DOCUMENTOS DE TRABAJO

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THE LONG-TERM DIVERGENCE BETWEEN YOUR CPI AND MINE, THE CASE OF CHILE*

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Abstract

In this paper we analyze the Chilean Consumer Price Index (CPI) with respect to ten price indexes representing the average price faced by ten different income groups. We construct these indexes using information from two versions of the Household Expenditure Survey: that obtained for the period 1996-1997 and for the period 2006-2007. We show that the official CPI is a fairly good representation of the prices faced by the eighth and seventh income decile agents (first income decile is the poorest, tenth income decile is the richest). CPI shows a decreasing ability to represent the cost of life as the distance to the seventh and eighth decile increases. In particular, the poorest and richest people are the worst represented by the CPI. We also show that the inflation faced by different income groups has important similarities, but also some remarkable differences. For instance, while all income groups display a monthly inflation rate around 0.25 percent, the standard deviation of the lowest income group annual inflation is 45% higher than that of the richest group. More importantly, we show that different income groups face either permanent or very persistent gaps in their price indexes, indicating that differences across income groups may take a long time to dissapear.

Resumen

En este paper comparamos el Índice de Precios al Consumidor de Chile con el índice de precios que representa la canasta de consumo promedio de diez grupos ordenados por distinto nivel de ingreso en Chile. Construimos estos índices usando información de dos versiones distintas de la Encuesta de Presupuestos Familiares, aquella obtenida durante el periodo 1996-1997 y aquella obtenida durante el periodo 2006-2007. Mostramos que el IPC es bastante representativo del nivel de precios enfrentado por los grupos que corresponden al séptimo y octavo decil de ingreso. (El primer decil es el más pobre, mientras que el décimo es el más rico). El IPC muestra una capacidad decreciente de representar el costo de vida de los otros grupos de ingreso en la medida que más se alejan de los deciles 7 y 8. En particular, el grupo más pobre y el más rico son los peores representados por el IPC. También mostramos que la inflación que enfrentan distintos grupos de ingreso presentan importantes similitudes pero también algunas diferencias notables. Por ejemplo, si bien todos los grupos de ingreso tienen una inflación mensual promedio similar de 0.25% , la desviación estándar de la inflación anual del grupo más pobre es 45% superior a la del grupo más rico. Más importante aún, mostramos que los distintos grupos de ingreso poseen brechas en el costo de vida que son o bien

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permanentes o muy persistentes, indicando que las diferencias en el costo de vida de grupos de ingresos distintos pueden tardar mucho tiempo en desaparecer.

1. Introduction

Inflation is usually measured by the Consumer Price Index (CPI) which is constructed using the prices of a representative bundle of goods in a given economy. It is clear that the consumption bundle of different agents may not coincide with the representative bundle used for the construction of the CPI (see for instance Chang, Chang and Lieu 2004, Crawford and Smith 2002, Deaton 1998, Hobijn and Lagakos 2005, Ley 2002 and Rigobón 2008). Most likely, this would be the case of an economy characterized by an unequal income and expenditure distribution (Rigobón 2008). Nevertheless, one could expect that differences may be either small, moderate or transitory, so that eventually the CPI would be a trustworthy measure of the cost of life in the economy.

Inflation heterogeneity is closely related to the issue raised in the previous paragraph. On the one hand, one could think of a quite homogeneous economy, in which all agents face fairly similar inflation rates. In this case the CPI will correctly represent the inflation faced by all the agents. On the other hand, one could think of an heterogeneous economy in which agents are confronted with different inflation processes. Such an economy is an interesting object of analysis. Depending on the distribution of inflation rates, the CPI may be considered either a useful or an unuseful inflation measure. If the distribution of inflation rates is normal, with an expected value that is well estimated by the inflation rate of the CPI, and the variance of this distribution is low, then clearly the CPI will be a useful measure of inflation. In contrast, if inflation rates follow a uniform distribution with high variance and an expected value which is not close to the average inflation, then the CPI might not be a very representative measure.

Inflation is also a dynamic object, therefore, not only static measures should be considered, but also autocorrelations and more generally, measures of dynamic dependence.

To evaluate the degree of heterogeneity in the inflation process in Chile, and how representative the CPI of the Chilean inflation process is, we analyze the behavior of the Chilean CPI with respect to ten price indexes representing the average price faced by economic agents from ten different income groups. We construct these indexes using information from two different versions of the Chilean Household Expenditure Survey (HES): the version covering the period 1996-1997 and the version covering the period 2006-2007[1].

We show that the official CPI is a fairly good representation of the prices faced by the eighth and seventh income decile agents in our sample (first income decile is the poorest, tenth income

[1] More details about the Chilean Household Expenditure Survey can be found in the appendix.

decile is the richest). The CPI shows a decreasing ability to represent the cost of life as the distance to the seventh and eigth decile increases. In particular, the poorest and richest people are the worst represented by the CPI. We also show that inflation faced by different income groups has important similarities, but also some remarkable differences. For instance, while all income groups display a monthly inflation rate around 0.25%, the standard deviation of the lowest income group annual inflation is 45% higher than that of the richest group. More importantly, we show that different income groups face either permanent or very persistent gaps in their price indexes, indicating that differences across income groups may take a long time to dissapear (similar results for Taiwan are reported by Chang, Chang and Lieu 2004).

