Whose Inflation? A Characterization of the CPI Plutocratic Gap

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Abstract. Prais (1958) showed that the standard CPI computed by most statistical agencies can be interpreted as a weighted average of household price indexes, where the weight of each household is determined by its total expenditures. In this paper, we decompose the difference between the standard CPI and a democratically-weighted index (*i.e.*, the CPI plutocratic gap) as the product of expenditure inequality and the sample covariance between the elementary individual price indexes and a parameter which is a function of the expenditure elasticity of each good. This decomposition allows us to interpret variations in the size and sign of the plutocratic gap, and also to discuss issues pertaining to group indexes.

Keywords. Consumer price index, plutocratic index, democratic index, group index, aggregation, equivalence scales, inflation.

JEL Classification System. C43, D31, D63

> "The answer to the question what is the *Mean* of a given set of magnitudes cannot in general be found, unless there is given also the object for the sake of which a mean value is required. There are as many kinds of averages as there are purposes; and we may almost say in the matter of prices as many purposes as writers. Hence much vain controversy between persons who are literally at cross purposes. To use a metaphor which has been applied to metaphysics, one party makes a good stroke at billiards, and thinks he has scored off another who is playing chess." —Francis Yisidro Edgeworth (1888), p. 346.

1. Introduction

The Hong Kong Census and Statistics Department routinely reports three consumer price indexes, by income bracket, along with an overall consumer price index (CPI).[1] CPI-A is based on the expenditure patterns of the bottom 50 percent of the population, CPI-B uses the next 30 percent, and CPI-C is for the next 10 percent. The composite CPI takes into

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[1] Prior to June 1999, these indexes were computed and reported by Hang Seng Bank, a private entity. Methodological information on the elaboration of CPIs (and other economic data) can be obtained from the IMF Data Dissemination Standard website, http://dsbb.imf.org/.

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account the expenditure patterns of all these households taken together —which cover 90 percent of the population. For the year 2000, while inflation (deflation) measured by the overall index was -3.7 percent, inflation rates of the group indexes were, respectively: -2.8, -3.8, and -4.5 percent. Thus, differences in inflation rates by income group can be quite substantial. In most countries, however, a single CPI is reported. Even when more than one index is made available by the statistical agency, a single one is often used as an inflation gauge from a macroeconomic policy perspective. How representative is, in general, the official inflation rate, as measured by the CPI?

It is known since Prais (1958) that the CPI computed by statistical agencies can be interpreted as a weighted average of household price indexes.[2] The weight of each household is given by its total expenditure, hence the term 'plutocratic index.' Alternatively, we could construct a democratically-weighted index, where each household weighs the same. We shall define the CPI *plutocratic gap* as the difference between the plutocratic index and the democratic one. Whether price behavior in a given period hurts relatively more the better-off or the worse-off households can be expressed in terms of this single scalar (Fry and Pashardes, 1985).

This paper investigates the sources of possible discrepancies between plutocratic and democratic indexes.[3] We show that the plutocratic gap can be expressed as the product of a measure of variation of household expenditures, and the sample covariance between the elementary individual price indexes and the corresponding good's expenditure-share regression coefficient on household expenditure. This coefficient, in turn, is a function of the expenditure elasticity of each good. Consequently, because the decomposition is multiplicative, three elements are required for the gap between plutocratic and democratic indexes to exist. First, there must be some dispersion in the distribution of expenditure across households. Second, there must be differences in patterns of expenditures by households at different expenditure brackets. And, third, there must be differences in behavior in prices. This paper ascribes mathematical quantities to these three elements. The gap decomposition allows us to interpret the empirical results obtained on the size and the sign of the plutocratic gap, and suggests that averaging the gap over long time periods may be misleading.

This paper is organized as follows: Section 2 presents analytical results regarding the plutocratic and democratic budget shares (the relation of these results with the approximation in Prais (1958) is shown in the Appendix). Section 3 derives a characterization of the CPI plutocratic gap, interprets the empirical evidence under this de-

[2] J.L. Nicholson derived similar results about the same time, which were later published as Nicholson (1975). See Diewert (1983) for a systematic exposition of results pertaining cost-of-living indexes.

