shows the income and consumption polarization curves, which are the median normalized income (consumption) distance of a person at each percentile (Foster and Wolfson, 2010). The income (consumption) polarization curve in 2004 is above or coincides with the one in 2019, which implies that the latter curve dominates the former. All in all, the results indicate the Peruvian middle class in 2019 is significantly larger than that in 2004. These findings are broadly consistent with those reported by Herrera (2017) and Winkelried and Torres (2019).

Second, both income polarization and consumption polarization indices do not show a definite trend despite this drop. After reaching a peak in 2006/2007, the polarization indices fell significantly until 2016/2017 and rebounded somewhat (see Figure 10). As a result, the

[9] Other polarization indices, including the Esteban and Ray (2011) polarization measure, separate the population into an arbitrary number of groups.

changes in polarization over the different sub-periods of analysis have not been homogeneous. Table 4 reports the change in the Foster and Wolfson polarization measures for income and consumption over each of the three sub-periods of analysis. The polarization indicators fell slightly in 2004/2008; however, this change was not statistically significant. Most of the reduction in the polarization indicators took place in the second sub-period, just like the significant reduction in inequality reported earlier. Finally, despite some backtracking of these gains, the polarization indices fell further in 2013/2019, particularly so in the case of income.

Inequality and polarization are two different, but related concepts. The polarization index is a function of the difference of "between-group" inequality and "within-group" inequality, which is measured in the Gini index (Foster and Wolfson, 2010). As a result, the polarization index could move in the same or opposite direction as the Gini coefficient, so higher inequality could be associated with either a smaller or larger middle class. In our exploration, we find that the Gini and polarization indices in Peru move together during the 2004/2019 period. This suggests that higher (lower) inequality is generally associated with a smaller (larger) middle class, as in Gasparini et al. (2008).

4 Factors related to the decline in inequality in Peru

This section examines the primary factors associated with the reduction of Peru's inequality in the first two decades of this century. To this end, we utilize two well-known inequality indices decomposition methods.[10] Recent studies that utilize one or more of these methods in the context of other countries include and Amarante (2016), Rani and Furrer (2016) and Benjamin et al. (2017).

4.1 The factor decompositions

Let Y denote total income (consumption) at a given time, which is the aggregate of K income (consumption) categories $\{y_1, y_2, \ldots, y_K\}$. Thus:

$$Y = \sum_{k=1}^{K} y_k \quad \text{such that} \quad \sum_{k=1}^{K} W_k = 1 \quad \text{where} \quad W_k = \frac{y_k}{Y} \text{ for } k = 1, 2, \ldots, K\,, \tag{3}$$

where W_k is the share of income (consumption) from source k.

4.1.1 The Shorrocks method

This method decomposes overall inequality into the contributions of its different component. More precisely, just as Y itself, an inequality indicator $I(Y)$ can be expressed the sum of k contributions C_k, $k = 1, 2, ...K$, of $I(Y) = C_1(Y) + C_2(Y) + \cdots + C_K(Y)$.

Let S_k be the share of income (consumption) inequality attributed to the k-th category: $S_k = C_k(Y)/I(Y)$. Shorrocks (1982) shows that for any inequality measure $I(Y)$ that satisfy a number of basic and desired axioms

$$S_k = \frac{\text{cov}(y_k, Y)}{\text{var}(Y)} \quad \text{for } k = 1, 2, \ldots, K\,. \tag{4}$$

[10] The original survey data is used in this analysis because of the adding up issues introduced by winsorizing the data.

Interestingly, equation (4) shows that S_k does not depend on the particular type of the inequality measure $I(Y)$, but on the correlation between the source and the total. Note also that S_k can be computed from the output of the OLS estimation of the simple linear regression of y_k on Y.

Note that if $S_k < W_k$, then the k source of income (consumption) has a mitigating effect on inequality. It contributes less to overall inequality than to the mean income (consumption). On the contrary, if $S_k > W_k$, the k source of income (consumption) has an amplifying effect on inequality. It contributes more to overall inequality than to the mean income (consumption).

4.1.2 The Lerman and Yitzhaki method

Lerman and Yitzhaki (1985) shows that Gini coefficient of Y can be expressed as a linear combination of the Gini coefficients of the k sources. In particular:

$$G(Y) = \sum_{k=1}^{K} W_k R_k G_k \equiv \sum_{k=1}^{K} W_k C_k \,, \tag{5}$$

where R_k is the so-called "Gini correlation" between income (consumption) source k and total income (consumption) Y. G_k is the Gini coefficient of income (consumption) source k. Finally $C_k = R_k G_k$ is the concentration index of income (consumption) source k.

The change in overall inequality over time can be determined by taking differences of (5) (Amarante, 2016)

$$\Delta G(Y) = \sum_{k=1}^{K} \left(W_k \Delta C_k + \Delta W_k C_k + \Delta W_k \Delta C_k \right) \,, \tag{6}$$

this change in overall inequality is the result of both changes in the source k concentration ΔC_k and changes in the source k share ΔW_k.

It is worth mentioning that the change in the concentration index is given by $\Delta C_k = \Delta R_k G_k + R_k \Delta G_k + \Delta R_k \Delta G_k$. A simple inspection shows that the concentration index does not change if and only if $\Delta R_k = \Delta G_k = 0$.

4.2 What income sources contributed to the reduction of inequality?

Household income comes from three primary sources: wages, public transfers, and other income. In 2004, wages accounted for 66 percent of household income (Table 5, column 2). Other income accounted for 26 percent of household income, and the remainder is accounted for by public transfers. In 2019, the contribution of wages to household income rose to 67.7 percent, while the contribution of other income and public transfers fell to 25.4 percent and 7 percent, respectively.

According to the Shorrocks decomposition, wages and other income were the two primary sources of overall inequality in 2004. The estimates of the contributions to overall inequality from these two sources, S_k, add to 92.2 percent of overall income inequality (see Table 5, column 3), and are close to the corresponding contributions to total income, W_k. However, these estimates suggest that both wage income and public transfers have an equalizing effect on income disparities as they contribute slightly less to overall inequality than they do to average income. In contrast, the other income contributed positively to income disparities.

When examining the evolution of the contribution to overall income inequality from wages and other income over time, we find that wages initially have an amplifying effect on overall disparities and then an equalizing one while the opposite is true for the other income. The contribution of wages and other income to overall income inequality rises to 95.1 percent in 2008 before falling to 94.7 and 93.4 percent in 2013 and 2019, respectively (see Table 5). These movements largely mirror the changing contribution of wages to overall income inequality. This contribution first rises sharply in 2008, as wages become an exacerbating source of overall inequality and then falls in 2013 and 2019, as wages turn once again into an equalizing force. The opposite movements were observed with the contribution of other income to overall inequality. Lastly, public transfers remained as an equalizing source.

According to the Lerman and Yitzhaki decomposition, the three sources of income are equalizing as they all contribute to the reduction of overall disparities during 2004/2019. Wages and public transfers account for almost 80 percent of the reduction in the income Gini coefficient in this period (Table 5, column 8). These findings are generally consistent with those reported in Lopez–Calva and Lustig (2010) for a sample of selected Latin American countries. Wages exhibit a declining Gini coefficient, while their correlation with overall income has been steady. Moreover, the share of wages on overall income rises somewhat over time. As a result, wages are the most important equalizing force. However, this effect has not been homogeneous over time, since wages are first an unequalizing source of income in 2004/2008 before they become an equalizing source in 2008/2013 and 2013/2019 (Figure 12, left panel).

Public transfers are the second most important equalizing source of income during the period of analysis. Because these transfers are typically targeted toward the poor, it is not surprising that the Gini coefficient of this source is the highest among all income sources. Why are public sector transfers considered an equalizing force? The main reason is the reduction in their Gini coefficient, which fell by 9 percent from 2004/2019. This indicates that the coverage of public transfer programs has improved over time. Besides, the correlation coefficient between public transfers and overall household income also fell by 0.22 in the same period. However, the importance of public transfers as equalizing forces has been declining over time (Figure 12, left panel).[11] They were the most important equalizing source during the 2004/2008 sub-period and the least equalizing ones in 2008/2013. From 2004/2008, the equalizing effect of public transfers more than offset the unequalizing effect of wages.

How do the different income sources account for the evolution of inequality in the urban and rural areas? Wages and public transfers were the primary sources of reductions in income disparities in urban areas (Figure 12, right panel). These two sources accounted for almost 80 percent of the reduction in urban income inequality. The importance of each of these sources as an equalizing source, however, has varied over time. Wages were first unequalizing sources from 2004/2008 and were equalizing ones from 2008/2013 and 2013/2019. The Gini coefficient of wages fell over time, indicating that these played an equalizing role. Public transfers have been an equalizing source over time, although their importance has decreased. The Gini coefficient of this income source fluctuated over time: It fell in 2004/2008, rose in 2008/2013, and fell again in 2013/2019.

[11] Other studies such as Yamada et al. (2012), Herrera (2017) and Flachsbarth et al. (2018) have also found that public transfers played an important equalizing role, although the degree of importance varies across studies. Lustig et al. (2014) report that cash transfers and direct taxes reduce inequality in Peru in a lesser extent than in Argentina, Brazil, and Uruguay. In constrast, Inchauste et al. (2012) find that public transfers play a minor role compared to non-farm income in reducing poverty, and to agricultural labor income in reducing rural inequality.

