Cost of living in Spain (2006-2011): regional differentials and the impact of economic crisis

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Abstract

In this article, we have estimated a demand system of Spanish households to measure the cost of living of these households across the Spanish regions and along the period 2006-2011. The data comes from Spanish Household Budget Survey and Deaton and Muellbauer (1980) approach was applied with a two-step methodology of Shonkwiler and Yen (1999) to address the problems derived of having censored data in the survey. The results obtained shows striking differences in prices levels across regions in all the period of study contrary to the evidence obtained with the CPI series which do not reflect any regional price differences. We also can observe that our COLI evolves in a similar way than the economic cycle while the CPI presents a smooth increase of price every year. Finally we find different impacts of prices across the income range implying important policy issues relating with welfare. This paper show how differences in price levels across regions exist and matter for economic outcomes and should be taken into account in every welfare policy.

Key words: Almost Ideal Demand Systems (AIDS), Spatial Cost of Living (SCOL), Spatial Effects of the Economic Crisis, Regional Economics and Spain.

JEL Classification: D12, R11 and R22.
1. Introduction.

Regional price levels differentials indicate differences in the regional cost of living and thus have important individual and social welfare implications. For this reason, differences in living conditions and in the quality of life always capture a lot of attention by citizens and local governments. In Spain as well as in other countries this issue is currently in a phase in which their quantification is increasingly important (Jurado et al., 2012).

The disparities in well-being are evidenced by the Spanish Autonomous Communities by some authors, such as Ayala et al. (2011), García-Luque et al. (2009), Pérez-Mayo (2008), or Poggi (2007) among others. However, there is a little research on this issue in Spain compared to the US or other EU countries. Due to the structure of Spanish political system, where almost all policies that affect citizens’ well-being are responsibly of the regional or local administrations, the neglect of this issue has important political implications (Jurado et al., 2012). As Kosfeld et al. (2008) pointed out the lack of area-wide price level data, regional policy has to rely on nominal data, in these cases disparities in standard of living can be distorted and spatial planning policies are expected to be different when based on real data.

The main reason which explains the lack of studies in this area for the Spanish case is the limitations of data availability. In Spain, like in the majority of the countries, the official Consumer Price Index (CPI) is often used for these purposes. But this CPI evaluates changes in the average prices for the acquisition of a basket of goods and services which is considered to be representative of the expenditure of all consumers independently of the region where the consumer is situated. This characteristic makes that the CPI is a limited indicator for measuring how the cost of living (COL) is in the different Spanish regions and how this COL evolves over time because even in the case that consumers face the same nominal prices, variations in the cost of living can arise because of differences in expenditure patterns. There is a great importance of having a proper price index for comparisons of costs of living between, for example, urban and rural areas, along the income distribution or along the age cohort because it is supposed that these index show income and poverty differences more accurately than otherwise. Also, it is of great importance take into account spatial differences in the cost of living over time for the measurement of average standard of living. Despite this, welfare programs in Spain do not make any adjustment for cost of living in different regions.

The objective of this study is provide evidence on intra-country regional price level differences in Spain across regions and along the time through a Cost of Living Index (COLI) calculated with the representative basket of each consumer in each region, and highlights the limits of the CPI as an indicator of the regional price
disparities over time as Alberola et al. (2001) and Garrido-Yserte et al. (2012) evidence for Spain in their respective works. In order to calculate costs of living and its distribution, we use expenditure data from the Spanish Household Budget Survey provided by the National Statistical Institute. This survey record the expenditure of many items but it has information neither about quantities purchased nor about prices except for the food and energy groups of goods. Because the COLI estimates require information about prices faced by consumers we are only able to calculate the COLI for food products and excluding the energy groups because the aforementioned group only represents a 4% of the total expenditure of a Spanish household. Despite this limitation we can obtain the advantage of knowing regional price differences in dairy products which are supposed to have less price dispersion than others. Differences in price levels are obvious in goods such as housing, but the critical question is whether the dispersion in other representative consumer goods is pervasive and of sufficient magnitude to influence households’ costs of living significantly (Slesnick, 2002).

