

Estimating local basic standard of living Impact on overall poverty and inequality measures

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Abstract

The aim of the present paper is to use subjective data on local needs to assess the local basic standard of living and to exploit the results in order to precise inequality measures and to get more accurate measure of the distribution of poverty throughout a heterogeneous territory. The European SILC-EU survey on households living provides location of households, their actual income and their answer to the question of the necessary income to make ends meet. A fixed point method crossing these two income definitions allows to estimate the local basic standard of living. It appears that overall inequality measures are not affected but that ordering of households in terms of standard of living is strongly impacted. Globally, the correction increases the mean standard of living in rural and small and small urban units (except in Parisian region and Mediterranean coast) and increases it in large urban units. These results raise the issue of local adaptation of assistance policies: if PPP of euros differ across the territory, the values of thresholds to be eligible to mean-tested redistribution policies vary locally in real terms.

Keywords: Within country PPP; Poverty measure; regional inequality.

JEL: I32; I31; R23

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1 Introduction

The present paper aims at developing an empirical method in order to assess the issue of purchasing power parity (PPP) within a country. The comparison of purchasing power across different communities has challenged economic theory since long time. Early authors have pointed out the relative characteristics of necessities, such did Smith (1776):

“By necessities I understand not only the commodities which are indispensably necessary for the support of life, but what ever the custom of the country renders it indecent for creditable people, even the lowest order, to be without.”

Marx (1867) has similar view when he defines the subsistence wage:

“His [the labourer] natural wants, such as food, clothing, fuel, and housing, vary according to the climatic and other physical conditions of his country. On the other hand, the number and extent of his so-called necessary wants, as also the modes of satisfying them, are themselves the product of historical development, and depend therefore to a great extent on the degree of civilisation of a country, more particularly on the conditions under which, and consequently on the habits and degree of comfort in which, the class of free labourers has been formed.”

Furthermore, Sen (1983) included the issue of poverty thresholds - and hence necessities definitions - within the concept of capabilities. The necessities are linked to the capabilities and not the direct consumption level itself, while capability differences may stand at an individual level but also at an inter-community level. Sen gives the example of car owning in a community affecting the public transport provision, and hence the necessity of cars. Such example fits our purpose as local necessities are strongly determined by local public goods.

Nevertheless, purely relative measures also presents weaknesses, as shown by the historical example of the Dutch Hunger winter of 1944-1945 where, famine hurt such a share of the population that relative poverty thresholds would have been very and so would have been relative poverty measures (Stein et al. (1975)). A large literature has been developed to build measures of poverty or discuss their weaknesses (see for example Ravallion (2016)'s discussion over achievement and challenges remaining).

Such issues may also arise when comparing different territory of the same country. More than local cultural needs, the geographic, urban and local public goods disparities create differences in needs. Hence, it is not possible to compare purchasing power with just comparing the price of the same basket across the country. The aim of the present paper is to use subjective data on local needs to assess the local basic standard of living and to exploit the results in order to precise inequality measures and to get more accurate measure of the distribution of poverty throughout a heterogeneous territory.

To do so, I use the European SILC-EU survey on households living conditions. It provides precise income and tax payment data for a sample of households, assorted with their region of inhabitation and the size of the urban unit they live in. Data on family composition is also included, in addition to the size of housing and the income subjectively considered as necessary to purchase necessities.

When comparing actual standard of living and declared basic standard of living - redressed from subjective answer to the question about the minimum income to make ends meet - it appears that for each territory, the relation between the two standard of living (considered on a logarithmic scale) is very linear, with a 0.6 slope. This means that households living at the same place with an actual standard of living 10% greater declare a basic standard of living 6% greater. This phenomenon comes from households being accustomed

to their actual standard of living. Households more affluent than the basic level consider some superfluous expenditure as necessary, hence overestimating the basic standard of living. Conversely, households poorer than the basic standard of living consider some necessary expenditure they cannot afford as superfluous, hence underestimating the basic standard of living.

Following this interpretation of the pattern of the relationship between actual standard of living and declared basic standard of living, it results that the true basic level is when both meet. Consequently, the aim of the present paper is to develop an econometric method for estimating this fixed point, interpreted as the local basic standard of living. Following, this method is applied on the French data in order to measure how it changes the way poverty and inequality are measured, particularly from a territorial point of view

The rest of this article is composed as follows. Second section presents the SILC-EU survey and descriptive statistics are detailed. Third section present the empirical strategy used to estimate the local basic standard of living. Fourth section assesses these local basic standards of living for France and analyses the consequences in terms of poverty and inequality measurement, then more precisely assesses the territorial inequalities in terms of standard of living.

2 Geographic economic disparities

2.1 Database on household living condition

In order to assess the geographic economic disparities and their impact on local cost of life, an individual database is exploited: the SILC-EU survey. It consists in a European panel on living conditions conducted in each European country by the national statistical agency (INSEE for France) under the Eurostat supervision and harmonization. Bases from 2008 to 2011 are used in the present paper to assess the local cost of life. Databases prior to 2008 are not used because income data was declared by the interviewed household until 2007 although it is matched from tax bases since 2008 (both personal income tax and local taxes). Consequently, there was a substantial under-declaration of income in SILC-EU surveys until 2007, which may be observed in the data through a strong income jump between 2007 and 2008.