Finally, wages and public transfers played smaller roles but were still important in reducing income inequality in the rural areas from 2004/2019. These two sources accounted for about 55 percent of the reduction in rural income inequality. This reflects the fact that wages contributed to the increase in inequality from 2004/2008, before becoming an equalizing force from 2008–13 and 2013–19 (Figure 12, middle panel). In this latter sub-period, wages were the most important equalizing force behind reducing inequality in the rural area and overall. Public transfers were mostly an equalizing source, particularly so in 2004/2008. In this sub-period, other income was the most important equalizing source, mainly because of the sharp drop in its share of total income.

4.3 What consumption sources contributed to the reduction of inequality?

Household consumption expenses are divided into four budget components: food prepared at home, social services, apparel/personal care, and other expenses.[12] In 2004, food accounted for almost 33 percent of all consumption expenses, services for 37 percent, apparel and personal care for 22 percent, and others for the remainder. The contribution of these budget components to total expenses has varied significantly over time. In 2019, the share of food prepared at home of total expenses fell significantly to 26.4 percent while the other three budget components' shares rose, particularly for services.

The Shorrocks decomposition suggests that food prepared at home and apparel/personal care are the two budget components that have an equalizing effect, while services and other expenses have an unequilizing one. In 2004, the contributions to consumption inequality from food and apparel/personal care were smaller than their corresponding contributions to total consumption W_k (Table 6, columns 2 and 3). The opposite is true for the other two budget components, services, and other expenditures, as they have a disproportionate effect on consumption inequality. Even though the contribution to overall consumption inequality has changed over time, so have their corresponding contributions to total consumption. These changes have not flipped the sign of the gaps between s_k and W_k, which for food and apparel/personal care has remained negative, while for services and other expenses, it has remained positive. Thus, food and apparel/personal care remained equalizing budget components up to 2019, while services and other expenses remained unequalizing ones.

On the other hand, the Lerman and Yitzhaki decomposition of the consumption Gini unveils that the four budget components have helped reduce overall consumption inequality in 2004/2019, with food prepared at home and services budget components were the ones that contributed the most to consumption inequality reduction. They accounted for almost 90 percent of the reduction in consumption inequality during this period (Table 6, column 8). Food consumption budget was the key equalizing force because of its Gini coefficient, its correlation —with overall consumption, and its share of total spending all fell. Services also contributed to reducing inequality as their Gini and correlation coefficient fell, but their share of total expenses rose. It is worth noting that the low food's Gini coefficients indicate that food, a necessity, is relatively homogeneously distributed among households. In contrast, the services and other spending budget categories are more unequally distributed.

[12] The first budget component, food prepared at home, is a proxy of basic consumption needs. It is also utilized in estimating extreme poverty in other studies. The second budget component, services, are goods related to basic services such as: education, health, transport, utilities and housing. The third budget component, apparel and personal care, includes clothing and personal care expenses. The last component, other expenses, includes expenses in restaurants, cultural and sports entertainment, communication (telephone, TV and internet), and durable goods (furniture, equipment, cell phone, vehicle).

The relative importance of the different budget categories as consumption equalizing forces has varied over time. While food prepared at home has always been an equalizing component, the other three budget components have been equalizing in some sub-periods and unequalizing in others (Table 6). It is worth noting that the Gini coefficient of a budget component may rise while its contribution to overall inequality falls. This is precisely the case for food during 2004/2018. In this sub-period, the increase in the Gini coefficient of food was more than offset by a drop in the correlation between food and overall spending and its diminishing share of total expenditures. Services were strongly equalizing between 2004 and 2008 and unequalizing subsequently. The opposite was observed with apparel and personal care; this budget component was unequalizing in 2004/2008 and equalizing thereafter (Figure 13, left panel).

The food prepared at home component was strongly equalizing in urban and rural areas, particularly in the latter areas (Figure 13, middle and right panels). Food accounted for 56 percent of the overall inequality reduction in the urban areas and 133 percent in the rural areas.[13] Instrumental in this substantial egalitarian contribution in the rural areas are a more egalitarian food consumption reflected by a sharp drop in this component's Gini coefficient; a reduction in the correlation between food budget and overall consumption; and a reduction in food's share of total consumption spending. This means that the poor's additional consumption growth compared with that of the rich has mainly been allocated on food, probably related to the massive reduction in extreme poverty.[14] Most of these gains were achieved between 2004 and 2013, a period that coincides with Peru's increased connection with the rest of the world as a result of its free trade agreements.

The services component was equalizing in the urban areas and unequalizing in the rural ones. Services account for almost 42 percent of the reduction in consumption inequality in the urban areas and 45 percent of the increase in consumption inequality in the rural areas (Figure 13). Why are there differences concerning this budget item? A brief inspection of the reduction in overall inequality in the urban areas concerning services over time reveals that this component helped reduce inequality sharply from 2004 to 2008. It then increased inequality in the following two sub-periods. This is explained mainly by a sharp reduction in the concentration effect, mainly driven by a reduction in the Gini coefficient for services in 2004/2008, which indicates that this budget component became more available to different urban households.

Finally, the apparel and personal care budget was first an unequalizing component and then an equalizing one, both in urban and rural areas. This component experienced a significant increase in its share of the total budget in 2004–08, which more than offsets the declining concentration effect and vice–versa. However, the effects of food and services changes are much larger than those of apparel and personal care.

In summary, we find evidence that the decline of income inequality in Peru is associated with both a narrowing in wage differentials and an increase in public transfers, the importance of which varies by geographic area. Besides, the decline in consumption inequality is mainly associated with narrowing the inequality in food spending and spending on services, the former in rural areas, the latter in urban ones.

[13] The fact that this contribution exceeds 100 percent implies that some of the other budget components had an unequalizing contribution which partially offset the gains from food.

[14] At the national level, the poverty rate declined from 58.7% in 2004 to 20.52% in 2019, and the rural extreme poverty level declined from 41.6% to 9.8% during the same period.

5 Conclusion

Inequality is a pervasive characteristic of the Peruvian economy. Income inequality and consumption inequality were high in 2004, with substantial geographic and regional differences. This high level of disparity was associated with a high degree of polarization in the Peruvian economy. Both inequality and polarization were about average for the Latin American region in 2004. Inequality experienced a significant decrease from 2004 to 2019, associated with the strong growth observed in the Peruvian economy, suggesting that growth has been inclusive. This decline in inequality is broad-based, yet it is not homogeneous across geographic zone, regions, or time. Moreover, the drop in inequality is robust as it is detected by the various inequality indicators that we utilized.

There are several factors associated with the decline in inequality, and their importance has varied over time. Wages and public transfers are the two key factors associated with reducing income inequality, particularly in urban areas. Both food prepared at home and services are the two budget components associated with reducing consumption inequality, the former being a key contributing component in rural areas. In contrast, services were an equalizing source in the urban areas and an unequalizing source in the rural ones.

Despite experiencing one of the largest reductions of inequality in the Latin America region during 2004/2019, Peru is still among the world's most unequal countries. Moreover, the Covid–19 pandemic is jeopardizing the gains in inequality reduction experienced, and it is expected that inequality indices to deteriorate in 2020. However, would this increase in inequality be a bump in the road or a turning point? The answer to this question depends on several factors, and especially the duration of the pandemic. Peru is one of the Latin American countries most severely affected by this pandemic. This reflects the weakness of its health system, the importance of a large service sector, and the extent of informality. Public policies, including transfers and expenses in services, will help mitigate the effects of the pandemic and obtain a more equitable outcome.

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Tables and figures

Table 1. *Changes in inequality by areas*

			2004/2019	2004/2008	2008/2013	2013/2019
(A) All	*Gini index*	Income	−6.685***	−1.272*	−3.302***	−2.111***
			(0.625)	(0.691)	(0.432)	(0.425)
		Consumption	−4.652***	−1.713***	−2.484***	−0.454
			(0.615)	(0.648)	(0.355)	(0.378)
	Theil index	Income	−11.298***	−2.728**	−5.384***	−3.186***
			(1.082)	(1.221)	(0.713)	(0.620)
		Consumption	−6.289***	−3.019***	−2.841***	−0.428
			(0.844)	(0.889)	(0.426)	(0.431)
	Bottom/top 20%	Income	6.328***	0.360***	3.423***	2.545***
			(0.041)	(0.041)	(0.032)	(0.038)
		Expenditure	4.735***	−0.197***	4.221***	0.711***
			(0.044)	(0.045)	(0.036)	(0.040)
(B) Urban	*Gini index*	Income	−5.478***	−1.311	−2.772***	−1.396***
			(0.732)	(0.813)	(0.500)	(0.451)
		Consumption	−3.073***	−2.316***	−1.025***	0.267
			(0.700)	(0.729)	(0.388)	(0.404)
	Theil index	Income	−8.805***	−2.448*	−4.343***	−2.014***
			(1.131)	(1.277)	(0.735)	(0.585)
		Consumption	−4.188***	−3.388***	−1.042**	0.242
			(0.861)	(0.895)	(0.422)	(0.428)
	Bottom/top 20%	Income	3.832***	0.363***	2.186***	1.282***
			(0.047)	(0.046)	(0.040)	(0.044)
		Consumption	1.276***	0.545***	1.492***	−0.761***
			(0.052)	(0.051)	(0.041)	(0.045)
(C) Rural	*Gini index*	Income	−2.832***	1.634**	−1.715***	−2.751***
			(0.604)	(0.672)	(0.510)	(0.471)
		Consumption	−3.131***	0.370	−1.326***	−2.174***
			(0.470)	(0.541)	(0.454)	(0.409)
	Theil index	Income	−4.841***	1.700*	−3.050***	−3.491***
			(0.872)	(1.012)	(0.759)	(0.640)
		Consumption	−3.180***	0.157	−1.271***	−2.067***
			(0.468)	(0.554)	(0.459)	(0.395)
	Bottom/top 20%	Income	1.409***	−2.511***	0.020	3.900***
			(0.054)	(0.060)	(0.047)	(0.042)
		Consumption	4.337***	−1.984***	2.680***	3.641***
			(0.058)	(0.066)	(0.055)	(0.047)

Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.
Notes: The change in the inequality indices are multiplied by 100. Standard errors, as computed by the Distributive Analysis Stata Package (Abdelkrim and Duclos, 2007), are reported in parentheses. * [**] {***} indicates statistical significance at the 10% [5%] {1%} confidence level.