There are many studies which provide evidence on spatial price differences and how these spatial differences affect poverty and inequality. Thomas (1987) measures disparities in living standards within Brazil, remain these, particularly, between the Northeast and the Southeast. Asra (1999) demonstrates the importance of urban-rural differences in Indonesia and their impact on poverty measures finding that the urban-rural food price differentials during 1987-96 was 13%-16% and not 28%-52% as implied by the official data. We find the same kind of studies for Ireland in Somerville (2004) and from China the work of Brandt et al. (2006) where they emphasize the spatial price differences and the disproportionally impact across the income range that clearly raises important welfare policy issues. In Germany, as in the US, we find many studies about regional price differences, some examples are Roos (2006) and Kosfeld et al. (2008) for German case, and Slesnick (2002) and Jolliffe (2006), among others, for the US case. Both conclude that adjust for differences in cost of living have complete reversal implications in terms of prevalence, depth and severity of poverty.

After this introduction of the problem of the spatial cost of living differences we follow with section 2 where the general methodology of price indices and cost of living indices is explained. Then, in section 3, we make an analysis and a discussion of the methodological approach applied to the Spanish case. Section 4 sets out the empirical findings of spatial price differences along the period 2006-2011, including an exploration of the impact of price differences across the income range. Finally, conclusions are drawn in section 5.

The theory of the Cost of Living (COL) was initially developed by Konüs (1939). In this seminar work Konüs focused his approach on comparing two periods of time: a household which faces two different price levels tries to adjust its commodity basket in order to maintain a constant level of utility with the minimum expenditure cost. A later line in the literature applies the Konüs’ idea but studying price differentials across space: see Desai (1969), Nelson (1991), Timmins (2006) or Atuesta and Paredes (2012) among others.

This analysis depart from the estimation of demand models. This estimation can be performed by means of various methods. A summary and evaluation of the different options can be found in Kakhki et al. (2010). One of the most widely applied proposals has been that of Deaton and Muellbauer (1980). Their approach has important advantages over other procedures; the most important of these being the fact that it considers non-homothetic preferences for each household income group. This makes it especially valuable for comparisons across space, given that it allows the basket of preferences between consumers of different regions or areas to be varied. With this approach we can know the not observable utility function, and, consequently, to derive the cost function and to calculate a COL index (COLI) by fixing the utility level instead the basket of consumer goods as in the case of the price indices calculated by statistical agencies.

Keeping fixed the quantities consumed instead of the utility level generates a substitution bias derived from ignoring the substitutions made by consumers in response to price variations. Recent literature shows that the substitution bias is more significant in spatial comparisons than in a time series context (see, for example, Paredes and Iturra, 2013). There are two main reasons that aggravate the bias problem in this spatial context: (i) because transportation costs affect prices in different ways across space, even in the same period of time; and, (ii) because the consumption basket is more heterogeneous among regions because of product at outlet heterogeneity and because of geographical and weather factors. For these reasons, the assumption that the consumption basket is fixed across the space could be a highly unrealistic assumption when spatial price variations are studied.

The estimation of the AIDS is used to recover the expenditure function and to calculate the COL for a representative household in each region. The definition of a COLI (Cost of Living Index) between regions \( h \) and \( r \) is:

\[
\text{COLI}_{hr} = \frac{c(\bar{p}_h, u)}{c(\bar{p}_r, u)}
\]  

[1]
where \( c \) is the cost function; \( \overline{p_h} \) and \( \overline{p_r} \) are vectors containing the prices paid by the reference consumer in the regions \( h \) and \( r \), respectively; and \( u \) is an utility level set as common for both regions.

The point of departure for estimating an AIDS starts by defining a PIGLOG class cost or expenditure function consistent with the microeconomic theory that sets the minimum expenditure necessary in order to attain a specific utility level at given prices for a set of \( n \) products:

\[
\log c(p, u) = (1 - u) \log(a(p)) + u \log(b(p)) \tag{2}
\]

where \( c \) is the expenditure function, \( p \) is the price vector and \( u \) is the utility level. With some exceptions, \( u \) lies between 0 (subsistence level) and 1 (bliss level) so \( \log(a(p)) \) and \( \log(b(p)) \) can be considered as the log of the costs of subsistence and bliss, respectively. Their respective functional forms are:

\[
\log(a(p)) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \log p_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i \log p_j \tag{3}
\]

\[
\log(b(p)) = \log(a(p)) + \beta_0 \prod_i p_i^{\beta_i} \tag{4}
\]

where the \( i \) sub-index \((j)\) denotes the products included in the demand system. The demand functions can be derived substituting \( (3) \) and \( (4) \) in the cost function \( (2) \), from which we obtain:

\[
\log c(p, u) = \alpha_0 + \sum_{i=1}^{n} \alpha_i \log p_i + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i \log p_j + u \beta_0 \prod_i p_i^{\beta_i} \tag{5}
\]