The French part of this survey contains more than eleven thousand observations per year and a rich variety of variables. They include both quantitative figures of income, taxes, expenditure for housing, etc. and qualitative characteristics of living conditions of households. The quantitative variables are extracted from tax bases (although some are declared as for example the overall debt amount or the size of housing) and the qualitative variables are declared and reflect the way households felt their own living conditions.

Furthermore, the base includes geographical data concerning the location of the surveyed household's dwelling. France is thus divided into eight major regions². In addition, the size of the urban unit inhabited is specified. The definition of urban units is determined by INSEE according to continuity of construction: are attached to the same urban unit all houses distant from each other by less than two hundred meters³. The units of less than 2,000 inhabitants are reported as rural. In the following of the study, large and small urban units are separated according to the 100,000 inhabitants' threshold (the computations run with threshold at

²These are the eight NUTS1 regions: major socio-economic regions; which are a grouping of administrative regions (corresponding to the NUTS2 regions). Before the 2016 reform, there were 22 continental regions. The NUTS1 regions are Parisian region (*Ile de France*), Parisian periphery (*Picardie, Champagne-Ardennes, Bourgogne, Centre, Haute-Normandie, Basse-Normandie*), North (*Nord-Pas de Calais*), East (*Alsace, Lorraine, Franche-Comté*), West (*Bretagne, Pays de Loire, Poitou-Charente*), South-West (*Limousin, Aquitaine, Midi-Pyrénées*), Center-East (*Auvergne, Rhône-Alpes*) and Mediterranean coast (*Provence-Alpes-Cote d'Azur, Languedoc-Roussillon, Corse*).

³<http://www.insee.fr/en/methodes/default.asp?page=definitions/unite-urbaine.htm>

150,000 or 200,000 inhabitants give the same qualitative results). In addition, sensitive urban zones - which are administratively defined in order to benefit from a particular regime of urban policy⁴ - are separated from other territories for following computations.

Concerning income and tax payment, different proxies of disposable income may be calculated. A variable called *disposable income* is directly given, which is latter on called *taxable income* because it is reconstituted by INSEE from tax data even if some part are actually exempted from taxation. It consists in all income declared to tax administration, including capital gains and social benefits, minus direct taxes (including social contributions and local taxes but excluding consumption taxes).

From this variable, I calculate *disposable income including housing* which consists in adding to this taxable income the in-kind income from housing owning. For the French part of the SILC survey, the imputed rent is calculated from hedonic regressions on an external source: the housing survey⁵. Living in its own housing may also generate costs, such as interests for loans contracted to achieve the permanent residence purchase. Therefore, I deduct these costs from the imputed rent. However, the rest of the mortgage repayment is not deducted as it generates an actual increase of the household's net wealth. The basic idea is that the disposable income of a household is the sum of consumption and the change of its net wealth: thus, consumption of its own housing is a kind property income, to which should be subtracted the financial costs, but financial costs only. For the same reason, the rental value of housing for households housed for free is added to their disposable income including housing.

From this disposable income including housing, it is possible to calculate the standard of living of the household by dividing it by the number of consumption units⁶. This allows to compare mean standards of living across the French territory (figure 1).

2.2 Overview of geographic economic disparities

From a comparative perspective between regions, the Parisian region appears clearly as the most affluent; to a lesser extent, northern region springs as poorest. Among the remaining six regions, regional differences are negligible compared to differences between the categories of territorial units.

Sensitive urban zones appear strongly below the others: the highest on the chart presenting a lower mean standard of living than the lower of all other territorial units. This is not informative in itself as sensitive urban zones are administratively defined to delimit frail territories. This confirms that the administrative division of sensitive urban zones actually corresponds to territories suffering from major socio-economic difficulties, which is also confirmed by all other statistics such as smaller housing sizes, greater feeling of tightness within housing, lower share of couple, more unemployment, more inactive people and more social welfare beneficiaries (figures 10 to 12 in appendix A).

Apart in Parisian, Center and Northern regions, average standard of living is lower in small urban units than in large ones. The gap seems to grow gradually as moving towards the south (no gap in the North, Center and Parisian region, small gaps in East and West regions and large gaps in Center-East, South-West and Mediterranean regions).

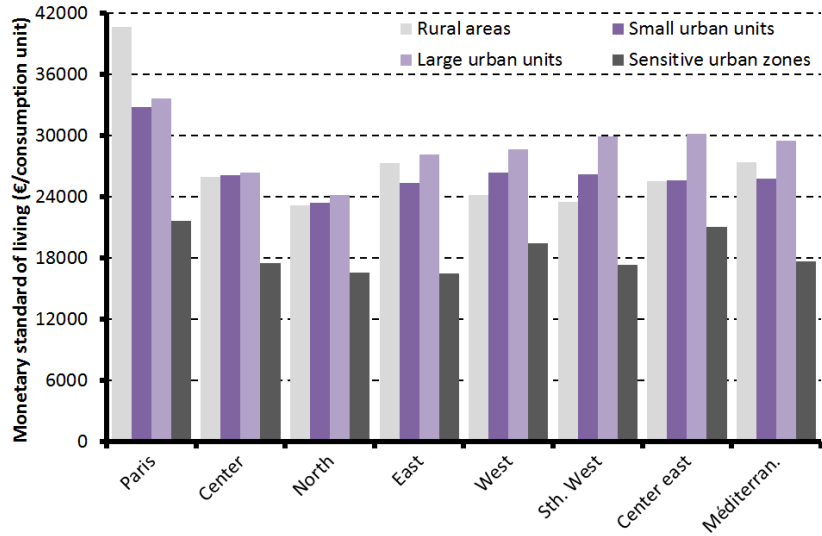
Concerning rural areas, the results are contrasted between the different regions. The inhabitants of rural areas of Parisian region are among the most affluent in France while rural households of western France (the