Table 2. *Changes in inequality by geographical region*

			2004/2019	2004/2008	2008/2013	2013/2019
(A) North	*Gini index*	Income	−6.914***	−0.179	−1.895**	−4.840***
			(0.894)	(1.064)	(0.766)	(0.730)
		Consumption	−3.640***	0.153	−2.233***	−1.560**
			(0.823)	(0.960)	(0.684)	(0.690)
	Bottom/top 20%	Income	7.646***	−0.543***	2.658***	5.530***
			(0.075)	(0.085)	(0.069)	(0.072)
		Consumption	6.300***	0.307***	3.233***	2.760***
			(0.080)	(0.090)	(0.074)	(0.076)
(B) Center	*Gini index*	Income	−6.691***	−2.345**	−3.396***	−0.950
			(0.996)	(1.112)	(0.688)	(0.658)
		Consumption	−4.454***	−3.079***	−1.696***	0.320
			(0.996)	(1.041)	(0.542)	(0.589)
	Bottom/top 20%	Income	6.367***	2.144***	2.955***	1.268***
			(0.064)	(0.065)	(0.054)	(0.059)
		Consumption	3.049***	1.002***	2.853***	−0.807***
			(0.071)	(0.072)	(0.054)	(0.060)
(C) South	*Gini index*	Income	−5.429***	1.920*	−5.382***	−1.966***
			(0.861)	(0.999)	(0.830)	(0.761)
		Consumption	−5.476***	0.055	−4.782***	−0.748
			(0.784)	(0.918)	(0.748)	(0.646)
	Bottom/top 20%	Income	3.641***	−2.658***	4.293***	2.006***
			(0.069)	(0.066)	(0.064)	(0.071)
		Consumption	6.113***	−0.993***	6.311***	0.794***
			(0.076)	(0.080)	(0.071)	(0.071)
(D) Amazon	*Gini index*	Income	−1.841**	2.561***	−1.661**	−2.741***
			(0.870)	(0.984)	(0.801)	(0.756)
		Consumption	−2.278***	1.556*	−2.264***	−1.570**
			(0.750)	(0.864)	(0.677)	(0.616)
	Bottom/top 20%	Income	−0.466***	−3.479***	0.007	3.006***
			(0.085)	(0.086)	(0.062)	(0.067)
		Consumption	1.793***	−2.179***	1.677***	2.295***
			(0.086)	(0.091)	(0.070)	(0.071)

Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.
Notes: The change in the inequality indices are multiplied by 100. Standard errors, as computed by the Distributive Analysis Stata Package (Abdelkrim and Duclos, 2007), are reported in parentheses. * [**] {***} indicates statistical significance at the 10% [5%] {1%} confidence level.

Table 3. *Inequality and economic growth*

	Gini index				Theil index			
	Income		Consumption		Income		Consumption	
β_0	-0.018^{**}	-0.013^{**}	-0.013	-0.014^{***}	-0.027^{***}	-0.020^{**}	-0.015^{*}	-0.018^{***}
	(0.007)	(0.006)	(0.008)	(0.005)	(0.009)	(0.008)	(0.009)	(0.005)
β_1	-0.006	0.004	-0.013^{***}	-0.004	-0.014	0.001	-0.016^{***}	-0.007
	(0.008)	(0.008)	(0.005)	(0.004)	(0.012)	(0.013)	(0.006)	(0.005)
β_2	-0.015	-0.009	-0.030^{***}	-0.022^{***}	-0.023	-0.011	-0.030^{***}	-0.021^{***}
	(0.010)	(0.009)	(0.007)	(0.007)	(0.014)	(0.014)	(0.007)	(0.007)
β_3	-0.026^{**}	-0.017	-0.009	0.006	-0.043^{**}	-0.030	-0.012	0.001
	(0.012)	(0.012)	(0.008)	(0.006)	(0.021)	(0.021)	(0.009)	(0.007)
ρ		0.466^{***}		0.552^{***}		0.391^{***}		0.508^{***}
		(0.073)		(0.066)		(0.068)		(0.070)
LRM	-0.064^{***}	-0.065^{***}	-0.064^{***}	-0.075^{***}	-0.107^{***}	-0.098^{***}	-0.073^{***}	-0.090^{***}
	(0.024)	(0.024)	(0.023)	(0.019)	(0.033)	(0.034)	(0.024)	(0.022)
ML	1.750^{***}	2.730^{***}	1.524^{***}	2.097^{***}	1.772^{***}	2.504^{***}	1.538^{***}	2.042^{***}
	(0.305)	(0.732)	(0.215)	(0.408)	(0.275)	(0.629)	(0.231)	(0.377)
Observations	384	360	384	360	384	360	384	360
Regions	24	24	24	24	24	24	24	24
Time periods	16	15	16	15	16	15	16	15
Adjusted R^2	0.487	0.646	0.497	0.674	0.478	0.603	0.489	0.647

Sources: ENAHO, rounds from 2004 to 2019, and Ministry of Economy and Finance. Own elaboration.
Notes: Fixed-effects estimation of equation (1) for $k = 3$ for various inequality indices. LRM and ML are defined in equation (2) and their standard errors are computed with the delta method. All regressions include political region and time effects. Standard errors clusterized by region in parentheses. * [**] {***} indicates statistical significance at the 10% [5%] {1%} confidence level.

Table 4. *Changes in polarization*

	Indices		Changes			
	2004	2009	2004/2019	2004/2008	2008/2013	2013/2019
Income	43.28	35.17	-8.111^{***}	-1.471	-4.122^{***}	-2.518^{***}
			(0.976)	(1.106)	(0.736)	(0.662)
Consumption	33.36	29.51	-3.852^{***}	-0.224	-3.369^{***}	-0.260
			(0.744)	(0.822)	(0.550)	(0.526)

Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.
Notes: The Polarization indices and their corresponding changes are multiplied by 100. Standard errors, as computed by the Distributive Analysis Stata Package (Abdelkrim and Duclos, 2007), are reported in parentheses. * [**] {***} indicates statistical significance at the 10% [5%] {1%} confidence level.

Table 5. *Income inequality by source*

		Shorrocks	Lerman and Yitzhaki					
	W_k	S_k	G_k	R_k	C_k	$W_k C_k$	Change $t/(t-1)$	Change $t/2004$
2004								
Wages	66.0	65.6	52.71	0.90	47.51	31.37	–	–
Public transfers	7.9	7.7	86.11	0.68	58.89	4.68	–	–
Other	26.0	26.7	60.97	0.82	50.14	13.05	–	–
Total	100.0	100.0	49.09	1.00	49.09	49.09	–	–
2008								
Wages	68.1	72.7	51.35	0.91	46.67	31.80	0.43	0.43
Public transfers	7.5	4.9	78.93	0.57	44.93	3.35	−1.33	−1.33
Other	24.4	22.4	62.55	0.82	51.01	12.45	−0.60	−0.60
Total	100.0	100.0	47.60	1.00	47.60	47.60	−1.49	−1.49
2013								
Wages	69.3	67.1	47.40	0.91	42.99	29.79	−2.01	−1.58
Public transfers	6.9	5.3	79.70	0.51	40.50	2.78	−0.57	−1.90
Other	23.9	27.6	59.87	0.80	48.15	11.49	−0.96	−1.56
Total	100.0	100.0	44.05	1.00	44.05	44.05	−3.55	−5.04
2019								
Wages	67.7	64.7	45.79	0.89	40.72	27.55	−2.24	−3.82
Public transfers	7.0	6.6	77.02	0.47	36.09	2.51	−0.27	−2.17
Other	25.4	28.8	57.50	0.79	45.29	11.49	0.00	−1.56
Total	100.0	100.0	41.55	1.00	41.55	41.55	−2.50	−7.54