By applying the Shepard’s lemma to \( (5) \), i.e., price derivates are equal to the quantities demanded, and multiplying both sides of the equation \( (5) \) by \( p_i/c(u, p) \), we obtain:

\[
\frac{\partial \log(c(p,u))}{\partial \log p_i} = \frac{p_i q_i}{c(p,u)} = w_i \tag{6}
\]

where \( w_i \) is the budget share of good \( i \):

\[
w_i = \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \beta_0 \prod_{i=1}^{n} p_i^{\beta_i} \tag{7}
\]

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1 This formulation of the AIDS is based on Deaton and Muellbauer (1980).
To obtain an estimable system we need to solve for \( u \) as a function of observed and known parameters from equation [5]:

\[
\begin{align*}
    u &= \frac{\log c(u,p) - \alpha_0 - \sum_{i=1}^{n} \alpha_i \log p_i - \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i \log p_j}{\beta_0 \prod_i p_i^{\beta_i}} \\
\end{align*}
\]

[8]

Substituting \( u \) in equation [7] we obtain:

\[
\begin{align*}
    w_i &= \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i (\log c(p,u) - \alpha_0) - \sum_{i=1}^{n} \alpha_i \log p_i \\
    &\quad - \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i \log p_j \\
\end{align*}
\]

[9]

The shares in [9] are determined from prices and the expenditure function, plus a set of parameters to be estimated. These shares are the AIDS demand functions and they can be expressed as:

\[
\begin{align*}
    w_i &= \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \log \{x/P\} \\
\end{align*}
\]

[10]

where \( \alpha, \beta \) and \( \gamma \) are the parameters to be estimated, \( x \) is the total expenditure on the food group and \( P \) is a price index defined as:

\[
\begin{align*}
    \log P &= \alpha_0 + \sum_{j=1}^{n} \alpha_j \log p_j + \frac{1}{2} \sum_{i=1}^{n} \sum_{j=1}^{n} \gamma_{ij} \log p_i \log p_j \\
\end{align*}
\]

[11]

Some empirical studies use the Stone Price Index to avoid problems of non-linear estimations. However, we estimated the original model as suggested by Deaton and Muellbauer (1980) using the translog price index described in [11].

3 As an alternative to [11], Cooper and McLaren (1992) suggest a modification of AIDS called MAIDS, which preserves regularity in a wider region of the expenditure-price space. Nevertheless, the most usual form in the literature is AIDS or its linear approximation, LAIDS.
Furthermore, the parameters are homogeneous of degree zero in prices and total expenditure taken together. This means that if prices and total expenditure increase by the same amount the demand remains unchanged:

\[
\sum_{j=1}^{n} y_{ji} = 0
\]  

[13]

Moreover, the total expenditure must verify the Slutsky symmetry, which requires that the compensated cross-price derivative of commodity \( i \) with respect to commodity \( j \) equals the compensated cross-price derivative of commodity \( j \) with respect to commodity \( i \):

\[
y_{ij} = y_{ji}
\]  

[14]

The \( \beta \) and \( \gamma \) parameters can be interpreted in economic terms. The \( y_{ij} \) elements quantify the effect of changes in relative prices, representing the % of change on the \( i_{th} \) budget share produced by a 1% increase in the price of the \( j_{th} \) product, being \( (x/P) \) held constant. The effects of changes in the real expenditure operate through the \( \beta_i \) coefficients, which are positive for luxuries and negative for necessities (Deaton and Muellbauer, 1980).

The following section will discuss how to apply this procedure to the Spanish case and databases.

