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An estimation of CPI biases in Argentina 1985-2005, and its implications on real income growth and income distribution[1]

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Abstract

On this paper we estimate the amount of CPI biases for GBA during the period 1985-2005 by shifts in Engel's curves estimated on expenditure surveys. The results confirm that the CPI overstates inflation by more than 60%, which implies an income growth of the surveys between 4.3 and 5.7% per year. Additionally we find that the impact of the bias is concentrated in lower-income individuals. Correcting this impact can alter the evolution of inequality over the period.
JEL: N36, E31

Resumen

En el presente trabajo se estima la cuantía del sesgo en el IPC para el GBA durante el período 1985-2005 mediante desplazamientos en las curvas de Engel estimadas en base a encuestas de gasto. Se obtiene que el IPC sobreestima la inflación en más de un 60% lo que implica un crecimiento del ingreso en las encuestas de entre 4.3 y 5.7% anual. Adicionalmente se encuentra que el impacto del sesgo se concentra en los individuos de menores ingresos. La corrección este impacto, altera la evolución de la desigualdad a lo largo del período.
JEL: N36, E31

[1] This paper was originally prepared for the Argentine Exceptionalism Conference at Harvard Kennedy School on February 13th , 2009. We would like to give special thanks to conference participants, Javier Alejo, Guillermo Cruces, Leonardo Gasparini, Ana Pacheco and Guido Porto for their useful comments. Contact address: gluzmann@yahoo.com.

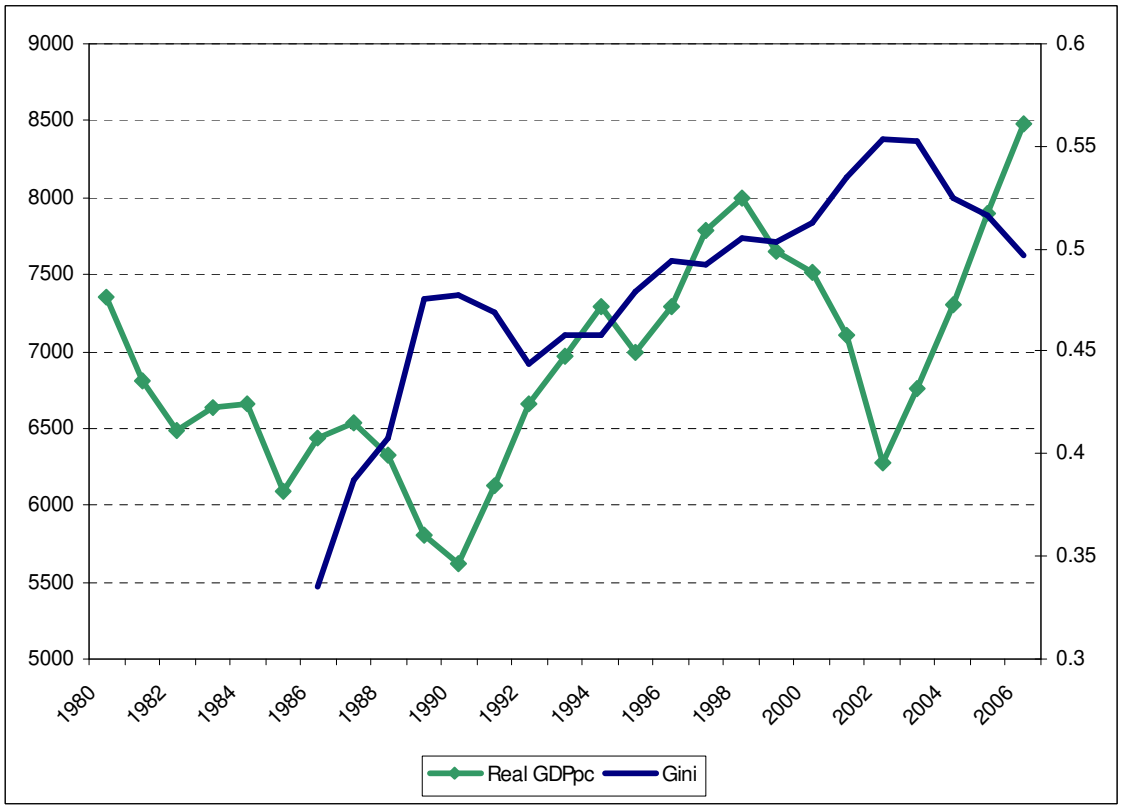
1 Introduction

Argentina has always been considered a basket case. No better proof of this fact than the name of this conference which refers to Argentina's exceptionalism, thus assuming that there is something unusual, "exceptional", for good or bad, regarding Argentina's economic performance.

It is a well known fact that at the turn of the XXth century Argentina was among the richest countries in the world, and that after WWII started a long period of economic decline. While by the turn of the XXIst century Argentina still was in PPP terms the richest among large Latin American countries it had lost significant ground relative to it peer group of a century ago. This long stagnation has become to some an apparently unavoidable fate, only to be interrupted occasionally by brief growth spurts that inevitably provided the stage for the following crisis (a process that has been dubbed "stop go" dynamics). In fact studies about the Argentine perception of the business cycle indicate that Argentines tend to become pessimists in the midst of each economic boom, as if anticipating an the unavoidable next crisis (see Gabrielli and Rouillet, 2003).

This stagnation and perennial process of going forward and backwards, has permeated not only the economic sphere, but has also been relevant in politics, as Argentina has seen a string of military interventions between 1930 and 1983. It is perhaps in this parallel dimension where Argentines feel that real progress has been made since 1983, as nowadays there is virtually no possibility of an interruption of the democratic political process. But this improvement in the political sphere has not, at least in the data, been matched by a similar success in economic performance. Since the return of democracy the country has experienced two hyperinflations, several defaults and restructurings of its debt, many large devaluations, periods of persistent high inflation, deflation, introduction of parallel currencies, deep economic crises and, not surprisingly a relatively poor economic performance. This poor economic performance is measured both in terms of GDP growth and in terms of a deteriorating income distribution as shown in Figure 1. Figure 1 shows a clear deteriorating trend in income distribution. In terms of real GDP while there is some growth in per capita income it comes up to a mere 0.5% per year throughout the whole period.

Figure 1. Real GDP growth and income distribution



Source: The Gini coefficient includes only Buenos Aires and its metropolitan area, it was computed using the Socioeconomic Database of Latin America and the Caribbean (SEDLAC-CEDLAS), the Real GDPpc are values reported in World Economic Outlook (IMF).

The purpose of this paper is to challenge the view that economic performance during Argentina's recent democracy has been so dismal, both in terms of earnings growth as well as in terms of income distribution. In fact we will argue that real earnings growth has been steady and much bigger than measured, and that income distribution has improved. In order to come to this conclusion, we use consumer surveys to estimate CPI biases. We find that biases are extremely large, particularly in the earlier years, as Argentina moved from a closed economy in the 1980s to a much more open economy in the 1990s. Our results are similar to those found by Carvalho Filho and Chamon (2006) for Brazil, and cast a much brighter light on recent economic performance. Our paper also innovates from a methodological point relative to previous work in the area (Costa, 2001, Hamilton, 2003; and Trebon, 2008) by using individual price indexes by household to obtain identification.

The outline of the paper is extremely simple. Section 2 explains the methodology, section 3 shows the results, and section 4 provides some final thoughts. Our conclusions are that Argentina's exceptionalism is a presumption that still needs to be proven, and that Argentina's economic performance during our recent democracy, both in terms of income distribution and earnings growth has been substantially better than accepted in the economic debate.

2 Methodology

2.1 Estimating CPI biases

The basis of our results are an estimation of the CPI biases. It is well known that CPI estimation is subject to a number of biases: new product entry, quality changes, as well as substitution biases. The existence of these biases has been known for some time. In recent years several researchers (Costa (2001), Hamilton (2001) and Carvalho Filho and Chamon (2006)) have used the estimation of Engel curves as a vehicle to estimate these CPI biases. In a nutshell the methodology uses the assumption that Engel curves for food should be relatively stable. If this is the case, when the estimation of the Engel curves at different dates show shifts, these may correspond to CPI bias. To illustrate the point, consider two points in time between which the share of food in income declines with a stagnant earning levels. If the Engel curve is stable there is a presumption that CPI may be biased (overestimated in this case) as otherwise the share of food should have remained constant. The changes in the share, with some assumptions, may be linked to the CPI bias.

More formally, we start from:

$$w_{ijt} = \phi + \gamma\left(\ln P_{Fjt} - \ln P_{Njt}\right) + \beta\left(\ln Y_{ijt} - \ln P_{Gjt}\right) + \sum_x \theta_x X_{ijt} + \mu_{ijt}, \qquad (1)$$

where w_{ijt} is the ratio of food to nonfood of household *i*, in region *j* at time *t* ;

P_{Fjt} is the true unobservable price of food in region *j* at time *t* ;

P_{Njt} is the true and unobservable price of non food in region *j* at time *t* ;

Y_{ijt} is nominal income for household *i*, in region *j* at time *t* ;

P_{Gjt} is the true and unobservable general price level in region *j* at time *t*;

X_{ijt} is a set of control variables for household *i*, in region *j* at time *t* ;

μ_{ijt} is a random term;

ϕ , γ , β , and the different θ_x are parameters.

If we call

$\prod_{Gjt}$ the cumulative percentage growth of the observable CPI in region *j*, since time 0 and time *t* ;

$\prod_{Fjt}$ the cumulative percentage growth of the price of food, in region *j*, between time 0 and time *t* ;

$\prod_{Njt}$ the cumulative percentage growth of the price of nonfood, in region *j*, between time 0 and time *t* ;

E_{Gjt} the cumulative percentage increase in the measurement error in the CPI in region *j*, between time 0 and time *t* ;

E_{Fjt} the cumulative percentage increase in the measurement error in the price of food, in region *j*, between time 0 and time *t* ;

E_{Njt} the cumulative percentage increase in the measurement error in the price of nonfood, in region *j*, between time 0 and time *t* ;

we can rewrite (1) as:

$$w_{ijt} = \phi + \gamma\left[\ln\left(1+\prod_{Fjt}\right) - \ln\left(1+\prod_{Njt}\right)\right] + \beta\left[\ln Y_{ijt} - \ln\left(1+\prod_{Gjt}\right)\right]$$
$$+ \gamma\left[\ln P_{Fj0} - \ln P_{Nj0}\right] - \beta \ln P_{Gj0}$$
$$+ \gamma\left[\ln\left(1+E_{Fjt}\right) - \ln\left(1+E_{Njt}\right)\right] - \beta \ln\left(1+E_{Gjt}\right)$$
$$+ \sum_x \theta_x X_{ijt} + \mu_{ijt} \quad . \qquad (2)$$

If we assume that the mismeasurement does not change across regions, we can rewrite (2) as:

$$w_{ijt} = \phi + \gamma\left[\ln\left(1+\prod_{Fjt}\right) - \ln\left(1+\prod_{Njt}\right)\right] + \beta\left[\ln Y_{ijt} - \ln\left(1+\prod_{Gjt}\right)\right]$$
$$+ \sum_j \delta_j D_j + \sum_t \delta_t D_t + \sum_x \theta_x X_{ijt} + \mu_{ijt}\,, \qquad (3)$$

where D_j y D_t are dummies by regions and period, and:

$$\delta_j = \gamma\left(\ln P_{Fj0} - \ln P_{Nj0}\right) - \beta \ln P_{Gj0} \qquad (4)$$

$$\delta_t = \gamma\left[\ln\left(1+E_{Ft}\right) - \ln\left(1+E_{Nt}\right)\right] - \beta \ln\left(1+E_{Gt}\right). \qquad (5)$$

Notice that δ_t is a function only of time. If we additional assume that the biases for food and nonfood items are similar we can computed a measure of the general CPI bias from:

$$\ln\left(1+E_{Gt}\right) = -\frac{\delta_t}{\beta} \qquad (6)$$

From (6) we can compute $E_{Gt} = e^{-\frac{\delta_t}{\beta}} - 1$ which is the measurement error between real inflation and CPI inflation. $-E_{Gt}$ is the cumulative bias.

The assumption that the bias for food and non food are the same is not necessarily very realistic. However, under reasonable assumptions our measure can be considered a lower bound for the estimate. From (5):

$$\ln\left(1+E_{Gt}\right) = \frac{\gamma\left[\ln\left(1+E_{Ft}\right) - \ln\left(1+E_{Nt}\right)\right]}{\beta} - \frac{\delta_t}{\beta}\,. \qquad (7)$$

If food is a basic good with an income elasticity less than one (β<0) and if the income effect is larger than substitution effect for food consumption (γ<0)[2], and under the reasonable assumption that the mismeasurement in nonfood is larger than in food products, the first term in (7) is negative and our bias can be considered a lower bound. In other words our measure would be underestimating the bias in the CPI.

