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Getting Real about Inequality

Evidence from Brazil, Colombia, Mexico, and Peru

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Abstract

Consumption baskets vary across households and inflation rates vary across goods. As a result, standard CPI inflation may provide a very misleading measure of the inflation actually faced by poor households, more so the more unequal the distribution of aggregate consumption across households. Likewise, changes in observed nominal consumption inequality may be very different from those in true inequality, i.e., that measured using household-specific CPIs. We explore empirically these issues using household data covering nine episodes from four Latin American countries (Brazil, Colombia, Mexico, and Peru). We find that in these countries standard CPI inflation typically reflects the inflation rate faced by a rich consumer located in the 80 to 90 percentile of the distribution of consumption expenditure. In most episodes we also find that inflation was anti-rich -- i.e. the inflation faced by the richest consumers was higher than the inflation faced by the poorest consumers. As a result of this bias, the observed increases in nominal inequality generally exceed the actual changes in real inequality. These results are robust to correcting for quality change bias in the CPI, to the use of alternative price indices, and to the use of alternative inequality measures.

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I. Introduction

The consumer price index (CPI) is the key economic indicator monitored by economic analysts and the general population to gauge the cost of living. Yet differences in spending patterns across households imply that the consumer price index relevant for each one will differ as well. For example, the elderly tend to spend more on health care than the young, while the poor typically spend a higher proportion of their income on food than the rich do. When these differences in consumption patterns occur in parallel with persistent differences in the rate of change of prices across goods, different households in effect face different rates of inflation.

If household-specific inflation rates vary a lot across households, the inflation rate of the standard CPI may become a very poor guide to the relevant inflation rate experienced by those at the bottom of the income distribution. This is easily understood by noting that the standard CPI is a weighted average of individual households' price indices, with the weights given by their respective shares in aggregate consumption expenditure. In practice, this means that the inflation rate of the standard CPI generally does a better job at tracking the inflation rate faced by rich households (who spend more on consumption, and hence weigh more in the index) than that faced by poor households – the so-called "plutocratic bias" of the CPI (Prais 1958). As a result, when households face different inflation rates the use of standard CPI inflation to determine cost-of-living adjustments of minimum wages, pensions, and other transfers may result in unanticipated welfare gains or losses for pension and transfer recipients and minimum wage earners.

More generally, the fact that different households face different inflation rates also means that changes in the distribution of real income or expenditure across households are driven not only by changes in the commonly-measured distribution of nominal income or expenditure, but also by the time path of their respective inflation rates. Indeed, with an appropriate pattern of household-specific inflation rates, it would be perfectly possible to observe an inequality-raising redistribution in nominal terms, when in reality the *real* income or expenditure distribution has become less unequal -- and conversely.

Clearly, the same reasoning applies to inequality comparisons performed across countries rather than over time. Unless the law of one price can be assumed to hold across countries, it is not clear how much of an observed cross-country difference in a particular inequality index (computed on the basis of nominal incomes) may be due to real inequality and how much to price differentials among countries.

Of course, the practical relevance of this discussion depends on the degree to which households with different income levels actually face different inflation rates. This issue has attracted some attention in the empirical literature. For the case of the U.S, Hagemann (1982) found some evidence that over 1973-82 households in the top income decile had experienced lower inflation than the rest. In turn, Garner, Johnson and Kokoski (1996) and Moulton and Stewart (1999), working with longer time series, found very little difference between the inflation rate faced by the poor and that of the general population.

More recently, Hobijn and Lagakos (2003) have reexamined the variability of inflation over 1987-2002 across U.S. households with different characteristics. Their main finding is that the elderly generally faced higher inflation than the rest (a difference of about .4 percent per

annum), mostly due to the rising relative cost of health care.[1] In contrast, they do not find systematic differences between the inflation rates faced by rich and poor households, nor between those of urban and rural households.[2]

Inflation inequality has also attracted some attention outside the U.S. For the U.K., Crawford and Smith (2002) find that poor households experienced significantly lower average rates of inflation than rich households over 1976-2000. For the case of Argentina, which experienced large fluctuations in inflation over 1989-1998, Lodola et al. (2000) find that on the whole the poor suffered lower inflation than the rich in high-inflation years, and the opposite happened in low-inflation years. For Taiwan, Lieu, Chang and Chang (2001) conclude that in 1991-96 inflation was persistently higher for low-income and urban households.

In Hong Kong, the Census and Statistics Department actually computes three consumer price indices by income bracket (in addition to the standard CPI).[3] In the year 2000, for example, the inflation rates of the three group-specific indices were, respectively -2.8, -3.8, and -4.5 percent, while the overall CPI fell by 3.7 percent. Thus, the differences in inflation rates across income groups were fairly substantial, given the relatively low levels of overall inflation.[4]

Few papers have focused explicitly on the distributional consequences of inflation heterogeneity. Ruiz-Castillo *et al* (2002) use Spanish data to explore the distributional implications of adjusting household-specific price indices for quality-change bias. In turn, Crawford and Smith (2002) reassess the trends in UK inequality over 1975-2000 using household-specific CPIs, but find that the results are highly sensitive to the choice of base year for the indices.

It is worth noting that these issues are closely related to, but conceptually different from, the question of whether inflation is more harmful for the poor than for the rich. This has been explored by a fairly sizable literature (see e.g., Easterly and Fischer 2001 for discussion and further references), focused on the workings of mechanisms such as indexation of prices, wages or financial assets and liabilities. Our analysis is not concerned with these issues, but with the measurement of real income and inequality under household heterogeneity.

This paper uses household survey data to explore the empirical significance of inflation inequality in nine episodes corresponding to four Latin American countries: Brazil (1988-1996), Colombia (1997-2003); Mexico (1984-1989; 1989-1994; 1994-1996; 1996-2002), and Peru (1995-1999; 1999-2001; 2001-2003). These countries seem well suited for this kind of analysis, given that some of them (e.g., Brazil, Colombia) are among the most unequal in the developing world, while others (e.g., Peru) not only suffer high inequality, but have also shown a deteriorating trend in recent years (see DeFerranti *et al* 2004 for details).

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[1]This issue has gone beyond scholarly debate, and a proposal currently with the House of Representatives (H.R.2035, 2001) would require the Bureau of Labor Statistics to build a special consumer price index for the elderly.

[2]Regarding the rural/urban inflation differential, Hobijn and Lagakos (2003) conclude that its fluctuations are mainly driven by the relative price of gas, due to the fact that rural households devote a much larger expenditure share to gas than do urban households.

[3] Specifically, CPI-A is based on the expenditure patterns of the bottom 50 percent of the population, CPI-B refers to the next 30 percent, and CPI-C is built for the next 10 percent.

[4] This is noted by Ley (2005).

To anticipate some of the results below, we find that: (i) in the countries under consideration, standard CPI inflation typically reflects the inflation rate faced by a consumer located in the 80 to 90 percentile of the expenditure distribution – in other words, CPI inflation tracks the inflation rate of fairly rich individuals; (ii) in most of the episodes we analyze, inflation has been anti-rich -- i.e. the inflation rate faced by the rich was higher than that faced by the poor; (iii) inflation heterogeneity across households accounts for a significant chunk of the observed changes in nominal inequality; and (iv) in general, the observed changes in nominal inequality provide an upward-biased measure of the true changes in real consumption inequality over the episodes under analysis.

The rest of the paper is organized as follows. Section II outlines a simple analytical framework. Section III describes the data. Section IV presents the empirical results, and assesses their robustness by exploring a number of departures form the basic specification. Finally, Section V concludes.

II. A basic framework

II.1 Individual and plutocratic consumer price indices

Let $c_t^h = (c_{1t}^h,....,c_{Nt}^h)'$ denote household *h*'s real consumption of each of the *N* goods available in the economy at time *t,* and let $p_t = (p_{1t},....,p_{Nt})'$ denote the vector of prices of these goods, so that household *h*'s total expenditures at time t are given by $x_t^h = p_t'c_t^h$. Then the share of the budget that household *h* devotes to good *i* is just $s_{it}^h = p_{it}c_{it}^h / x_t^h$, and a Laspeyres-type consumer price index specific for household *h* can be expressed as

$$CPI_t^h = \left(\frac{p_t'c_0^h}{p_0'c_0^h} \right) = \overline{p}_{t,0}'s_0^h, \qquad (1)$$

where we take period 0 as base year; $\overline{p}_{t,0} \equiv (\frac{p_{1t}}{p_{10}},....,\frac{p_{Nt}}{p_{N0}})'$ and $s_0^h \equiv (s_{10}^h,....,s_{N0}^h)'$.