3. Application to the Spanish case: data limitations and first results.

As in many other countries, the application of this approach to the Spanish case entails the difficulties arising from the lack of availability of data. The only survey that contains information on household expenditure and consumption patterns is the Household Budget Survey (HBS), an extensive survey of Spanish household purchases, income and other socioeconomic characteristics with 21,790 observations. The Spanish Statistical Institute (INE) conducts this survey annually with different households each year. The estimation of the AIDS requires information on prices, quantities and household expenditure. As all the prices must be observable to estimate the model, the unitary prices at which households purchase the commodities are recovered by dividing expenditures by quantities. This procedure to obtain the unit prices is accepted in the literature and it is well known as unit values (Deaton, 1988). All these information requirements limit the applied estimation to be feasible only for the foodstuffs group, divided into ten food sub-groups in the Household Budget Survey classification: (i) Bread and cereals, (ii) Meat, (iii) Fish, (iv) Milk, cheese and eggs, (v) Oil, (vi) Fruits, (vii)
Vegetables, (viii) Sugar, (ix) Coffee, tea and cacao; and (x) Mineral water and soft drinks.

An additional issue in the estimation process, derived from the Spanish database characteristics, is the existence of censored data or households that report zero consumption. Consequently, prices are not available for all items in all households. This situation can happen when the consumed quantities are not reported by a household, or because the household do not really consume that specific group, being the consequence that the price of the item cannot be obtained by means of unit values. In both cases the price of the item is replaced by a geometric mean of the prices of this item in the same region\(^4\), distinguishing if this item is purchased by a household situated in a capital city or not. In the first case, the price is replaced by the average price of the same item in the same capital city. In the second case, the price is replaced by the average price of the item in the region where the household is located. Controlling by the effect of capital city is expected to produce more accurate estimates because prices in capital cities are assumed different than prices in the rest of the region. This is assumed because the capital city is normally the main city of the region (and the largest one in most of the cases), which results in an agglomeration process of public and private services in this type of locations.\(^5\)

Additionally, another particular characteristic in our formulation is that we incorporate a spatial factor into the model. The model to be estimated in our case is a specific version of the AIDS model where censored data and spatial factor are considered. The modeling of demand systems with household-level microdata has the advantage of providing a large and statistically rich sample avoiding the problem of aggregation over consumers. In the other hand detailed microdata may cause a problem of censored commodity purchases, especially when a very detailed classification for the commodities is used. Not accounting for the zero consumption bias the estimation of the parameters of the model and it may produce a selection bias if we do not incorporate these observations into the estimation process. Dealing with censored data is more complicated in the case of demand systems than in a case of the econometric estimation of one single equation. The complication arises from the necessity of ensuring nonnegative estimates of the quantities consumed; the requirement of including the constraints imposed by economic theory; and the numerical problem of having to evaluate

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\(^4\) This is a usual procedure to replace prices that are missing. Dong et al. (2004) and Atuesta and Paredes (2012) use the same procedure for Mexico and Colombia, respectively.

\(^5\) This procedure to determine missing prices implies assuming that the households that do not report the quantities consumed or households with censored data are facing the average commodity prices.
high-dimension cumulative density functions during the estimation (Dong et al., 2004).

To address these problems we will follow the two-step method proposed by Shonkwiler and Yen (1999), which improves the previous “favorite” two-step estimation procedure of Heien and Wessells (1990). In the first step we estimate a PROBIT regression with a dependent binary variable that represents the household decision of consuming or not, which takes the value of 1 if the household purchases the commodity and the value of 0 if not, which depends on a set of socioeconomic variables that are used as regressors. The PROBIT model determines the probability that a given household consumes a given good and it is used to estimate the cumulative distribution function ($Φ$) and the normal density function ($ϕ$). The second step includes the cumulative function $Φ(x)$ as a scalar in the equations for shares, while the density function $ϕ(x)$ is included as an extra explanatory variable:

$$w_i = \Phi(x) \left[ \alpha_i + \sum_{j=1}^{n} \gamma_{ij} \log p_j + \beta_i \log(x/P) \right] + \sum_k c_k R_k + \delta \phi(x) \tag{15}$$

where $R_k$ are dummy variables for the 17 Spanish regions, called Autonomous Communities (NUTS II regions in European nomenclature), that represent unobservable heterogeneity across spatial units and idiosyncratic components; $c_k$ is a parameter associated to the regional dummy $R_k$; and $\delta$ is an extra parameter associated with the density function.