⁴<http://www.insee.fr/en/methodes/default.asp?page=definitions/zone-urbaine-sensible.htm>

⁵<http://www.insee.fr/en/methodes/default.asp?page=definitions/enquete-logement.htm>

⁶Because using Data collected by French national statistics institute (INSEE), it is appropriate to use their equivalent scale (<http://www.insee.fr/en/methodes/default.asp?page=definitions/unite-consommation.htm>) which is the same as the OECD-modified equivalent scale recommended for use by Eurostat.

Figure 1: Regional income disparities

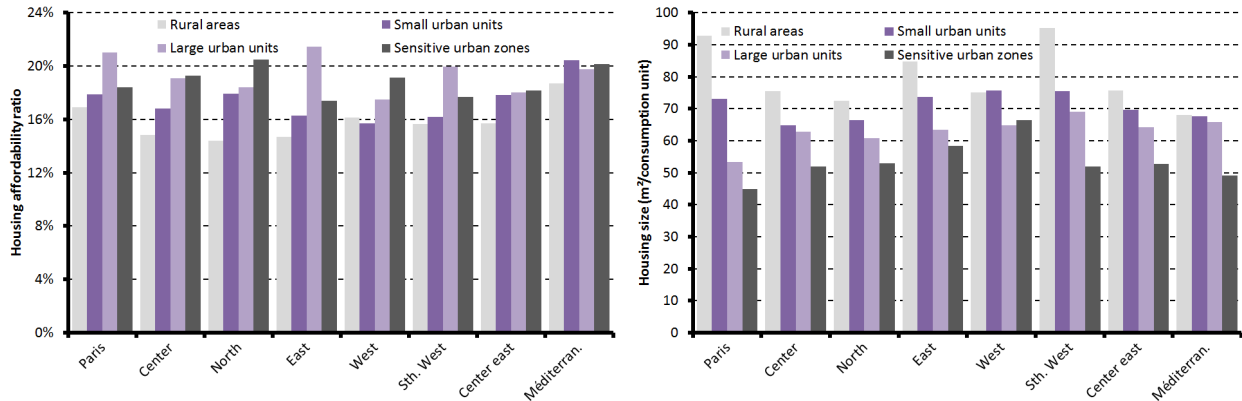


Notes: The regions are the eight French continental NUTS 1. Rural area consists in a built continuity lower 2000 inhabitants; the separation between small and large urban units is considered at the 100,000 inhabitants threshold.
Source: SILC 2011.

West and South-West regions) are on average poorer than urban inhabitants of these regions. Elsewhere, no significant difference appears between mean standard of living of rural areas and small urban units.

Besides, the disposable income is also used to calculate the rates of effort for different expenses, which are the ratio of the payment over this disposable income. In particular are calculated the housing affordability ratio.

Figure 2: Disparities in housing access



Notes: The regions are the eight French continental NUTS 1. Rural area consists in a built continuity lower 2000 inhabitants; the separation between small and large urban units is considered at the 100,000 inhabitants threshold.
Source: SILC 2011.

The housing affordability ratio depends on the income of households, the level of rents and the habits of housing consumption (figure 2). The Mediterranean region, and in a lesser extent the Parisian and Center-East regions present a relative homogeneity of rate of effort between different sizes of urban units. In the Mediterranean region, it corresponds also to homogeneity of mean size of housing with the exception of

sensitive urban zones (and there is also homogeneity of mean standard of living). In other regions, clear differences appear between small units (rural territories and small urban units) and larger ones (large urban units and sensitive urban areas).

The rural areas are populated by households with standard of living weakly inferior to those of other households, but they benefit from substantially lower price for their housing. Consequently, they live in far larger houses and bear a far lower housing affordability ratio. In addition, a lower share of households declares feeling tight in their house (figure 10 in appendix A). At the opposite, Mediterranean feeling of tightness is larger in rural areas than in urban units. This comes probably from a high price of land in the Mediterranean countryside due to large demand from wealthy households (for both yearly living and tourism).

Inhabitants of small urban units live in relatively large housing and very rarely complain about feeling tight in their houses. Although mean sizes are very close from one region to another, the housing affordability ratios differ mainly because of housing price differences. Only Parisian small urban units are populated of more affluent people, but this is compensated by more expensive price of land. Conversely, the very expensive housing in the Mediterranean region is not compensated by more affluent inhabitants, who should pay a larger share of their income for their housing. At the opposite, the relatively affluent inhabitants of the East, West and South-West regions benefit from a lower cost of housing and have therefore of low housing affordability ratio.

Households of large urban units and sensitive urban zones pay a large share of their income for their housing despite their living in relatively small dwellings. This is due to very low income in sensitive urban zones and to very expensive housing in large urban units.

A strong emphasis has been made upon housing costs, because it represents a large share of households' budget and shows large disparities between localities. Scarcity of land and the cost of housing and corporate property impact directly impact the budget of inhabitants through housing prices and indirectly through prices of goods and services necessitating a local input.