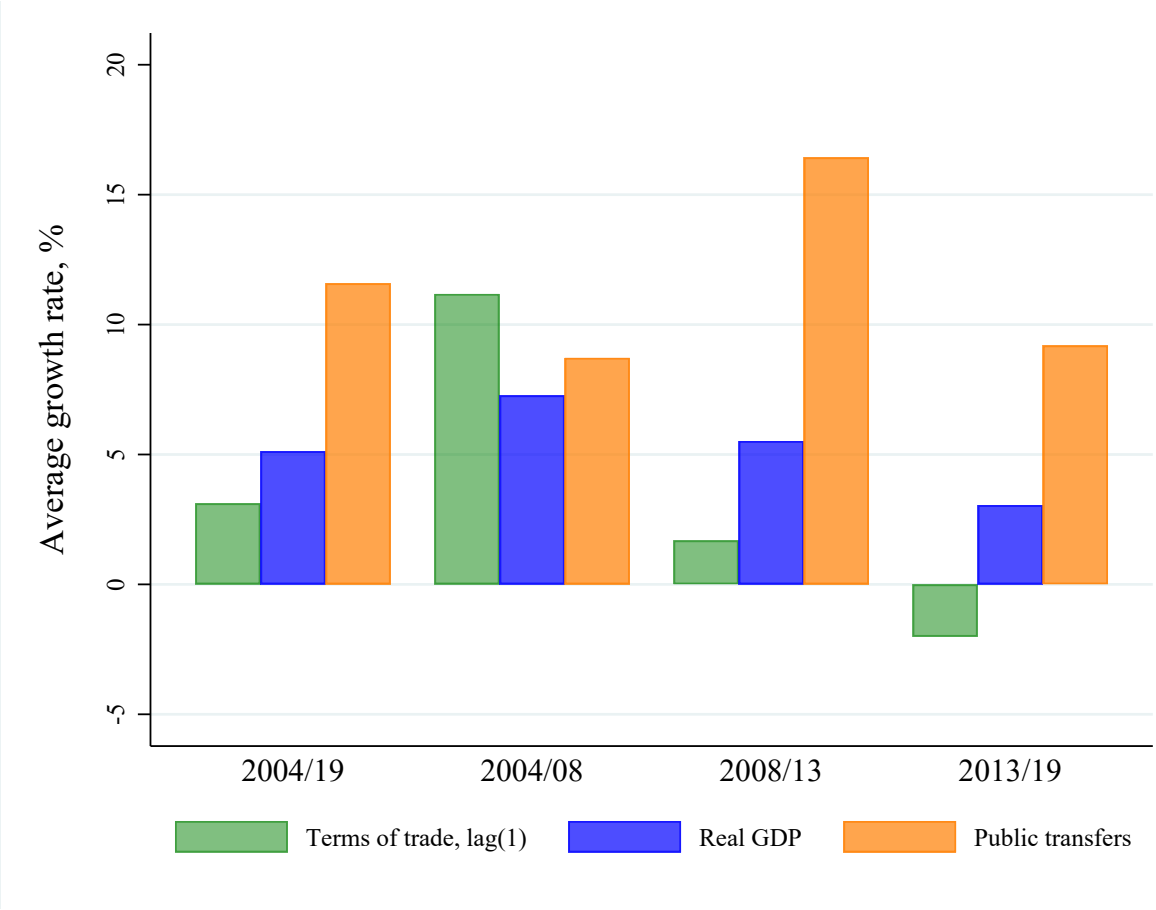
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Table 6. *Consumption inequality by source*

		Shorrocks	Lerman and Yitzhaki					
	W_k	S_k	G_k	R_k	C_k	W_kC_k	Change $t/(t-1)$	Change $t/2004$
2004								
Food	32.7	12.1	29.88	0.71	21.16	6.91	–	–
Services	37.5	57.4	55.21	0.94	51.84	19.42	–	–
Apparel/personal care	22.3	17.3	50.47	0.78	39.12	8.71	–	–
Others	7.6	13.1	63.96	0.91	58.16	4.42	–	–
Total	100.0	100.0	39.46	1.00	39.46	39.46	–	–
2008								
Food	30.3	13.4	30.74	0.71	21.79	6.59	−0.32	−0.32
Services	35.8	49.3	51.01	0.93	47.60	17.02	−2.40	−2.40
Apparel/personal care	25.4	23.5	47.32	0.78	36.98	9.37	0.66	0.66
Others	8.6	13.8	58.32	0.90	52.47	4.53	0.11	0.11
Total	100.0	100.0	37.52	1.00	37.52	37.52	−1.94	−1.94
2013								
Food	27.6	10.1	27.78	0.63	17.43	4.81	−1.78	−2.10
Services	37.9	53.3	48.93	0.93	45.35	17.20	0.18	−2.22
Apparel/personal care	25.5	23.6	45.15	0.78	35.14	8.95	−0.42	0.24
Others	9.0	12.9	52.58	0.87	45.62	4.10	−0.43	−0.32
Total	100.0	100.0	35.07	1.00	35.07	35.07	−2.45	−4.39
2019								
Food	26.4	9.4	26.55	0.58	15.50	4.09	−0.72	−2.82
Services	40.3	54.4	47.21	0.93	43.87	17.69	0.49	−1.73
Apparel/personal care	23.8	22.4	44.58	0.78	34.92	8.30	−0.65	−0.41
Others	9.5	13.8	51.61	0.88	45.18	4.29	0.19	−0.13
Total	100.0	100.0	34.38	1.00	34.38	34.38	−0.69	−5.08

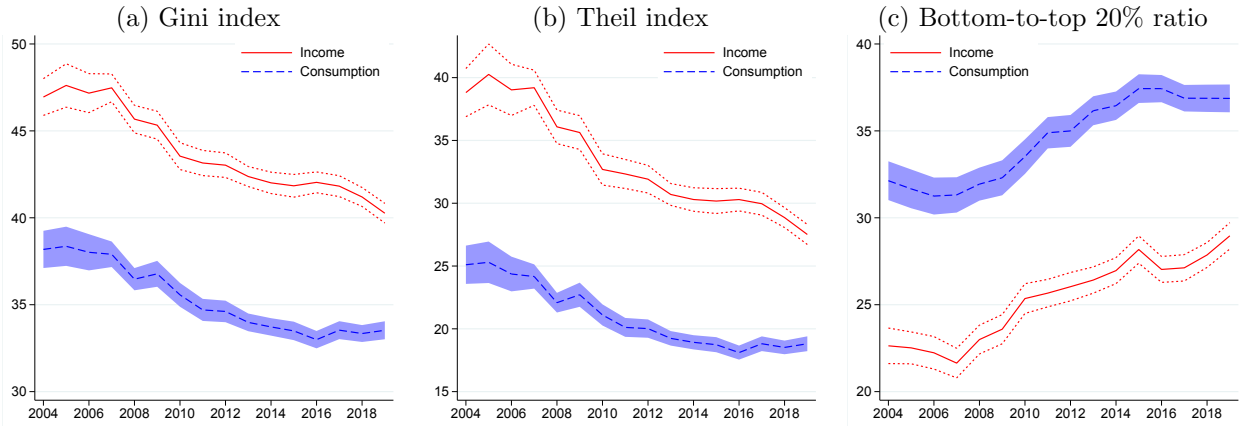
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 1. *Macroeconomic context: Real GDP, terms of trade, and public transfers*



Sources: Central Bank of Peru and Ministry of Economy and Finance. Own elaboration.
Notes: Public transfers include the execution in seven programs—conditional cash transfers (Juntos), non–contributory pensions (Pension 65), housing subsidy (Techo Propio), scholarships (PRONABEC), school feeding (Qali Warma), daycare (Cuna Mas), and communal infrastructure (FONCODES). All variables are in real terms.

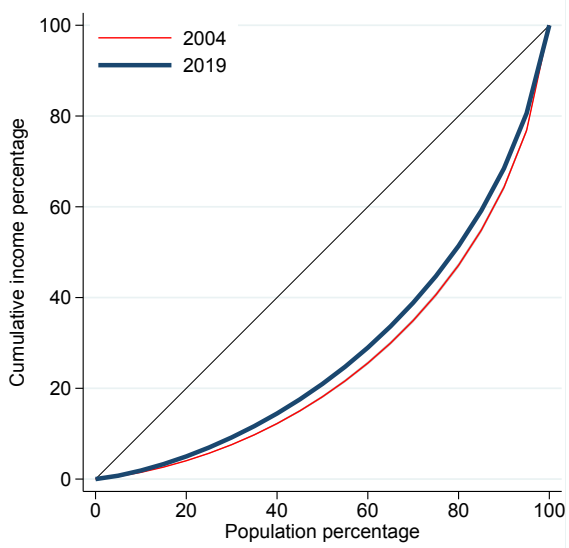
Figure 2. *Inequality*



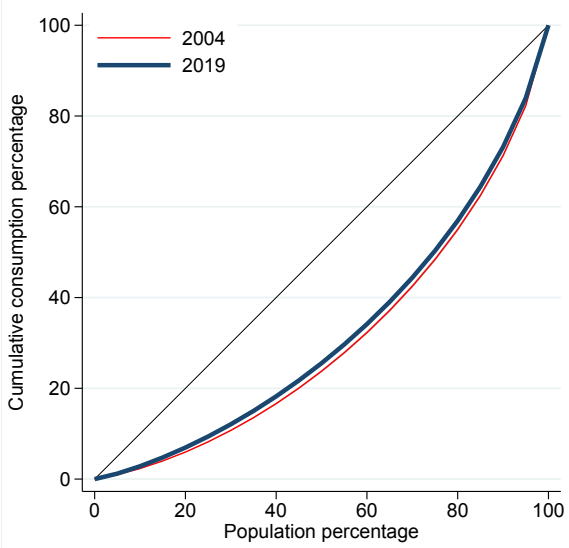
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.
Notes: Bounds are 95% confidence intervals. Winzorized data.