The set of $n–1$ equations like [15] conform the demand system, where $n$ is the number of shares, being the last share recovered as a residual of the remaining $n–1$ ones. Once this demand system is estimated, the parameters are used to recover the expenditure function of a representative household for each spatial unit and the SCOL index defined in [1] is calculated.

The estimates of the PROBIT model for the first step of the Shonkwiler and Yen (1999) methodology are not shown here, we have PROBIT estimates for each year of the study since 2006 to 2011. A binary variable which represents the decision of consumption of each one of the ten food groups at the sample is regressed as a function of the socioeconomic variables, demographic variables represented as region dummies, that is one dummy for each of the region; and one dummy that takes the value 1 if the household is living in a capital city and 0 otherwise.

The estimation results show that all the socio-economic variables are significant at the 1% level. There is evidence that there are significant different purchase patterns across NUTS-II regions, given that all the regional dummies, with the exception of only a few, are significant at the 1% level for all the commodities. The estimates also show that the effect of being located in a capital city is a negative factor in the decision of consumption of all commodities, since in all the
commodity regressions the coefficient of the capital city dummy is negative and
significant at the 1% level. The results of the PROBIT models will be used to
calculate the cumulative (Φ) and the density (ϕ) functions, which are included as
regressors in the second step in the estimation of the AIDS.

As in the first step, in the estimation of the second step we have one demand
system estimation for each year, 2006 to 2011. The parameters of the AIDS model
are recovered by applying Nonlinear Seemingly Unrelated Regression (NLSUR),
which estimates a system of nonlinear equations by Feasible Generalized
Nonlinear Least Squares (FGNLS). The parameters estimates are neither shown
here\(^6\), but most of the estimates are significant at the 1% level. These estimates are
required in order to recover the utility level and the expenditure equation
described in [2] as a function on prices and income. More specifically, the
household in the median of the expenditure distribution in each region is taken as
representative household, being the prices in [2] set to median prices on each
region. Once the value for this expenditure function is calculated, it is used to
calculate the SCOL index defined in equation [1]. Note that this formulation
requires having a common utility level \(u\) in order to make regional comparisons at
constant utility. In our case the utility level of the median household in the region
of Madrid in year 2011 is taken as reference for the computation of the index,
which means that Madrid 2011 is the benchmark for our analysis. The results of
this SCOL index are shown in Table 1.

\[\text{\texttt{>> Insert Here Table 1 \texttt{<<<}}\]

This Table 1 shows the results obtained for our constructed Cost of Living Index
for the 17 regions and for the period 2006-2011. These data reflect the spatial and
the temporal dimension, so they permit comparisons across the space in different
time moments simultaneously. More exactly, shows the COL in Euros of attaining
the utility level of Madrid in year 2011. These quantities show the total annual
expenditure that the median household of each region needs to acquire the utility
level of reference, Madrid in 2011. Note, that we emphasize in the issue of the
utility level because the approach is very different to the fixed basket approach
that reflect the cost of attaining a fix basket of goods in different places or in
different moments of time. So, Table 1 does not represent the cost of attaining the
basket of goods of Madrid 2011, but the utility level.

\[^6\text{All the estimates are available on request to authors.}\]
4. Results discussion.

4.1. An overview.

This data represented in Table 1, previous section, is the first evidence that there exist relevant differences in price levels across the regions in Spain. The same results are presented in Table 2 but in the form of an index. We have divided all the expenditure functions of all the Spanish regions by the expenditure function of the region of Madrid (that contains the capital and the largest city of the country) in year 2011, for this reason Madrid 2011 takes the value 1.

>>> INSERT HERE TABLE 2 <<<

We can see the evolution of the cost of living during the entire period that shows that all regions had a downward evolution of prices in year 2006 that turned in a sharp increase since in 2007 to 2009 when prices return to decrease. The region most expensive is Basque Country in 2009 a 34% higher than the cheapest region (Castile La Mancha 2007). This means that a consumer in the Basque Country paid a 37% more than a consumer in Castile La Mancha for attaining the same utility level.