[3] On the welfare foundations for aggregate indexes see Pollak (1981) and Fisher (2002). Fisher (2002) considers an infinitesimal change in prices, and looks at the problem of minimizing total aggregate expenditure subject to (i) mantaining a given level aggregate welfare, and (ii) preserving the initial distribution of nominal household expenditures. In this framework, he shows that both democratic and plutocratic indexes can only be justified if either (i) exact aggregation is possible, or (ii) the initial distribution of household expenditures is considered optimal by the planner. In addition, the democratic index requires this initial distribution to be egalitarian. In this framework a democratic index would never be justified except when it coincides with the plutocratic index.

composition. Section 4 presents alternative household-weighting schemes, in particular, a demographically-weighted index —where the number of equivalent adults is used as the household weight— which will generally lie between the democratic and plutocratic indexes. Section 5 concludes.

2. Plutocratic and Democratic CPI budget shares

Let x^h denote household-h's total expenditures and x_i^h the expenditure on good i. Then household-h's budget share for good i is given by $s_i^h = x_i^h/x^h$, and total aggregate expenditure is given by $X = \sum x^h$. The *plutocratic* budget shares for good i in the aggregate CPI are given by $\tilde{s}_i^P = X^{-1} \sum_h x^h s_i^h$. The CPI (at time t) is given by

$$CPI^P = \sum_i \tilde{s}_i^P \, \mathcal{I}_i, \tag{1}$$

where $\mathcal{I}_i = (p_{it}/p_{i0})$ are elementary price indexes (for details, see Izquierdo *et al.* (2003)). Noting that household h individual index is given by $cpi^h = \sum_i s_i^h \mathcal{I}_i$, the CPI^P in (1) may be interpreted as a 'representative' CPI.[4] It is natural to ask then what is the household better represented by the CPI^P. Muellbauer (1974) searched for the household whose budget shares were closest to the $\tilde{s}_i^P$ aggregate weights in the U.K. CPI, and found it to be at the 71 percentile in the household expenditures distribution. For the U.S. in 1990, Deaton (1998) estimates that this consumer occupies the 75 percentile. Thus, the 'representative' consumer embedded in (1) is inclined towards upper-expenditure households.

Alternatively, we could use *democratic* budget shares, $\tilde{s}_i^D = H^{-1} \sum_h s_i^h = \bar{s}_i$, where H denotes the number of households, to construct a democratically-weighted index,

$$CPI^D = \sum_i \tilde{s}_i^D \, \mathcal{I}_i. \tag{2}$$

Other obvious possibility, explored in section 4, consists in weighting each household proportionately to the number of its members using an equivalence-scale approach.

The difference between good-i plutocratic and democratic shares in the CPI is given by

$$\begin{aligned} (\tilde{s}_i^P - \tilde{s}_i^D) &= \frac{1}{\bar{x}H} \sum_h (x^h - \bar{x}) s_i^h \\ &= \frac{1}{\bar{x}} \hat{\sigma}(x, s_i) = \hat{\sigma}(x/\bar{x}, s_i) \end{aligned} \tag{3}$$

where $\bar{x} = X/H$ is the sample mean of total expenditures, and $\hat{\sigma}(x, s_i)$ is the sample covariance, across households, of the budget share of good i, s_i^h, and the total household

[4] It can be established that $CPI^P = \sum p_{it}\bar{q}_i / \sum p_{i0}\bar{q}_i$, where $\bar{q}_i$ is the average consumption of good i. Consequently, at least in this sense, the CPI^P is indeed the CPI of an average consumer. Similarly, by simply multiplying the average quantities by H, we obtain that the CPI^P is also the CPI of an aggregate consumer.

expenditures (scaled by mean total household expenditures). We can now rescale the covariance term in (3) and convert it into a regression coefficient. Thus, multiplying and dividing the right-hand side of expression (3) by the the square of the coefficient of variation of total household expenditures, we obtain:

$$(\tilde{s}_i^P - \tilde{s}_i^D) = \hat{\zeta}\,\hat{\beta}_i, \tag{4}$$

where $\hat{\zeta}$ = $(\hat{\sigma}^2/\overline{x}^2)$, and $\hat{\beta}_i$ denotes the OLS estimator in the regression given by

$$(s_i^h - \overline{s}_i) = \beta_i \left(\frac{x^h - \overline{x}}{\overline{x}} \right) + \varepsilon_i^h. \tag{5}$$

Equation (4) indicates that the difference in good i's plutocratic and democratic CPI shares depends on the product of: *(i)* a measure of inequality of household expenditure, $\hat{\zeta}$; and *(ii)* a measure of how good i's budget share varies with total expenditure in the household sample, $\hat{\beta}_i$. Since the decomposition is multiplicative, the shares must coincide when there is no inequality in total expenditures or when expenditure shares are not affected by those differences.