So far we have just described the estimation methodology used in previous works. However, due to data limitations, we need to introduce some changes in the

[2] While these are here arbitrary assumptions, they are consistent with the values estimated in the following section.

estimation procedure. Argentina has relatively few consumption expenditures that are publicly available and we only had access to the Survey of household Expenditures of 1985/1986 (Encuesta de Gasto de los Hogares 1985/86, EGH85/86), the National Survey of household Expenditures 1996/1997 (Encuesta Nacional de Gasto de los Hogares 1996/97, ENGH 96/97) and National Survey of household Expenditures 2004/2005 (Encuesta Nacional de Gasto de los Hogares 2004/05, ENGH 04/05). The EGH 85/86 took place in the city of Buenos Aires and its metropolitan area. Fort the ENGH 2004/05 we only have data for the city of Buenos Aires.

As a result our data includes only two regions, thus equation (3) becomes:

$$w_{ijt} = \phi + \gamma\left[\ln\left(1+\prod_{Fjt}\right) - \ln\left(1+\prod_{Njt}\right)\right] + \beta\left[\ln Y_{it} - \ln\left(1+\prod_{Gt}\right)\right] + \delta_j D_j + \sum_t \delta_t D_t + \sum_x \theta_x X_{ijt} + \mu_{ijt}, \quad (8)$$

where D_j equals one for households belonging to the city of Buenos Aires.

In the literature, identification is obtained from regional variations, thus P_{Fjt} is the food price in region *j*, and P_{Gjt} is the general price index in region *j*. This gives several observations for each moment in time allowing to estimate the coefficient on the time dummy. Unfortunately, we can't follow this procedure here because we only have price indexes for the entire sample (Buenos Aires and its metropolitan area). Even if we would have the regional price indexes, that of only two neighbor regions is clearly not good enough to identify the price relative effect and time dummy.

Fortunately, while the specification assumes two types of goods, food and nonfood, in reality there are many goods within each of those categories. In the data it is not feasible to compute a family specific food price index, but this is feasible for the non food bundle. Thus we construct a relative price between the food and non food baskets at the household level. More precisely we have that :

$$P_{Fit} = P_{Ft} \quad (9)$$

$$P_{Nit} = \sum_k \lambda_{ik} P_{kt}, \quad (10)$$

where λ_{ik} is the ratio of expenditure in item *k* over overall spending on non food items, for household *i* at time *t*.

Considering that λ_{ik} can be estimated from the individual data from the surveys, we can now rewrite (3) as:

$$w_{ijt} = \phi + \gamma\left[\ln\left(1+\prod_{Ft}\right) - \ln\left(1+\prod_{Nit}\right)\right] + \beta\left[\ln Y_{it} - \ln\left(1+\prod_{Gt}\right)\right] + \delta_j D_j + \sum_t \delta_t D_t + \sum_x \theta_x X_{ijt} + \mu_{ijt}, \quad (11)$$

where $(\prod_{Nit})$ is the cumulative percentage growth of the price of nonfood between time 0 and time *t* at the household level[3].

[3] It is likely that the price index estimated at the family level may be correlated with the error term of the equation. We return to this endogeneity issue later on.

Trebon (2008) has suggested that economies of scale in each household may affect the share of food to non food and suggests a correction based on introducing the household size interacted with the time dummies (that identify the bias). In other words he suggests estimating:

$$w_{ijt} = \phi + \gamma\left[\ln\left(1+\prod_{Ft}\right) - \ln\left(1+\prod_{Nit}\right)\right] + \beta\left[\ln Y^{pc}{}_{it} - \ln\left(1+\prod_{Gt}\right)\right]$$
$$+ \delta_j D_j + \sum_t \delta_t D_t + \sum_t \psi_t (D_t * hhsize) + \sum_x \theta_x X_{ijt} + \mu_{ijt}. \quad (12)$$

While Trebon finds that this correction reduced CPI biases by as much as a half relative to the findings in Costa(2001) and Hamilton(2001) for the US we will show below that in our case this correction does not change things.

2.2 Income distribution effects

Following Carvalho Filho y Chamon (2006) we explore also the possibility that the amount of bias may change along the Engel curve thus allowing to estimate the mismeasurements in earnings growth for different income levels. Using a semiparametric specification and assuming, as before, that the biases are the same for the food and non food bundles, we have that:

$$w_{ijt} = \phi + \gamma\left[\ln\left(1+\prod_{Ft}\right) - \ln\left(1+\prod_{Nit}\right)\right]$$
$$+ f_t\left[\ln Y_{it} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Git}\right)\right] + \sum_x \theta_x X_{ijt} + \mu_{ijt}. \quad (13)$$

The function $f_t\left[\ln Y_{it} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Git}\right)\right]$ may be estimated non parametrically using the differencing method of Yatchew (1997).

To apply this method we sort observations by income. The difference between two observations can be written as:

$$w_{ijt} - w_{i-1\,jt} = \phi + \gamma\left\{\left[\ln\left(1+\prod_{Ft}\right) - \ln\left(1+\prod_{Nit}\right)\right] - \left[\ln\left(1+\prod_{Ft}\right) - \ln\left(1+\prod_{Ni-1t}\right)\right]\right\}$$

$$+ f_t\left[\ln Y_{it} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Git}\right)\right] - f_t\left[\ln Y_{i-1t} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Gi-1t}\right)\right]$$
$$+ \sum_x \theta_x\left(X_{ijt} - X_{i-1\,jt}\right) + \mu_{ijt} - \mu_{i-1\,jt}. \quad (14)$$

As we have sorted by incomes, incomes are pretty similar so

$$\ln Y_{it} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Git}\right) \cong \ln Y_{i-1t} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Gi-1t}\right). \quad (15)$$

Assuming that f_t is a smooth function

$$f_t\left[\ln Y_{it} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Git}\right)\right] \cong f_t\left[\ln Y_{i-1t} - \ln\left(1+\prod_{Gt}\right) - \ln\left(1+E_{Gi-1t}\right)\right]. \quad (16)$$

So equation (14) becomes:

$$w_{ijt} - w_{i-1\,jt} = \phi + \gamma\{[\ln(1+\prod_{Ft}) - \ln(1+\prod_{Nit})] - [\ln(1+\prod_{Ft}) - \ln(1+\prod_{Ni-1t})]\} + \sum_x \theta_x (X_{ijt} - X_{i-1\,jt}) + \mu_{ijt} - \mu_{i-1\,jt}. \quad (17)$$

Note that equation (17) is a lineal function (with coefficients identical to those of (13)) so that so we can consistently estimate it by OLS, and construct an estimate the lineal part estimated prediction of w_{ijt}, called $\hat{w}_{ijt}$, to arrive to:

$$w_{ijt} - \hat{w}_{ijt} = f_t[\ln Y_{it} - \ln(1+\prod_{Gt}) - \ln(1+E_{Git})] + \mu_{ijt}. \quad (18)$$

If we take the right side of equation (18) as a dependent variable, we can estimate equation (18) by any common non parametric method, we choice to estimate it by local weighted regression method.

After estimating $\hat{f}_t$, the cumulative bias may then be computed as the value of E_{Git}, that solves for each household *i* at time *t* the following equation:

$$\hat{f}_t[\ln Y_{it} - \ln(1+\prod_{Gt}) - \ln(1+E_{Git})] = \hat{f}_0[\ln Y_{it} - \ln(1+\prod_{Gt})]. \quad (19)$$

Intuitively we may think that if the function f is constant in time the value of f for a given income level must be the same independently of the time period used for its estimation.

To estimate the cumulative bias for households at time *t* we went through the following steps. First, we selected the real income of households at time 0 that had an $\hat{f}_0$ near the value estimated for each households at time *t* (that is $\hat{f}_t$). In fact, we selected two incomes at time 0 for each household at time *t (*those with income that were immediately higher and lower in terms of $\hat{f}$). Second, we computed the difference in real income between the two selected households. Third, we distributed linearly the difference according to the number of households from time *t* contained between the higher and lower bounds selected above (in terms of $\hat{f}$) from households at time 0. Fourth, we computed the real income from household in time *t* that it should have as per its share of food, adding to the income of lower (in terms of $\hat{f}$) the difference computed before. Fifth, we computed the bias from household *i* at time *t*, using the real income from household at time *t*, and the real income that it should as per its share of food. More precisely what we do is to compute:

$$E_{Git} = \exp\left[\ln Y_{it} - \ln(1+\prod_{Gt}) - \left[\ln Y_{i0}^{\hat{f}_0^1} + \frac{\left(\ln Y_{i0}^{\hat{f}_0^2} - \ln Y_{i0}^{\hat{f}_0^1}\right)}{H} * h\right]\right] - 1. \quad (20)$$

Given that $Y_{i0}^{\hat{f}_0^1}$ is the income of the household with the lowest closest $\hat{f}_0$ to the household *i* at time *t*, and $Y_{i0}^{\hat{f}_0^2}$ is the income of the household with the highest closest $\hat{f}_0$ to the household *i* at time *t*, H is the number of households at time *t* that has an $\hat{f}_1$ between $\hat{f}_0^{\,1}$ y $\hat{f}_0^{\,2}$ and $h = 1...H$ is the order of these households sorted by $\hat{f}$.

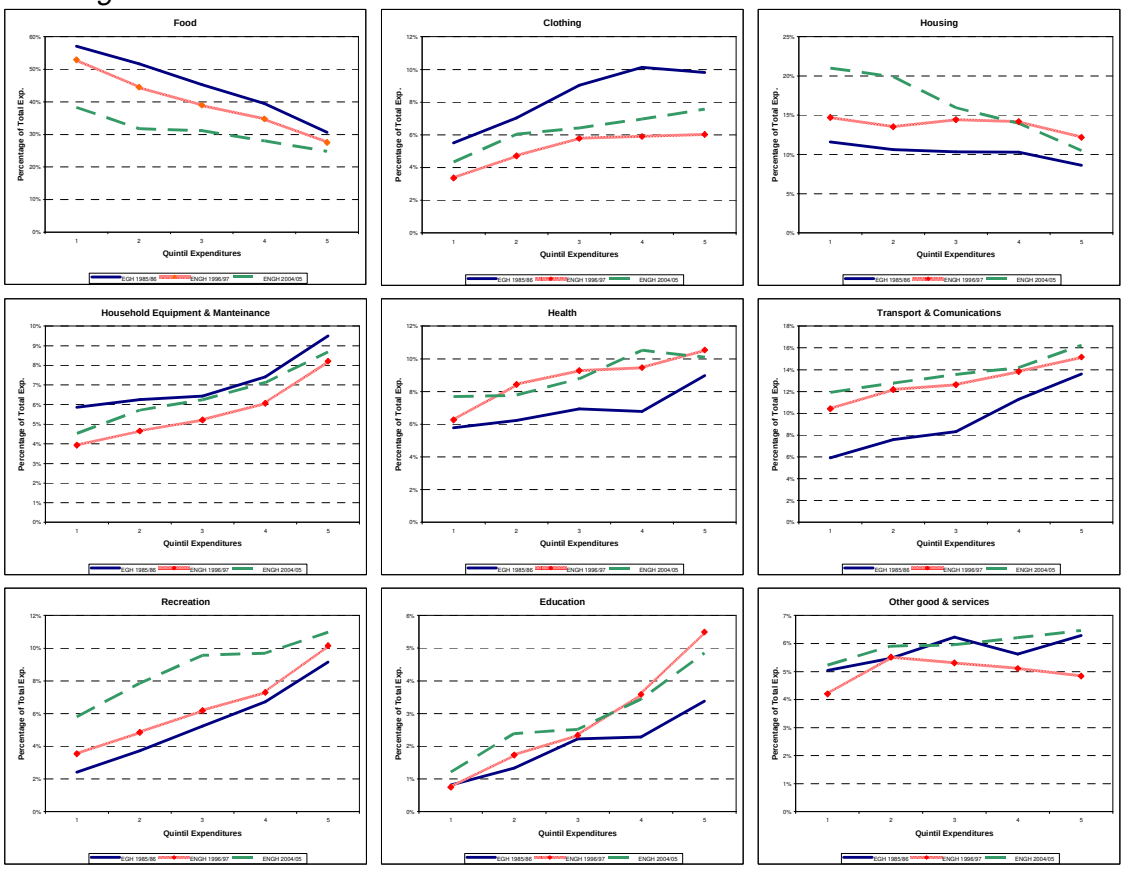
3 Results

3.1 Data

We start with a brief survey of some basic statistics for the three household surveys in Figure 2, which shows the share of expenditures on different types of goods, as a function of income levels. The three curves depict the three surveys for which we have data.