However, other differences matters for explaining local costs of life. Pricing to market - at infra-national level - in case of imperfect competition may also generate differences in cost of life. According to monopolistic competition with endogenous elasticity of substitution⁷ the elasticity of substitution between varieties depends on consumption level and consequently depends on income. Under the most credible assumption - love for varieties increases with respect to consumption level - the elasticity of substitution decreases with income and prices are larger in richer areas.

These disparities in the cost of life come from price differences. Furthermore, the needed basket may differ from one region to another. It may be due to local social habits (Sen (1983)) but also to specific needs due to geography or to differences in public input.

3 Empirical strategy for estimating the local cost of life

Usual method for evaluating local cost of life consists in comparing the price of a given bundle between regions. However, the bundle of needs varies from one region to another, and even more between a center city and the periphery. Local public goods may be substitutes of private goods' consumption. If so, they decrease the level of income necessary to reach the minimum standard of living. One example is public transportation, allowing

⁷See Zhelobodko et al. (2012) for the development on Dixit and Stiglitz (1977) monopolistic competition model through the love for variety concept.

to save private car costs. Conversely, specific expenditure may be necessary depending on the geography. One example is the climate, with different heating costs between regions.

The method developed in the present paper estimated local basic standard of living using individual subjective data. The SILC-EU survey contains an item about the minimum monthly income the household needs in order to “make ends meet”. Obviously this item is biased. First of all, it should be corrected from income not considered by the household: particularly the imputed rent (net of mortgaged interests) if any. Furthermore, the declared amount is for the whole households and should be divided per the number of consumption units to obtain the “*declared basic standard of living*”.

Second and most importantly, such subjective declaration is biased: the answer is influenced by the actual standard of living of the declaring household through the consumption habits. This is linked to the Easterlin (1974) paradox, whose interpretations highlight income evaluation relative to others (social comparison) or to oneself in the past (habituation) (see Clark et al. (2008) for a review). The comparison to oneself has been defended by several author included Easterlin (2001), it is defined as “*a reduction in the affective intensity of favorable and unfavorable circumstances*” by Frederick and Loewenstein (1999) and is largely documented in the psychology literature (Kimball and Willis (2006)).

The application to the case of subjective declaration of “*necessary income to make ends meet*” is the following: households underestimate their distance to the basic income, which means that they overestimate the basic income if their are above and underestimate it if their are under. Household richer than the basic standard of living consider some of their actual “luxury” consumption as “necessary” because they are used to it. Similarly, households poorer than the basic standard of living are used to live without some necessary consumptions and do not count them as necessary.

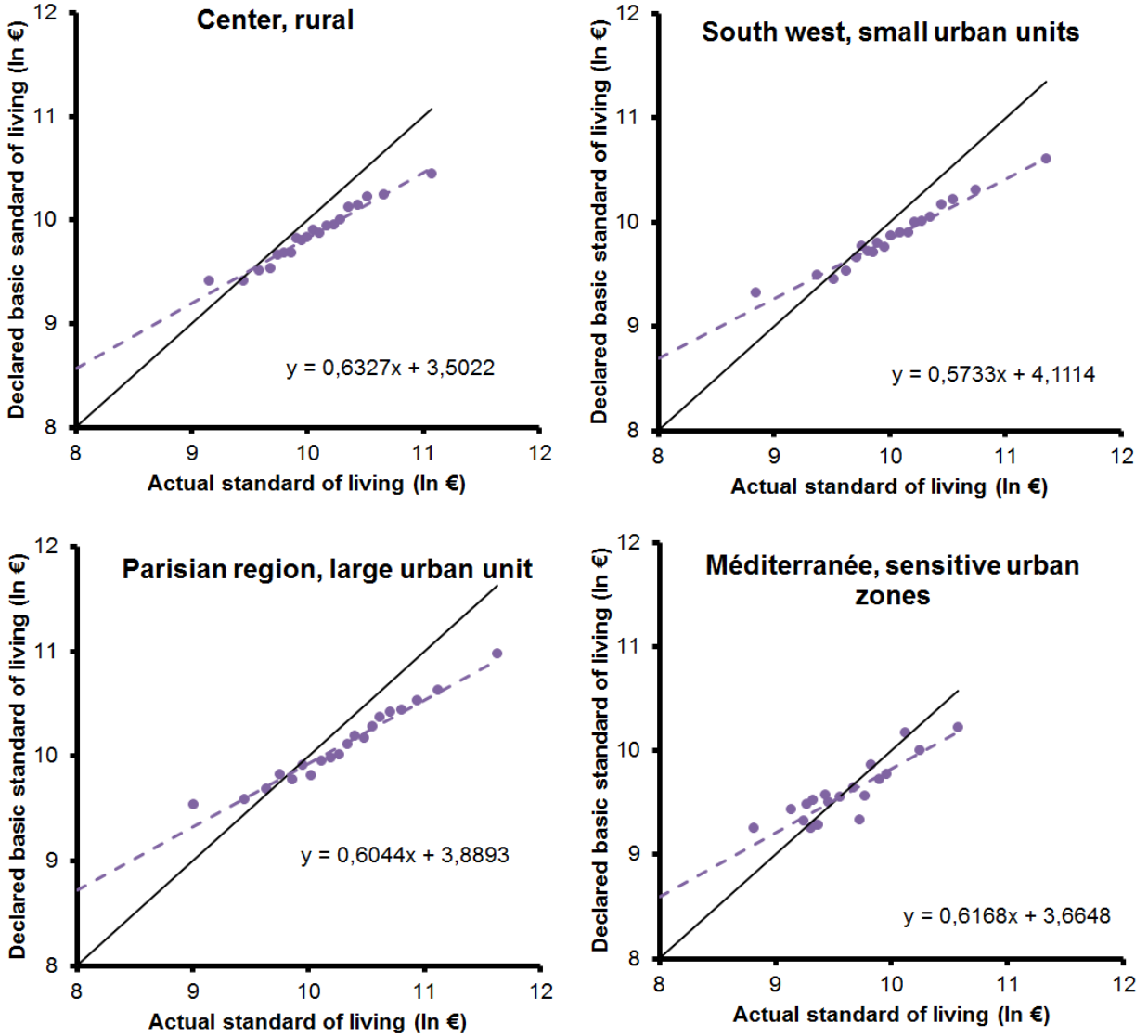
Such assumption is confirmed when plotting the mean declared basic standard of living over the quantiles of actual standard of living (figure 3 present a sample of regions and type of urban units, the whole set is presented in figure 13 to 20 in appendix B). Declared basic standards of living seem attracted by the actual standard of living (close to the first bisectrix in graphs). Nevertheless, the slope of the declared needed income (in relation to actual income) is much lower than one. It is very similar for each region and size of urban unit, around 60%. It means that getting 10% more affluent induces a household to declare a basic standard of living 6% higher.