Most of the regions have lower prices than Madrid 2011. The exceptions are Catalonia, Basque Country and Navarra. These three regions have maintained this tendency in prices since 2006, except Catalonia in 2006 and 2007 and Navarra in 2007, when the cost of living was less than the cost of living of Madrid in 2011. Additionally, in the period 2008-2009 we can observe that a few more cases were high price regions, showing a cost of living higher than Madrid in 2011. These regions are Canary Islands, Valencia and Murcia, all of them are important tourist regions.

In the works of Alberola & Marqués (2001) and Garrido et al. (2012) we find similar conclusions for the Spanish case. The former arrived to these conclusions with their constructed series of regional CPIs finding that regional price divergences at a regional level are evident and persistent. Their study uses quarterly data of the INE from 1961 to 1998 and like us they find Zamora in Castile La Mancha the lowest inflation region and Vizcaya in the Basque Country the highest one. Garrido et al. (2012) proposed a Cost of Living Index that incorporates the cost of acquiring or living in owned housing. Their data proceed from the Ministry of Housing from 1995 to 2007 and they note that the regional differences have grown over time.
4.2. Different behaviors between the richest and poorest regions.

In Figure 1 we represent the CPI samples from 2006 to 2011 in some of the 17 Spanish regions. This is a representation of time series of price of the poorest and the richest regions but it is not a representation of price levels. Our alternative constructed data is necessary to assess whether at a given point of time the prices are higher or lower in one region respect to another one.

We can observe that the overall trends are the same across regions. There is no gap between the poorest (Andalusia, Castile La Mancha and Extremadura) and the richest (Catalonia, Navarra and Basque Country) throughout the sample period. This result is not in the line neither with the literature about regional prices in Spain, nor with the regional economics. Alberola & Marqués (2001) and Garrido et al. (2012) evidence substantial and permanent differences in prices among Spanish regions. The same is observed in Figure 2:

In Figure 2 we show the evolution of our constructed cost of living for the same three richest regions and the same three poorest regions for the period 2006-2011 derived for the data of the Table 1. By contrast with the Figure 1 and according to the regional economics, with the data represented in Figure 2, we appreciate considerable differences in the cost of living among Spanish regions, more precisely, between the poorest (with the discontinuous line) and the richest regions (solid line). We can appreciate this heterogeneity in the way of an existing high-price area formed by Navarra, Catalonia and Basque Country and a low-price area formed by Andalusia, Castile La Mancha and Extremadura.

One could think that an important reason behind the strike differences between two indexes could be that the CPI data represents the entire consumption basket with all kind of goods and services, in contrast with our Cost of Living Index which represents only the food group. In Figure 3 we can contrast this issue. Again, the food CPI data show the same results as the whole CPI represented in Figure 1, that is, no price differences among regions. After that, the Cost of Living data represented in Figure 2 could be considered a better and more realistic indicator of the economic situation both for the whole country and at a regional level.

The Figure 3 shows up an important proposal of the regional economics, which is that the high income regions support higher prices than lower income regions (Kosfeld et al., 2007). Suedekum (2006) in his paper also indicates a strong correlation between Cost of Living Index and nominal earnings indicators such as income and wage. As we could see in Figure 1 these proposals cannot be inferred from the CPI official data.
Another important issue to be treated in the paper is the evolution of both indexes over the time. We see this represented in Figure 4 the Cost of Living Index growth rate derived from the data reported in Table 2.

>>> INSERT HERE FIGURE 4 <<<

While the CPI presents similar increases in prices in all Spanish regions around 12-15% in 2011 respect to the year 2006, our COL index shows both increments and decrements in prices very far from the magnitudes recover by the CPI ranging from an 8.04% increase in Catalonia to a decrease of 9.82% in Balearic Islands. The maximum gap in the CPI in 2011 among regions is 5.19% while with our COL the gap is almost 18%. In average, the divergence between the most inflationary and the less inflationary regions over the whole period is around 15-19% with our COL.