Some very straightforward conclusions may be inferred from the figure. First, that the relation between food and income is negative, indicating that food is a basic good (β<0). More so it can clearly be seen that the share of food falls systematically for all quintiles and for each later survey. To the extent that Engel curves are stable, this would clearly indicate that income levels increased uninterruptedly throughout the period. With the exception of housing the share of the remaining composite goods tend to increase with income. For a non Argentinean perhaps it is surprising how much Education expenditures increase with income, a result that originates on the much higher use of private education among higher income levels.

Figure 2. Basic Statistics



To check the consistency and quality of the data, Table 1a show the main demographic characteristics used in the estimation. The table shows over the period of the three surveys a reduction in household size, a larger share of females in the labor force and a larger number of single parents' households.

Table 1a. Demographics

	EGH 85 / 86				ENGH 96 / 97				ENGH 04 / 05			
	Mean	S. D.	Minimun	Maximun	Mean	S. D.	Minimun	Maximun	Mean	S. D.	Minimun	Maximun
Share of food	0.45	0.17	0.01	1.00	0.40	0.17	0.01	1.00	0.31	0.14	0.00	0.95
Relative price of food and non-food	1.09	0.20	0.52	1.69	1.06	0.03	0.95	1.17	1.17	0.06	0.99	1.39
Household expenditure	1,601.0	1,334.7	100.9	13,929.3	1,011.6	947.5	2.2	12,792.5	1,375.9	1,196.9	52.1	15,337.8
Household income	1,657.6	1,447.4	0.0	23,933.0	1,202.4	1,118.6	0.0	14,980.3	1,490.2	1,521.9	0.0	29,779.5
Household size	3.58	1.70	1	13	3.46	1.96	1	17	2.61	1.46	1	12
Percentage of pop. in Capital Federal	35%	48%	0%	100%	30%	46%	0%	100%	100%	0%	100%	100%
% of members ages 0 to 4	0.08	0.14	0%	67%	6%	12%	0%	67%	4%	11%	0%	67%
% of members ages 5 to 9	0.08	0.14	0%	67%	6%	12%	0%	67%	4%	11%	0%	67%
% of members ages 10 to 15	0.07	0.13	0%	75%	6%	12%	0%	75%	4%	10%	0%	75%
% of members ages 15 to 19	0.06	0.13	0%	75%	7%	14%	0%	100%	4%	12%	0%	100%
Male head	83%	38%	0%	100%	74%	44%	0%	100%	64%	48%	0%	100%
Spouse present	78%	42%	0%	100%	68%	47%	0%	100%	55%	50%	0%	100%
Head has a job	75%	43%	0%	100%	65%	48%	0%	100%	72%	45%	0%	100%
Spouse has a job	24%	43%	0%	100%	24%	43%	0%	100%	30%	46%	0%	100%
Head and spouse have both a job	22%	41%	0%	100%	19%	39%	0%	100%	28%	45%	0%	100%
Owner occupied	75%	43%	0%	100%	71%	45%	0%	100%	61%	49%	0%	100%
Free housing occupied	11%	31%	0%	100%	15%	36%	0%	100%	11%	31%	0%	100%
Observations	2,703				4,867				2,814			
Weigthed sample	2,885,720				3,224,364				1,127,851			

For ease of comparison nominal variables are all expressed in 1999 pesos. The table shows that income levels decrease quite sizably between the 85/86 wave and the 96/97 sample. At the same time, Figure 2 shows an unambiguous decline in the share of food for all income groups. It is this inconsistency that will allow estimating the CPI bias during this period. For the later period, incomes increase and food shares continue to decline, so at this stage it is less clear whether a bias exists or not.

Table 1b. Demographics, city of Buenos Aires only

	EGH 85 / 86				ENGH 96 / 97				ENGH 04 / 05			
	Mean	S. D.	Minimun	Maximun	Mean	S. D.	Minimun	Maximun	Mean	S. D.	Minimun	Maximun
Share of food	0,38	0,16	0,02	0,92	0,32	0,15	0,01	0,95	0,31	0,14	0,00	0,95
Relative price of food and non-food	1,13	0,20	0,52	1,68	1,06	0,02	0,99	1,16	1,17	0,06	0,99	1,39
Household expenditure	2.031,3	1.670,7	122,8	13.929,3	1.384,9	1.225,9	71,9	12.792,5	1.375,9	1.196,9	52,1	15.337,8
Household income	2.122,0	1.924,8	0,0	23.933,0	1.631,5	1.414,7	99,4	14.980,3	1.490,2	1.521,9	0,0	29.779,5
Household size	3,02	1,44	1	11	2,82	1,68	1	11	2,61	1,46	1	12
Percentage of pop. in Capital Federal	100%	0%	100%	100%	100%	0%	100%	100%	100%	0%	100%	100%
% of members ages 0 to 4	0,05	0,12	0%	67%	3%	10%	0%	67%	4%	11%	0%	67%
% of members ages 5 to 9	0,04	0,11	0%	60%	3%	9%	0%	67%	4%	11%	0%	67%
% of members ages 10 to 15	0,04	0,11	0%	67%	3%	10%	0%	67%	4%	10%	0%	75%
% of members ages 15 to 19	0,05	0,13	0%	67%	5%	13%	0%	100%	4%	12%	0%	100%
Male head	77%	42%	0%	100%	66%	47%	0%	100%	64%	48%	0%	100%
Spouse present	71%	45%	0%	100%	58%	49%	0%	100%	55%	50%	0%	100%
Head has a job	72%	45%	0%	100%	63%	48%	0%	100%	72%	45%	0%	100%
Spouse has a job	27%	44%	0%	100%	26%	44%	0%	100%	30%	46%	0%	100%
Head and spouse have both a job	24%	43%	0%	100%	22%	42%	0%	100%	28%	45%	0%	100%
Owner occupied	69%	46%	0%	100%	68%	47%	0%	100%	61%	49%	0%	100%
Free housing occupied	7%	25%	0%	100%	8%	27%	0%	100%	11%	31%	0%	100%
Observations	867				1.321				2.814			
Weigthed sample	1.005.899				966.500				1.127.851			

Table 1b shows that data for Buenos Aires, which provide an even more striking finding: household income has fallen throughout in spite of declining food shares.

3.2 Estimating biases

In order to estimate the bias in CPI measurement we use equation (11) that allows to estimate the magnitude (as well as the statistical significance) of the bias. The results are shown in Table 2.

Table 2

	Dep. Var.: Share of food					
	Small set of control variables			Extended set of control variables		
	Using Expenditure	Using Income	Using income as instrument of expenditure	Using Expenditure	Using Income	Using income as instrument of expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for ENGH 96/97	-0.110***	-0.086***	-0.115***	-0.099***	-0.076***	-0.104***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Dummy for ENGH 04/05	-0.111***	-0.101***	-0.115***	-0.100***	-0.084***	-0.105***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Ln of household expenditure	-0.118***		-0.130***	-0.097***		-0.108***
	(0.002)		(0.003)	(0.003)		(0.004)
Ln of household income		-0.101***			-0.072***	
		(0.003)			(0.003)	
Food prices/non-food prices	0.038***	0.050***	0.032**	0.046***	0.061***	0.041***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Observations	10,380	10,364	10,364	10,380	10,364	10,364
R-squared	0.407	0.35	0.405	0.424	0.382	0.422
Adj. R-squared	0.406	0.349	0.404	0.421	0.379	0.420
Cumulative Bias in CPI from 85/86 to 96/97	**60.6%**	**57.6%**	**58.6%**	**64.0%**	**65.2%**	**61.9%**
P. 5%	62.5%	60.2%	60.5%	66.4%	68.6%	64.3%
P. 95%	58.4%	54.7%	56.5%	61.7%	61.5%	59.3%
Annual Implicit Bias from 85/86 to 96/97	**8.11%**	**7.51%**	**7.71%**	**8.88%**	**9.16%**	**8.40%**
P. 5%	8.53%	8.04%	8.10%	9.44%	9.98%	8.95%
P. 95%	7.67%	6.95%	7.28%	8.34%	8.31%	7.86%
Cumulative Bias in CPI from 85/86 to 04/05	**61.0%**	**63.5%**	**58.7%**	**64.4%**	**69.0%**	**62.3%**
P. 5%	63.0%	66.3%	61.0%	67.2%	72.4%	65.0%
P. 95%	58.3%	60.2%	56.0%	60.5%	64.5%	58.5%
Annual Implicit Bias from 85/86 to 04/05	**4.59%**	**4.92%**	**4.33%**	**5.03%**	**5.68%**	**4.76%**
P. 5%	4.85%	5.30%	4.60%	5.42%	6.23%	5.11%
P. 95%	4.28%	4.50%	4.02%	4.54%	5.04%	4.30%
Cumulative Bias in CPI from 96/97 to 04/05	**0.95%**	**13.90%**	**0.27%**	**1.07%**	**10.80%**	**1.04%**
P. 5%	7.26%	20.00%	6.11%	8.73%	19.80%	8.14%
P. 95%	-5.70%	7.12%	-5.84%	-8.10%	-0.44%	-7.09%
Annual Implicit Bias from 96/97 to 04/05	**0.11%**	**1.65%**	**0.03%**	**0.12%**	**1.26%**	**0.12%**
P. 5%	0.83%	2.44%	0.70%	1.01%	2.42%	0.94%
P. 95%	-0.62%	0.82%	-0.63%	-0.87%	-0.05%	-0.76%

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses

P. 5% and P. 95% correspond to percentile 5 and percentile 95 of 90 percent bootstrap confidence interval

Small set of control variables includes percentage of members ages 0 to 4, percentage of members ages 5 to 9, percentage of members ages 10 to 15, percentage of members ages 15 to 19, Dummies for Capital Federal, Male head, Spouse present, Head has a job, Spouse has a job,Head and spouse have both a job, Owner occupied and Free housing occupied.

Extended set of control variables includes also percentage of members ages 20 to 35, percentage of members ages 35 to 60, Number of income perceptors, Dummies for Head self emploied, Head employer, Household has a last one car, Head is married, Head is single, Head unmarried with spouse, educational levels of Heads, and Head's job Sectors.

Columns (1) and (4), use expenditures as a proxy for permanent income. Columns (2) and (5) use current income. Columns (3) and (6) use current income as an instrument for expenditure. The second set of regressions, add a number of additional control variables.

If we compare the 85/86 – 96/97 periods, we see similar measured biases across the estimations, with a cumulative bias of the order of between 58% and 65%. The large bias indicates an overestimation of the CPI of a whopping range between 7.7% and 9.2% per year. Considering that it is likely that the bias may not have occurred uniformly across years, this suggests a massive overestimation in particular years. On the contrary, when comparing the 96/97 and 04/05 periods, we find a relatively small bias, which is also, typically, not significant.

Considering the whole sample, spanning the entire democratic period, we find an average bias of between 4.3% and 5.7%, indicating that real earnings may have grown by this additional amount during the period, similar to the numbers found for Brazil, and much larger than the numbers found for the US.

The fact that the overestimation of the CPI takes place in the first part of the sample, has to do, in our view, to the massive change occurred in Argentina as a result of the opening up of the economy of the early 90s. While this result will have to be tested and evaluated in future work, we present here an "illustration" of the effect by showing the change in variety in commercial retailing in Argentina between the 1980s and the 1990s. In the 1980s varieties were minimal and quality relatively poor. We believe that visualizing the difference may help in understanding the magnitude of the potential gain. Figure 3, shows three pictures. One corresponds to the typical grocery store in the 1980s. The shelves show how limited the variety offered was. The two other pictures show a minimarket and a large chain store supermarket ("hipermercado" as is known in Argentina) in the 1990s. The change is mind-boggling. While the change depicts the food component, similar changes were observed throughout this period across all consumption baskets.

Figure 3. Variety in food retailing

Grocery store in the 80's

Grocery store in the 2000's

Super market in the 2000's

One potential criticism of our results is that the food item is composed of products consumed both inside and outside the household. Since goods consumed outside home nay include some service component and thus not be entirely subject to the pattern of the typical Engel curve, Table 3 shows the results using only the share of food at home, as the dependent variable. It can be seen that the results are similar to those obtained previously.