It is important to note that no distributional or behavioral assumption is needed to obtain $\hat{\beta}_i$, because we can always estimate the regression coefficient in equation (5). Of course, if assumptions are made, then different interpretations could be given to the parameters involved. For now, however, we simply want to stress that the decomposition in (4) holds because of algebraic identities, and does not rely on any assumptions on consumer behavior or household-expenditures distribution.

Note that $\hat{\zeta}$ = $2I_2(\mathbf{x})$, where $I_2(\mathbf{x})$ corresponds to the Generalized Entropy inequality measure, $I_c(\mathbf{x})$, for c = 2. The parameter c summarizes the sensitivity of I_c in different parts of the household total expenditures distribution: the more positive (negative) c is, the more sensitive I_c is to differences at the top (bottom) of the distribution (Cowell and Kuga, 1981). Inequality indexes belonging to the Generalized Entropy family are the only measures of relative inequality that satisfy the usual normative properties required for an inequality index and, in addition, are decomposable by inequality subgroups (Shorrocks, 1984). Finally, using the fact that $\sum_i s_i^h$ = 1, it follows that $\sum \hat{\beta}_i$ = 0 (so that if, for some i, we have $\hat{\beta}_i > 0$ we must also have $\hat{\beta}_j < 0$ for some j).

3. The CPI plutocratic Gap

As discussed before, we shall define the plutocratic gap as: $\mathcal{G} \equiv (\Pi^P - \Pi^D) \div 100$ = $(CPI^P - CPI^D)$, where Π = $(CPI - 1) \times 100$ is the inflation rate between 0 and t (in percent). Using (3) we can write:

$$\mathcal{G} = \sum_i (\tilde{s}_i^P - \tilde{s}_i^D)\mathcal{I}_i = \hat{\zeta} \sum_i \hat{\beta}_i \mathcal{I}_i = \hat{\zeta} \sum_i \hat{\beta}_i (\mathcal{I}_i - \overline{\mathcal{I}}), \tag{6}$$

where $\overline{\mathcal{I}}$ = $N^{-1} \sum \mathcal{I}_i$ is a simple average. Equation (6) may be rewritten as:

$$\mathcal{G} = \hat{\zeta}\, N\, \hat{\sigma}(\hat{\beta}, \mathcal{I})\,, \tag{7}$$

where $\hat{\sigma}(\hat{\beta}, \mathcal{I})$ refers to the sample covariance of $\hat{\beta}_i$ and $\mathcal{I}_i$, this time over goods instead that over households.

Equation (7) is our fundamental result. It shows that the plutocratic gap is determined by the dispersion of household expenditure, measured by $\hat{\zeta}$, and the sample covariance between $\hat{\beta}_i$ and $\mathcal{I}_i$. The sign of the plutocratic gap is determined by the covariance term. A positive covariance term means that the goods favored by the richer households experience higher than average inflation and necessities a lower than average inflation. Similarly, a negative covariance implies that necessities experience higher than average inflation while superior or luxury goods experience lower than average inflation. These effects are also scaled by the magnitude of the inequality of household expenditures, as measured by $\hat{\zeta}$. *Ceteris paribus*, the higher the dispersion in household expenditures, the higher the size of the plutocratic gap.

Inspection of equation (7) indicates that three elements are required for the plutocratic gap to be different from zero: *(a)* there must be some dispersion in the distribution of household expenditures (reflected by $\hat{\zeta} \neq 0$); *(b)* there must be some observed differences in consumption patterns among households with different total expenditures (reflected by $\hat{\beta}_i \neq 0$ for some i); and *(c)* there must be some differences in price behavior across some goods which display behavioral differences across households (reflected by $\mathcal{I}_i \neq \overline{\mathcal{I}}$ for some i which has $\hat{\beta}_i \neq 0$). These three conditions are necessary for $\mathcal{G} \neq 0$, and if they all hold we must have $\mathcal{G} \neq 0$ —*i.e.*, they are also jointly sufficient.