Needless is to say that the consequencess of a poorly representation of the inflation process of an economy might have a relevant impact on different areas. For instance, if inflation erodes the consumption power of a given group of people who are key to determine a presidencial election, then overlooking this heterogeneity may have important political implications (see Rigobón, 2008). From the point of view of social policies, inflation heterogeneity might also be relevant, as these policies might mitigate its distributional impact if that is desired. Finally, monetary policy may also be part of this discussion, as a strong disregarded heterogeneity might make central banks to overlook second round effects or the propagation of certain inflationary shocks.

Interesting recent analyses along these lines are found in Rigobón (2008) and Cobb (2012), but they focus on the sharp increase in food and commodity prices experienced during 2007 and 2008 and on the distributional impact of that shock on the poorest income groups of the economy. Our approach is slightly different because we consider a 14 years period and we focus both on a high and low frequency analysis of the inflation process. In this regard, our main distinctive result is the finding of heterogeneous cointegrating relationships in the price indexes corresponding to different income groups. We interpret this as a situation in which differences between income group price indexes are either permanent or extremely persistent, which opens a new debate, beyond those associated with the food crisis at the end of the past decade.

The rest of the article is organized as follows: Section two describes our data. In section three we carry out a cointegration analysis and several comparative exercises following the work of Rigobón (2008). In section 4 we summarize our results and discuss their policy implications.

2. Data

2.1 Deciles' weights

In this paper we analyze the inflation process in Chile using information from two different versions of the Household Expenditure Survey (HES): that obtained for the period 1996-1997 and that obtained for the period 2006-2007. We use information from these two versions of the survey to build our own Consumer Price Index (CPI) items' weights.

First, average item's weights from the 1996-1997 HES are used to replicate the CPI expressed in the December 1998 reference month. Then, following the same procedure, decile items' weights built from the 1996-1997 HES are used to construct representative bundles for each income group. These bundles are the basic units from which we compute the price indexes that represent the average price faced by these income groups. Second, average item's weights from the 2006-2007 HES are used to replicate the CPI expressed in the December 2008 reference month. Next, decile items' weights built from the 2006-2007 HES are used to construct representative bundles for each income group. Finally, using these representative bundles we construct the ten different decile price indexes expressed in the December 2008 reference month. We end up with ten different price indexes at a monthly frequence covering the period December 1998 - May 2013.

We present the items' weights for the ten income groups coming from the 1996-1997 HES in Table 1. It is remarkable that people belonging to the lowest income decile group spent around forty five percent of their income on Food, while households in the highest income decile spent around fifteen percent of their income on Food. Meanwhile, weights for Transportation and Education and Recreation were significantly higher for the tenth decile of the income distribution than for the first decile. The CPI bundle is between the bundles corresponding to deciles VII and VIII.

Table 1: Indexes' Weights 1998

Deciles and Consumer Price Index

Indexes weights - December 1998	Total	DI	DII	DIII	DIV	DV	DVI	DVII	DVIII	DIX	DX	Standard Deviation (Deciles)
Food	**27.2**	45.0	38.9	38.7	35.7	34.6	33.7	30.2	25.9	21.2	15.4	8.9
Housing	**20.2**	21.3	17.9	18.5	17.2	19.2	17.5	19.1	19.1	20.6	23.4	1.9
Household furnishings	**8.1**	7.2	9.4	8.4	9.3	8.7	9.0	8.8	8.1	7.8	7.0	0.8
Apparel	**7.9**	5.1	6.0	6.9	8.3	7.2	8.7	8.3	9.7	8.8	7.4	1.4
Transportation	**12.2**	7.4	9.4	8.9	9.4	9.9	9.8	11.0	12.9	11.8	17.0	2.7
Medical care	**9.4**	6.4	8.6	7.7	8.1	7.9	8.6	9.0	9.8	11.7	10.1	1.5
Education and recreation	**11.1**	3.9	5.8	6.9	6.7	8.3	8.0	9.0	11.0	14.2	16.6	3.9
Other goods and services	**3.9**	3.7	3.8	4.1	5.3	4.1	4.6	4.5	3.4	4.0	3.1	0.6

We also present the items' weights for the ten income groups coming from the 1996-1997 HES in Table 2. People belonging to the lowest income decile spend around thirty five percent of their income on Food and Non-Alcoholic beverages, while the households in the highest income decile spend around eight percent of their income on Food and Non-Alcoholic beverages. Meanwhile, weights for Transportation, Education and Recreation and Culture are significantly higher for the tenth decile of the income distribution than for the first decile. Also in this case, the CPI bundle is between the bundles corresponding to deciles VII and VIII