Figure 3. *Income and consumption Lorenz curves*

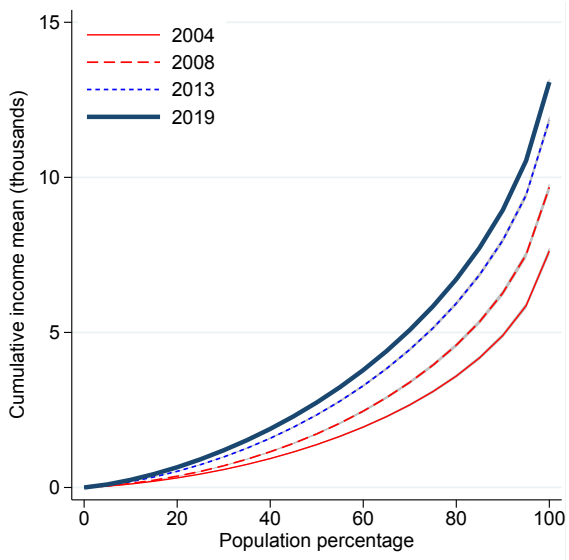
(a.1) Relative curves for income



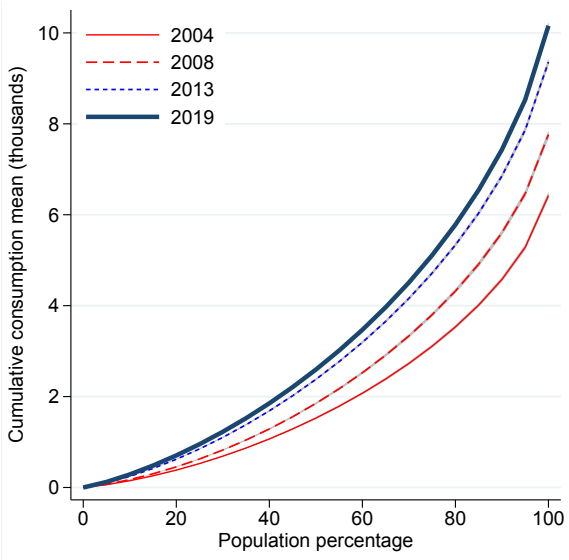
(a.2) Relative curves for consumption



(b.1) Generalized curves for income

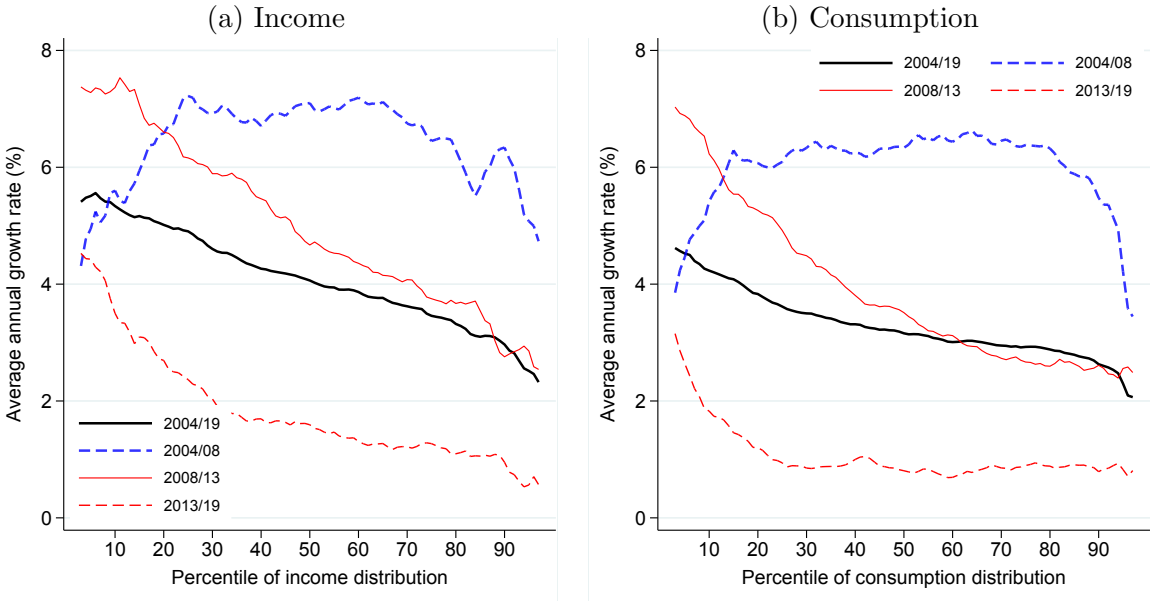


(b.2) Generalized curves for consumption



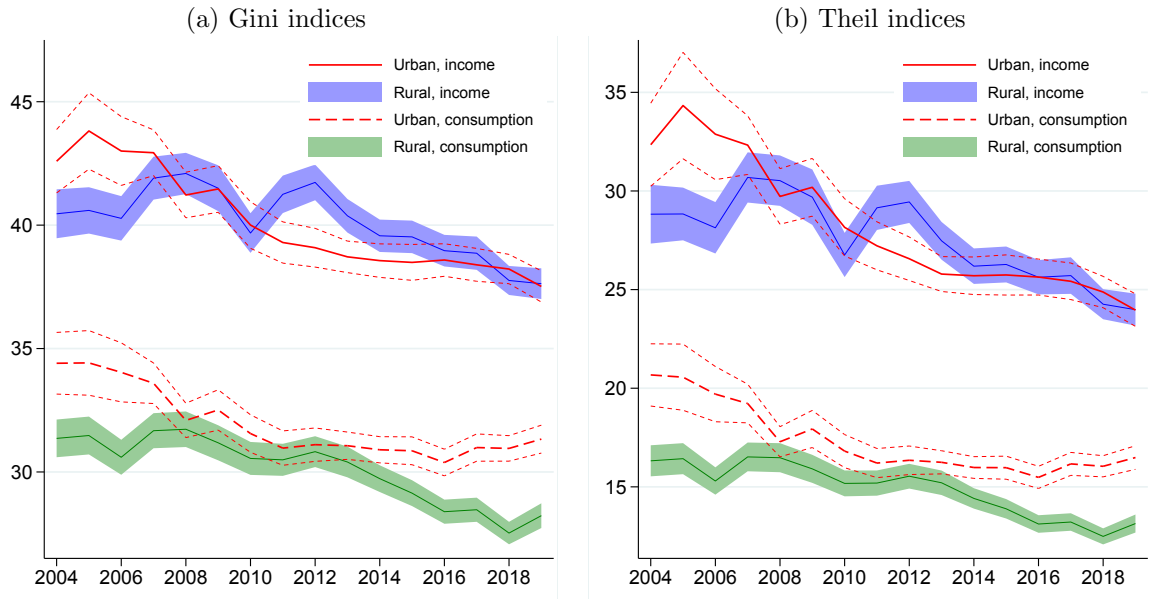
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 4. *Income and consumption growth by percentiles*