In contrast, the standard aggregate (or plutocratic) CPI is given by:

$$CPI_t = \overline{p}_{t,0}'s_0, \qquad (2)$$

where $s_0 \equiv (\sum_h \theta_0^h s_{10}^h,....,\sum_h \theta_0^h s_{N0}^h)'$ and $\theta_0^h \equiv \frac{x_0^h}{\sum_h x_0^h}$.

Hence the weight of each good's price in the aggregate consumer price index s_{i0} is itself a weighted average of the shares of that good in individual households' overall consumption spending s_{i0}^h (*i*=1,...,*N*; *h*=1,...,*H*), with weights θ_0^h given by the share of each household's total consumption expenditure in aggregate consumption expenditure in the base year. Thus households with relatively large consumption levels will be assigned larger weights, and as a

consequence s_0 will be closer to their individual s_0^h than in the case of poor households. Formally, the difference between the individual and the overall CPI is, from (1) and (2),

$$CPI_t^h - CPI_t = \overline{p}_{t,0}' s_0^h - \overline{p}_{t,0}' s_0 = \overline{p}_{t,0}' \left(s_0^h - s_0 \right). \qquad (3)$$

The larger θ_0^h, the closer s_0 is to s_0^h, and thus the closer the aggregate CPI to cpi^h In the limit, as $\theta_0^h \to 1$ for some h, $s_0 \to s_0^h$ and the overall CPI would be identical to that of household h.

In simpler terms, with heterogeneous consumption baskets the overall CPI tends to mimic the individual price index of the better off. This is what Prais (1958) termed the "plutocratic bias" of the CPI. Moreover, for a given level of total and average consumption expenditure across households, the more disperse their individual consumption levels (i.e. the more unequal society is), the less representative the overall CPI will be of the consumption price index faced by those at the lower end of the distribution – i.e., the larger the plutocratic bias.

Finally notice that the difference between the inflation rate affecting household h and overall CPI inflation is given by

$$\frac{CPI_t^h}{CPI_{t-1}^h} - \frac{CPI_t}{CPI_{t-1}} = \frac{\overline{p}_{t,0}' s_0^h}{\overline{p}_{t-1,0}' s_0^h} - \frac{\overline{p}_{t,0}' s_0}{\overline{p}_{t-1,0}' s_0} \qquad (3')$$

This is zero when either (i) all prices change in proportion (i.e., $\overline{p}_{t,0} = k\, \overline{p}_{t-1,0}$ for some scalar k), or (ii) $s_0^h = s_0$, so individual and aggregate CPI shares are the same. As we show below, these two conditions are clearly violated in practice.

II.2 Inflation inequality and observed inequality

As noted earlier, when inflation rates differ across individuals the distributions of nominal and real consumption may follow different paths. Observed changes in standard inequality indices (which are typically computed from cross-sectional nominal income or expenditure data) may offer a misleading picture of the trends in *real* income or consumption inequality, which are the relevant ones from the welfare perspective. For example, it would be perfectly possible for real inequality increases to be offset by price inequality declines, so that by just observing nominal quantities one may get the mistaken impression that no change in inequality has taken place.

Following Ruiz-Castillo, et al. (2002), let $\xi(x_t)$ denote some inequality index (which is assumed to be an increasing function in the level of inequality) in period t, where $x_t = (x_t^1, ..., x_t^H)' = (p_t' c_t^1, ..., p_t' c_t^H)'$. Note that $\xi(x_t)$ measures the inequality of nominal quantities. Further, let $x_{t,s} \equiv (p_t' c_s^1, ..., p_t' c_s^H)'$, i.e. the vector of household consumptions at s evaluated at the prices of period t (from (1) this implies $x_{t,0}^h = x_{0,0}^h \, cpi_t^h$). Then we can write:

$$\Delta\xi = \xi(x_t) - \xi(x_{t-1}) = \xi(x_t) - \xi(x_{t,t-1}) + \xi(x_{t,t-1}) - \xi(x_{t-1}), \quad (4)$$

or in condensed form

$$\Delta\xi = \Delta\xi_Q + \Delta\xi_P. \quad (5)$$

Thus, the total change in the inequality index of the nominal consumption vector x (henceforth "nominal inequality" for short) can be broken down into a component $\Delta\xi_Q$ that captures the effects of changing consumption *quantities* (i.e. changing real inequality) and another component $\Delta\xi_P$ that captures the effects of changing consumption *prices* (i.e. inflation inequality). Notice that, holding constant real inequality, nominal inequality can change in response to price changes. In fact, if price changes are anti-poor then $\Delta\xi_P < 0$: prices rise faster at the lower tail of the distribution than at the upper tail, and hence for a fixed bundle of goods the relative spending of the poor rises. In such case, it follows that $\Delta\xi < \Delta\xi_Q$. Thus, *ceteris paribus*, for given real inequality, anti poor price changes *reduce* nominal inequality, giving the (false) appearance of an improving distribution. Similarly, anti-rich price changes imply $\Delta\xi_P > 0$ and, *ceteris paribus*, lead to higher nominal inequality, giving the (again false) impression of a worsening distribution.

III. Empirical results

III. 1 Data

Inflation differentials across consumers are driven by two factors. The first is the difference in consumption patterns across individuals. The second is the difference in inflation rates across goods. Hence, for our empirical analysis we need two ingredients: data on the consumption patterns of different households, and data on the trends in the prices of different groups of goods. We take the data on consumption patterns from household expenditure surveys, which contain relatively detailed information on the type of goods and services consumed by different households. Depending on the country under consideration, consumption is disaggregated into 7 or 8 major categories, although finer partitions are usually possible. As for the matching price data, we rely on the disaggregation of the overall CPI by category of expenditure, which is usually available from national sources (typically the Central Bank).

Table 1 offers summary information on the expenditure surveys used in the empirical analysis. The surveys correspond to four Latin American countries and allow constructing nine inflation spells: one each for Brazil (1988-1996) and Colombia (1997-2003), four for Mexico (1984-1989, 1989-1994, 1994-1996, and 1996-2002) and three for Peru (1995-1999, 1999-2001, and 2001-2003). The nine spells span periods of time of varying length: 8 years in Brazil, 6 years in Colombia, between 2 and 6 years in Mexico (for a grand total of 18 years), and between 2 and 4 years in Peru (for a combined total of 8 years).

Tables 2 to 5 report for each country the budget shares devoted by each quintile of the expenditure distribution to the various categories of goods and services: apparel, education, food

and beverage, housing, health, transport and communications, and other goods and services.[5] The exception is Brazil, for which we only have six expenditure categories, as education is included in other goods and services. Inspection of these tables reveals that in all countries lower quintiles tend to spend relatively more on food and beverages, whereas upper quintiles tend to spend relatively more on the consumption of services such as education, transport and communication, and other services.

For example, in Colombia in 2003 (Table 3) the first quintile of the distribution devoted 45 percent of their spending budget to food and beverages, against 21 percent devoted to the same end by the fifth quintile. These shares are roughly similar to those found in Mexico in 2002 (Table 4). In Peru (Table 5) the shares of spending allocated to food in 2003 were even higher, but the relative pattern across quintiles was similar -- 55 percent for the first quintile, versus 33 percent for the fifth. In contrast, in Brazil in 1996 (Table 2) the share of food was lower, but still three times as high for the first quintile as for the fifth quintile (37 percent versus 13 percent).

The other side of the coin is the expenditure on transport and communications. In Brazil, this attracts 12 percent of the expenditure of the first quintile, versus 25 percent of the fifth. The situation is similar for Colombia (8 percent versus 14 percent), Mexico (10 percent versus 20 percent), and Peru (4 percent versus 14 percent). The poor also tend to spend less on housing (although the inter-quintile differences in Colombia and Mexico are small) and education.

On the whole, the data suggests major differences in consumption patterns across household groups. Moreover, Tables 2 to 5 also suggest that these patterns are fairly persistent over time, although there are some exceptions. For example, in the case of Brazil Table 2 shows an increase in the expenditure shares of housing (from 25 to 33 percent) and transport and communications (from 16 percent to 21 percent). The share of housing also increased in Colombia, from 15 percent in 1997 to 26 percent in 2003, but fell in Peru, from 35 percent in 1995 to 15 percent in 2003. Finally, in Mexico the most remarkable development was the declining share of food, from 37 to 28 percent over 1984-2002.