In practical situations, however, not all households face the same prices. For each good i, the statistical agency collects j prices, p_{ijt}, one for each geographical area j. This can be readily accommodated within the present analysis by thinking of item i in different areas as different goods. We would expand the good space to include $N \times J$ goods. As a result, s_i^h will be always zero for the 'goods' outside the geographical area where household h resides. All the previous analysis applies without further changes.

3.1. Empirical Estimates of the CPI plutocratic Gap

Table 1 summarizes the main findings of various empirical studies that have estimated the plutocratic gap for different countries during various time periods.[5] Care must be applied to cross-country comparisons because the range of publicly-provided goods (*e.g.*, health care or housing) varies widely across countries.

Given a household survey, $\hat{\zeta}$ and the $\hat{\beta}_i$'s are then fixed, and any source of variation in the sign and size of the gap for, *e.g.*, each year must be solely explained by the price behavior reflected by the $\mathcal{I}_i$'s. The movements in the $\mathcal{I}_i$'s may cause $\hat{\sigma}(\hat{\beta}, \mathcal{I})$ to change sign from one year to another (Table 2 below). Thus, as noted, looking at the overall $\mathcal{G}$, simply averaging over a long period may be misleading.

[5] We are unable to provide estimates sampling variability for the different inflation rates because elementary price data is not publicly available. For Spain, the sampling variability of household expenditure shares would imply uncertainty well to the right of the third decimal of annual inflation rates expressed as percentages. However, the variability from price sampling is likely to outweight the variability due to the household shares. For the U.S., the best estimates for the standard error of inflation rates (expressed as percentages) is of the order of 0.06 to 0.1; see Leaver and Valiant (1995) and Leaver and Cage (1997).

Table 1. Empirical Studies of the CPI plutocratic Gap

	Country	Time Period	N	Range (percentage points per year) Π^P	$\mathcal{G}$
Carruthers *et al.* (1980)	U.K.	1975–78	11	8.2 to 24.2	−0.1
Fry and Pashardes (1985)	*id.*	1974–82	95	8.2 to 24.2	negative
Deaton and Muellbauer (1980)	*id.*	1975–76	10	14.5	−2
Crawford (1996)	*id.*	1979–92	74	3.4 to 18.0	+0.16
Newbery (1995)	*id.*	1980s	87	3.4 to 18.0	slightly positive
ibid.	Hungary	1980s	87	4.5 to 16.9	slightly positive
Kokoski (1987)	U.S.	1972–80	146	3.3 to 13.5	−0.1 to −0.3
Erbas and Sayers (1998)	*id.*	1986–95	7	1.9 to 5.4	negative
Garner *et al.* (1999)	*id.*	1980s	207	1.9 to 13.5	slightly negative
Kokoski (2000)†	*id.*	1987–97	146	2.0 to 5.25	−0.28 to +0.56
Lódola *et al.* (2000)	Argentina	1989–91	9	220 to 10,781	+2.3 to +663.4
ibid.	*id.*	1991–93	9	11.2 to 20.0	−0.66 to −0.78
ibid.	*id.*	1993–98	9	1.2 to 3.3	−0.48 to +0.65
Yahav and Yitzhaki (1991)	Israel	1960–71	10	1.99 to 12.06	−0.12 to +0.25
ibid.	*id.*	1981–86	28	19.9 to 373.8	−1.7 to +6.3
Ruiz-Castillo *et al.* (2003)	Spain	1973–81	57	14.54 to 23.02	−0.04 to +0.53
ibid.	*id.*	1981–91	58	4.59 to 9.48	−0.19 to +0.30
ibid.	*id.*	1991–98	2,042	2.49 to 6.99	−0.08 to +0.15

Source: Studies cited, IMF Government Financial Statistics and author's calculations.

† This paper has a typo in its Table 2: the column headings "Democratic" and "Plutocratic" should be switched.

Because of data limitations, most of the results in Table 1 are based on a substantially smaller number of goods than the number for which prices were collected by the statistical agencies (column N). In particular, most studies do not have information on geographical price variation, they assume that the same national average CPI prices apply to all households in the sample, and focus on the effect of expenditure shares variability across households. Ruiz-Castillo *et al.* (2003), uses 2,042 goods for the 1990s (see below), but only 58 and 57 for the 1980s and 1970s.As a result, working with highly aggregated goods causes an underestimation of the true plutocratic gap for two reasons. First, price aggregates already embody a plutocratic gap. Second, expenditure elasticities revert to the mean (*i.e.*, to one) as we aggregate goods. As a result, the true size of the plutocratic gap is underestimated.[6]

For Spain during the 1990s, Ruiz-Castillo *et al.* (2003) estimate that the average plutocratic gap in Spain amounts to 0.055 percent per year.[7] However, as shown in Table

[6] Algebraically, in equation (6), the first effect implies that the $\mathcal{I}_i$'s are artificially close to CPI^P. The second effect implies that the $\hat{\beta}_i$'s are artificially close to zero. The end result is that the size of $\sigma(\hat{\beta}, \mathcal{I})$ shrinks towards zero, producing an underestimation of the true plutocratic gap, $\mathcal{G}$.