This regularity of the slope leads to develop a strategy to estimate the “true” local necessary income to make ends meet, similar to the strategy adopted by Bishop et al. (2014) for estimating different equivalence scales in the different EU countries. Indeed, as households richer than the threshold overestimate and households poorer than the threshold underestimate the “true” threshold of necessary income to make ends meet, the true threshold should lie at the level of income where the declared necessary income cross the actual income. It is possible to estimate it as the fix point from the regression line of the declared necessary income on the actual income. To get rid of the household size heterogeneity, the evaluation is implemented by running the regression of the standard of living calculated thanks to the OECD-modified equivalent scale recommended for use by European and French statistical agencies (Eurostat and INSEE). The regression is therefore

$$\ln(DSL_{hrs}) = \alpha + \beta \ln(ASL_{hrs}) + \sum_{rs} \gamma_{rs} * \mathbf{1}_r * \mathbf{1}_s + \epsilon_{hrs} \quad (1)$$

where DSL_{hrs} is the declared basic standard of living (corrected for imputed rents) of household h living in a urban unit of size s in the region r and ASL_{hrs} is its actual standard of living. Hence, the “true” basic standard of living BSL_{rs} in urban unit of size s in region r may be calculated as

Figure 3: Impact on actual standard of living on declared basic standard of living



Notes: Mean of declared necessary standard of living for making ends meet (redressed for imputed rents net of mortgaged loans' interests) per quantiles (20 bins) of actual standard of living (from tax return, including imputed rents net of mortgaged loans interests).

Source: SILC 2011.

$$BSL_{rs} = \exp\left(\frac{\alpha + \gamma_{rs}}{1 - \beta}\right). \quad (2)$$

For estimating the standard errors of the estimates, it is possible to derive the Taylor series of the function giving the basic standard of living from the regression parameters (from equation 1 with $BSL_{rs} = f(\theta_{rs})$) between the estimated point $\hat{\theta}_{rs} = (\hat{\alpha}, \hat{\beta}, \hat{\gamma}_{rs})$ and the "true" parameter $\theta_{rs} = (\alpha, \beta, \gamma_{rs})$. It gives

$$f(\hat{\theta}_{rs}) \approx f(\theta_{rs}) + f'(\theta_{rs})^T(\hat{\theta}_{rs} - \theta_{rs}) \quad (3)$$

and therefore the variance of the estimated basic standard of living is:

$$\begin{aligned}
\mathbb{V}[f(\hat{\theta}_{rs})] &\approx \mathbb{V}[f'(\theta_{rs})^T \hat{\theta}_{rs}] \\
&\approx \left[\frac{f(\theta_{rs})}{1-\beta} \right]^2 \mathbb{V} \left[\hat{\alpha} + \frac{\alpha+\gamma_{rs}}{1-\beta} \hat{\beta} + \hat{\gamma}_{rs} \right] \\
&\approx \left[\frac{f(\theta_{rs})}{1-\beta} \right]^2 \left[\sigma_{\alpha}^2 + \left(\frac{\alpha+\gamma_{rs}}{1-\beta} \right)^2 \sigma_{\beta}^2 + \sigma_{\gamma}^2 + 2 \frac{\alpha+\gamma_{rs}}{1-\beta} (\sigma_{\alpha\beta} + \sigma_{\beta\gamma}) + 2\sigma_{\alpha\gamma} \right]
\end{aligned} \tag{4}$$

For the computation of this formula, the parameters σ_{α}^2 , σ_{β}^2 , σ_{γ}^2 , $\sigma_{\alpha\beta}$, $\sigma_{\alpha\gamma}$, and $\sigma_{\beta\gamma}$ are approximated at their estimated value in the variance-covariance matrix of the regression.