As already stressed, differences in consumption patterns across individuals provide only a necessary, but not sufficient, condition for inflation inequality. The other required ingredient is a changing relative price structure. Table 6 summarizes the trends in prices for the different expenditure categories, and reveals significant differences across them. In the case of Brazil, for example, the differential between the inflation rates of food and beverages and transport and communications was about 6 percent per year over the period 1988-1996. This amounts to a divergence of more than 50 percent on a cumulative basis. Similarly, in Colombia (1997-2003), Mexico (1996-2002), and Peru (2001-2003) the differential between these two categories was about 3 percent per year, resulting in cumulative differences of 20 percent for Colombia and Mexico and about 6 percent for Peru. Inflation in the education category, on the other hand, has usually been higher than food and beverage inflation.

[5] In some cases the Housing category is further broken down into Housing and Home equipment. In such cases all the calculations in the text were performed taking this disaggregation into account (i.e. distinguishing the specific expenditures and price indices of each of these two categories).

III. 2 Empirical evidence on inflation inequality

What are the empirical patterns of inflation across households in different percentiles of the expenditure distribution? The first issue to consider is whose inflation rate is best captured by standard CPI inflation. For the U.K., Muellbauer (1974) estimates that CPI inflation is close to the inflation rate faced by a household in the 71 percentile, whereas for the U.S. Deaton (1998) estimates that it approaches the inflation of the 75 percentile.

Given the higher income and consumption inequality of the Latin American countries under analysis here, one would expect the CPI to represent an even higher percentile of the distribution. Figure 1 plots the effective annual inflation of the different percentiles and the average CPI–based inflation for the last available spell for each country.[6] The figure reveals three interesting facts. First, the line describing the percentile-specific inflation rates crosses the horizontal line that describes CPI inflation between the 80 and 90 percentile (more specifically, between the 80 and 85 percentile in Brazil, Mexico and Peru and between the 85 and 90 percentile in Colombia). This indicates that in all countries under analysis CPI-based inflation is most representative of the inflation rate experienced by a household in the highest quintile.

Second, the percentile-specific inflation rates in Figure 1 display in all cases a rising pattern, implying that in the episodes shown richer households experienced higher inflation than poorer ones – in other words, inflation was anti-rich. More formally, Table 7 reports the results of regressing the percentile-specific inflation rate on the percentile and a constant term, for the nine episodes under consideration. It indicates that, except in the case of Mexico (1994 – 1996), the inflation rate always rises significantly with the percentile – i.e., higher percentiles have significantly higher inflation rates.

Third, the difference between the inflation rates of the richest and the poorest is of a significant magnitude. For example, in Brazil (1988-1996) the difference between the inflation of the highest and lowest quintiles was close to 7 percentage points per year. In Colombia (1997-2003), Mexico (1996-2002) and Peru (2001-2003), the inflation differential was smaller but still noticeable, at .5-.7 percentage points per year. Similarly, the difference between average CPI inflation and the inflation of the lowest percentiles is not negligible either for the same periods – some .3 percentage points per year in Peru, .4 in Mexico and Colombia, and 4 percentage points in Brazil.

For all the spells under consideration, Table 8 summarizes the inflation rates by quintile, and their respective deviation from standard CPI inflation. For the most part, the table conveys the same message as Figure 1 above. In the episodes considered, inflation has consistently been anti-rich, with poorer households experiencing lower inflation rates than richer ones. The only exception was Mexico in 1994-1996.

For comparison, Table 8 also reports the growth rate of real household consumption by quintile, computed using each percentile's consumption price index. This provides a rough

[6] Due to unavailability of expenditure surveys for the exact years on which official CPIs are based, we use the expenditures from the survey closest to the CPI base year in each country in order to mimic the base-period households' baskets. In particular, we use as base periods 1996, 1997, 2002 and 1995 for Brazil, Colombia, Mexico and Peru respectively (the official base periods are Dec 1993, Dec 1998, Jun-Dec 2002 and 1994 respectively).

benchmark to better judge the order of magnitude of the measurement error incurred by (wrongly) using the same CPI inflation rate for all households, as done in conventional practice. Such practice implies a misstatement of the growth rate of their real expenditures, with the magnitude of the error given by the differential between the household-specific inflation rate and standard CPI inflation. It is clear from Table 8 that the error can be quite substantial, in some cases even exceeding the growth rate of real consumption – e.g., for the first quintile in Brazil as well as Mexico over 1994-1996. On the whole, the inflation differentials for the first quintile range from some 150 percent of its real consumption growth in these two episodes, to a low of 8 percent in Mexico over 1984-1989. Overall, the average of all 9 spells under analysis is around 40 percent.

III.3 Quality change bias and inflation inequality

Can these discrepancies between the inflation rates of rich and poor be an artifact of quality change bias (QCB) in their respective consumption price indices? Quality change is commonly viewed as one of the key sources of bias in the CPI.[7] When an existing product is replaced by a newer, higher-quality substitute carrying a higher price, the CPI captures the price increase but not the quality improvement. Indeed, the Boskin et al. (1996) Senate commission concluded that the U.S. CPI overstates the true inflation rate by about .6 percent per year due to QCB. For Japan, Shiratzuka (1999) places the inflation overstatement between .3 and .9 percent per year, whereas for Spain Ruiz Castillo et al. (2002) put it at about .4 percent per year.

Of course, if all individuals faced the same quality changes, QCB would be of no consequence for inflation inequality. However, Deaton (1998) argues that new products most affected by quality change are disproportionately consumed by the rich, in which case QCB will lead to an overestimation of the inflation of the better off, more so than for the inflation of the poor. If true, this might account for the general anti-rich pattern of inflation found above.

To assess this issue, we compute some rough estimates of QCB for the 9 spells under consideration. To do this, we follow Ruiz-Castillo et. al. (1999) and use a corrected version of the QCB estimates for the different types of goods employed by the Boskin Commission.[8] In particular, letting b_i be the best estimate of the QCB in the measurement of inflation of good i expressed in percent per year, the household specific quality change bias is computed as $b^h = \sum_i s_i^h b_i$ and the individual price index after the correction for the QCB as $CPI_t^h\left(1-b^h\right)$. The results of the exercise are presented in Table 9.

Two main messages emerge from the table. First, our estimated QCB for the different consumer price indices is in line with other estimates reported in the literature. They range from about .40 in Peru over 1995-1999 and 1999-2001, to .54 in Brazil for 1988-1996. Second, the QCB of the different quintiles does tend to increase with the level of per capita expenditure, as argued by Deaton -- i.e., the QCB is larger for richer than for poorer households. However, QCB differences across quintiles are fairly small, at least when compared with the differences between quintile-specific and overall CPI inflation rates reported earlier in Table 8. From this we conclude that QCB does not appear to be a significant driver of the inflation differentials across

[7]Another source of bias is the use of fixed base-period weights in the calculation of the CPI, as it amounts to ignoring substitutability across goods. This is taken up below.
[8] See table 2 in Ruiz-Castillo et al. (1999)

individuals.

III.4 Substitution across goods and inflation inequality

The other well-known shortcoming of the standard CPI stems from its use of a Laspeyres framework of fixed base-year weights, which amounts to ignoring substitution across goods and hence leads to overstating inflation. This makes the CPI an upper bound for a true cost-of-living index; see e.g., Diewert (1998).

In this regard, the Boskin report identified two types of substitution bias. The first, estimated to raise measured inflation by 0.25 percentage point annually, is *lower-level* substitution bias and occurs when consumers substitute between similar items within a category (e.g., substituting between pippin and gala apples). The second type, estimated to boost inflation by 0.15 percentage point annually, is called *upper-level* substitution bias and occurs when consumers substitute between items from different categories (computers for television sets, for example) in response to price changes.

From the perspective of inflation inequality, the overstatement of inflation implied by the substitution bias is a concern if it differs between rich and poor households. This is not entirely implausible; for example, if the rich enjoy broader upper-level (i.e., inter-category) substitution possibilities than the poor (because their consumption basket includes a lower share of hard-to-replace items such as food, say) then the CPI would exaggerate the inflation rate faced by the rich more than that faced by the poor. In a similar fashion, lower-level (i.e., intra-category) substitution could broaden the gap between inflation of poor and rich because the latter might have access to a wider variety of within-category substitutes. Under these conditions, our finding above of anti-rich inflation could be partly an artifact of the use of a Laspeyres index.

An indirect way to assess this issue is to compute a Paasche index, whose weights are given by the current consumption basket, rather than that of the initial period, thereby capturing the effects of substitution across goods on households' consumption patterns. Following the notation in (1) and (2), we have:

$$CPI_t^{Paasche,h} = \left(\overline{p}_{0,t}' s_t^h\right)^{-1} \quad \text{and} \qquad CPI_t^{Paasche} = \left(\overline{p}_{0,t}' s_t\right)^{-1}, \tag{6}$$

where now $\overline{p}_{0,t} \equiv (\frac{p_{10}}{p_{1t}},....,\frac{p_{N0}}{p_{Nt}})'$,

with $s_t \equiv (\sum_h \theta_t^h s_{1t}^h,....,\sum_h \theta_t^h s_{Nt}^h)'$ and $\theta_t^h \equiv \frac{x_t^h}{\sum_h x_t^h}$.