Table 3

Dep. Var.: Share of food at home

	Small set of control variables			Extended set of control variables		
	Using Expenditure	Using Income	Using income as instrument of expenditure	Using Expenditure	Using Income	Using income as instrument of expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for ENGH 96/97	-0.126***	-0.101***	-0.134***	-0.113***	-0.088***	-0.123***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Dummy for ENGH 04/05	-0.135***	-0.126***	-0.142***	-0.124***	-0.108***	-0.134***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln of household expenditure	-0.131***		-0.151***	-0.110***		-0.131***
	(0.002)		(0.003)	(0.003)		(0.004)
Ln of household income		0.052***			0.056***	
		(0.016)			(0.015)	
Food prices/non-food prices	0.079***	0.091***	0.088***	0.094***	0.091***	0.100***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)	(0.007)
Observations	10,380	10,364	10,364	10,380	10,364	10,364
R-squared	0.483	0.432	0.478	0.503	0.463	0.499
Adj. R-squared	0.482	0.431	0.478	0.500	0.460	0.497
Cumulative Bias in CPI from 85/86 to 96/97	**61.6%**	**58.0%**	**58.9%**	**64.2%**	**63.7%**	**60.8%**
P. 5%	63.2%	60.3%	60.5%	66.2%	66.7%	62.9%
P. 95%	59.8%	55.6%	57.1%	62.2%	60.8%	58.9%
Annual Implicit Bias from 85/86 to 96/97	**8.33%**	**7.59%**	**7.77%**	**8.91%**	**8.81%**	**8.17%**
P. 5%	8.69%	8.05%	8.09%	9.39%	9.52%	8.61%
P. 95%	7.94%	7.11%	7.40%	8.46%	8.15%	7.76%
Cumulative Bias in CPI from 85/86 to 04/05	**64.2%**	**66.1%**	**61.0%**	**67.6%**	**71.2%**	**64.1%**
P. 5%	66.3%	68.5%	63.1%	70.2%	74.3%	66.7%
P. 95%	61.9%	63.5%	58.8%	64.9%	67.9%	61.6%
Annual Implicit Bias from 85/86 to 04/05	**5.00%**	**5.26%**	**4.60%**	**5.48%**	**6.03%**	**5.00%**
P. 5%	5.29%	5.62%	4.86%	5.87%	6.58%	5.35%
P. 95%	4.72%	4.91%	4.34%	5.11%	5.53%	4.67%
Cumulative Bias in CPI from 96/97 to 04/05	**6.69%**	**19.20%**	**5.03%**	**9.62%**	**20.60%**	**8.42%**
P. 5%	11.50%	24.20%	9.20%	16.40%	27.90%	14.40%
P. 95%	0.80%	13.60%	-0.26%	2.05%	12.00%	2.12%
Annual Implicit Bias from 96/97 to 04/05	**0.77%**	**2.34%**	**0.57%**	**1.12%**	**2.53%**	**0.97%**
P. 5%	1.35%	3.03%	1.07%	1.97%	3.57%	1.71%
P. 95%	0.09%	1.61%	-0.03%	0.23%	1.41%	0.24%

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses

P. 5% and P. 95% correspond to percentile 5 and percentile 95 of 90 percent bootstrap confidence interval

Small set of control variables includes percentage of members ages 0 to 4, percentage of members ages 5 to 9, percentage of members ages 10 to 15, percentage of members ages 15 to 19, Dummies for Capital Federal, Male head, Spouse present, Head has a job, Spouse has a job,Head and spouse have both a job, Owner occupied and Free housing occupied.

Extended set of control variables includes also percentage of members ages 20 to 35, percentage of members ages 35 to 60, Number of income perceptors, Dummies for Head self emploied, Head employer, Household has a last one car, Head is married, Head is single, Head unmarried with spouse, educational levels of Heads, and Head's job Sectors.

Table 4 shows the results including the specification suggested by Trebon (2008). A quick inspection of the table reveals that in the case of Argentina this also does not alter the numbers in any significant manner.

Table 4. The Trebon critique

	Dep. Var.: Share of food					
	Small set of control variables			Extended set of control variables		
	Using Expenditure	Using Income	Using income as instrument of expenditure	Using Expenditure	Using Income	Using income as instrument of expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for ENGH 96/97	-0.111***	-0.093***	-0.114***	-0.101***	-0.082***	-0.104***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Dummy for ENGH 04/05	-0.123***	-0.112***	-0.125***	-0.113***	-0.097***	-0.116***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)
Ln of per capita expenditure	-0.118***		-0.130***	-0.097***		-0.107***
	(0.002)		(0.003)	(0.003)		(0.004)
Ln of per capita income		-0.100***			-0.071***	
		(0.003)			(0.003)	
Food prices/non-food prices	0.037**	0.048***	0.032**	0.045***	0.058***	0.040***
	(0.015)	(0.016)	(0.015)	(0.015)	(0.016)	(0.015)
(Dummy for ENGH 96/07) *	0.001	0.006	(0.001)	0.002	0.006	0.000
(Ln household size)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
(Dummy for ENGH 04/05) *	0.015**	0.012	0.012*	0.016**	0.016**	0.014*
(Ln household size)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Observations	10,380	10,364	10,364	10,380	10,364	10,364
R-squared	0.407	0.35	0.405	0.424	0.382	0.423
Adj. R-squared	0.406	0.349	0.404	0.421	0.379	0.420
Cumulative Bias in CPI from 85/86 to 96/97	**61.2%**	**60.3%**	**58.2%**	**65.0%**	**68.4%**	**62.2%**
P. 5%	65.9%	66.0%	62.9%	70.3%	74.6%	67.2%
P. 95%	56.5%	54.3%	53.6%	59.9%	61.4%	56.9%
Annual Implicit Bias from 85/86 to 96/97	**8.24%**	**8.06%**	**7.63%**	**9.11%**	**9.94%**	**8.46%**
P. 5%	9.33%	9.34%	8.62%	10.50%	11.70%	9.63%
P. 95%	7.28%	6.88%	6.74%	7.96%	8.30%	7.36%
Cumulative Bias in CPI from 85/86 to 04/05	**64.9%**	**67.2%**	**61.8%**	**69.1%**	**74.4%**	**66.2%**
P. 5%	68.7%	71.6%	65.7%	73.4%	79.2%	70.6%
P. 95%	60.8%	61.9%	57.6%	64.2%	67.7%	61.0%
Annual Implicit Bias from 85/86 to 04/05	**5.10%**	**5.42%**	**4.70%**	**5.70%**	**6.58%**	**5.28%**
P. 5%	5.64%	6.10%	5.21%	6.40%	7.56%	5.93%
P. 95%	4.57%	4.71%	4.20%	5.01%	5.49%	4.60%
Cumulative Bias in CPI from 96/97 to 04/05	**9.70%**	**17.30%**	**8.62%**	**11.60%**	**18.90%**	**10.60%**
P. 5%	16.50%	25.10%	14.90%	20.60%	30.00%	18.70%
P. 95%	-1.43%	4.99%	-1.33%	-2.25%	0.61%	-1.89%
Annual Implicit Bias from 96/97 to 04/05	**1.13%**	**2.09%**	**1.00%**	**1.36%**	**2.30%**	**1.23%**
P. 5%	1.99%	3.16%	1.78%	2.54%	3.88%	2.28%
P. 95%	-0.16%	0.57%	-0.15%	-0.25%	0.07%	-0.21%

* significant at 10%; ** significant at 5%; *** significant at 1%

Robust standard errors in parentheses

P. 5% and P. 95% correspond to percentile 5 and percentile 95 of 90 percent bootstrap confidence interval

Small set of control variables includes percentage of members ages 0 to 4, percentage of members ages 5 to 9, percentage of members ages 10 to 15, percentage of members ages 15 to 19, Dummies for Capital Federal, Male head, Spouse present, Head has a job, Spouse has a job,Head and spouse have both a job, Owner occupied and Free housing occupied.

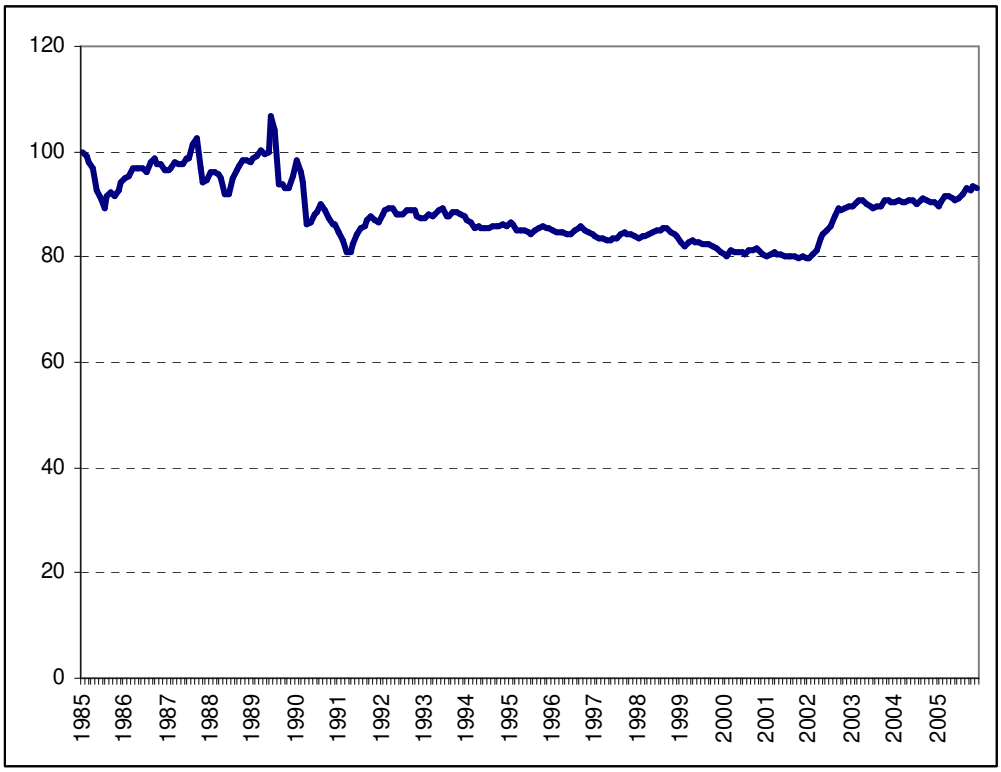
Extended set of control variables includes also percentage of members ages 20 to 35, percentage of members ages 35 to 60, Number of income perceptors, Dummies for Head self emploied, Head employer, Household has a last one car, Head is married, Head is single, Head unmarried with spouse, educational levels of Heads, and Head's job Sectors.

As mentioned in section 2, the price index includes only Buenos Aires and its metropolitan area which makes it impossible to identify the effects of relative prices from regional differences. This study set out to identify the effect of relative prices from using different weights in nonfood prices for each individual. However, as mentioned in footnote 3, this may pose an endogeneity problem, if this price level is correlated with

the taste for food. To deal with this problem, an alternative is to assign an arbitrary value for γ and then compute $w_{ijt} - \gamma[\ln(1+\prod_{Ft}) - \ln(1+\prod_{Nt})]$ as the dependent variable to estimate the bias. This circumvents the need to use the individual price level altogether.

But where can we take this coefficient from. If we use the coefficient estimated in equation (1) from Table 2 (0.038) the total cumulative bias reaches 59.5%, which is very similar to the 61% from Table 2. But better still is to use exogenous measures of this coefficient. Costa (2001) obtains a coefficient of 0.046 for the United States, when identifying the effect of relative prices from differences in regions is possible. Repeating the exercise with 0.046, the cumulative bias reaches 59.4%. Using twice the coefficient for the United States (0.092) the cumulative bias reaches 58.9%. The main reason why it does not significantly alter the results is that relative prices have not changed too much. Figure 4 shows the evolution of the relative price of food in terms of the general level between 1985 and 2005.

Figure 4: Relative price of food in terms of CPI (jan-1985=100)



Because the price of food in terms of the CPI has fallen about 10% between period of the first and second survey, and only 4% between the first and the third, to significantly alter the results, the coefficient should be extremely large. For example, to reduce the cumulative bias to half (i.e. to about 30%) the coefficient should be more than 40 times the estimated coefficient for United States.

An additional robustness test includes using only the data for city of Buenos Aires. The results are similar to those estimated previously and thus not shown here. .