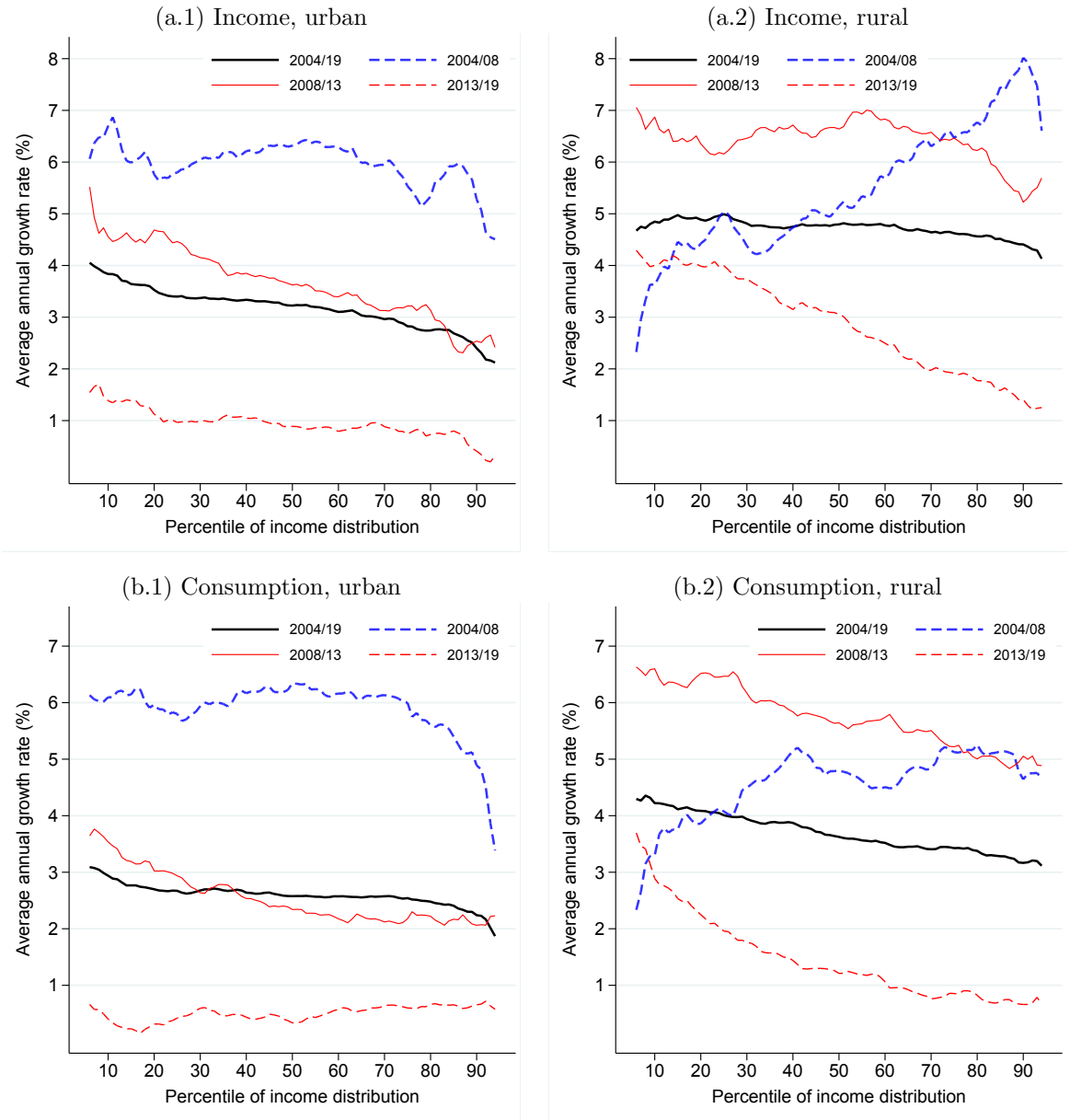
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 5. *Inequality by geographic area*



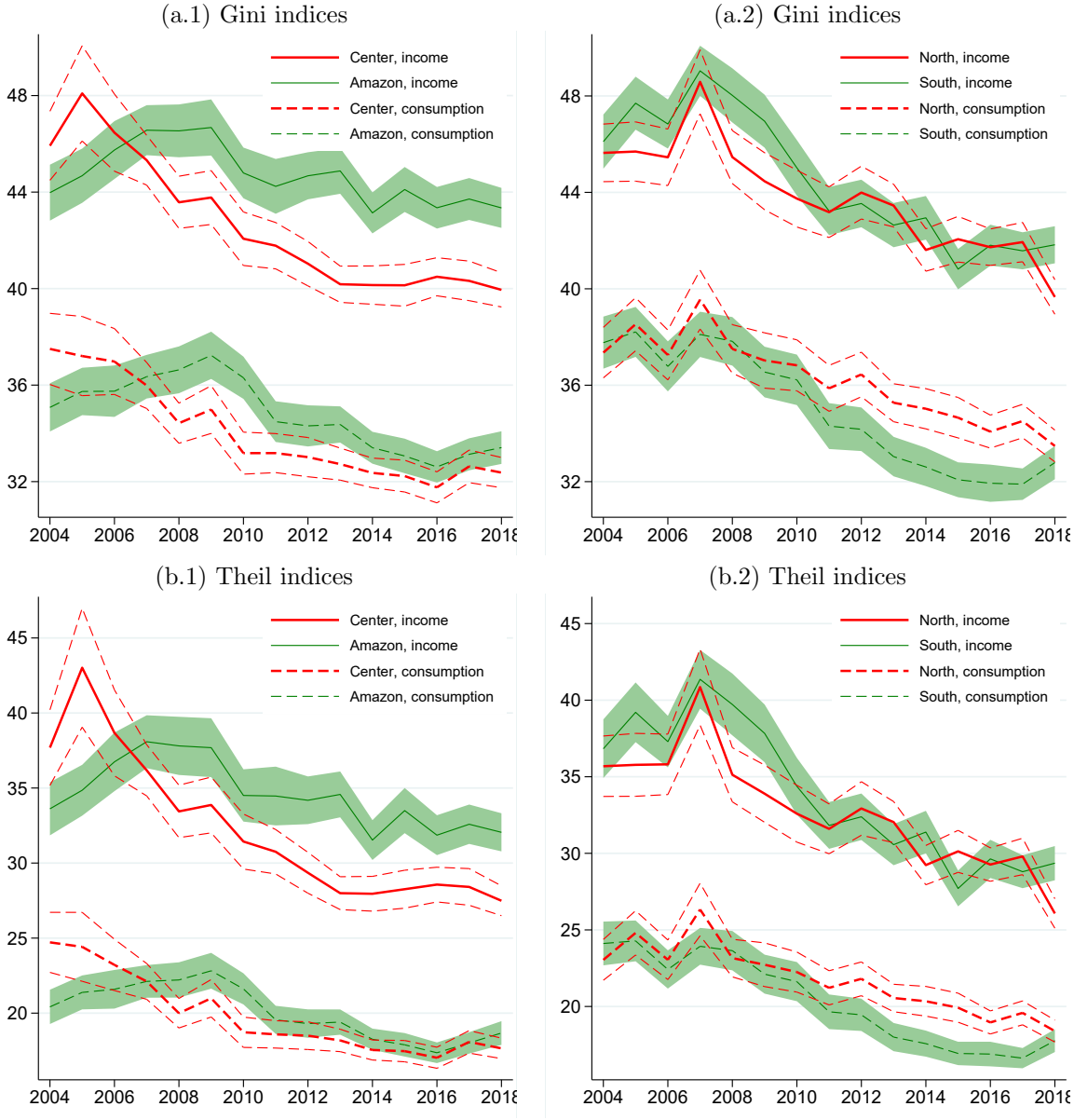
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 6. *Income and consumption growth by percentiles and geographic area*



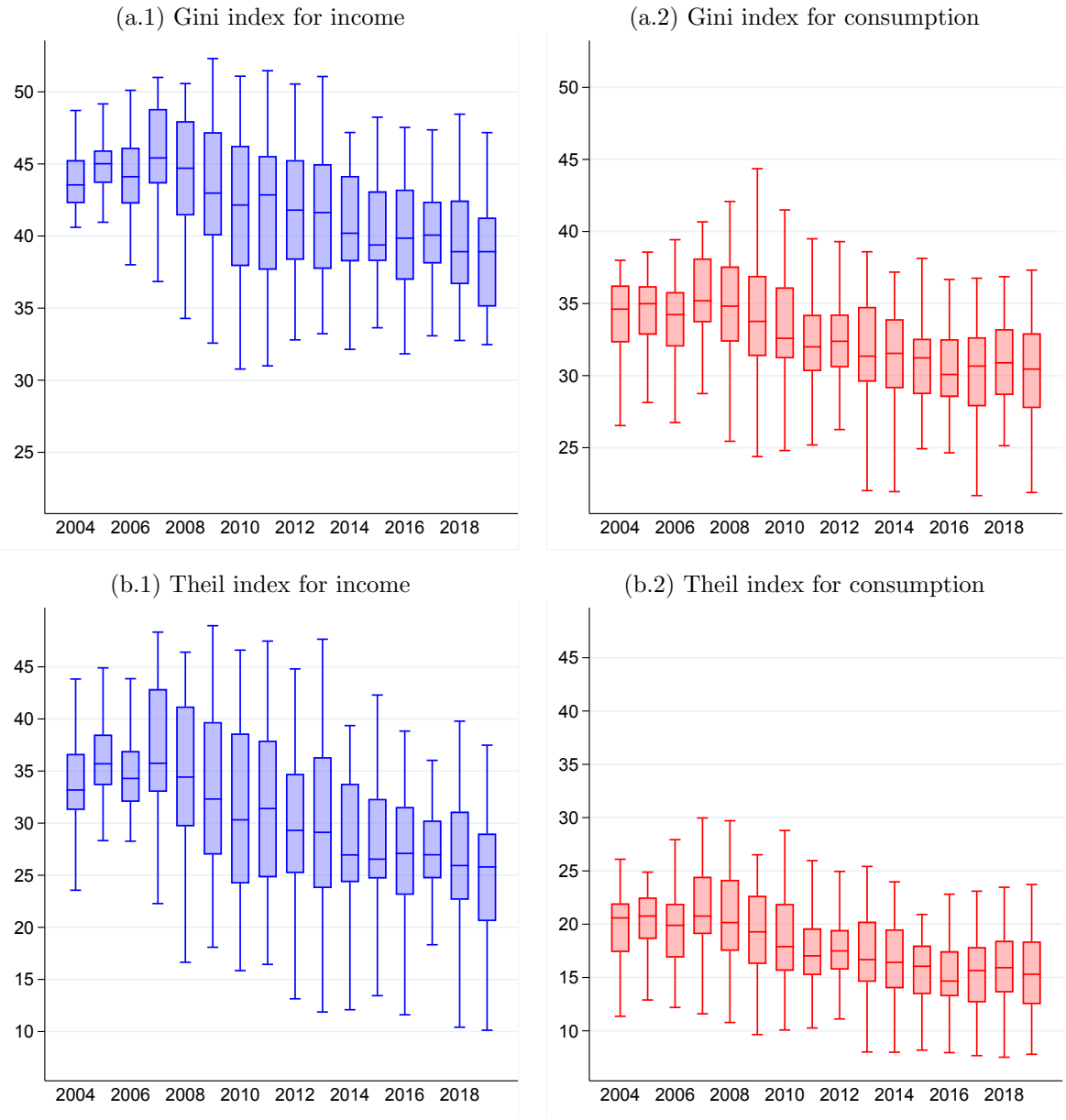
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 7. *Income and consumption inequality by geographical region*



Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

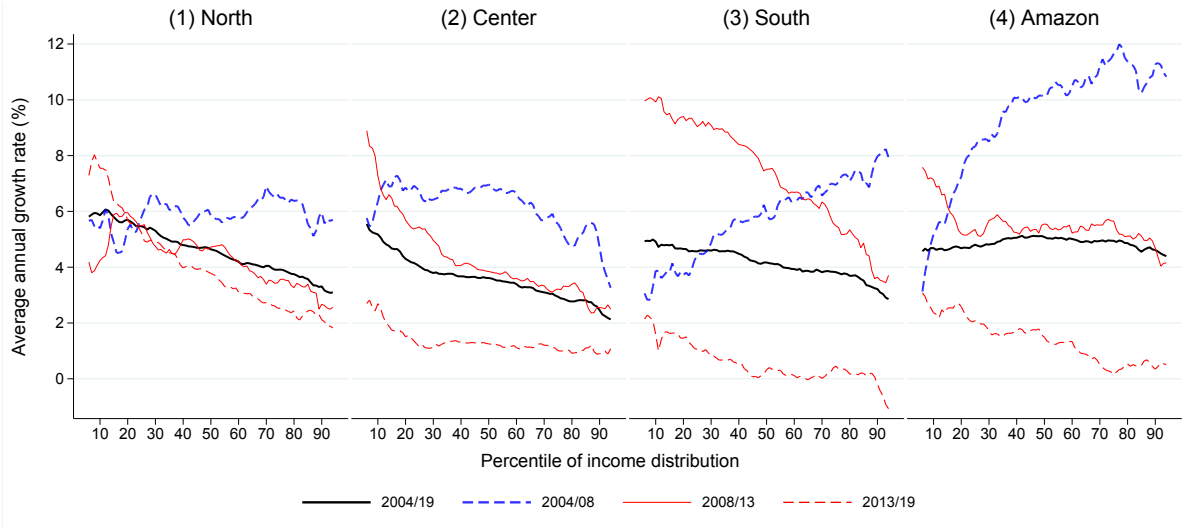
Figure 8. *Income and consumption inequality across political regions*



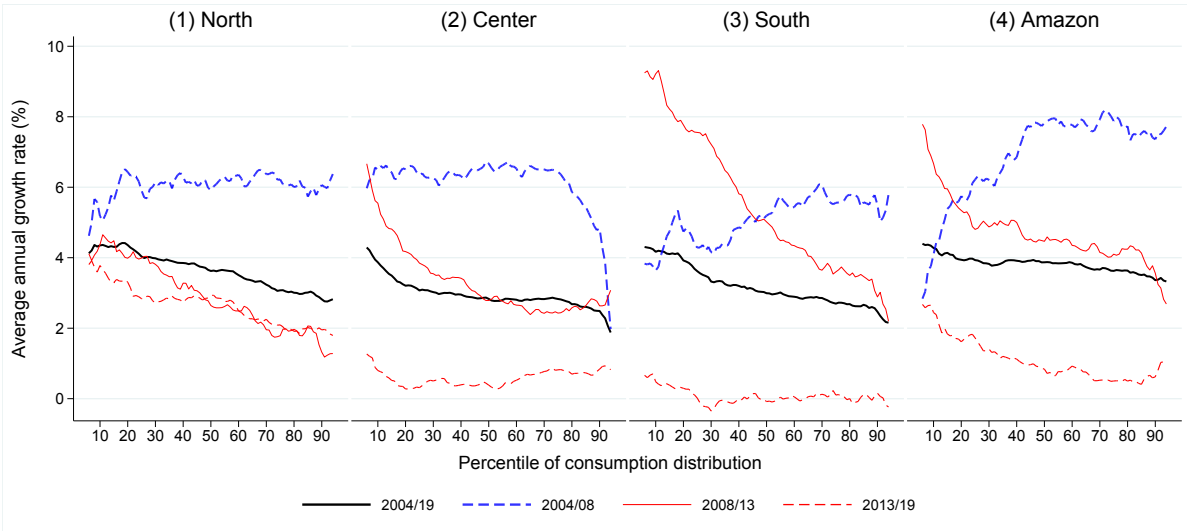
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 9. *Income and consumption growth by percentiles and geographical region*

(a) Income

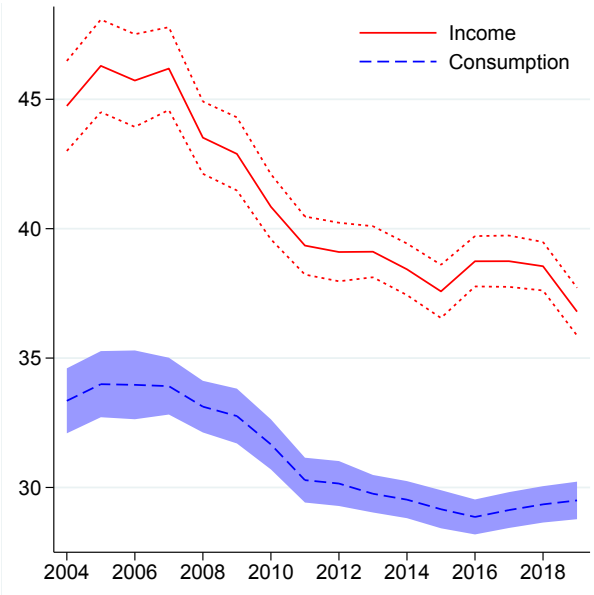


(b) Consumption



Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

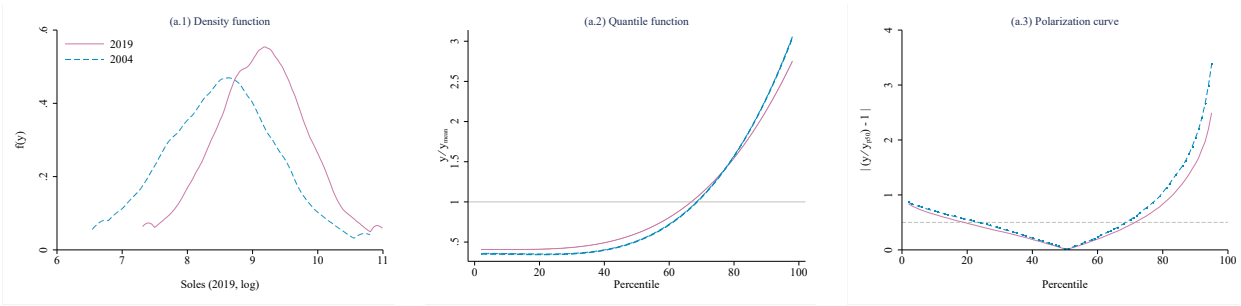
Figure 10. *Polarization indices*



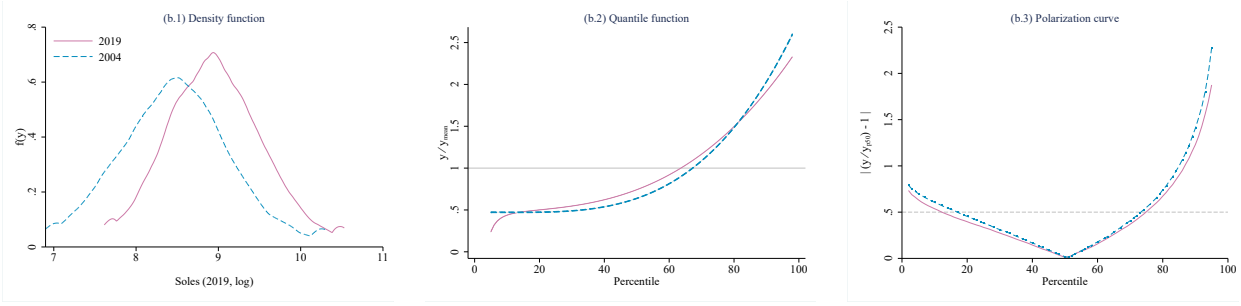
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 11. *Income and consumption distribution functions*