However, the Paasche index raises the opposite problem of that posed by the Laspeyres index, namely that it tends to understate inflation by overstating the degree of substitution. The ideal Fisher index, given by the geometric average of the Laspeyres and Paasche indices, has been shown to provide a much better alternative, and is in fact viewed by many as the best practical approximation of a true cost-of-living index (see Diewert 1998).

Table 10 reports calculations using all three alternative indices. The figures show that the specific choice of index is of little consequence for the estimated inflation differentials across households. The use of end-period weights leads, in general, to a reduction in the computed inflation rates of all quintiles, as should be expected, but also to a slight decline in the estimated differential of the lowest quintile (although there are exceptions to this rule, e.g., some specific episodes in Peru and Mexico). Results with the Fisher index fall somewhere in between those obtained with the Laspeyres and Paasche indices, as should be the case. In any event, both Table 10 and Figure 2 show that the same pattern of inflation inequality remains, regardless of the choice of CPI definition.

III. 5 The distributional impact of inflation inequality

We turn to assessing the extent to which inflation inequality drives the observed trends in nominal inequality. As already noted, this is of particular interest in the countries under analysis, given their extremely high levels of inequality (DeFerranti *et al* 2004).

To this end, we evaluate each household's first-period expenditure basket at second-period prices – i.e., in terms of the notation in equation (4), we compute $x_{2,1}$. The difference between the (nominal) inequality index in the second period $\xi(x_2)$, and the inequality index computed on this re-evaluated spending $\xi(x_{2,1})$, captures the real component of the change in the nominal inequality index – for short, the change in real inequality. In turn, the difference between the inequality index computed on the re-evaluated spending $\xi(x_{2,1})$ and the first-period nominal inequality index $\xi(x_1)$ measures the contribution of inflation inequality to the observed change in nominal inequality.

Implementation of this procedure obviously requires a suitable inequality index $\xi(.)$. We use two kinds of indices. First, the Gini coefficient. Second, indices of the generalized entropy family $\xi(\delta)$. In particular, we take $\delta = 0$, which yields the mean of the logarithmic deviation, and $\delta = 1$, which yields the Theil index.

Table 11 shows the results of this analysis for the various country episodes under consideration. The first two columns report the nominal inequality indices in the initial and final year of each episode, and the third column shows the percentage change in nominal inequality over the period. Note that inequality declined in six out of the nine episodes under consideration. The fourth and fifth columns break down the observed percentage change in nominal inequality into the part attributable to inflation inequality across households and that attributable to *real* inequality changes, as in equations (4)-(5).

Inspection of Table 11 reveals three main facts. First, prices (i.e., inflation differentials) play a non-negligible role in observed nominal inequality changes. Their contribution is of the same order of magnitude as that of real inequality changes, although the latter generally is somewhat larger (in absolute value).

Second, in all but one of the episodes under analysis, inflation differentials contributed to increasing nominal inequality. In other words, in all those episodes the changes in nominal inequality provide an upward-biased measure of the underlying changes in real inequality. The only exception to this rule is the Mexico 1994-1996 Tequila episode which, as Tables 7 to 10 showed, is also the only one in our sample featuring an anti-poor pattern of inflation

differentials.

Third, in the majority of spells (six out of nine), the respective contributions of price changes and of real expenditure changes to nominal inequality trends were of opposite signs. Loosely speaking, in these episodes inflation inequality partially offsets real inequality. In some cases (e.g., Brazil 1988-1996) real and nominal inequality indices move in opposite directions. In others, the direction of change in nominal and real inequality is the same but the respective magnitudes are very different – e.g., in Mexico (1984-1989) we find, by any of the indices considered, a modest decline in nominal inequality, but a much bigger one in real inequality.

It is worth noting that these results arise from a decomposition of nominal inequality changes in which the contribution of price changes is calculated on the initial-year consumption basket, as can be seen from equation (4) above. Alternatively, the calculations could make use of the final-year basket, yielding the alternative decomposition

$$\Delta\xi = [\xi(x_{t-1,t}) - \xi(x_{t-1})] + [\xi(x_t) - \xi(x_{t-1,t})]. \qquad (4')$$

As with (4), the first term in the right-hand side of (4') captures the change in real inequality, while the second reflects the contribution of price changes. Crawford and Smith (2002) report that when inequality decompositions are performed over long time spells and based upon levels of inequality indicators, the results turn out to depend on the base year. However, when looking at changes instead of levels of the inequality indicators, they find that yearly variations are not sensitive to the selection of reference basket.

Hence, in our case we might expect that the choice between (4) and (4') should not make a big difference. This is explored in the last two columns of Table 11, which report the results obtained using the decomposition in (4'). Comparison with the two preceding columns, based on (4), reveals only slight changes in the results. It also confirms the finding in Table 9 that when final-period baskets are used, the relative contribution of prices is diminished due to the substitution effects, but the trends in real and nominal inequality measures are largely unaffected.

IV. Conclusions

Differences in spending patterns across households, together with differences in the evolution of prices across goods, imply that different households face different inflation rates. This has potentially important implications for the extent to which standard CPI inflation can be viewed as a meaningful summary measure of the price trends faced by consumers, particularly those at the bottom of the income distribution, as well as for its frequent use as benchmark for cost-of-living adjustment of public transfers and administered prices.

Furthermore, the fact that different households face different inflation rates also means that conventional assessments of distributional trends based only on nominal income and/or expenditure may provide a misleading guide to the trends in the distribution of their constant-price counterparts. Such discrepancy between trends in nominal and real inequality arises when inflation differentials across households are systematically related to their income (or expenditure) differentials.

This paper has explored these issues using household survey data from four Latin

American countries. The focus on these countries is of particular interest because of their persistently high inequality. Indeed, we find that in these countries the conventional CPI inflation rate actually represents the price trends faced by a household in the top quintile of the expenditure distribution.

Our findings can be summarized in four main points. First, in virtually all of the episodes analyzed, inflation differentials across households in different quintiles of the expenditure distribution are fairly substantial, of an order of magnitude similar to that of their respective rates of real consumption growth. In general, the standard CPI inflation typically reflects the inflation rate faced by a consumer located in the 80 to 90 percentile of the expenditure distribution.

Second, in all but one of the country episodes analyzed, inflation was anti-rich – i.e., households in the upper quintiles of the distribution faced higher inflation than those in the lower quintiles. The exception was Mexico's Tequila episode, in which inflation was anti-poor.

Third, inflation heterogeneity across households accounts for a big chunk of the observed changes in nominal inequality. We reach this conclusion from a decomposition of trends in nominal inequality into two separate portions attributable to inflation differntials and to trends in real inequality, respectively.

Fourth, in our sample changes in nominal inequality provide an upward-biased measure of the underlying changes in real inequality. The reason is that in all but one of the episodes examined (with the Tequila crisis again as the exception), inflation differentials contributed to increasing nominal inequality.

These results are robust to (i) corrections for quality change bias in the CPI; (ii) the use of alternative price indices (Laspeyres, Paasche, Fisher); and (iii) the use of alternative inequality indices in the decompositions. One immediate implication of our findings is that the overall picture of distributional trends in Latin America may be less gloomy than commonly thought, once the focus of attention shifts from nominal inequality to real inequality.

References

Boskin, M., E. Dulberger, R. Gordon, Z. Griliches and D. Jorgenson. (1996); "Toward a More Accurate Measure of the Cost of Living," Final Report, Senate Finance Committee.

Crawford, I. and Z. Smith (2002); "Distributional aspects of inflation," IFS *Commentary* 90.

Deaton, A. (1998); "Getting Prices Right: What should be done?," *Journal of Economic Perspectives* 12, 37-46.

DeFerranti, D., G. Perry, F. Fereira and M. Walton (2004); *Inequality in Latin America: Breaking with History ?* Washington DC: The World Bank.

Diewert, W. (1998); "Index number issues in the consumer price index," *Journal of Economic Perspectives* 12, 47-58.

Easterly, W. and S. Fischer (2001); "Inflation and the Poor," *Journal of Money, Credit and Banking* 33*,* 159-178.

Garner, T., D. Johnson and M. Kokoski (1996); "An experimental consumer price index for the poor," *Monthly Labor Review* 119, 32-42.