Table 2: Indexes' Weights 2008

Deciles and Consumer Price Index

Indexes weights - December 2008	Total	DI	DII	DIII	DIV	DV	DVI	DVII	DVIII	DIX	DX	Standard Deviation (Deciles)
Food and non-alcoholic beverages	**17.9**	34.8	31.4	29.9	26.1	24.9	22.4	20.9	16.8	14.0	8.3	8.2
Alcoholic beverages and tobacco	**2.1**	2.2	3.1	3.0	2.7	3.1	2.6	2.7	2.0	1.9	1.2	0.6
Apparel	**5.1**	4.4	5.4	5.4	5.6	5.6	5.4	5.5	5.2	4.9	4.6	0.4
House utilities	**12.7**	16.6	15.5	13.4	13.2	12.9	12.6	12.0	11.8	12.2	12.7	1.6
Household furnishings	**7.2**	5.9	6.4	6.2	6.2	6.3	6.5	6.6	7.3	7.3	8.5	0.8
Medical care	**5.5**	5.0	4.0	4.1	4.9	5.6	5.2	5.4	6.8	6.2	5.5	0.8
Transportation	**18.7**	10.2	10.8	12.4	15.2	14.3	15.9	16.5	19.6	21.2	23.9	4.4
Communications	**4.0**	3.6	3.5	4.2	4.2	4.4	4.6	4.4	4.5	4.3	3.3	0.5
Recreation and culture	**9.2**	6.1	6.6	7.4	7.5	7.4	8.4	8.9	8.8	9.1	11.8	1.6
Education	**6.2**	2.8	3.5	4.4	4.7	5.2	5.7	5.8	6.0	6.9	7.9	1.5
Restaurants and hotels	**5.9**	3.8	4.9	4.5	5.0	5.3	5.4	5.8	5.7	6.7	6.8	0.9
Other goods and services	**5.4**	4.7	4.9	4.9	4.9	5.0	5.5	5.5	5.6	5.4	5.7	0.4

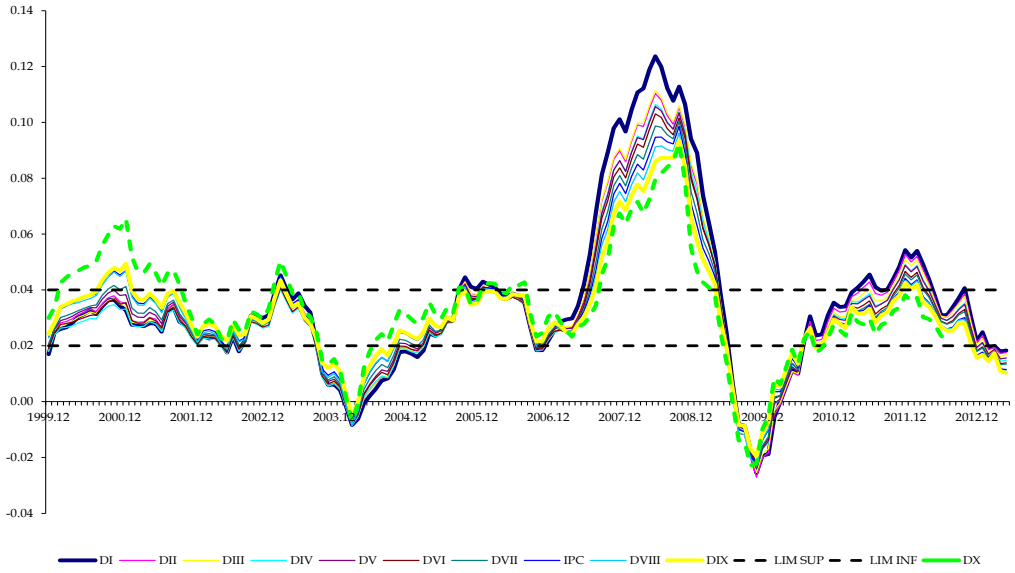
2.2 Deciles and CPI annual inflation

Using items' weights and items' price indexes, we construct the CPI, and the price index for each income decile group. We label theses indexes as IDPI, IIDPI, IIIDPI, IVDPI, VDPI,…IXDPI, XDPI[2]. We use them to calculate a proxy of the inflation faced by each income group. Beyond the peculiar 2007-2008 period of soaring commodities prices (Cepal 2009, Cobb 2012, FAO 2011, Moreno and Pistelli 2008, Pistelli and Riquelme 2010, Rigobón 2008), that determined a high difference between the first and the tenth income deciles inflations rate, there are other periods in which the gap is also important. Gaps higher than 150 basis points between the extreme deciles' annual inflation rates were recorded during 2000, 2007, 2008 and 2011. In the year 2000 inflation faced by the tenth income decile was higher, while in the other three years the opposite happened. Few years (2002, 2005 and 2012) showed small differences.

The data show that income deciles' annual inflation differences exacerbate when CPI inflation is higher (see 2000, 2007, 2008 and 2011). Chart 1 shows the evolution of the ten income deciles' inflation rates and the CPI inflation rate in the last thirteen years. We also depict in the same chart the lower and upper tolerance bounds of the current inflation targeting regime (2% and 4%).

Chart 1

Deciles and CPI annual inflation



[2] We do not construct the Core Index, we take it from INE's website.

The fact that differences increase when inflation raises is better exposed in Chart 2. Indeed, since only the extreme indexes (deciles I and X) and CPI are depicted, gaps are easily shown. As before, we also depict the lower and upper bounds of the inflation targeting regime (2% and 4%).