Also, derived from the comparison between Figures 1 and 4 is the contrast in the evolution of prices in the period studied. Respect this issue the Balassa-Samuelson model postulates a positive correlation between economic performance and increases in prices. This implies that higher growth should be associated with higher inflation (Alberola & Marqués, 2001). If we observe, again, the Figure 4 we can see that, effectively, the worst years of the actual economic crisis, 2010 and 2011, present a downward trend in the cost of living, contrary to the evidence found in the CPI data represented in Figure 1 which evidence a sharp increase in prices in this period.

4.3. The COL index for different income groups.

It makes sense to use the Cost of Living Index as a general inflation measure for deciding on basic political issues, as the Spatial Cost of Living Index is more appropriate for regional policies we would need to construct a separate Cost of Living Index for different groups of people if governments would like to reach the more effectiveness of social policies targeted to groups of vulnerable and disadvantaged people (Ward et al., 2011).

As Deaton (1998) argue for constructing a separate measure by income groups, there is no guarantee that changes in prices faced by households across the income distribution were similar and the index should have the sufficiently flexibility to allow inflation to vary across the income groups. Also, Kuznets (1996), among others, has documented the tendency for the price food to rise relative to the price of other goods as income grows. This clearly disfavors the poor households. Loughrey (2012) and Slesnick (2002) argue that movements in consumer prices combined with the heterogeneous consumption baskets of different households means that the cost of living due to price changes can differ considerably between households.

For all these arguments we have estimate a Cost of Living for the 1st decile and 9th decile of the distribution. Table 3 and Table 4 show these estimations. Table 3
show the estimated Cost of Living Index of attaining the utility level of reference, that is, as always, Madrid in 2011, for the households of the 1st decile of the distribution by regions and for the period 2006 to 2011; and Table 4 shows the same estimates but for the 9th decile of the distribution. The differences between the highest and the lowest cost of living each year is significantly bigger for households of the 1st decile than for the 9th decile ones. This difference ranges from 36% to more than 50% for the former, and between 23% and 30% for the 9th decile, depending on the observed year. For example, for the 1st decile households in 2011, Castile La Mancha had the lowest cost of living with a value of 873.4 Euros, while the poorest households in Navarra had a 50.7% higher cost of living in the same year with a value of 1,315.5 Euros. There were not, however, so large differences in the costs of living of the richest households; the gap between the highest cost of living in Euros in 2011, reached in Basque Country, and the lowest cost of living in Euros in 2011, reached in Castile La Mancha, was 30.21%.

In the case of the 1st decile of the distribution Castile La Mancha and Navarra maintained their positions (the lowest and the highest cost of living, respectively) since 2008, but the gap between them growth continuously since then, more than a 10% and being the increment between 2010 and 2011, when the economic crisis was stronger, of 3%. Is very interesting make the same analysis for the 9th decile of the distribution. In this case, the cheapest (Castile La Mancha) and the most expensive (Basque Country) regions have maintained their positions since 2007 with a continuously growth of the gap between them until 2010. But between 2010 and 2011, this growth turned to a decrease in the cost of living of almost a 4% in the hard period of the economic crisis. Important evidence derived from this data is that richest households have been beneficiated from the consequences and from the price policies derived from the economic crisis. While poorest households not only they are not in the same standard of living after the economic crisis, but they are considerably worst. This is the evidence that price influence inequality in a very important way, and inflation is often referred to as the “cruelest tax” because of its disproportionate reduction in the welfare of the poor (Slesnick, 2002). The same result has been found in Somerville (2004) for Ireland where there is a negative correlation between income rank and the index growth. In contrast, Irvine and McCarthy (1978) found in Ireland the growth of the cost of living positively related with the income but only 0.14% per annum and for a very remote period: 1968-1974.

We illustrate these results in Figure 5 and Figure 6. In both figures we can see the evolution of the Cost of Living Index respect year 2006 for the 1st deciles households, with the discontinuous line, and for the 9th deciles households, with the solid line. Figure 5 represents the richest regions for both decile 1st and decile 9th. The evolution of the Cost of Living Index from 2006 to 2010 is almost identical in all regions and for both deciles, but in 2010 the differences between the two deciles are illustrated. We clearly see the rise in the cost of living in the three
regions for households of the 1º decile, and, contrary, we see the downward cost of living for the richest households. The most striking fall in the cost of living took place in Navarra for the richest households which in 2011 they had a cost of living 3.78% below the cost of living of 2006.