Hagemann, R. (1982); "The variability of inflation rates across household types," *Journal of Money, Credit and Banking* 14, 494-510.

Hobjin, B. and D. Lagakos (2003); "Inflation inequality in the United States," Staff Report no. 173, Federal Reserve Bank of New York.

Ley, E. (2005); "Whose inflation? A characterization of the CPI Plutocratic Gap," *Oxford Economic Papers*, forthcoming.

Lieu, P., C. Chang and J. Chang (2004); "Inflation rate variations across households: empirical evidence for Taiwan," *International Journal of Business* 9, 103-124.

Lódola, A., F. Busso and F. Cerimedo (2000); "Sesgos en el IPC: el Sesgo Plutocrático en Argentina," *Anales de la Asociación Argentina de Economía Política*.

Moulton, B. and K. Stewart (1999); "An overview of experimental U.S. price indices," *Journal of Business and Economic Statistics* 17, 141-151.

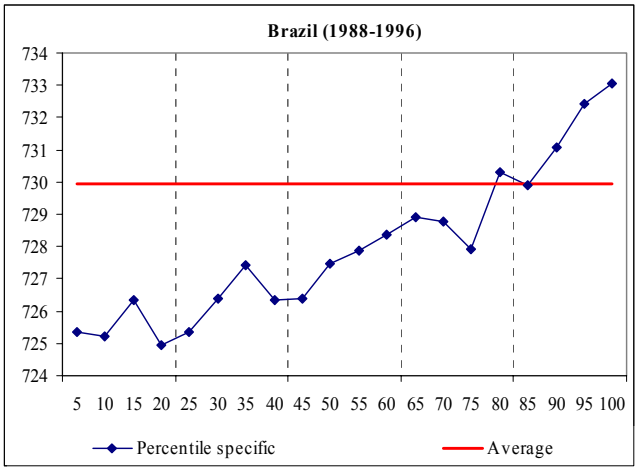
Muellbauer J. (1974); "The Political Economy of Price indices," Birbeck Discussion Paper, No. 22.

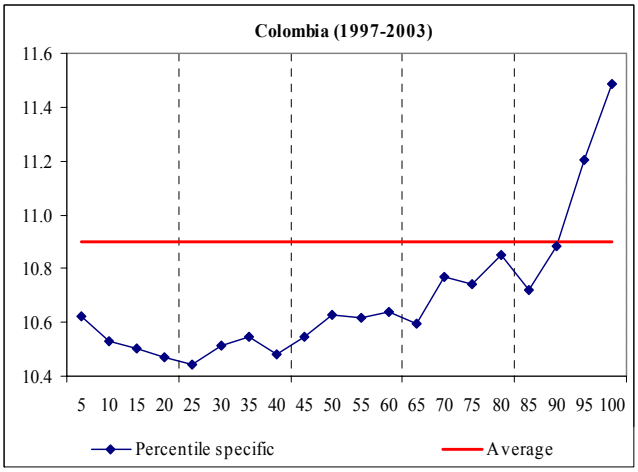
Prais, S. (1959); "Whose cost of living?," *Review of Economic Studies* 26, 126-134.

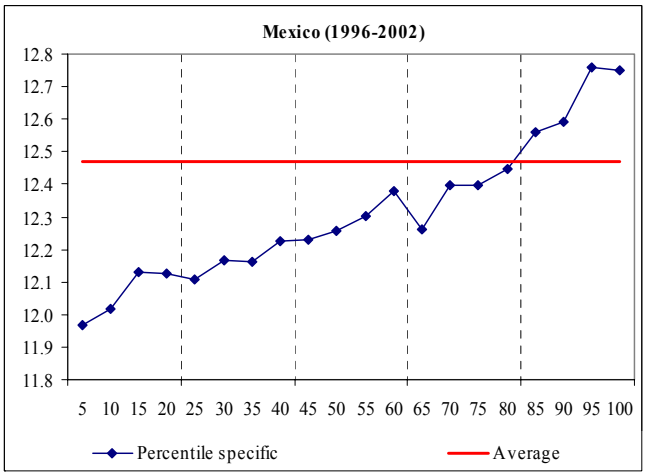
Ruiz-Castillo J., E. Ley, and M. Izquierdo (2002); "Distributional aspects of the quality change bias in the CPI: evidence from Spain," *Economic Letters*, 76, 137-144.

Shiratzuka, S. (1999); “Measurement errors in Japanese Consumer Price Index,” Federal Reserve Bank of Chicago, WP-99-2

Figure 1. Individual and average annual inflation, by percentiles







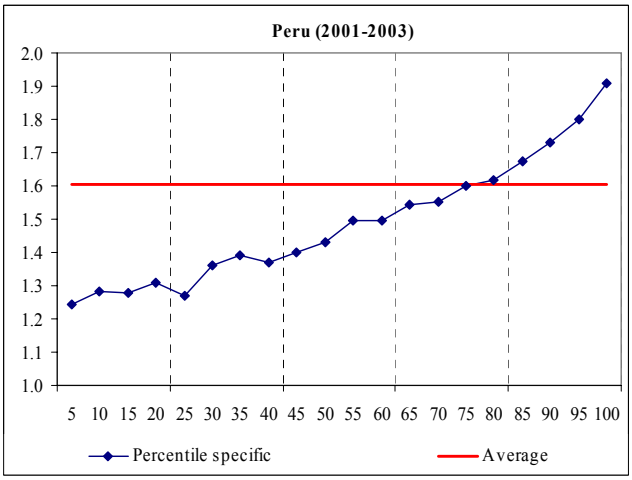
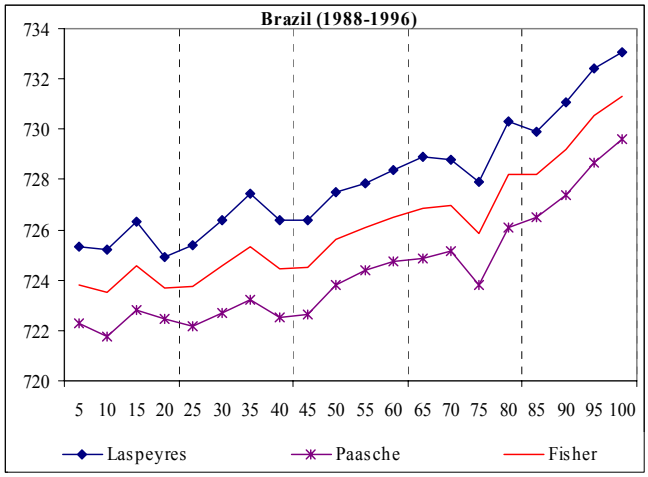
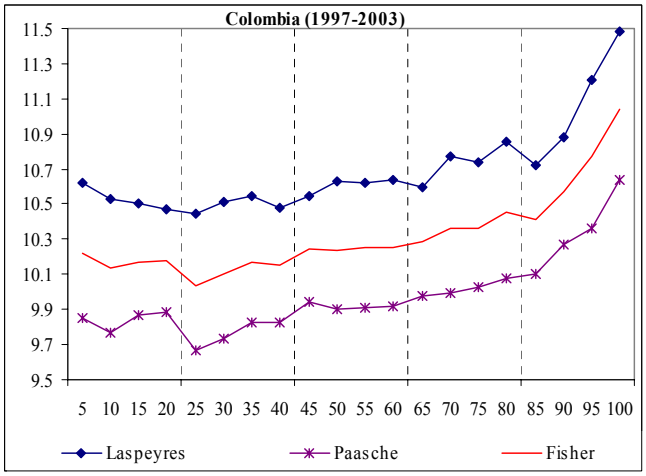
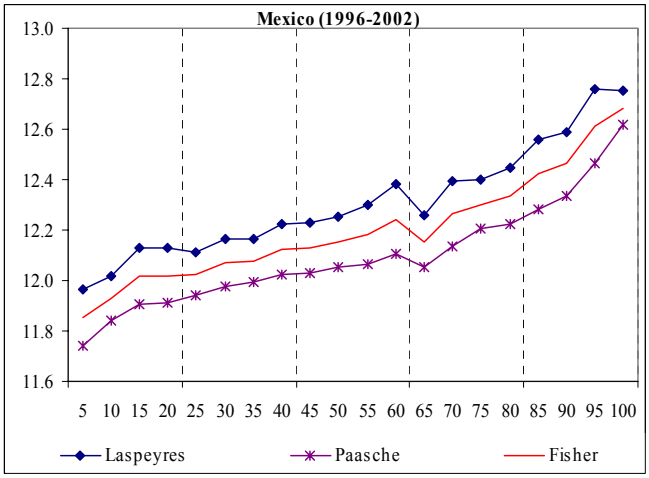