In addition, different kinds of pooling may be implemented. It is possible to run one different regression for each locality (and hence there is no γ parameter but α_{rs} and β_{rs} are estimated separately in each locality); or to run a unique regression for all localities with a complete set of γ_{rs} parameters. It consists in forcing a unique slope β equal in all localities. Conversely, separate regressions allow different slope of bias in different regions, but by decreasing the number of observations in each regression, it increases the standard errors of the estimates. Intermediates are also possible, such as running one regression per region with only the size dependent γ_s parameters or conversely one regression per size of urban unit with only the region dependent γ_r parameters. The different specifications give results very closed the one from the others because the values of the β_{rs} parameters are very closed the one from the other: around 60%.

4 Results

4.1 Local cost of life and localized purchasing power

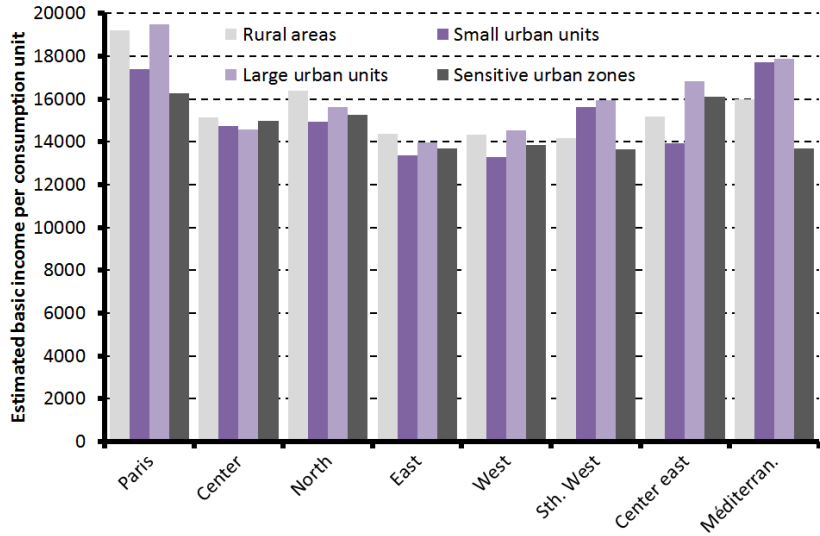
The results of the different specifications are presented in tables 1 to 4 in appendix C (depending on the pooling of regions and urban unit's sizes) and the corresponding necessary standard of living and standard errors are presented in figure 21 in the same appendix. The results of the four different specifications are very close the one to the others and their mean is presented in figure 4.

The Parisian region appears the most expensive region with a large gap with the other regions. In a lesser extent, cost of life is also greater in Mediterranean region than in the other regions. In addition, it should be noticed that - apart for the Parisian region - the differences in the estimated cost of life are not correlated with the mean nominal standard of living of the regions. This rules out the possibility that the results are due to a simple Easterlin effect. Particularly, the Northern region - which is the poorest in France - presents a relatively high cost of life, although the lowest costs of life are found in East and West regions - which are composed of relatively affluent households.

With the center region as exception - where differences between units are negligible - life in large urban units is more expensive than in small urban units. Rural areas are also relatively expensive, more expensive than small urban units except in the very south of France (the Mediterranean and South-West regions). Except for this south of France, the small urban units are the place where the basic standard of living is the lower.

Figure 5 presents the mean nominal standard of living of the different units by size in the different regions, and compares it with the standard of living corrected from the local cost of life. This correction consists in considering the standard of living as a proportion of the basic standard of living necessary to make ends meet. To keep monetary values, Paris is taken as reference for the cost of life: The actual standard of living in each place is divided by the basic standard of living in the same place then multiplied by the basic standard of living of Paris. The corrected standard of living correspond to the standard of living evaluating in Parisian euros PPP (PEPPP).

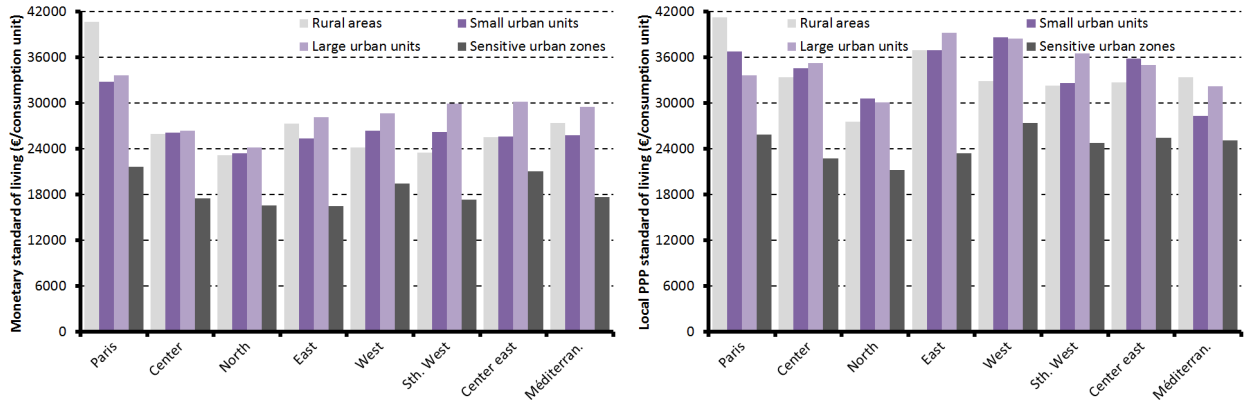
Figure 4: Regional and urban disparities in income necessary to make ends meet



Notes: “Nominal standard of living”, standard of living - ratio of income over the number of consumption units of the household - based on tax data on all declared income net of all direct taxes (social contribution, personal income tax, housing tax and property tax) ; “Excluding housing”, previous standard of living with the addition of imputed rent (net of mortgaged loans’ interest) for owners of their housing ; “textitLocalized standard of living”, previous standard of living with income adjusted for local cost of life.