**>>> INSERT HERE FIGURE 5 AND 6 <<<**

In Figure 6 the evolution of the COL for the poorest regions is represented. There are more heterogeneous evolution between the regions and, also, between the two deciles of the distribution inside them. The most remarkable in this Figure 6 is the enormous gap between the 1st and the 9th deciles in Castile La Mancha where since year 2006 the Cost of Living Index has been falling in the poorest households while the opposite has been occur in the same magnitude for richest households. Also, in this Figure 6 we can observe the decline in the cost of living for the 9th decile households in the three regions, although we cannot see as clear as in figure 5 the rise in the cost of living for the poorest households. From then, it clearly seen that poor households in the richest regions are more damaged than poor households in the poorest regions, and, in addition, these households supported in 2011 a Cost of Living which was above the Cost of Living of the richest households.

5. **Summary and conclusions.**

In this article, we have estimated a demand system of Spanish households to measure the Cost of Living of these households across the Spanish regions and along the period 2006-2011. Followin the Konus’ (1939) idea it is postulated that comparing two periods of time or two regions in the space, a household which faces two different price levels tries to adjust its commodity basket in order to maintain a constant utility level with the minimum expenditure cost. Since the Spanish CPI provides a poor approximation of the Cost of Living, our proposed index is a better estimate because is consistent with the microeconomic theory and it maintains the utility level constant instead of the basket of goods as the CPI does. Moreover, the CPI only permits comparisons along time taken a base year as reference, but with our COLI we can compare across the space and along the time simultaneously. For calculating the COLI with the Spanish Household Budget Survey we apply the AIDS approach of Deaton and Muellbauer (1980) and we apply the two-step methodology of Shonkwiler and Yen (1999) to address the problems derived of having censored data in the survey.

The results obtained shows striking differences in prices levels across regions in all the period of study contrary to the evidence obtained with the CPI series which do not reflect any regional price differences. The COLI shows different behaviors among regions according to the regional economics, we can see a gap between the richest regions and the poorest ones, clearly distinguishing a high price area formed by the regions with the highest COL and a low price area formed by the
regions with the lowest COL. This result is in line with an important proposal of the regional economics: the high income regions support higher prices than the lower income regions and the strong correlation between nominal indicators such as wages and income and the COLI. Respect to the time dimension, we can observe that our COLI evolves in a similar way than the economic cycle. While the CPI presents a smooth increase of price every year, our COLI evolves according with the economic performance, presenting a strong decrease in prices in the worst years of the economic crisis that is 2010-2011.

Another interesting point of the COLI is the possibility of estimate it for different income groups. We find a disproportionately impact of prices across the income range implying important policy issues relating with welfare. We find that the poorest households are considerable worst in terms of standard of living in the economic crash in 2010 than the richest ones. We can observe that in 2010 the first decile household have experimented an increase in their cost of living, contrary to the highest income decile which has a decrease in their cost of living.

This paper show how differences in price levels across regions exist and matter for economic outcomes and should be taken into account in every welfare policy. Although our COLI is not without shortcomings, we consider that it contributes to a better understanding of the cost of living and we hope that provides help in further research results.
6. References.


Table 1. Cost of Living in Euros of the utility level of Madrid-2011 for Spanish Regions (2006-2011).

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<thead>
<tr>
<th>Region</th>
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<th>2008</th>
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### Table 2. Cost of Living Index with the utility level of Madrid-2011 for Spanish Regions (2006-2011).

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Figure 1. Consumer Price Index by regions for 2006-2011.
Figure 2. Cost of Living in Euros by regions for 2006-2011.
Figure 3. Food CPI growth rate for 2007-2011, Base 2006.
Figure 4. Cost of Living Index growth rate for 2007-2011, Base 2006.
Table 3. Cost of Living Index of the utility level Madrid-2011 by regions and for the 1st decile (2006-2011).

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Table 4. Cost of Living Index of the utility level Madrid-2011 by regions and for the 9th decile (2006-2011).

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Figure 5. Evolution of the Cost of Living Index between 1st and 9th deciles of the richest regions for 2006-2011, Base 2006.
Figure 6. Evolution of the Cost of Living Index between 1st and 9th deciles of the poorest regions for 2006-2011. Base 2006.