[7] The results in Table 2 are based on the Spanish household budget survey collected by the Spanish statistical

2, annual gaps are typically larger, and price movements significantly change the sign and magnitude of the annual gap. The results in Table 2 are based on $21 \times 18 + 32 \times 52 = 2,042$ different $\mathcal{I}_{ij}$'s; 21 food goods in 18 autonomous communities and 32 non-food goods in 52 provinces.[8]

Table 2. Decomposition of the CPI plutocratic Gap: Spain 1993–97
(All values in percentage points)

	Π^P	Π^D	$\hat{\zeta}$	$N\,\hat{\sigma}(\hat{\beta},\mathcal{I})$	$\mathcal{G}$
1993	5.271	5.165	0.496	0.212	0.105
1994	4.621	4.701	0.496	-0.161	-0.080
1995	4.079	4.130	0.496	-0.101	-0.050
1996	3.180	3.090	0.496	0.181	0.090
1997	2.494	2.369	0.496	0.252	0.125

$\bar{x}$ = 2.56E+6, $\hat{\sigma}$ = 1.81E+6, $N = 2,042$

Thus, as discussed above, the sign and magnitude of the gap may vary significantly year after year, even when using the same budget survey. As a result, finding the gap small during one particular period has little bearing over its size and sign at other time when prices may behave differently. For different household surveys, not only the price dynamics may change, but also expenditure inequality may be different (*e.g.*, $\hat{\zeta}$ was 2% larger for Spain in 1980–81). As a result, findings for one country may have little implications for other countries with larger income inequality and different price dynamics. For instance, income inequality in Latin America is very large, IDB (1998) reports that countries in the region experience the largest income inequality in the World. It is very likely then that the CPI plutocratic gap be of a larger significance in Latin America, especially in countries with double-digit inflation that may have more differentiated price dynamics. It is common in the region to excludr the richer households —*e.g.*, the CPI weights in Ecuador are computed because of the 'large dispersion in their consumption patterns.' (In the U.K., the index weight calculation excludes the top 4% of the population by income and also pensioners mainly dependent on state benefits.) Nonetheless, in Ecuador, as is typically done in many countries (including the U.S.), the household survey on which the CPI is based is restricted to urban areas.

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agency 1990–91. This is a household budget survey of 21,155 household sample points, representative of a population of approximately 11 million households and 38 million persons occupying residential housing in all of Spain. The survey was collected from April 1990 to March 1991.

[8] The statistical agency collects elementary price indexes for a commodity basket consisting of 471 items in 130 municipalities spread over the 52 Spanish provinces under the CPI present system, based in 1992. Approximately 150,000 prices are collected each month from approximately 29,000 establishments. Price information at this disaggregated level is not publicly available. Prices are generally collected once a month at each establishment, except for perishable items which are collected three times a month from all establishments.

While the Hong Kong indexes mentioned in the introduction are obtained by simple reweighting, there are instances where statistical agencies make an effort to adequately address these two issues. The Indian Ministry of Statistics and Programme Implementation computes four different CPIs: CPI-IW, CPI-RL, CPI-AL, and CPI-UNME. The CPI-IW covers households headed by industrial workers in 70 industrial centers following 260 items and sampling approximately 160,000 retail price quotes from 16,545 outlets and selected open markets. The CPI-RL covers all rural households and it is compiled for 20 states and for all India, covering 85 to 106 items; 61,005 monthly price quotes are collected from retail outlets in 600 villages. The CPI-AL, similar to the RL, except that it covers only households headed by agricultural laborers. Finally, the CPI-UNME covers households headed by non-manual workers in 59 urban centers sampling 1022 price quotes on a varying number of items depending on the center, from 146 in Imphal to 345 in Delhi. Inflation rates may differ significantly for these indexes. For instance, in January 2001, the annual inflation rates were 3.3, -2.0, -1.6, and 5.8 percent, respectively.