Chart 2

Extreme deciles annual inflation

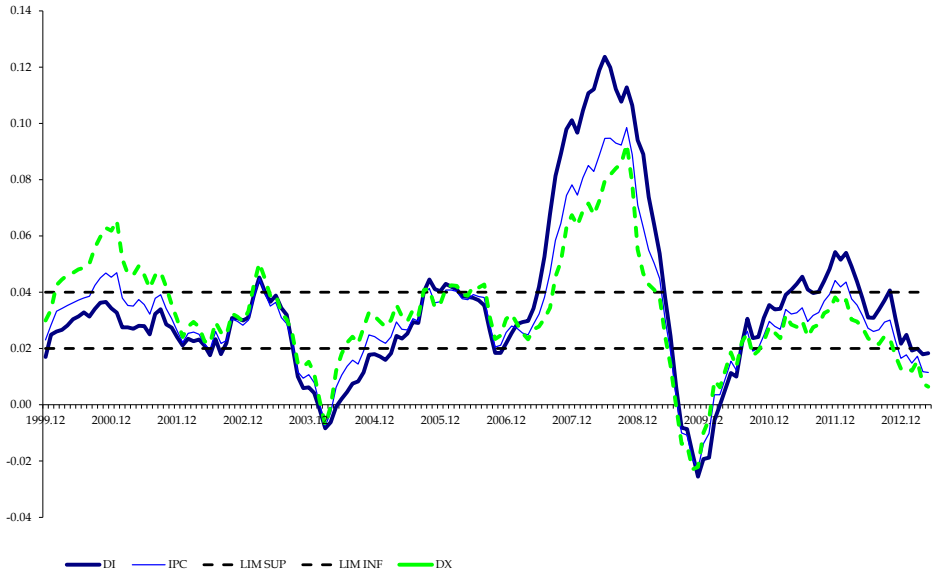
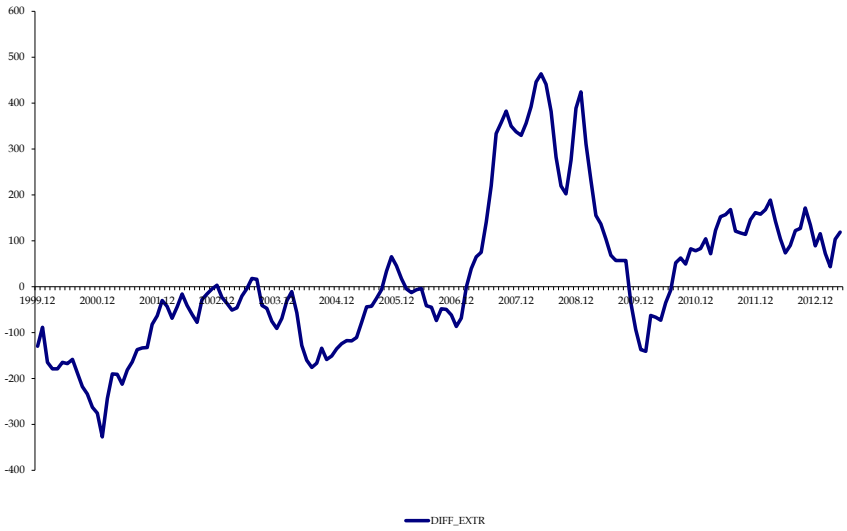


Chart 3 directly depicts the inflation gap, defined as the difference between the first income decile and the tenth income decile inflation rates expressed in basis points. Clearly, it does not fluctuate around zero. On the contrary, it seems to have a trend and to be very persistent.

Chart 3

Difference between extreme deciles annual inflation



2.3 Deciles and CPI monthly inflation

Higher monthly inflation rates were recorded during 2007, 2008 and 2011. As it happens with annual measures, the data show that deciles' annual inflation differences exacerbate when CPI inflation is higher. Chart 4 shows that monthly inflation increases its volatility after the 2007-2008 period (food crisis).