Figure 2. Annual inflation by percentiles (Laspeyres, Paasche and Fisher indices)







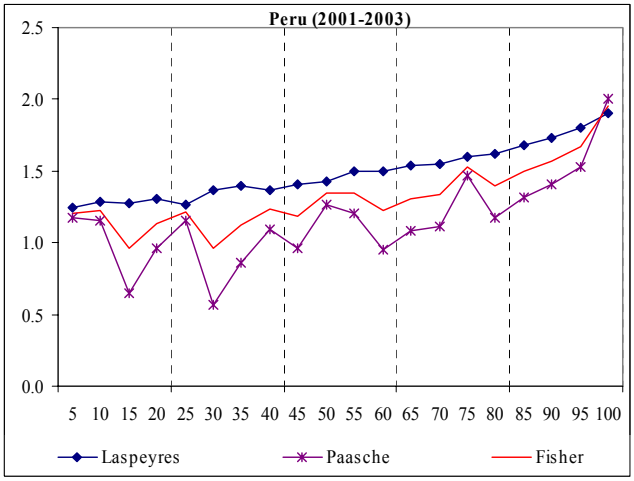


Table 1. Surveys used in the analysis

Country	Survey	Period	Collection Period	Survey Structure	Sample Size (# of households)
Brazil	Family Budget Survey (*Pesquisa sobre Orcamentos Familiares* - POF)	1988	03/87-02/88	Cross section	13,611
		1996	10/01/95-09/30/96	Cross section	19,816
Colombia	Living Standard Survey (*Encuesta de Calidad de Vida* - ECV)	1997	08/25/97 to 11/15/97	Cross section	10,016
		2003	Country: 03/12-05/16 Bogota: 06/06-07/23	Cross section	24,090
Mexico	Household Income and Expenditure Survey (*Encuesta Nacional de Ingresos y Gastos de los Hogares* - ENIGH)	1984	3rd quarter	Cross section	4,768
		1989	3rd quarter	Cross section	11,531
		1994	3rd quarter	Cross section	12,815
		1996	3rd quarter	Cross section	14,042
		2002	08/21-11/15	Cross section	20,252
Peru	Household National Survey (*Encuesta Nacional de Hogares* - ENAHO)	1995	4th quarter	Cross section	20,443
		1999	Nov-Dec	Panel	4,016
		2001	Nov-Dec	Cross section and Panel	18,179 3,587
		2003	Nov-Dec	Cross section and Panel	20,084 6,146

Table 2. Brazil: Composition of expenditure by population quintile (in %)

Quintile	Apparel	Food & Beverages	Transport & Communications	Housing	Health	Other	Total Expenditure
			1988				
1	10.17	38.31	8.94	21.95	6.91	13.72	5.76
2	11.67	31.36	9.94	23.60	6.94	16.49	8.96
3	11.88	26.17	13.88	22.57	7.15	18.35	13.45
4	10.13	19.81	15.09	26.45	7.33	21.19	21.43
5	8.22	11.79	20.02	26.96	6.30	26.72	50.40
All	9.54	18.72	16.60	25.67	6.73	22.75	100.00
			1996				
1	6.42	37.21	11.79	27.98	7.63	8.98	5.89
2	6.67	30.68	14.99	29.75	7.92	10.00	8.73
3	6.30	25.40	16.69	31.16	8.33	12.14	13.41
4	5.42	21.16	19.91	30.97	8.81	13.73	21.32
5	4.16	13.20	25.25	35.51	7.61	14.27	50.65
All	5.07	19.47	21.27	33.01	7.99	13.19	100.00

Note: The table reports the composition of expenditure by population quintile of the expenditure distribution corresponding to six expenditure categories in each of the surveys analyzed.

Table 3. Colombia: Composition of expenditure by population quintile (in %)

Quintile	Apparel	Education	Food & Beverages	Transport & Communications	Housing	Health	Other	Total Expenditure
				1997				
1	3.31	11.08	49.25	7.59	12.75	10.96	5.06	7.88
2	3.90	12.29	45.32	8.54	13.91	10.56	5.49	10.79
3	4.17	11.53	38.65	12.10	15.97	10.60	6.99	14.27
4	4.30	12.21	32.26	14.71	16.61	10.23	9.69	20.45
5	3.88	13.08	20.78	19.16	15.74	9.26	18.11	46.63
All	3.97	12.44	30.57	15.19	15.52	9.92	12.41	100.00
				2003				
1	4.50	7.27	45.34	8.11	24.48	4.31	6.00	8.44
2	5.51	7.44	41.31	9.36	26.11	3.96	6.32	10.80
3	5.04	9.36	36.21	11.47	26.03	4.11	7.78	14.86
4	4.72	10.38	30.26	12.48	27.12	4.64	10.41	20.76
5	3.64	9.98	21.83	14.36	26.38	5.51	18.30	45.14
All	4.35	9.47	29.80	12.47	26.29	4.85	12.77	100.00

Note: The table reports the composition of expenditure by population quintile of the expenditure distribution corresponding to seven expenditure categories in each of the surveys analyzed.

Table 4. Mexico: Composition of expenditure by population quintile (in %)

Quintile	Apparel	Education	Food & Beverages	Transport & Communications	Housing	Health	Other	Total Expenditure
				1984				
1	7.07	4.36	56.49	5.37	15.38	3.00	8.33	6.24
2	7.06	4.56	54.82	6.93	15.15	3.45	8.05	11.15
3	7.62	6.57	49.21	8.24	15.64	2.61	10.12	14.72
4	7.83	6.85	44.55	10.39	16.99	2.18	11.22	21.83
5	5.73	6.07	24.08	15.40	14.31	2.20	32.22	46.06
All	6.70	6.04	37.70	11.68	15.25	2.45	20.20	100.00
				1989				
1	7.82	4.75	55.42	6.04	16.36	4.00	5.61	6.52
2	7.66	5.84	50.04	7.88	17.01	2.42	9.16	11.14
3	8.13	6.59	46.39	9.07	17.44	3.24	9.16	15.31
4	8.44	6.29	39.98	10.46	19.97	2.92	11.93	20.55
5	6.74	7.74	25.14	14.66	19.14	3.47	23.12	46.48
All	7.48	6.86	36.19	11.62	18.63	3.24	15.99	100.00
				1994				
1	7.00	6.26	50.60	9.08	17.63	3.63	5.79	6.28
2	7.27	7.42	46.42	11.19	17.97	3.31	6.41	11.13
3	8.14	7.99	41.91	12.74	18.95	3.37	6.91	14.63
4	7.99	9.07	36.06	14.29	21.08	3.59	7.93	20.61
5	7.06	14.62	23.16	16.77	23.35	4.14	10.91	47.35
All	7.43	11.18	32.88	14.56	21.28	3.79	8.89	100.00
				1996				
1	5.89	7.01	53.97	8.20	16.34	2.89	8.20	6.95
2	5.87	8.36	47.46	11.56	17.52	2.97	11.56	11.75
3	5.82	8.87	43.57	13.23	18.57	3.31	13.23	15.61
4	6.54	10.17	37.39	15.59	19.69	3.22	15.59	21.43
5	6.27	14.01	23.85	18.98	22.82	3.82	18.98	44.26
All	6.19	11.23	34.70	15.74	20.41	3.44	15.74	100.00
				2002				
1	5.85	13.54	45.69	10.31	14.05	2.38	8.18	6.67
2	5.53	12.41	40.80	14.65	15.07	2.66	8.88	11.32
3	5.80	14.50	35.28	16.77	15.36	2.89	9.40	14.84
4	6.19	15.11	31.55	18.14	15.33	2.97	10.71	20.39
5	5.60	21.57	20.50	20.06	16.34	3.11	12.83	46.78
All	5.76	17.63	28.93	17.92	15.70	2.95	11.13	100.00

Note: The table reports the composition of expenditure by population quintile of the expenditure distribution corresponding to seven expenditure categories in each of the surveys analyzed.