Source: SILC 2011.

Figure 5: Standard of living per size and region, nominal versus corrected for cost of life



Source: SILC 2011

The PEPPP standard of living keeps very low in sensitive urban zones, as the cost of life does not compensate low nominal standard of living. At the opposite, the small urban units appear to host the most affluent households on average when correcting for cost of life. From a regional perspective, Parisian region keeps among the most affluent, but with no gap anymore with others, and even outweighed by East and West regions, where cost of life is very low although income is not.

The region appearing the poorest when taking cost of life into account is the North, with a substantial gap compared to all other regions but the Mediterranean. North is the poorest in monetary terms, and life

is quite expensive. The Mediterranean region has a globally medium income but is very expensive (mainly due to housing prices because of a large demand).

4.2 Impact of local cost of income distribution, inequality and poverty measures

4.2.1 Measure and geographic distribution of poverty

Official poverty threshold is set in the EU at 60% of national median standard of living. The poverty rate calculated in our sample with this definition (let us call it “*relative nominal*” definition) is slightly lower than the official poverty rate for the same year 2011 calculated by the statistical agency (14.0 instead of 14.3). This is mainly due to the fact that we consider imputed rent of owners in their income. It is shown below that, mainly in rural areas - some very poor households own their housing, which may change the poverty statistics if taking housing property into account.

There is several ways to take local differences in costs of life into account when calculating the poverty rate. A first method (let us call it “*relative PPP*” definition) is to keep the threshold of 60% of median standard of living, with considering PEPPP standards of living instead of nominal ones. This increase a little the measured rate of poverty (14.4%, that is 0.4 points higher). Despite the small change in overall measure, the difference is substantial from an individual perspective: 2.3 points relative nominal non poor households are relative PPP poor households and conversely 1.9 points of relative nominal poor households are relative PPP non poor households.

Another way of measuring PEPPP poverty (let us call it “*absolute PPP*” definition) is to compare directly actual standard of living of households with the local basic standard of living, poor household being those with income lower that basic needs. With that measure, the poverty rate is 6.6 points higher than with the relative nominal definition. As only 0.1 point of relative nominal poor households are absolute PPP non poor households, this definition is an extension of the official one. Other way of saying it is that all officially poor households are actually below the locally estimated basic standard of living but that 50% more households are under locally estimated basic standard of living.

A last definition (let us call it “*corrected PPP*” definition) may be derived from the previous one, in order to match the global figure of poverty rates. Such a definition should not be used to measure poverty importance throughout the territory (it is by construction the same as the official poverty rate) but to understand the bias in the official measure of poverty localization. In order to get the exact same poverty rate, the poverty threshold should be set at 87.46% of the locally measured basic standard of living. It appears that 2.15% of relative nominal poor households are corrected PPP non poor households, and vice versa. This poor measurement bias du to cost of life differences corresponds to 15.4% of poor households. Figure 6 shows how these differences of poverty measures are distributed across the territory.

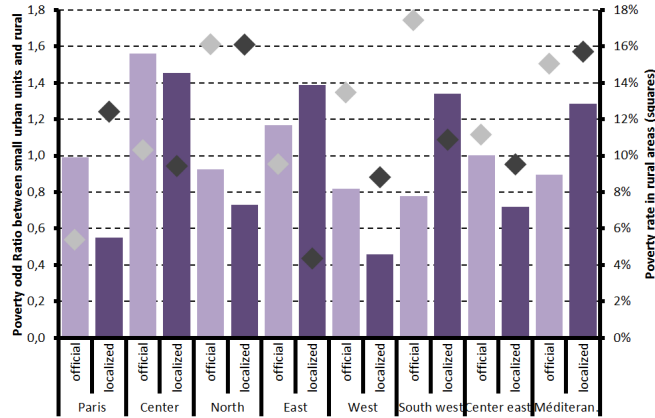
Parisian region appears very differently from all others. It is the only region where the poverty rate increase in rural areas when considering corrected PPP measure (starting from the lowest poverty rate level). The poverty rate is also low in small urban units, but it increase strongly in the unique large urban unit (Paris agglomeration), leading to very high poverty odd ratios, even increasing when considering corrected PPP measures. Conversely, the poverty odd ratio of SUZ versus non SUZ decreases strongly (from very high levels) in parisian region despite an increase of the poverty rate in SUZ.

This last combination is only found in Méditerranéan region. This region is also unique in France due to its very high level of poverty rate in rural areas (not decreasing with corrected PPP measure), with small urban units’ poverty rate lower with relative nominal definition but higher for corrected PPP definition.

Figure 6: Comparison of poverty measures



Poverty rate in non ZUS areas and odd ratio ZUS versus non ZUS



Poverty rate in rural areas and odd small urban units versus rural areas



Poverty rate in small urban units and odd ratio large versus small urban units

Notes: Official poverty corresponds to the share of households with standard of living lower than 60% of the national median nominal standard of living (relative nominal definition). Localized standard of living corresponds to the share of households with standard of living lower than 87,46% of the locally estimated basic standard of living (corrected PPP definition, 87,46% is chosen to obtain the same overall poverty rate).