4. Alternative Weighting Schemes

For any family of household weights, $\omega^h(\theta)$, parametrized by θ, we can define $\tilde{s}_i(\theta) = \sum_h \omega^h(\theta) s_i^h$, and construct $CPI(\theta) = \sum_i \tilde{s}_i(\theta)\mathcal{I}_i$. Defining $\mathcal{G}(\theta) = (CPI^P - CPI(\theta))$ leads to the following generalization of equation (7):

$$\mathcal{G}(\theta) = N\left\{\hat{\zeta}\,\hat{\sigma}(\hat{\beta},\mathcal{I}) - \hat{\xi}(\theta)\,\hat{\sigma}(\hat{\delta}(\theta),\mathcal{I})\right\} = \sum_i \left\{\hat{\sigma}(x/\bar{x}, s_i) - \hat{\sigma}(\omega(\theta)/\bar{\omega}(\theta), s_i)\right\}\mathcal{I}_i \quad (8)$$

where $\hat{\xi}$ is the inequality index applied to $\omega^h(\theta)$, and $\hat{\delta}_i(\theta)$ is the OLS estimate of the regression of $\tilde{s}_i(\theta)$ on $\omega^h(\theta)/\bar{\omega}(\theta)$.

As suggested by Nicholson (1975), instead of weighting equally each household, an alternative approach is to consider explicitly the number of members in each household using an equivalence-scale approach. Equivalence scales are used in empirical studies of consumption behavior to take into account economies of scale in household composition. Following Buhmann *et al.* (1988) we could adopt an equivalence scale model in which scale economies in consumption depend only on household size. Let n^h be the number of members of household h; then $\omega^h(\theta) \propto (n^h)^\theta$, with $\theta \in [0, 1]$, can be interpreted as the number of 'equivalent adults' in a household of size n^h. We have $\omega^h(0) = \frac{1}{H}$, which would weight each household equally as in our democratic index. At the other extreme, $\omega^h(1) \propto n^h$ would simply represent the number of members for a super-democratic index. Weighting households by the number of equivalent adults will generally push the index towards to the plutocratic index.

The top panel in table 3 shows $\mathcal{G}(\theta)$ for different values of θ, for Spain in the 1990s, when $\omega^h(\theta) \propto (n^h)^\theta$. The magnitude of the gap decreases with θ. Moreover, there is even a sign reversal, for 1995, with $\mathcal{G}(1) > 0$ while for all other values of θ the gap, $\mathcal{G}(\theta)$, is negative. The results in Table 3 are a consequence of the fact that, as it is to be expected, for Spain, in that time period, household size and total expenditure are correlated. Nonetheless, even for $\theta = 1$, the size of the gaps in Table 3 is not negligible.

Table 3. Alternative Aggregation Schemes: Spain 1993–97
(All values in percentage points)

Equivalence-Scale Weighting: $\omega^h(\theta) \propto (n^h)^\theta$						
		$\mathcal{G}(\theta)$				
	Π^P	θ = 0	θ = 0.25	θ = 0.50	θ = 0.75	θ = 1
1993	5.271	0.105	0.098	0.090	0.083	0.077
1994	4.621	-0.080	-0.065	-0.052	-0.042	-0.034
1995	4.079	-0.050	-0.033	-0.018	-0.004	0.009
1996	3.180	0.090	0.088	0.087	0.086	0.085
1997	2.494	0.125	0.121	0.117	0.113	0.110
Equivalent Household Expenditures: $\omega^h(\theta) \propto x^h/(n^h)^\theta$						
		$\mathcal{G}(\theta)$				
	Π^P	θ = 0	θ = 0.25	θ = 0.50	θ = 0.75	θ = 1
1993	5.271	0.000	0.004	0.007	0.010	0.013
1994	4.621	0.000	-0.009	-0.020	-0.034	-0.050
1995	4.079	0.000	-0.010	-0.020	-0.032	-0.045
1996	3.180	0.000	-0.002	-0.004	-0.007	-0.010
1997	2.494	0.000	-0.002	-0.006	-0.009	-0.014
Muellbauer Homogeneous Social Weights: $\omega^h(\theta) \propto (x^h)^{(1-\theta)}$						
		$\mathcal{G}(\theta)$				
	Π^P	θ = 0	θ = 0.25	θ = 0.50	θ = 0.75	θ = 1
1993	5.271	0.000	0.027	0.053	0.080	0.105
1994	4.621	0.000	-0.015	-0.033	-0.055	-0.080
1995	4.079	0.000	-0.007	-0.017	-0.032	-0.050
1996	3.180	0.000	0.023	0.045	0.067	0.090
1997	2.494	0.000	0.029	0.060	0.091	0.125