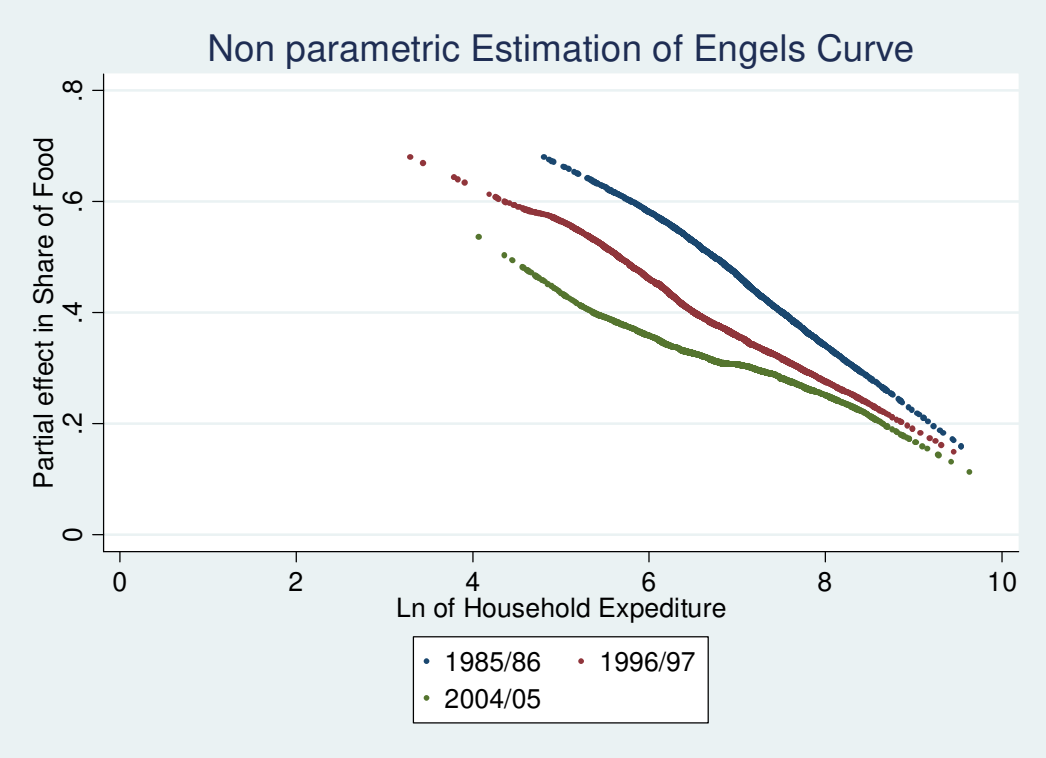
3.3 Income distribution effects

The Engel curve that we estimate in the parametric version of equations (11) and (12) assumes that the bias is the same across all income levels. If so the bias is by definition neutral from an income distribution point of view. But this may not be the case. Thus the more flexible estimation procedure such as the nonparametric estimation of Yatchew (1997), explained in Section 2.2 allows to test the validity of this assumption. The result of this more flexible estimation procedure, shown in Figures 5 and 6, confirm that, in fact, the biases are dramatically different across income levels, being much larger at lower income levels, as shown by the much larger movement in the shares at low income levels.

Figure 5 shows the estimated Engel curves in log terms, whereas Figure 6 relates the bias to income levels directly.

Figure 5 Individual effects (log version)

Using share of Food



Using share of Food at home

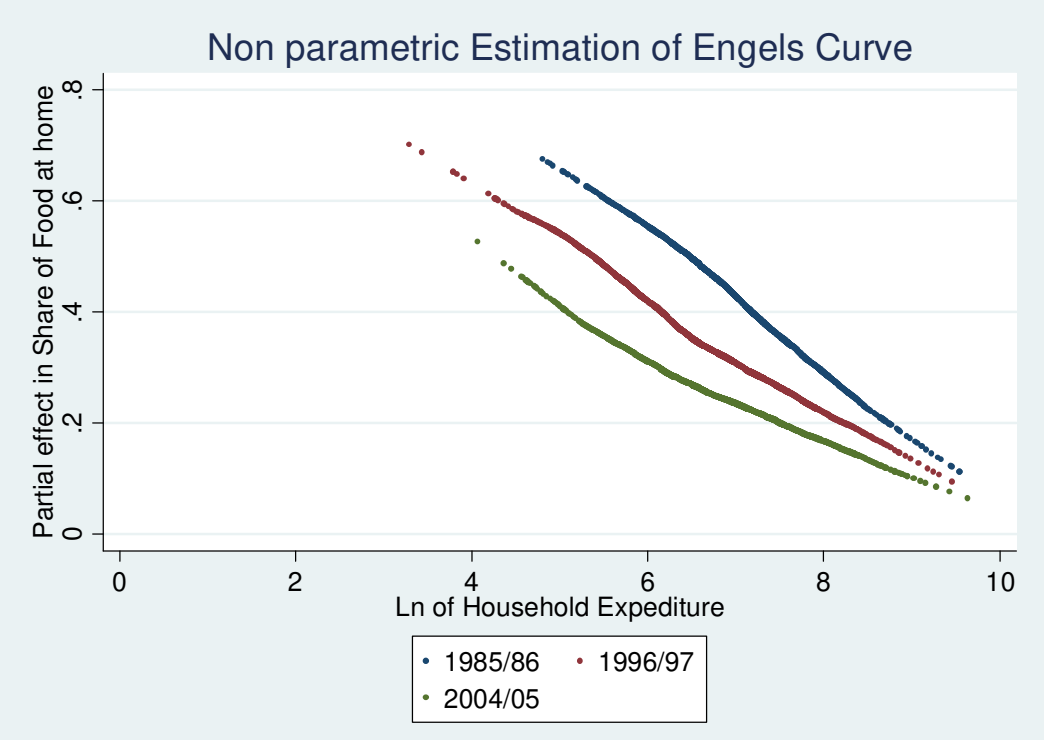
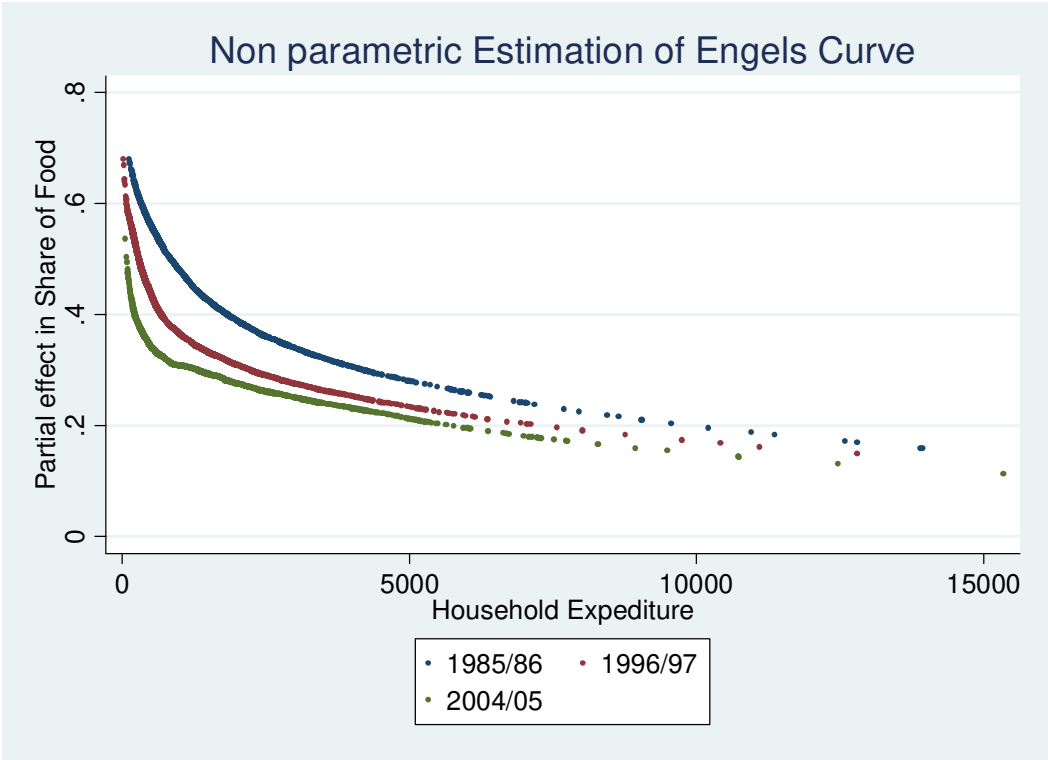
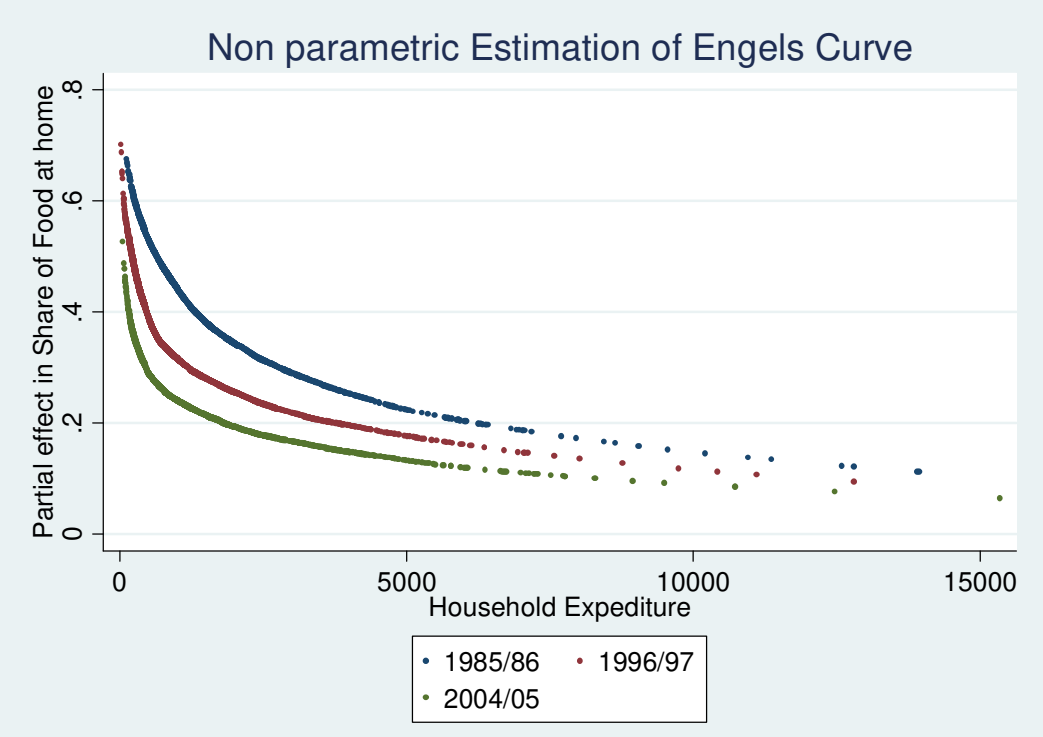


Figure 6. Individual Effects

Using share of Food



Using share of Food at home



This result is similar to the one obtained by Carvalho Filho and Chamon (2006) for Brazil.

As we mentioned in methodological section, we can compute the bias at different income levels using the difference in incomes of curves in Figure 5 (see equation 15).

Table 5 shows basic statistic of the bias between the base year and the two following periods at each income level.

Table 5. Biases by income level

Bias using share of food			
1996/97		2004/05	
Mean	59.7%	Mean	72.4%
Std. Dev.	7.9%	Std. Dev.	11.0%
Minimun	78.8%	Minimun	90.5%
Maximun	16.2%	Maximun	39.1%
Percentiles		Percentiles	
5	67.8%	5	87.2%
10	66.6%	10	85.2%
25	64.3%	25	81.5%
50	62.6%	50	74.3%
75	56.2%	75	64.7%
90	48.4%	90	57.8%
95	44.5%	95	51.8%

Bias using share of food at home			
1996/97		2004/05	
Mean	60.0%	Mean	76.0%
Std. Dev.	7.2%	Std. Dev.	7.2%
Minimun	71.6%	Minimun	89.0%
Maximun	27.2%	Maximun	51.4%
Percentiles		Percentiles	
5	66.8%	5	86.1%
10	66.5%	10	84.7%
25	64.5%	25	81.9%
50	63.2%	50	76.8%
75	56.8%	75	71.0%
90	49.2%	90	66.7%
95	45.3%	95	62.4%

At an average level, the bias estimated is fairly similar, though somewhat larger, to that obtained in Tables 2 to 4, but as can be seen in Table 5 this hides a large heterogeneity across income levels.

Once we compute the bias we can correct individual income levels using individual biases. Thus, we reestimate the corrected income by this basic formula:

$$RY^*_{it} = \frac{RY_{it}}{(1+E_{it})}, \quad (16)$$

where $RY_{it} = \frac{Y_{it}}{(1+\prod_{Gt})}$ is the real income and RY^*_{it} is the real income bias corrected.

While we can compute E_{it} only for the common support area[4] between time 0 and *t*, we use the minimum (maximum) value of E_{it} to correct real income in observations at time *t* that have a real income higher (lower) than the maximum (minimum) real income in the common support area[5].