Chart 4

Deciles and CPI monthly inflation

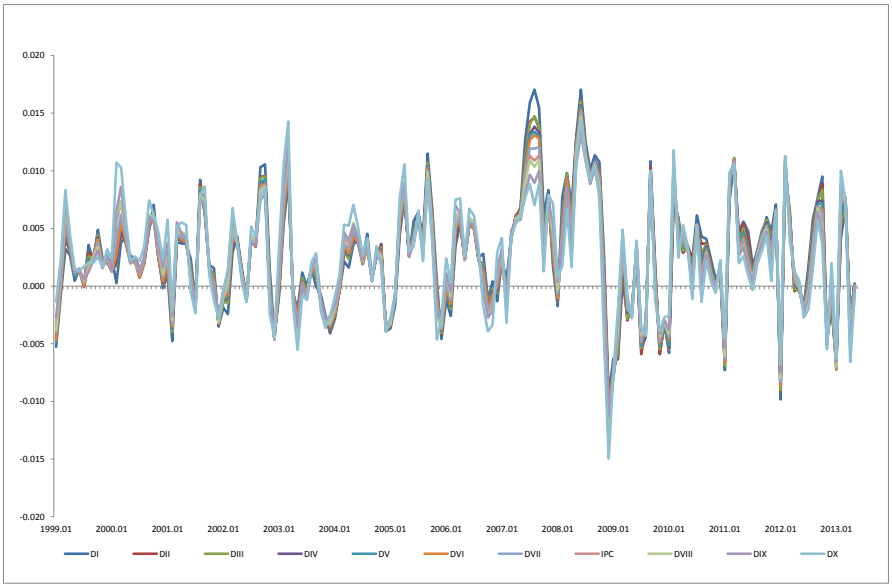
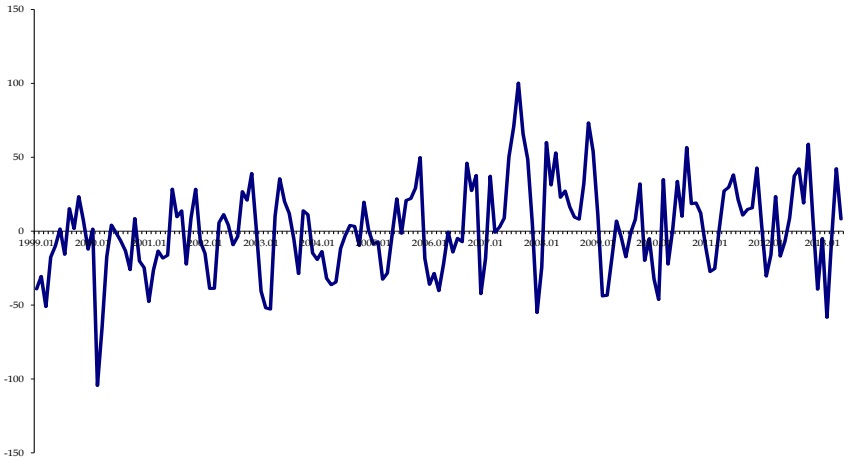


Chart 5 displays the inflation gap, defined as the difference between the first income decile and the tenth income decile monthly inflation rates and expressed in basis points. Clearly, at a monthly frecuency the persistence of the inflation gap is much lower than at an annual frequency (Chart 3).

Chart 5

Difference between extreme deciles monthly inflation



2.4 Annual and Monthly Inflation Main Statistics

Our previous charts suggest that inflation features and main statistics are dissimilar across deciles. Table 3 seems to show that differences are not very important in means (with the exception of the first decile that is 27 basis points higher than the CPI), nevertheless differences are relevant in standard deviations and variation coefficients.

Table 3: Main statistics of monthly and annual inflation

	December 1999 - May 2013			January 1999 - May 2013		
	Annual Mean	Std. Deviation (bp)	Variation Coefficient	Monthly Mean	Std. Deviation (bp)	Variation Coefficient
DI	3.500%	289.3	82.659%	0.272%	49.6	182.758%
DII	3.319%	259.8	78.276%	0.260%	47.2	181.546%
DIII	3.302%	260.3	78.820%	0.258%	47.1	182.076%
DIV	3.175%	248.7	78.315%	0.249%	46.0	184.934%
DV	3.270%	244.7	74.824%	0.257%	46.0	178.906%
DVI	3.152%	239.0	75.811%	0.248%	45.7	184.353%
DVII	3.180%	228.9	71.990%	0.251%	45.3	180.453%
DVIII	3.150%	212.0	67.293%	0.249%	45.6	182.751%
DIX	3.181%	197.5	62.077%	0.253%	43.8	173.100%
DX	3.276%	199.1	60.777%	0.262%	47.8	182.634%
CPI	3.230%	218.8	67.732%	0.255%	45.3	177.229%
PIX1	2.434%	207.1	85.100%	0.200%	31.0	154.601%
AVG	3.251%	234.9	72.258%	0.253%	45.8	180.579%
MED	3.251%	234.9	72.258%	0.253%	45.8	180.579%

Table 4: Correlation, Year-on-Year Inflation of Different Income Groups

	DECILE 1	DECILE 2	DECILE 3	DECILE 4	DECILE 5	DECILE 6	DECILE 7	DECILE 8	DECILE 9	DECILE 10	IPC
DECILE 1	1.000	0.997	0.998	0.997	0.994	0.994	0.985	0.962	0.951	0.836	0.968
DECILE 2	0.997	1.000	0.999	0.999	0.998	0.998	0.993	0.977	0.967	0.867	0.981
DECILE 3	0.998	0.999	1.000	1.000	0.998	0.999	0.993	0.976	0.966	0.863	0.980
DECILE 4	0.997	0.999	1.000	1.000	0.998	0.999	0.993	0.976	0.967	0.864	0.981
DECILE 5	0.994	0.998	0.998	0.998	1.000	0.999	0.998	0.986	0.978	0.890	0.990
DECILE 6	0.994	0.998	0.999	0.999	0.999	1.000	0.997	0.984	0.975	0.882	0.987
DECILE 7	0.985	0.993	0.993	0.993	0.998	0.997	1.000	0.994	0.989	0.915	0.996
DECILE 8	0.962	0.977	0.976	0.976	0.986	0.984	0.994	1.000	0.998	0.952	0.999
DECILE 9	0.951	0.967	0.966	0.967	0.978	0.975	0.989	0.998	1.000	0.963	0.998
DECILE 10	0.836	0.867	0.863	0.864	0.890	0.882	0.915	0.952	0.963	1.000	0.945
IPC	0.968	0.981	0.980	0.981	0.990	0.987	0.996	0.999	0.998	0.945	1.000

Table 4 shows the correlation between year-on-year inflation rates corresponding to the different income groups and also between the CPI. We can see that correlations are very high. The minimum value is 0.836, and the majority of them are above 0.95 indicating that, linearly

speaking, they are all very similar. From this point of view, the CPI has a lot of representativeness as its correlation with the different deciles is above 0.94.