Table 5. Peru: Composition of expenditure by population quintile (in %)

Quintile	Apparel	Education	Food & Beverages	Transport & Communications	Housing	Health	Other	Total Expenditure
				1995				
1	4.27	1.49	55.50	4.28	28.01	4.89	1.55	8.39
2	4.05	2.36	52.85	5.86	28.54	4.42	1.92	12.07
3	3.76	3.29	48.35	7.46	30.29	4.48	2.38	16.24
4	4.11	4.87	42.01	8.28	33.92	4.29	2.52	22.73
5	4.34	7.78	30.09	9.94	41.72	3.66	2.47	40.58
All	4.15	5.21	40.64	8.19	35.35	4.13	2.32	100.00
				1999				
1	4.75	5.48	52.94	1.25	21.14	5.22	9.23	6.14
2	3.53	6.19	51.93	2.40	22.60	3.49	9.87	10.96
3	3.79	7.18	48.31	3.28	23.01	3.57	10.86	16.05
4	3.81	8.86	43.06	4.28	24.73	3.33	11.93	21.68
5	3.21	13.17	25.06	12.30	35.31	3.19	7.77	45.17
All	3.56	10.04	37.35	7.35	28.78	3.44	9.49	100.00
				2001				
1	6.03	5.83	56.75	3.58	13.68	4.31	9.82	6.82
2	4.82	6.22	56.66	3.79	13.39	4.20	10.93	11.58
3	3.94	7.81	53.77	4.87	13.50	3.91	12.20	17.63
4	3.61	9.80	48.95	6.86	13.65	4.16	12.98	24.35
5	3.55	14.73	35.00	13.65	17.09	4.35	11.65	39.62
All	3.95	10.71	45.70	8.62	14.96	4.21	11.86	100.00
				2003				
1	7.63	5.10	54.86	3.80	14.36	4.82	9.43	6.80
2	5.74	5.46	55.31	3.97	13.12	5.12	11.30	11.80
3	5.12	6.46	51.64	5.15	13.81	5.14	12.69	17.38
4	4.69	8.24	46.88	7.31	14.02	5.46	13.41	23.19
5	3.61	13.66	33.29	13.90	18.76	5.94	10.85	40.83
All	4.65	9.60	43.70	8.99	15.84	5.51	11.72	100.00

Note: The table reports the composition of expenditure by population quintile of the expenditure distribution corresponding to seven expenditure categories in each of the surveys analyzed.

Table 6. Inflation by expenditure category (average annual rate)

Country	Period	Apparel	Education	Food & Beverages	Transport & Communications	Housing	Health	Other
Brazil	**1988-1996**	663.46		716.30	722.00	759.69	739.63	735.91
Colombia	**1997-2003**	3.73	10.11	10.35	13.96	7.64	12.93	13.33
Mexico	**1984-1989**	73.79	80.44	76.79	75.71	78.21	77.26	86.39
	1989-1994	11.18	21.38	13.45	18.46	21.84	16.58	16.09
	1994-1996	31.36	27.22	40.41	36.38	29.46	37.50	27.78
	1996-2002	12.11	14.00	10.97	13.04	12.14	13.70	14.23
Peru	**1995-1999**	7.34	10.01	6.72	10.02	8.78	11.14	7.70
	1999-2001	2.96	4.34	0.60	6.74	8.13	6.76	4.78
	2001-2003	1.04	2.38	0.26	3.89	2.10	3.11	0.53

Note: The table reports the inflation rate by expenditure category over the spells under analysis. In Brazil, the *education* category is included in *other*.

Table 7. Tests of inflation inequality

Country	Period	Constant	Percentile	R2
Brazil	**1988-1996**	724.27*	0.07*	0.61
		(0.34)	(0.01)	
Colombia	**1997-2003**	10.34*	0.01*	0.48
		(0.04)	(0.001)	
Mexico	**1984-1989**	77.42*	0.01*	0.47
		(0.04)	(0.001)	
	1989-1994	15.66*	0.02*	0.76
		(0.05)	(0.001)	
	1994-1996	35.67*	-0.03*	0.79
		(0.08)	(0.001)	
	1996-2002	11.94*	0.01*	0.85
		(0.02)	(0.0003)	
Peru	**1995-1999**	7.66*	0.01*	0.83
		(0.02)	(0.0003)	
	1999-2001	3.41*	0.02*	0.84
		(0.04)	(0.001)	
	2001-2003	1.18*	0.01*	0.86
		(0.01)	(0.0003)	

Note: The table reports regression results with the inflation rate by percentile as dependent variable and the corresponding percentile and a constant as explanatory variables. Standard error in parethenses.
(*) Significant at the 5%.

Table 8. Inflation by population quintile

	Period	Quintile	Quintile Inflation	Inflation Differential	Growth
Brazil	**1988-1996**	**1**	725.47	4.48	2.68
		2	726.43	3.51	1.95
		3	727.59	2.36	2.09
		4	729.06	0.89	1.89
		5	732.02	-2.08	1.65
		All	729.95		1.84
Colombia	**1997-2003**	**1**	10.53	0.37	1.50
		2	10.50	0.40	0.38
		3	10.61	0.29	0.94
		4	10.76	0.14	0.38
		5	11.20	-0.30	-0.81
		All	10.90		0.00
Mexico	**1984-1989**	**1**	77.58	0.30	3.76
		2	77.60	0.29	2.83
		3	77.65	0.23	3.63
		4	77.73	0.16	1.54
		5	78.15	-0.27	2.71
		All	77.88		2.68
	1989-1994	**1**	15.94	0.83	4.33
		2	16.17	0.59	4.88
		3	16.42	0.34	3.74
		4	16.51	0.26	4.66
		5	17.26	-0.49	4.32
		All	16.77		4.37
	1994-1996	**1**	35.12	-1.34	-0.89
		2	34.92	-1.14	-3.08
		3	34.47	-0.69	-2.22
		4	34.17	-0.39	-3.27
		5	32.92	0.86	-7.41
		All	33.78		-4.85
	1996-2002	**1**	12.08	0.39	4.08
		2	12.17	0.30	4.09
		3	12.30	0.17	3.73
		4	12.38	0.09	3.67
		5	12.69	-0.22	5.21
		All	12.47		4.45
Peru	**1995-1999**	**1**	7.79	0.37	-6.45
		2	7.86	0.30	-1.33
		3	7.98	0.18	0.66
		4	8.13	0.03	-0.37
		5	8.41	-0.25	3.29
		All	8.16		0.79
	1999-2001	**1**	3.75	0.87	7.60
		2	3.89	0.73	4.80
		3	4.16	0.46	6.59
		4	4.52	0.10	7.42
		5	5.24	-0.62	-5.73
		All	4.62		1.25
	2001-2003	**1**	1.28	0.32	3.35
		2	1.35	0.25	4.38
		3	1.46	0.14	2.57
		4	1.58	0.02	0.69
		5	1.81	-0.20	4.52
		All	1.60		3.16

Note: The table reports the annual inflation rate by population quintile of the expenditure distribution, the difference between the inflation rate corresponding to each quintile and the average inflation rate, and the estimated annual growth rate in real consumption of each quintile.

Table 9. Quality Change Bias and inflation inequality by population quintile

	Period	Quintile	Quintile Inflation	QCB	Corrected Inflation	Inflation Differential
Brazil	1988-1996	1	725.47	0.501	721.33	4.12
		2	726.43	0.523	722.11	3.35
		3	727.59	0.543	723.09	2.36
		4	729.06	0.558	724.43	1.02
		5	732.02	0.541	727.53	-2.07
		All	729.95	0.541	725.45	
Colombia	1997-2003	1	10.53	0.399	10.09	0.30
		2	10.50	0.407	10.05	0.34
		3	10.61	0.420	10.15	0.24
		4	10.76	0.446	10.26	0.13
		5	11.20	0.482	10.66	-0.27
		All	10.90	0.450	10.39	
Mexico	1984-1989	1	77.58	0.387	76.90	0.24
		2	77.60	0.365	76.95	0.19
		3	77.65	0.395	76.95	0.19
		4	77.73	0.406	77.00	0.13
		5	78.15	0.448	77.35	-0.21
		All	77.88	0.418	77.14	
	1989-1994	1	15.94	0.385	15.50	0.76
		2	16.17	0.389	15.72	0.54
		3	16.42	0.407	15.95	0.31
		4	16.51	0.425	16.02	0.24
		5	17.26	0.466	16.71	-0.46
		All	16.77	0.435	16.26	
	1994-1996	1	35.12	0.354	34.64	-1.38
		2	34.92	0.371	34.42	-1.16
		3	34.47	0.387	33.95	-0.69
		4	34.17	0.404	33.63	-0.37
		5	32.92	0.450	32.32	0.94
		All	33.78	0.414	33.26	
	1996-2002	1	12.08	0.365	11.67	0.32
		2	12.17	0.379	11.74	0.25
		3	12.30	0.399	11.85	0.14
		4	12.38	0.413	11.92	0.07
		5	12.69	0.442	12.20	-0.21
		All	12.47	0.418	11.99	
Peru	1995-1999	1	7.79	0.406	7.35	0.41
		2	7.86	0.363	7.47	0.30
		3	7.98	0.376	7.58	0.19
		4	8.13	0.384	7.72	0.05
		5	8.41	0.418	7.96	-0.19
		All	8.16	0.397	7.77	
	1999-2001	1	3.75	0.383	3.35	0.79
		2	3.89	0.374	3.51	0.64
		3	4.16	0.370	3.77	0.37
		4	4.52	0.385	4.12	0.03
		5	5.24	0.422	4.79	-0.65
		All	4.62	0.396	4.14	
	2001-2003	1	1.28	0.408	0.87	0.32
		2	1.35	0.403	0.94	0.24
		3	1.46	0.409	1.04	0.14
		4	1.58	0.425	1.15	0.04
		5	1.81	0.461	1.34	-0.15
		All	1.60	0.433	1.19	

Note: The table reports the inflation rate by population quintile of the expenditure distribution, the quality change bias (QCB), the inflation rate by quintile once the QCB is taken into account (corrected inflation), and the difference between the corrected inflation rate corresponding to each quintile and the average corrected inflation rate.