Table 6 shows the mean values for income and expenditure deflacted by the CPI, together with the numbers that result after correcting for the bias in the CPI[6]. In the first two columns, income is corrected to represent purchasing power in the 80's; in the last two columns income is corrected to represent purchasing power in the 2000's.

[4] That is, the range that we have observations at time 0 and *t*.
[5] This procedure can underestimate the effect of bias correction in incomes because we have seen that the bias is decreasing in income. However, there are only a few observations outside the common support area, so we do not expect this to change the results in any significant way.
[6] The bias used to correct incomes and expenditures is the one that uses expenditure as approximation to permanent income in the semi-parametric estimation.

Table 6. Corrected income levels (mean values)

			corrected to '86 purchasing power		*corrected to '05 purchasing power*	
			Using share of food	Using share of food at home	Using share of food	Using share of food at home
1985/86	Entire Sample	Expenditure	1,601	1,601	1,601	1,601
		Bias corrected expenditure			287	268
		Income	1,658	1,658	1,658	1,658
		Bias corrected Income			279	266
	Buenos Aires	Expenditure	2,031	2,031	2,031	2,031
		Bias corrected expenditure			432	383
		Income	2,122	2,122	2,122	2,122
		Bias corrected Income			432	387
1996/97	Entire Sample	Expenditure	1,012	1,012	1,012	1,012
		Bias corrected expenditure	2,256	2,285	443	412
		Income	1,202	1,202	1,202	1,202
		Bias corrected Income	2,728	2,759	511	483
	Buenos Aires	Expenditure	1,385	1,385	1,385	1,385
		Bias corrected expenditure	2,909	2,952	665	590
		Income	1,631	1,631	1,631	1,631
		Bias corrected Income	3,463	3,512	760	682
2004/05	Buenos Aires	Expenditure	1,376	1,376	1,376	1,376
		Bias corrected expenditure	4,507	5,365		
		Income	1,490	1,490	1,490	1,490
		Bias corrected Income	5,028	5,903		

Table 7 shows, in turn, the Gini coefficients for the original data and the corrected numbers, they show that income distribution rather than deteriorating has improved during this period.

Tabla 7 Corrected Gini coefficients

			corrected to '86 purchasing power		*corrected to '05 purchasing power*	
			Using share of food	Using share of food at home	Using share of food	Using share of food at home
1985/86	Entire Sample	Expenditure	0.381	0.381	0.381	0.381
		Bias corrected expenditure			0.614	0.536
		Income	0.389	0.389	0.389	0.389
		Bias corrected Income			0.592	0.519
	Buenos Aires	Expenditure	0.378	0.378	0.378	0.378
		Bias corrected expenditure			0.636	0.554
		Income	0.394	0.394	0.394	0.394
		Bias corrected Income			0.626	0.547
1996/97	Entire Sample	Expenditure	0.422	0.422	0.422	0.422
		Bias corrected expenditure	0.329	0.333	0.550	0.474
		Income	0.422	0.422	0.422	0.422
		Bias corrected Income	0.344	0.348	0.537	0.466
	Buenos Aires	Expenditure	0.397	0.397	0.397	0.397
		Bias corrected expenditure	0.310	0.313	0.534	0.459
		Income	0.405	0.405	0.405	0.405
		Bias corrected Income	0.334	0.337	0.523	0.453
2004/05	Buenos Aires	Expenditure	0.408	0.408	0.408	0.408
		Bias corrected expenditure	0.240	0.312		
		Income	0.440	0.440	0.440	0.440
		Bias corrected Income	0.330	0.372		

Figure 7 shows Lorenz Curves and the bias corrected versions for 1996/97 (left column) period and 2004/05 (right column) both for income (first row) and expenditures

(second row). We can see that bias corrected curves strictly dominate not corrected curves, so we can reproduce same results of Table 7, using any inequality index.

Figure 7. Original and modified Lorenz curves (using incomes corrected to '86 purchasing power)

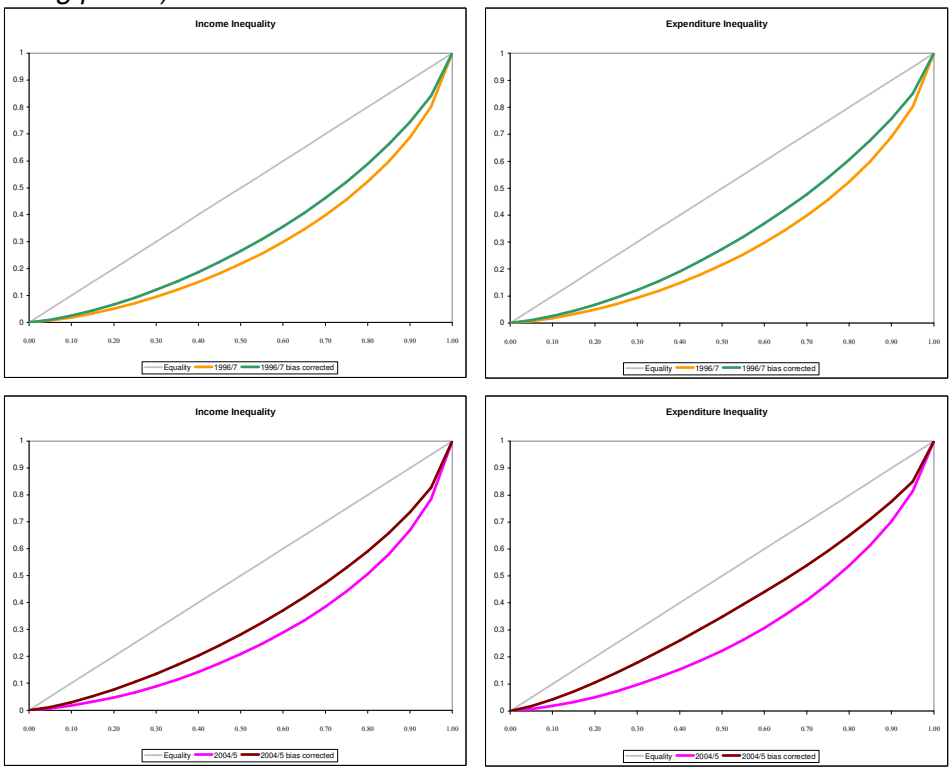
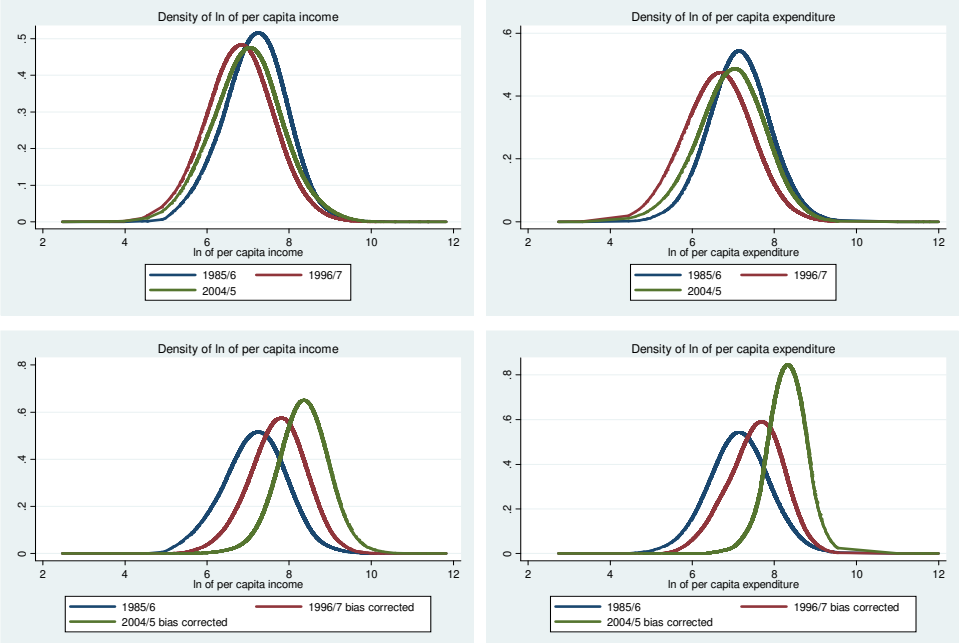


Figure 8, mimics the same graphs but for the distribution of income and expenditure levels (left and right columns, respectively), when comparing the original data and the bias corrected data (upper and lower rows respectively).

Figure 8 Income distribution (using incomes corrected to '86 purchasing power)



4. Conclusions

This paper has estimated the CPI measurement bias for Argentina during its recent democratic period. While we used a methodology that unveils the bias from the inconsistencies between the assumption of stable Engel curves and the evolution of the share of food in expenditures, we innovate in that we obtain identification from individual differences in the consumption bundles and price indexes at the household level, thus being able to estimate the bias with data from only one region, something that had not been done in previous work.

The findings are striking. Argentina's democracy has seen a much larger raise in real expenditure levels than previously thought, and has achieved a much better income distribution that previously thought.

The bias in expenditure levels arises primarily sometime between 84/85 and 96/97. It is difficult with further data to estimate when the bias may be originating. 84/85 were years of very high inflation, thus the data may be underestimating the level of regressivity in the income distribution those years. Additionally, the late eighties and early nineties showed a period of significant opening up of the economy that led to a significant increase in income levels. Because openness comes with large changes in the quantity and quality of available products it is not surprising that during these period we may have experienced substantial increases in economic well being not fully reflected in the standard statistics.

The second period is a bit more puzzling. While the data suggests an overestimation of the CPI, the level of this overestimation appears to be small. However, the bias in income distribution appears to be larger. This is puzzling because the later period within this span sees a rising inflation, indicating, a priori, that there should be deterioration in the income distribution levels. All in all, our conclusion is that Argentina's democracy has allowed for a much brighter performance in economic terms than it is usually credited for.

Appendix A: The data

To run our estimations we use the individual data points for the (EGH 85/68), (ENGH 96/97) and (ENGH 04/05) constructed by the Instituto Nacional de Estadísticas y Censos (INDEC). The EGH 85/86 covers only the city of Buenos Aires and its metropolitan area. As a result we only considered the same region for the ENGH 96/97. For the ENGH 04/05 we only had access to the data for the city of Buenos Aires. This appears to have no fundamental effect on our estimations. Running all the estimates just for data from the city of Buenos Aires give virtually identical results.

The price index used is the CPI for the greater Buenos Aires area, 1999=100.

The EGH 85/86, ENGH 96/97 and ENGH 04/05 provide data for 2,717, 4,907 y 2,841 households[7] each, reporting income and expenditures (itemized by groups) as well as the typical demographic characteristics.

Because the INDEC does not provide information about inconsistent observations in the survey, we keep out of the analysis a few observations that seem to be inconsistent in expenditure. We take out households that:

- Do not report total expenditure or report a negative value (1 in EGH 85/86, 6 in ENGH 96/97 and 10 in ENGH 04/05)
- Report a very low total expenditure (lower than 100 pesos of 1999) and a share of food lower than 50% (19 in ENGH 96/97 and 3 in ENGH 04/05)
- Do not report expenditures in food (26 in EGH 85/86, 49 in ENGH 96/97 and 31 in ENGH 04/05)

Additionally, we found 58 households in ENGH 96/97 and 93 households in ENGH 04/05, with negative consumption in at least one expenditure group. We have set at zero the level corresponding to negative expenditure.

Needless to say, these obvious mistakes are numerically insignificant, and do not change the main results.

In the ENGH 96/97 and the ENGH 04/05 there is information about households with imputed income and expenditure[8], but not in the EGH 85/86, as a consequence we will assume that the imputation method used by the INDEC, is valid and similar across surveys.

The EGH 85/86 was conducted between July 1985 and June 1986. The base indicates the quarter in which each household has been surveyed. Based on this information we have paired the data with the corresponding CPI level (and its categories) corresponding to the average for each quarter.

ENGH 96/97 took place between February 1996 and March 1997, but numbers have been taken nominal values relative to the average CPI during the period, as there is no information as to the specific quarter in which the survey was conducted. Fortunately, this is a very low inflation period, and therefore whatever mistake arises from this must necessarily be minimal.[9]

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[7] These numbes correspond only to households from Buenos Aires and its Metropolitan Area and to the city of Buenos Aires in the last sample.

[8] 26.8% of incomes in Buenos Aires and its Metropolitan Area are imputed in ENGH 96/97, 28.1% of incomes and 26.4% of expenditures in Buenos Aires are total or partial imputed in ENGH 04/05.

[9] Cumulative inflation between February, 1996 and March, 1997 is about 0.4%, instead cumulative inflation between July, 1985 and June, 1986 arise to 41.3%.