In contrast to Table 4, Table 5 provides another dimension in which the CPI does not to seem to be very representative of the different inflation processes. In Table 5 we show the Mean Absolute Distance (MAD) between each inflation froup and the CPI inflation rate. This is a measure of distante between the CPI inflation rate and the rest of the inflation rates corresponding to the different income groups. We see that the CPI reaches a minimum distance with respect to the eigth decile. The distance is the biggest for the poorest decile, in which, on average, annual inflation is 72 basis points different from the CPI inflation rate. The richest group is not much better represented as the average distance to the CPI is 58 basis points. When compared with the median and average inflation rates, we detect a distance of 22 and 31 basis points, which is not negligible.

Table 5: Mean Absolute Difference (Decile i-CPI) in Basis Points

Year-on-Year Inflation Rates

Decile	MAD
I	72.12
II	49.56
III	49.04
IV	45.17
V	33.26
VI	33.91
VII	18.04
VIII	8.97
IX	18.28
X	57.92
Median Decile	31.43
Average	21.95

Table 6 shows the proportion of months that annual and monthly inflation rates are 20 basis points higher (lower) than the CPI inflation rates. There are huge difference across deciles. The first decile has the highest percentage of times out of the interval. The tenth decile follows, and afterwards the second and the third.

Table 6: Volatility

% of times decile inflation falls out the [CPI-0.2, CPI+0.2]		
	Annual	Monthly
DI	54.3%	71.7%
DII	30.2%	64.2%
DIII	30.9%	64.7%
DIV	29.6%	58.4%
DV	15.4%	48.6%
DVI	18.5%	49.1%
DVII	8.0%	39.3%
DVIII	6.8%	35.8%
DIX	10.5%	39.9%
DX	40.1%	68.8%

3. Cointegration analysis

In our last exercise we aim at analyzing the relationship between the different price indexes under consideration. From Table 7 we see that all the price indexes seems to have a unit root, but their first differences seem to be stationary. This is a perfect environment to study cointegration relationships between the different indexes.

Table 7: Unit Root Hypothesis

P-Value (Ho: There is a Unit Root)		
Deciles	Augmented Dickey-Fuller	Phillips-Perron
I	0.948	0.975
II	0.936	0.968
III	0.937	0.969
IV	0.940	0.970
V	0.924	0.959
VI	0.929	0.962
VII	0.902	0.942
VIII	0.850	0.902
IX	0.826	0.867
X	0.591	0.611
CPI	0.859	0.905
Core	0.572	0.628

To that end, we explore relationships of the following shape

$$\log(P_{it}) - \gamma_{ij} \log(P_{jt}) = c_{ij} + v_{ijt}$$

where

P_i represents the price index corresponding to decile "i" income group where i=1,..,10. When i=11, P_i represents the CPI.

If a cointegration relationship does exist between log(P_i) and log(P_j) then we expect v_{ijt} to be mean zero stationary. If that is so, then the vector $(1, -\gamma_{ij})$ is called a cointegration vector for log(P_i) and log(P_j), and γ_{ij} is called the contegrating coefficient. We would like to analyze two important implications coming from this simple cointegration exercise:

1. A little algebra allows us to write the following expression when cointegration does exist:

$$\log(P_{it}) - \gamma_{ij}\log(P_{jt}) = c_{ij} + v_{ijt}$$

$$\log(P_{it-12}) - \gamma_{ij}\log(P_{jt-12}) = c_{ij} + v_{ijt-12}$$

Substracting both expressions we arrive at

$$\pi_{it}^{(12)} - \gamma_{ij}\pi_{jt}^{(12)} = v_{ijt} - v_{ijt-12}$$

Where $\pi_{it}^{(12)}$ represents the logarithm aproximation to year-on-year inflation according to the price index P_i. Taking expected values at both sides we arrive to

$$E(\pi_{it}^{(12)}) = \gamma_{ij}E(\pi_{jt}^{(12)})$$

The implication is that if $\gamma_{ij} \neq 1$ then the expected values of accumulated inflations (over a year or any given period of time) will be different. If instead, $\gamma_{ij} = 1$, then expected inflation rates will be the same and observable differences would simply correspond to random disturbances.

2. We can also write down the cointegrating relationship as

$$\log(P_{it}) - \gamma_{ij}\log(P_{jt}) = \log(P_{it}) - \log(P_{jt}) + (1-\gamma_{ij})\log(P_{jt}) = c_{ij} + v_{ijt}$$

or

$$\log(P_{it}) - \log(P_{jt}) = c_{ij} - (1-\gamma_{ij})\log(P_{jt}) + v_{ijt}$$

which indicates that the differences between different log price indexes should be stationary, and therefore transitory, as long as the cointegrating coefficient is equal to 1. Otherwise, differences between the different price indexes will follow a process with a unit root and consequently, they will depart permanently.