Table 10 Inflation rate by population quintile: alternative indices

	Period	Quintile	Laspeyres		Paasche		Fisher	
			Inflation	Inflation differential	Inflation	Inflation differential	Inflation	Inflation differential
Brazil	1988-1996	1	725.47	4.48	722.37	3.85	723.92	4.16
		2	726.43	3.51	722.69	3.53	724.56	3.52
		3	727.59	2.36	723.96	2.26	725.77	2.31
		4	729.06	0.89	725.04	1.18	727.05	1.04
		5	732.02	-2.08	728.42	-2.20	730.22	-2.14
		All	729.95		726.22		728.08	
Colombia	1997-2003	1	10.53	0.37	9.85	0.30	10.19	0.33
		2	10.50	0.40	9.77	0.38	10.13	0.38
		3	10.61	0.29	9.92	0.23	10.27	0.25
		4	10.76	0.14	10.02	0.12	10.39	0.13
		5	11.20	-0.30	10.42	-0.28	10.81	-0.29
		All	10.90		10.15		10.52	
Mexico	1984-1989	1	77.58	0.30	77.99	1.05	77.79	0.67
		2	77.60	0.29	77.68	1.36	77.64	0.82
		3	77.65	0.23	78.11	0.94	77.88	0.58
		4	77.73	0.16	78.30	0.75	78.01	0.45
		5	78.15	-0.27	80.11	-1.07	79.13	-0.67
		All	77.88		79.04		78.46	
	1989-1994	1	15.94	0.83	15.34	0.63	15.64	0.72
		2	16.17	0.59	15.44	0.53	15.81	0.56
		3	16.42	0.34	15.58	0.40	16.00	0.37
		4	16.51	0.26	15.63	0.34	16.07	0.29
		5	17.26	-0.49	16.46	-0.49	16.86	-0.50
		All	16.77		15.97		16.37	
	1994-1996	1	35.12	-1.34	36.06	-1.53	35.59	-1.44
		2	34.92	-1.14	35.60	-1.08	35.26	-1.11
		3	34.47	-0.69	35.27	-0.75	34.87	-0.72
		4	34.17	-0.39	34.85	-0.32	34.51	-0.36
		5	32.92	0.86	33.61	0.91	33.27	0.88
		All	33.78		34.53		34.15	
	1996-2002	1	12.08	0.39	11.87	0.38	11.97	0.39
		2	12.17	0.30	11.99	0.26	12.08	0.28
		3	12.30	0.17	12.06	0.18	12.18	0.18
		4	12.38	0.09	12.16	0.08	12.27	0.08
		5	12.69	-0.22	12.47	-0.23	12.58	-0.23
		All	12.47		12.24		12.36	
Peru	1995-1999	1	7.79	0.37	7.69	0.39	7.74	0.38
		2	7.86	0.30	7.70	0.38	7.78	0.34
		3	7.98	0.18	7.79	0.29	7.89	0.23
		4	8.13	0.03	7.89	0.19	8.01	0.11
		5	8.41	-0.25	8.40	-0.32	8.41	-0.29
		All	8.16		8.08		8.12	
	1999-2001	1	3.75	0.87	1.93	0.35	2.84	0.41
		2	3.89	0.73	1.99	0.29	2.94	0.31
		3	4.16	0.46	2.12	0.16	3.13	0.11
		4	4.52	0.10	2.33	-0.05	3.42	-0.17
		5	5.24	-0.62	2.70	-0.42	3.96	-0.71
		All	4.62		2.28		3.25	
	2001-2003	1	1.28	0.32	0.95	0.40	1.12	0.36
		2	1.35	0.25	0.92	0.43	1.14	0.34
		3	1.46	0.14	1.09	0.26	1.28	0.20
		4	1.58	0.02	1.22	0.14	1.40	0.08
		5	1.81	-0.20	1.71	-0.35	1.76	-0.28
		All	1.60		1.36		1.47	

Note: The table reports the inflation rate by population quintile of the expenditure distribution and the difference between the inflation rate corresponding to each quintile and the average inflation rate for alternative indices.

Table 11. Distributional effects of inflation inequality

Period	Inequality measure	Initial inequality	Final inequality	% Change	Base in initial period		Base in final period	
					Price Change	Quantity Change	Price Change	Quantity Change
Brazil								
1988 - 1996	GINI Coefficient	**0.54**	**0.55**	**1.60**	**2.17**	**-0.58**	**1.45**	**0.14**
	Mean Log Deviation	0.55	0.57	4.56	4.34	0.21	3.24	1.32
	Theil Index	0.57	0.59	3.44	6.56	-3.12	3.41	0.03
Colombia								
1997 - 2003	GINI Coefficient	**0.53**	**0.50**	**-5.49**	**1.92**	**-7.41**	**0.95**	**-6.43**
	Mean Log Deviation	0.51	0.45	-11.87	4.02	-15.89	1.76	-13.63
	Theil Index	0.53	0.47	-11.76	5.16	-16.92	2.12	-13.89
Mexico								
1984 - 1989	GINI Coefficient	**0.50**	**0.50**	**-0.20**	**2.77**	**-2.97**	**2.02**	**-2.21**
	Mean Log Deviation	0.48	0.47	-1.96	5.07	-7.03	3.89	-5.85
	Theil Index	0.50	0.50	-0.03	8.91	-8.94	5.19	-5.23
1989 - 1994	GINI Coefficient	**0.50**	**0.49**	**-1.85**	**1.38**	**-3.23**	**1.50**	**-3.35**
	Mean Log Deviation	0.47	0.44	-5.11	2.30	-7.41	2.85	-7.96
	Theil Index	0.50	0.45	-10.27	3.66	-13.93	3.34	-13.62
1994 - 1996	GINI Coefficient	**0.49**	**0.46**	**-6.88**	**-1.30**	**-5.57**	**-1.08**	**-5.79**
	Mean Log Deviation	0.44	0.38	-13.79	-2.44	-11.35	-1.96	-11.83
	Theil Index	0.45	0.39	-13.48	-3.14	-10.33	-2.34	-11.14
1996 - 2002	GINI Coefficient	**0.46**	**0.49**	**6.32**	**1.42**	**4.90**	**1.02**	**5.30**
	Mean Log Deviation	0.38	0.43	12.51	2.88	9.63	2.22	10.29
	Theil Index	0.39	0.45	14.06	3.42	10.64	2.53	11.53
Peru								
1995 - 1999	GINI Coefficient	**0.46**	**0.50**	**9.91**	**1.28**	**8.63**	**0.79**	**9.13**
	Mean Log Deviation	0.38	0.51	34.43	2.56	31.88	1.80	32.63
	Theil Index	0.38	0.46	21.54	2.98	18.55	2.05	19.48
1999 - 2001	GINI Coefficient	**0.50**	**0.49**	**-2.72**	**1.05**	**-3.78**	**0.40**	**-3.13**
	Mean Log Deviation	0.51	0.49	-4.06	1.78	-5.84	0.75	-4.80
	Theil Index	0.46	0.42	-7.32	2.71	-10.03	1.00	-8.32
2001 - 2003	GINI Coefficient	**0.49**	**0.48**	**-1.21**	**0.47**	**-1.67**	**0.40**	**-1.60**
	Mean Log Deviation	0.49	0.47	-3.97	0.82	-4.79	0.69	-4.66
	Theil Index	0.42	0.41	-2.05	1.19	-3.24	0.98	-3.03

Note: The table reports the change in different inequality indices between the initial and final period for each spell under analysis. The table also reports the changes in inequality (in %) due to prices and quantity changes computed using as base the initial and final periods.