Another possible weighting scheme could be based on equivalent household expenditures, $\omega^h(\theta) \propto x^h/m^h(\theta)$, which results in the plutocratic index for θ = 0 (second panel of table 3).

Finally, Muellbauer (1974) proposes a class of *homogeneous social price indexes* parameterized by a measure of aversion to inequality, $\theta \in [0, 1]$. The household weights are now proportional to $(x^h)^{(1-\theta)}$, which reduces to democratic weights when θ = 1, and plutocratic weights when θ = 0. Table 3 shows the gaps for this aggregating scheme with respect to the plutocratic CPI. It is interesting to focus on the polar cases. Both indexes coincide with the plutocratic Laspeyres when θ = 0, so the corresponding gap is zero. The last column for the Muelbauer aggregation scheme corresponds to a democratic index —*i.e.*, it coincides with first column in the top panel.

5. Concluding Remarks

What is the appropriate inflation gauge from a macroeconomic perspective? How should we adjust, *e.g.*, tax brackets, public pensions, or social programs transfers annually?[9] BLS (1997, p. 172) warns "CPI users should understand that the CPI may not be applicable to all questions about price movements for all population groups." Nevertheless, in most places and in most times, these quantities are invariably revised according to a plutocratic CPI. Thus, a dollar-weight logic prevails over a household-weight logic.

Escalating transfer payments by the plutocratic CPI may result in over- or under-compensation relative to a democratic index during different time periods. While these deviations may tend to cancel off over longer horizons, there is, however, an important perversity emphasized by Ruiz-Castillo *et al.* (2003). The plutocratic gap in the CPI often accentuates the change in household welfare rather than smoothing it. In effect, the worse-off households suffer under-adjustments when inflation is more harmful to them —*i.e.*, when they can least afford it. In periods where the plutocratic gap is negative (when prices behave in an way more detrimental to the poorer households) then social programs, which primarily benefit the poor, are revised less than what would be the case with a democratic group index. Similarly, when price movements are less detrimental to the poorer households —*i.e.*, when the plutocratic gap is positive— indexed social transfers grow more than cost-of-living adjustments would dictate. Thus, plutocratic-CPI adjustments display harmful 'procyclical' features.[10]

Nonetheless, the plutocratic CPI has its own merits. It naturally arises when computing the aggregate Laspeyres price index, and it is consistent with aggregate deflators arising from the national accounts. It also provides an upper bound for the theoretical aggregate compensating variation (Hicks, 1940) —*i.e.*, by how much would monetary national income need increase to compensate for a price variation. Plutocratic weights would also arise if we were to draw prices at random in such a way that each dollar of expenditure had an equal chance of being selected (Theil, 1967; p. 136).

While different indexes could be easily computed for different uses, Prais (1958, p. 131) asked: Can more than one index numbers be tolerated without confusion? There is a crucial tradeoff between the simplicity of the current prevailing one-size-fits-all approach and the conceptual superiority of a piecemeal-menu approach to index numbers. The best resolution may well vary in different places and at different times. This paper shows that the larger the income (expenditure) inequality, the more different the consumption patterns by income group, and the larger the variance in individual price behavior, the less appealing is a single plutocratic CPI as the only policy adjuster. Finally, if a

[9] See Triplett (1983), Fry and Pashardes (1985), Griliches (1995), Pollak (1998), and Jorgenson and Slesnick (1999).

[10] For the richer households, since the plutocratic index is always closer to their true index than a democratic one, this problem is unlikely to be too important. However, CPI adjustments also display procyclicality. Possibly the most important CPI adjustment involving the richer households involves the revision of income-tax brackets. In this case, when inflation is more detrimental to the richer households, the plutocratic CPI will be below the true inflation of the rich, and they would pay too much in taxes. Conversely, they will pay too little when inflation is less detrimental to them.

single index number is to be computed, then as Prais (1958, p. 126) asked: Whose cost of living should one have in mind?

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