(a) Income

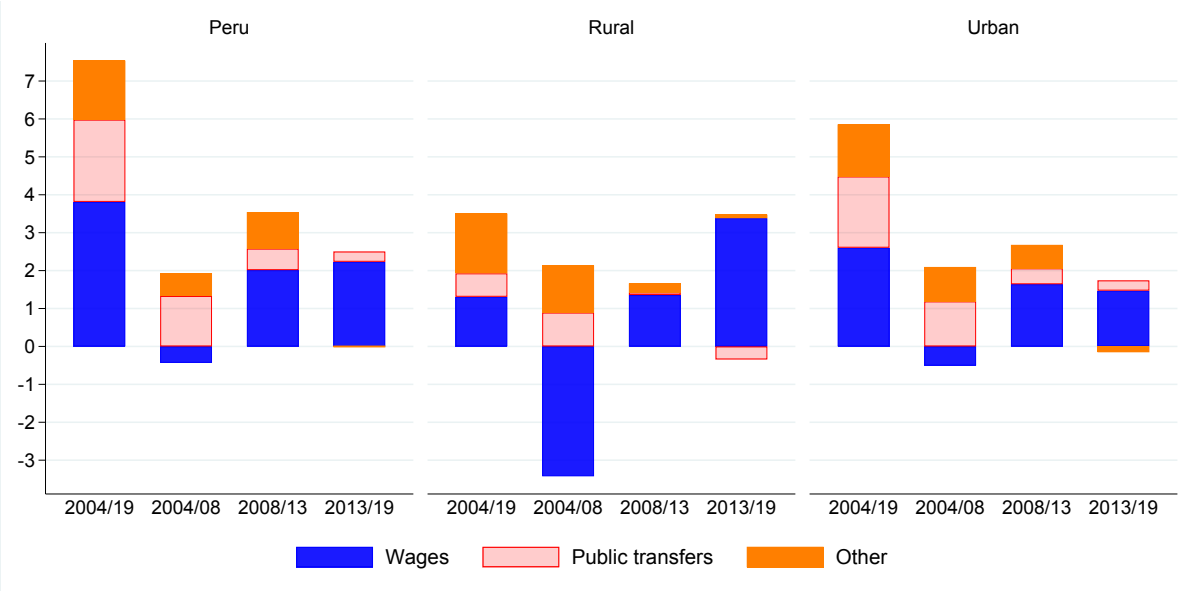


(b) Consumption



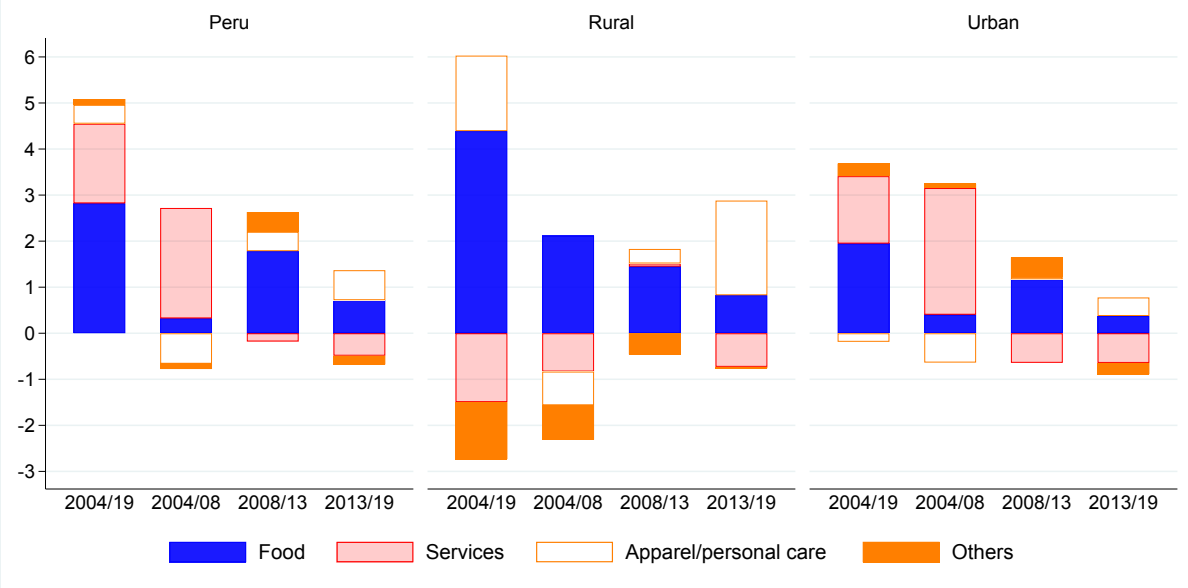
Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.

Figure 12. *Decomposition of the changes in income inequality*



Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.
Notes: Changes in the Gini index times 100 decomposed by the Lerman and Yitzhaki (1985) method using non-winzorized data.

Figure 13. *Decomposition of the changes in consumption inequality*

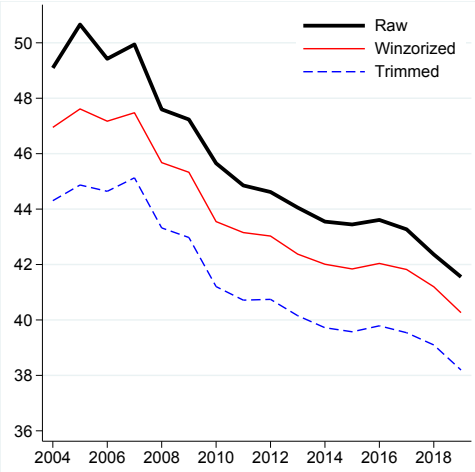


Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.
Notes: Changes in the Gini index times 100 decomposed by the Lerman and Yitzhaki (1985) method using non-winzorized data.

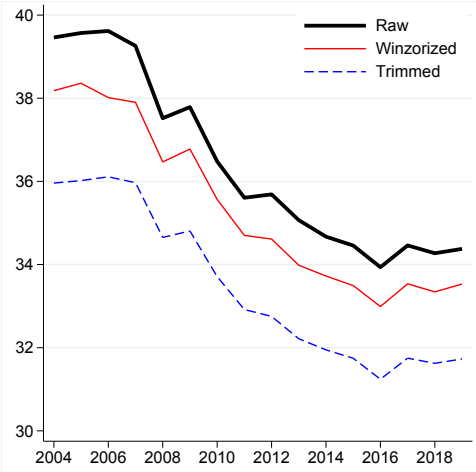
Appendix

Inequality indicators with raw and treated data

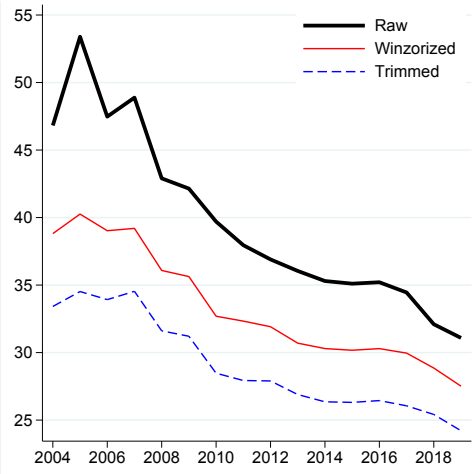
(a.1) Gini index for income



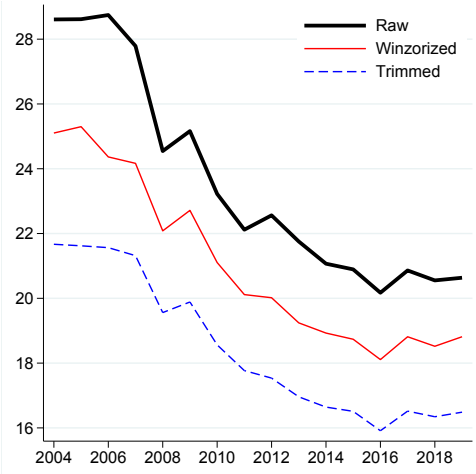
(a.2) Gini index for consumption



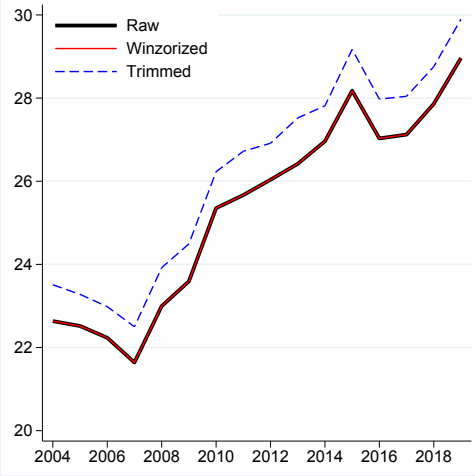
(b.1) Theil index for income



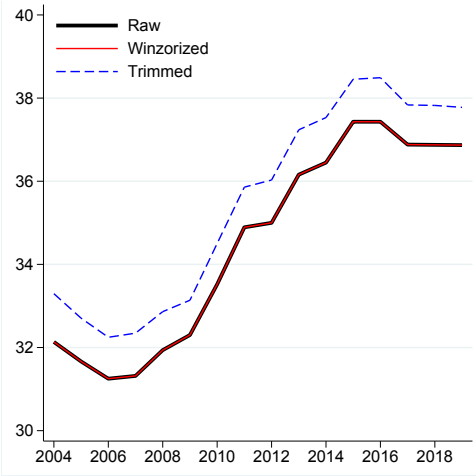
(b.2) Theil index for consumption



(c.1) Bottom-to-top 20% ratio for income



(c.2) Bottom-to-top 20% ratio for consumption



Sources: ENAHO, rounds from 2004 to 2019. Own elaboration.