ENGH 04/05 took place between October 2004 and December 2005. The base indicates the quarter in which each household was surveyed and therefore the procedure followed is similar that used for EGH 85/86.

Appendix B: Additional tables

B1: Basic statistics of additional variables used for regressions (4) to (6)

	EGH 85 / 86				ENGH 96 / 97				ENGH 04 / 05			
	Mean	Standar Dev.	Minimun	Maximun	Mean	Standar Dev.	Minimun	Maximun	Mean	Standar Dev.	Minimun	Maximun
% of members ages 20 to 35	23%	27%	0%	100%	22%	28%	0%	100%	27%	35%	0%	100%
% of members ages 35 to 60	29%	29%	0%	100%	30%	30%	0%	100%	29%	33%	0%	100%
Number of income perceptors	1.75	0.85	1	7	1.76	0.89	0	7	1.73	0.81	1	6
Head has Public job	12%	33%	0%	100%	7%	26%	0%	100%	11%	31%	0%	100%
Head has Private job	35%	48%	0%	100%	40%	49%	0%	100%	1%	12%	0%	100%
Head self emploied	24%	42%	0%	100%	21%	41%	0%	100%	18%	38%	0%	100%
Head employer	4%	20%	0%	100%	4%	20%	0%	100%	6%	25%	0%	100%
Household has a last one car	39%	49%	0%	100%	33%	47%	0%	100%	35%	48%	0%	100%
Head is married	71%	45%	0%	100%	55%	50%	0%	100%	43%	49%	0%	100%
Head is single	6%	23%	0%	100%	9%	28%	0%	100%	17%	37%	0%	100%
Head unmarried with spouse	7%	25%	0%	100%	13%	33%	0%	100%	13%	34%	0%	100%
Head has primary complete education	39%	49%	0%	100%	36%	48%	0%	100%	15%	36%	0%	100%
Head has secondary incomplete education	14%	35%	0%	100%	15%	35%	0%	100%	12%	33%	0%	100%
Head has secondary complete education	15%	36%	0%	100%	15%	36%	0%	100%	18%	39%	0%	100%
Head has superior incomplete education	5%	23%	0%	100%	1%	11%	0%	100%	3%	18%	0%	100%
Head has superior complete education	8%	28%	0%	100%	17%	38%	0%	100%	46%	50%	0%	100%
Head has a second job	10%	30%	0%	100%	5%	22%	0%	100%	11%	31%	0%	100%
Spouse has a second job	2%	14%	0%	100%	2%	13%	0%	100%	4%	19%	0%	100%
Sector of Head's job: Agriculture, Fishing, etc.	0.3%	6%	0%	100%	0.5%	7%	0%	100%	0.3%	5%	0%	100%
Sector of Head's job: Mining	0.3%	6%	0%	100%	0.2%	5%	0%	100%	0.2%	4%	0%	100%
Sector of Head's job: Food manufacturing	3%	17%	0%	100%	2%	15%	0%	100%	1%	9%	0%	100%
Sector of Head's job: Textile manufacturing	4%	21%	0%	100%	4%	19%	0%	100%	3%	16%	0%	100%
Sector of Head's job: Other manufacturing	22%	41%	0%	100%	9%	29%	0%	100%	6%	23%	0%	100%
Sector of Head's job: Electricity, Gas and Water	1%	12%	0%	100%	1%	11%	0%	100%	0%	5%	0%	100%
Sector of Head's job: Construction	7%	26%	0%	100%	8%	27%	0%	100%	2%	14%	0%	100%
Sector of Head's job: Wholesale and retail trade	10%	30%	0%	100%	11%	32%	0%	100%	9%	28%	0%	100%
Sector of Head's job: Restaurants and Hotels	1%	11%	0%	100%	2%	12%	0%	100%	3%	17%	0%	100%
Sector of Head's job: Transport, and Communic.	6%	24%	0%	100%	8%	28%	0%	100%	6%	24%	0%	100%
Sector of Head's job: Financing, Insurance, etc.	5%	23%	0%	100%	7%	25%	0%	100%	18%	39%	0%	100%
Sector of Head's job: Education, Health, etc	6%	23%	0%	100%	8%	27%	0%	100%	18%	39%	0%	100%
Sector of Head's job: Repair services	4%	19%	0%	100%	2%	15%	0%	100%	1%	9%	0%	100%
Sector of Head's job: Other sectors	6%	24%	0%	100%	7%	25%	0%	100%	3%	17%	0%	100%

B2: Table 2 coefficients

	Dep. Var.: Share of food					
	Small set of control variables			Extended set of control variables		
	Using Expenditure	Using Income	Using income as instrument of expenditure	Using Expenditure	Using Income	Using income as instrument of expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for ENGH 96/97	-0.110***	-0.086***	-0.115***	-0.099***	-0.076***	-0.104***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Dummy for ENGH 04/05	-0.111***	-0.101***	-0.115***	-0.100***	-0.084***	-0.105***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.006)
Ln of household expenditure	-0.118***		-0.130***	-0.097***		-0.108***
	(0.002)		(0.003)	(0.003)		(0.004)
Ln of household income		-0.101***			-0.072***	
		(0.003)			(0.003)	
Food prices/non-food prices	0.038***	0.050***	0.032**	0.046***	0.061***	0.041***
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Ln household size	0.088***	0.097***	0.094***	0.082***	0.078***	0.086***
	(0.005)	(0.005)	(0.005)	(0.007)	(0.007)	(0.007)
Dummy for Capital Federal	-0.032***	-0.042***	-0.026***	-0.027***	-0.034***	-0.024***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
% of members ages 0 to 4	-0.088***	-0.115***	-0.096***	-0.070***	-0.075***	-0.075***
	(0.014)	(0.015)	(0.014)	(0.016)	(0.017)	(0.016)
% of members ages 5 to 9	-0.042***	-0.075***	-0.049***	-0.038**	-0.050***	-0.042***
	(0.013)	(0.014)	(0.013)	(0.016)	(0.016)	(0.016)
% of members ages 10 to 15	-0.027**	-0.065***	-0.035***	-0.029*	-0.044**	-0.032**
	(0.013)	(0.014)	(0.013)	(0.016)	(0.017)	(0.016)
% of members ages 15 to 19	-0.020	-0.050***	-0.024*	-0.029**	-0.045***	-0.030**
	(0.012)	(0.013)	(0.012)	(0.014)	(0.014)	(0.014)
% of members ages 20 to 35				-0.015**	-0.014*	-0.015**
				(0.007)	(0.008)	(0.007)
% of members ages 35 to 60				0.005	0.004	0.005
				(0.007)	(0.007)	(0.007)
Male head	0.028***	0.027***	0.028***	0.031***	0.033***	0.030***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Spouse present	-0.011*	-0.019***	-0.011*	-0.024	-0.035	-0.023
	(0.006)	(0.006)	(0.006)	(0.027)	(0.029)	(0.027)
Head has a job	-0.003	-0.001	0.002	0.007	0.007	0.009
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)
Spouse has a job	0.006	0.009	0.007	0.008	0.008	0.009
	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)
Head and spouse have both a job	-0.016*	-0.012	-0.016*	-0.015*	-0.012	-0.015*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Owner occupied	0.058***	0.071***	0.057***	0.070***	0.085***	0.067***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Free housing occupied	0.068***	0.084***	0.063***	0.076***	0.092***	0.071***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Head has Public job				-0.011*	-0.004	-0.011*
				(0.007)	(0.007)	(0.007)
Head has Private job				-0.008	-0.003	-0.007
				(0.006)	(0.006)	(0.006)
Head self emploied				-0.012**	-0.007	-0.013**
				(0.006)	(0.006)	(0.006)
Head employer				-0.024***	-0.027***	-0.021***
				(0.008)	(0.008)	(0.008)
Household has a last one car				-0.034***	-0.048***	-0.029***
				(0.004)	(0.004)	(0.004)
Number of income perceptors				0.000	0.002	0.000
				(0.003)	(0.003)	(0.003)
Head is married				0.018	0.026	0.017
				(0.027)	(0.029)	(0.027)
Head is single				0.017***	0.017**	0.015**
				(0.007)	(0.007)	(0.007)
Head unmarried with spouse				0.025	0.036	0.022
				(0.027)	(0.029)	(0.027)
Head has primary complete education				-0.008	-0.013**	-0.007
				(0.005)	(0.005)	(0.005)
Head has secondary incomplete education				-0.027***	-0.037***	-0.023***
				(0.006)	(0.006)	(0.006)
Head has secondary complete education				-0.026***	-0.040***	-0.022***
				(0.006)	(0.006)	(0.006)
Head has superior incomplete education				-0.050***	-0.068***	-0.043***
				(0.009)	(0.009)	(0.009)
Head has superior complete education				-0.043***	-0.062***	-0.035***
				-0.006	-0.007	-0.007
Head has a second job				(0.003)	(0.006)	(0.001)
				-0.006	-0.006	-0.006
Spouse has a second job				(0.014)	-0.015*	(0.013)
				-0.009	-0.009	-0.009
Sector of Head's job: Agriculture, Fishing, etc.				0.001	(0.001)	0.002
				-0.024	-0.028	-0.024
Sector of Head's job: Mining				(0.011)	(0.011)	(0.009)
				-0.034	-0.034	-0.033
Sector of Head's job: Food manufacturing				(0.003)	(0.004)	(0.002)
				-0.011	-0.012	-0.011
Sector of Head's job: Textile manufacturing				0.008	0.010	0.008
				-0.009	-0.009	-0.009
Sector of Head's job: Other manufacturing				(0.001)	(0.004)	0.000
				-0.006	-0.006	-0.006
Sector of Head's job: Electricity, Gas and Water				0.008	0.015	0.008
				-0.014	-0.014	-0.014
Sector of Head's job: Construction				0.015**	0.016**	0.014**
				-0.007	-0.007	-0.007
Sector of Head's job: Wholesale and retail trade				0.000	(0.004)	0.000
				-0.007	-0.007	-0.007
Sector of Head's job: Restaurants and Hotels				0.032***	0.031**	0.031**
				-0.012	-0.013	-0.012
Sector of Head's job: Transport, and Communic.				0.016**	0.017**	0.016**
				-0.007	-0.007	-0.007
Sector of Head's job: Financing, Insurance, etc.				-0.002	-0.006	0.000
				(0.007)	(0.007)	(0.007)
Sector of Head's job: Education, Health, etc				0.001	0.000	0.001
				(0.007)	(0.007)	(0.007)
Sector of Head's job: Repair services				0.015	0.016	0.014
				(0.011)	(0.012)	(0.011)
Sector of Head's job: Other sectors				0.007	0.007	0.007
				(0.008)	(0.009)	(0.008)
Constant	1.148***	1.020***	1.225***	1.012***	0.838***	1.080***
	(0.016)	(0.019)	(0.020)	(0.019)	(0.022)	(0.028)
Observations	10,380	10,364	10,364	10,380	10,364	10,364
R-squared	0.407	0.35	0.405	0.424	0.382	0.422
Adj. R-squared	0.406	0.349	0.404	0.421	0.379	0.420