Table 8 below shows estimates of the cointegrating coefficient γ_{ij} for all the income deciles inflation rates under consideration. We compute these estimates using Dynamic Ordinary Least Squeares according to Stock and Watson (1993).

Table 8: Cointegrating Relationships (γ_{ij})

	Decile I	Decile II	Decile III	Decile IV	Decile V	Decile VI	Decile VII	Decile VIII	Decile IX	Decile X	CPI	Core Index
Decile I	1.000											
Decile II	1.069	1.000										
Decile III	1.067	0.998	1.000									
Decile IV	1.106	1.035	1.036	1.000								
Decile V	1.084	1.014	1.016	0.980	1.000							
Decile VI	1.117	1.045	1.047	1.010	1.030	1.000						
Decile VII	1.117	1.046	1.048	1.011	1.032	1.001	1.000					
Decile VIII	1.137	1.065	1.067	1.029	1.051	1.020	1.019	1.000				
Decile IX	1.129	1.059	1.060	1.023	1.045	1.014	1.014	0.995	1.000			
Decile X	1.104	1.036	1.038	1.001	1.024	0.993	0.995	0.978	0.984	1.000		
CPI	1.107	1.037	1.039	1.002	1.023	0.993	0.992	0.973	0.978	0.988	1.000	
Core Index	1.360	1.273	1.276	1.231	1.256	1.219	1.218	1.193	1.198	1.208	1.226	1.000

Includes intercept

Table 8 indicates that all the cointegrating coefficientes are close to 1, but they are not exactly one. In particular, differences up to 14% on average inflation are shown considering only the 10 inflation deciles plus the CPI. Differences about 30% are shown with respect to the core Inflation index.

It is important to notice that the null hypothesis that the cointegration coefficient is equal to one is rejected at usual significance levels for all the pairwise comparisons in Table 8. In particular, the CPI index has a cointegration coefficient higher than one when compared to low income deciles, and lower than one when compared with higher income deciles, suggesting that poorer people tend to have inflation rates that are higher than CPI inflation rates and that richer people tend to have lower inflation than that of the CPI.

Results in Table 8 are quite interesting. They also say that we should expect permament (or very persistent) differences in the price of the representative bundle of goods of different income groups. Chart 6 and 7 below illustrate this point when comparing the price index of the poorest income group with the CPI, and when comparing the richest income group with the CPI as well. We see that the log-price differential of the representative bundles is quite persistent.

Chart 6

Log Price Difference Between Decile 1 Income Group

Inflation Rate and the CPI Inflation Rate

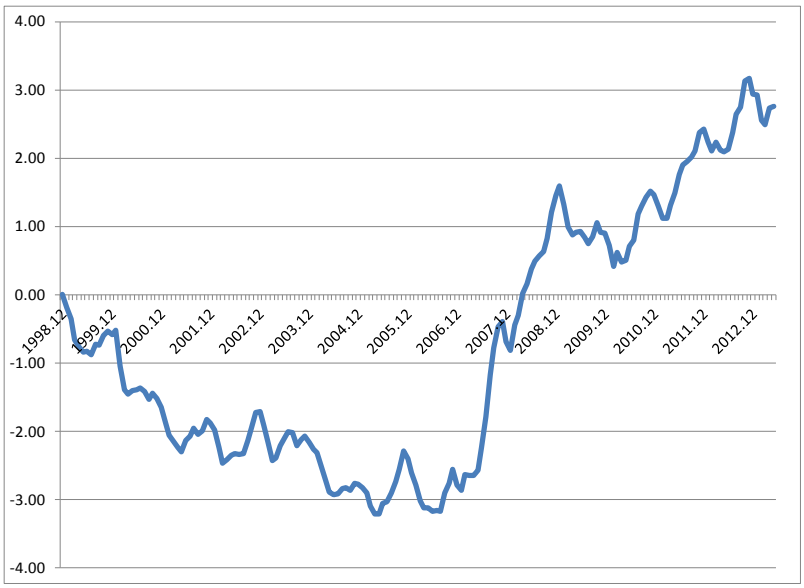


Chart 7

Log Price Difference Between Decile 10 Income Group

Inflation Rate and the CPI Inflation Rate

Chart 6 indicates that during the first 8 years of our sample, the bundle of goods representing the lowest income decile was cheaper than the aggregate bundle captured by the CPI. In April

2008 this situation reverses and since then, the bundle of the poor has remained more expensive than that captured by the CPI.

Chart 7 shows a remarkable pattern of the price corresponding to the bundle of the richest income group. During all our sample period (more than 14 years) this bundle has been more expensive than the bundle associated to the CPI.

4. Conclusions

We show that the inflation faced by households of different income groups in Chile has important similarities, but also some remarkable differences. While all income groups display a monthly inflation rate around 0.25% between December 1998 and May 2013, the standard deviation of the lowest income group annual inflation is 45% higher than that of the richest group. Moreover, we show that there are permanent or very persistent gaps in price indexes, indicating that differences across income groups may take a long time to dissapear.

In this regard, our may distinctive result is the finding of heterogeneous cointegrating relationships in the price indexes corresponding to different income groups. We interpret this as a situation in which differences between income groups price indexes are either permanent or extremely persistent, which opens a new debate, beyond those associated with the food crisis at the end of the past decade.

According to our analysis, inflation in Chile is heterogeneous and the official CPI does not correctly represent the inflation faced by all the agents. Specifically, the CPI is a fairly good representation of the prices faced by the eigth and seventh income decile agents in our sample. Nevertheless, the CPI shows a decreasing ability to represent the cost of life as the distance to the seventh and eigth decile increases. In particular, the poorest and richest people are the worst represented by the CPI. We also report differences in volatility and our cointegration analysis suggests the existence of differences in expected values as well. Furthermore, we report that representative bundles relative prices are extremely persistent and indicate that a given bundle could stay cheaper than another one for a fairly very long period of time.

To illustrate the distributional impact of the detected inflation's gaps, we conduct a very simple exercise: we compute the present value of the average household income for each decile from the latest Household Expenditure Survey (2006-2007) using both the CPI and, alternatively, the corresponding decile price index. We observe that the tenth decile to first decile ratio falls from 29,8 to 27,3.

If desired, social policies might mitigate the distributional impact of inflation's heterogeneity. To our knowledge, initiatives in this direction, funded with permanent fiscal resources, are not being discussed yet.

A poor representation of the inflation process by means of the CPI inflation rate might have political consequences as well. For instance, it may determine riots and protests and, in extreme situations, may have an impact on the outcome of a presidential election.

Finally, inflation heterogeneity is an issue that might also be relevant for the design of monetary policy. When such heterogeneity is disregarded, central banks might be overlooking sources of second round effects that might amplify or propagate certain type of shocks to the whole economy. While we have not addressed this issue directly in this paper, we think it would be an interesting topic for further research.

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Methodological Appendix

a. Deciles' weights

The purpose of this article is to explore the evolution of inflation according to the CPI, CPIX1 (PIX1)[3], First Decile Price index (IDPI), Second Decile Price Index (IIDPI), Third Decile Price Index (IIIDPI), and so on.

To do this, we first compare the average 1996-1997 Household Expenditure Survey items' weights with the CPI December 1998 Reference Base items' weights; and after that we do the same with the 2006-2007 and the CPI December 2008 versions.[4]

It is worth noticing that only those products that represent more than 0.025 percent of the total expenditure of the households surveyed between August 1996 and July 1997 are considered in the Consumer Price Index (CPI) of the December 1998 bundle. Thus, while the number of products is 1500 in the Household Expenditure Survey (HES), it is 483 in the CPI bundle.

On the other hand, three products that represent more than 0.025 percent of the total expenditure were excluded because they were consumed mainly by the one percent of the population with highest income: dishwashers, video cameras and car rental services.

Finally, some items are part of one group for the HES and part of another group for the CPI bundle. For instance, while telephone and mail services are part of Transportation and Communication in the HES, they belong to Housing in the CPI bundle. In the same way, while cleaning services are part of Household Furnishings in the HES, they belong to Housing in the CPI bundle. Similarly, many items considered as part of Recreation (TV, video, audio, photograph, etc.) in the HES belong to Household Furnishings in the CPI bundle. Also, while some services form part of Education in the HES, they belong to Transportation in the CPI bundle.

With all these methodological considerations, average item's weights from de HES were used to replicate the CPI bundle; then, following the same procedure, decile items' weights from the HES were used to build the decile bundles of the price decile indexes.

[3] PIX1 correspond to the definition of CPIX1 from the Central Bank of Chile.
[4] It is worth noting that agents adapt their consumption patterns, changing groups (December 1998 CPI) and division (December 2008 CPI) weights.

The same procedure was followed for the construction of the 2006-2007 HES decile items' weights and the CPI December 2008 decile items' weights.

b. Households

In the following tables the main features of the average household of each decile are presented. First, it is worth noticing that for most of the deciles the average reported monthly income is lower than the average reported monthly expenditure, suggesting that only households of the highest 20% are able to save. Second, according to both the 1996-1997 and the 2006-2007 HES, inequality measured using income is higher than it would be using expenditure. Indeed, as it is shown in the tables, the richest 10% to the poorest 10% ratios are higher when income is considered instead of expenditure.

Table A1: Households´ income and expenditure

	1996-1997 HES Households	
Deciles	Expenditures	Income
I	443	265
II	728	493
III	787	654
IV	979	812
V	1,120	1,004
VI	1,265	1,230
VII	1,558	1,536
VIII	2,042	2,065
IX	2,885	3,117
X	5,426	7,227
Average	1,982	2,200
Ratio X/I	12.3	27.2

Source: Own calculations, EPF
US dollars

	2006-2007 HES Households	
Deciles	Expenditures	Income
I	483	240
II	706	445
III	867	618
IV	1,057	797
V	1,244	1,008
VI	1,461	1,257
VII	1,778	1,587
VIII	2,271	2,115
IX	3,070	3,095
X	5,960	7,133
Average	1,889	1,829
Ratio X/I	12.3	29.8

Source: Own calculations, EPF
US dollars

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