B3: Table 3 coefficients

	Dep. Var.: Share of food at home					
	Small set of control variables			Extended set of control variables		
	Using Expenditure	Using Income	Using income as instrument of expenditure	Using Expenditure	Using Income	Using income as instrument of expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for ENGH 96/97	-0.126***	-0.101***	-0.134***	-0.113***	-0.088***	-0.123***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Dummy for ENGH 04/05	-0.135***	-0.126***	-0.142***	-0.124***	-0.108***	-0.134***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Ln of household expenditure	-0.131***		-0.151***	-0.110***		-0.131***
	(0.002)		(0.003)	(0.003)		(0.004)
Ln of household income	0.040***	0.052***	0.031**	0.041***	0.056***	0.031**
	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)	(0.015)
Food prices/non-food prices	0.079***	0.091***	0.088***	0.094***	0.091***	0.100***
	(0.005)	(0.005)	(0.005)	(0.006)	(0.007)	(0.007)
Ln household size	-0.035***	-0.045***	-0.026***	-0.031***	-0.038***	-0.026***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Dummy for Capital Federal	-0.059***	-0.093***	-0.071***	-0.076***	-0.082***	-0.082***
	(0.013)	(0.014)	(0.013)	(0.016)	(0.017)	(0.016)
% of members ages 0 to 4	-0.006	-0.047***	-0.017	-0.053***	-0.067***	-0.057***
	(0.013)	(0.014)	(0.013)	(0.016)	(0.016)	(0.016)
% of members ages 5 to 9	0.020	-0.025*	0.010	-0.037**	-0.055***	-0.041**
	(0.013)	(0.014)	(0.013)	(0.016)	(0.017)	(0.016)
% of members ages 10 to 15	-0.002	-0.038***	-0.008	-0.051***	-0.070***	-0.052***
	(0.012)	(0.013)	(0.012)	(0.014)	(0.014)	(0.014)
% of members ages 15 to 19				-0.058***	-0.056***	-0.056***
				(0.007)	(0.007)	(0.007)
% of members ages 20 to 35				-0.018***	-0.017**	-0.015**
				(0.007)	(0.007)	(0.007)
% of members ages 35 to 60	0.006	0.006	0.007	0.011**	0.013**	0.010**
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Male head	0.027***	0.017***	0.026***	0.008	-0.005	0.010
	(0.006)	(0.006)	(0.006)	(0.031)	(0.032)	(0.031)
Spouse present	-0.033***	-0.030***	-0.026***	-0.013*	-0.011	-0.008
	(0.004)	(0.005)	(0.004)	(0.007)	(0.007)	(0.007)
Head has a job	-0.027***	-0.023***	-0.025***	-0.009	-0.009	-0.009
	(0.008)	(0.009)	(0.008)	(0.009)	(0.009)	(0.009)
Spouse has a job	0.005	0.010	0.006	0.001	0.004	0.001
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Head and spouse have both a job	0.056***	0.071***	0.054***	0.057***	0.073***	0.052***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Owner occupied	0.059***	0.076***	0.051***	0.062***	0.079***	0.055***
	(0.005)	(0.006)	(0.006)	(0.005)	(0.006)	(0.006)
Free housing occupied				-0.012*	-0.005	-0.013**
				(0.006)	(0.007)	(0.007)
Head has Public job				-0.018***	-0.013**	-0.018***
				(0.006)	(0.006)	(0.006)
Head has Private job				-0.003	0.002	-0.005
				(0.005)	(0.006)	(0.005)
Head self emploied				-0.015**	-0.017**	-0.009
				(0.007)	(0.008)	(0.007)
Head employer				-0.031***	-0.045***	-0.022***
				(0.004)	(0.004)	(0.004)
Household has a last one car				-0.009***	-0.005*	-0.007**
				(0.003)	(0.003)	(0.003)
Number of income perceptors				0.008	0.017	0.007
				(0.030)	(0.031)	(0.030)
Head is married				0.006	0.006	0.004
				(0.006)	(0.007)	(0.006)
Head is single				0.004	0.016	0.000
				(0.030)	(0.032)	(0.031)
Head unmarried with spouse				-0.003	-0.008	0.000
				(0.005)	(0.005)	(0.005)
Head has primary complete education				-0.021***	-0.031***	-0.014**
				(0.006)	(0.006)	(0.006)
Head has secondary incomplete education				-0.026***	-0.039***	-0.017***
				(0.006)	(0.006)	(0.006)
Head has secondary complete education				-0.056***	-0.073***	-0.042***
				(0.009)	(0.010)	(0.009)
Head has superior incomplete education				-0.044***	-0.062***	-0.029***
				(0.006)	(0.007)	(0.007)
Head has superior complete education				-0.003	-0.007	-0.001
				-0.005	-0.005	-0.005
Head has a second job				(0.013)	-0.014*	(0.012)
				-0.009	-0.008	-0.009
Spouse has a second job				0.010	0.008	0.011
				-0.024	-0.030	-0.023
Sector of Head's job: Agriculture, Fishing, etc.				(0.040)	(0.038)	(0.036)
				-0.029	-0.029	-0.028
Sector of Head's job: Mining				0.003	0.002	0.004
				-0.011	-0.012	-0.011
Sector of Head's job: Food manufacturing				0.009	0.010	0.008
				-0.009	-0.009	-0.009
Sector of Head's job: Textile manufacturing				0.004	0.001	0.005
				-0.006	-0.006	-0.006
Sector of Head's job: Other manufacturing				0.001	0.009	0.000
				-0.013	-0.013	-0.013
Sector of Head's job: Electricity, Gas and Water				0.010	0.011	0.008
				-0.007	-0.007	-0.007
Sector of Head's job: Construction				0.004	(0.001)	0.005
				-0.006	-0.007	-0.006
Sector of Head's job: Wholesale and retail trade				(0.007)	(0.011)	(0.010)
				-0.012	-0.012	-0.012
Sector of Head's job: Restaurants and Hotels				0.018***	0.019***	0.019***
				-0.007	-0.007	-0.007
Sector of Head's job: Transport, and Communic.				0.000	(0.005)	0.002
				-0.007	-0.007	-0.007
Sector of Head's job: Financing, Insurance, etc.				0.009	0.008	0.009
				(0.006)	(0.007)	(0.006)
Sector of Head's job: Education, Health, etc				0.014	0.015	0.012
				(0.011)	(0.012)	(0.011)
Sector of Head's job: Repair services				0.002	0.000	0.000
				(0.008)	(0.008)	(0.008)
Sector of Head's job: Other sectors		-0.116***			-0.087***	
		(0.003)			(0.003)	
Constant	1.224***	1.111***	1.348***	1.113***	0.951***	1.246***
	(0.016)	(0.019)	(0.020)	(0.019)	(0.022)	(0.027)
Observations	10,380	10,364	10,364	10,380	10,364	10,364
R-squared	0.483	0.432	0.478	0.503	0.463	0.499
Adj. R-squared	0.482	0.431	0.478	0.500	0.460	0.497

B4: Table 4 coefficients

	Dep. Var.: Share of food					
	Small set of control variables			Extended set of control variables		
	Using Expenditure	Using Income	Using income as instrument of expenditure	Using Expenditure	Using Income	Using income as instrument of expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
Dummy for ENGH 96/97	-0.111***	-0.093***	-0.114***	-0.101***	-0.082***	-0.104***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Dummy for ENGH 04/05	-0.123***	-0.112***	-0.125***	-0.113***	-0.097***	-0.116***
	(0.009)	(0.009)	(0.009)	(0.009)	(0.010)	(0.009)
Ln of per capita expenditure	-0.118***		-0.130***	-0.097***		-0.107***
	(0.002)		(0.003)	(0.003)		(0.004)
Ln of per capita income		-0.100***			-0.071***	
		(0.003)			(0.003)	
Food prices/non-food prices	0.037**	0.048***	0.032**	0.045***	0.058***	0.040***
	(0.015)	(0.016)	(0.015)	(0.015)	(0.016)	(0.015)
(Dummy for ENGH 96/07) * (Ln household size)	0.001	0.006	(0.001)	0.002	0.006	0.000
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
(Dummy for ENGH 04/05) * (Ln household size)	0.015**	0.012	0.012*	0.016**	0.016**	0.014*
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Ln household size	-0.033***	-0.009	-0.037***	-0.019**	0.001	-0.024***
	(0.007)	(0.007)	(0.007)	(0.009)	(0.009)	(0.009)
Dummy for Capital Federal	-0.032***	-0.043***	-0.027***	-0.028***	-0.035***	-0.025***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
% of members ages 0 to 4	-0.087***	-0.113***	-0.095***	-0.069***	-0.074***	-0.075***
	(0.014)	(0.015)	(0.014)	(0.016)	(0.017)	(0.016)
% of members ages 5 to 9	-0.040***	-0.073***	-0.048***	-0.037**	-0.047***	-0.040**
	(0.013)	(0.014)	(0.013)	(0.016)	(0.016)	(0.016)
% of members ages 10 to 15	-0.026*	-0.063***	-0.034**	-0.028*	-0.042**	-0.031*
	(0.013)	(0.014)	(0.013)	(0.016)	(0.017)	(0.016)
% of members ages 15 to 19	-0.020	-0.050***	-0.023*	-0.028**	-0.045***	-0.030**
	(0.012)	(0.013)	(0.012)	(0.014)	(0.015)	(0.014)
% of members ages 20 to 35				-0.015**	-0.014*	-0.014**
				(0.007)	(0.008)	(0.007)
% of members ages 35 to 60				0.004	0.004	0.005
				(0.007)	(0.007)	(0.007)
Male head	0.028***	0.027***	0.028***	0.032***	0.033***	0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.006)	(0.005)
Spouse present	-0.012**	-0.019***	-0.011**	-0.025	-0.036	-0.024
	(0.006)	(0.006)	(0.006)	(0.027)	(0.029)	(0.027)
Head has a job	-0.003	-0.001	0.002	0.007	0.007	0.008
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.007)
Spouse has a job	0.006	0.008	0.008	0.008	0.008	0.009
	(0.008)	(0.009)	(0.008)	(0.008)	(0.009)	(0.008)
Head and spouse have both a job	-0.017**	-0.012	-0.016*	-0.015*	-0.012	-0.015*
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Owner occupied	0.058***	0.071***	0.057***	0.070***	0.085***	0.068***
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Free housing occupied	0.068***	0.084***	0.063***	0.076***	0.091***	0.072***
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Head has Public job				-0.010	-0.003	-0.010
				(0.007)	(0.007)	(0.007)
Head has Private job				-0.006	-0.002	-0.006
				(0.006)	(0.006)	(0.006)
Head self emploied				-0.011*	-0.006	-0.011**
				(0.006)	(0.006)	(0.006)
Head employer				-0.023***	-0.027***	-0.020***
				(0.008)	(0.008)	(0.008)
Household has a last one car				-0.034***	-0.048***	-0.029***
				(0.004)	(0.004)	(0.004)
Number of income perceptors				0.000	0.002	0.000
				(0.003)	(0.003)	(0.003)
Head is married				0.018	0.026	0.018
				(0.027)	(0.029)	(0.027)
Head is single				0.018***	0.018***	0.016**
				(0.007)	(0.007)	(0.007)
Head unmarried with spouse				0.025	0.036	0.023
				(0.027)	(0.029)	(0.027)
Head has primary complete education				-0.008	-0.013**	-0.006
				(0.005)	(0.005)	(0.005)
Head has secondary incomplete education				-0.027***	-0.037***	-0.024***
				(0.006)	(0.006)	(0.006)
Head has secondary complete education				-0.027***	-0.040***	-0.022***
				(0.006)	(0.006)	(0.006)
Head has superior incomplete education				-0.050***	-0.069***	-0.043***
				(0.009)	(0.009)	(0.009)
Head has superior complete education				-0.043***	-0.062***	-0.035***
				-0.006	-0.007	-0.007
Head has a second job				(0.003)	(0.006)	(0.001)
				-0.006	-0.006	-0.006
Spouse has a second job				(0.014)	-0.015*	(0.013)
				-0.009	-0.009	-0.009
Sector of Head's job: Agriculture, Fishing, etc.				0.000	(0.002)	0.002
				-0.024	-0.028	-0.024
Sector of Head's job: Mining				(0.011)	(0.010)	(0.009)
				-0.034	-0.034	-0.033
Sector of Head's job: Food manufacturing				(0.003)	(0.004)	(0.003)
				-0.011	-0.012	-0.011
Sector of Head's job: Textile manufacturing				0.008	0.009	0.007
				-0.009	-0.009	-0.009
Sector of Head's job: Other manufacturing				(0.001)	(0.004)	(0.001)
				-0.006	-0.006	-0.006
Sector of Head's job: Electricity, Gas and Water				0.008	0.014	0.008
				-0.013	-0.014	-0.014
Sector of Head's job: Construction				0.015**	0.016**	0.014**
				-0.007	-0.007	-0.007
Sector of Head's job: Wholesale and retail trade				(0.001)	(0.005)	0.000
				-0.007	-0.007	-0.007
Sector of Head's job: Restaurants and Hotels				0.032***	0.031**	0.031**
				-0.012	-0.013	-0.012
Sector of Head's job: Transport, and Communic.				0.016**	0.017**	0.016**
				-0.007	-0.007	-0.007
Sector of Head's job: Financing, Insurance, etc.				-0.002	-0.006	-0.001
				(0.007)	(0.007)	(0.007)
Sector of Head's job: Education, Health, etc				0.001	0.000	0.001
				(0.007)	(0.007)	(0.007)
Sector of Head's job: Repair services				0.015	0.017	0.014
				(0.011)	(0.012)	(0.011)
Sector of Head's job: Other sectors				0.007	0.006	0.006
				(0.008)	(0.009)	(0.008)
Constant	1.151***	1.025***	1.226***	1.015***	0.843***	1.080***
	(0.017)	(0.019)	(0.021)	(0.020)	(0.023)	(0.029)
Observations	10,380	10,364	10,364	10,380	10,364	10,364
R-squared	0.407	0.350	0.405	0.424	0.382	0.423
Adj. R-squared	0.406	0.349	0.404	0.421	0.379	0.420

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