Source: SILC 2011.

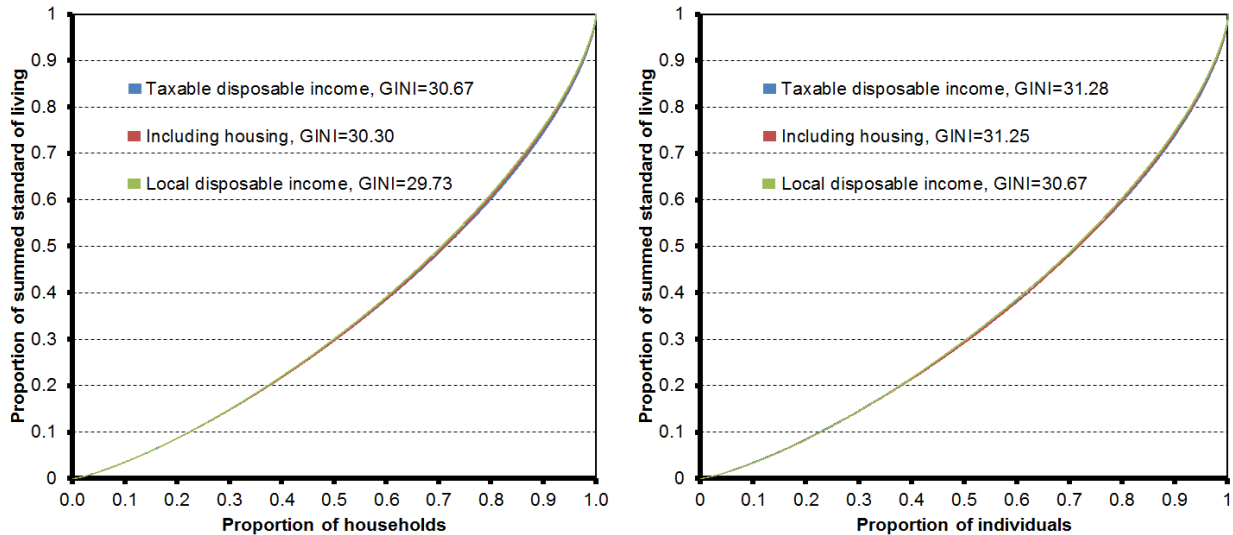
Concerning other regions, Center and North are very similar, with high poverty rates not affected by PPP correction. Poverty rate odd ratios are not either affected by PPP correction, they are close to one within non SUZ areas, with even higher poverty rates in SUZ areas.

Last, East and West region present huge poverty rate decreases when correcting for PPP, whatever in SUZ, rural areas, small or large urban units. The odd ratios between SUZ and non SUZ are high in the East and low in the West compared to other regions. One other particularity is that the poverty odd ratio between large and small units strongly increases when correcting for PPP because of strong decreases of the small urban unit poverty rates. The same pattern is found for center east, even stronger for the odd ratio because the poverty rate decrease in small urban units is accompanied to steep poverty rate increase in large urban units.

4.2.2 Overall inequality measure

Previous subsection uses the local estimation of PPP to compare poverty across regions and urbanities. The present subsection extend the use of this measure to the global inequality measure. Before looking at the global standard of living distribution within regions and urban units, a first step consists in analyzing the impact of the local cost of life correction on the global measures of income distributions. It is possible by building Lorentz curves and calculating GINI indexes according to different measures of standard of living: with or without imputed rents, with or without correction for local cost of life (figure 7).

Figure 7: Lorentz curves of income distribution depending on income measure



Notes: The individual level is calculated by attributing to each individual a ‘fictive’ income equal to the standard of living of her household. *Taxable income* corresponds to all monetary disposable income (including taxes and transfers); *Including housing* adds to this disposable income the imputed rent of owners of their housing, net of the interests of loans contracted to finance this housing; *Local disposable income* consists in the correction of the disposable income including housing by the local cost of life.

Source: SILC 2011.

The construction of Lorentz curves and GINI indexes is not straightforward when based on standard of living instead of personal income, because no global standard of living exists which would be the sum of the individual ones. To deal with that issue, a first method - not followed here - would have consisted in considering households for the x-axis classification (each household count for one) and the sum of the

disposable income (and not standard of living, which are not simply additive) for the y-axis, while the classification of households along the x-axis where done according to their standard of living. The problem with that solution is that the sum of the y-axis is not the variable according to which are sorted households in the x-axis. Therefore, a second method is preferred, which consists in creating a ‘fictive’ income equal to the standard of living attributed to each members of the household, and to generate Lorentz Curves and GINI indexes based on this ‘fictive income’ (hence considering a fictive sum of standards of living).

The differences between the distributions of the different standard of living measures are hardly discernible with the Lorentz curves. Actually, the different measures change the ordering of households along the income distribution more than it changes the anonymous inequality of standard of living. Nevertheless, the overall changes are not zero and are more discernible when looking at the GINI indexes. At both household and individual levels, the GINI indexes decrease when considering imputed rents and decrease even more when correcting for local cost of life. The change in GINI indexes due to local cost of life is greater than half a point, which is not negligible.

4.2.3 Distribution of standard of living per urban type

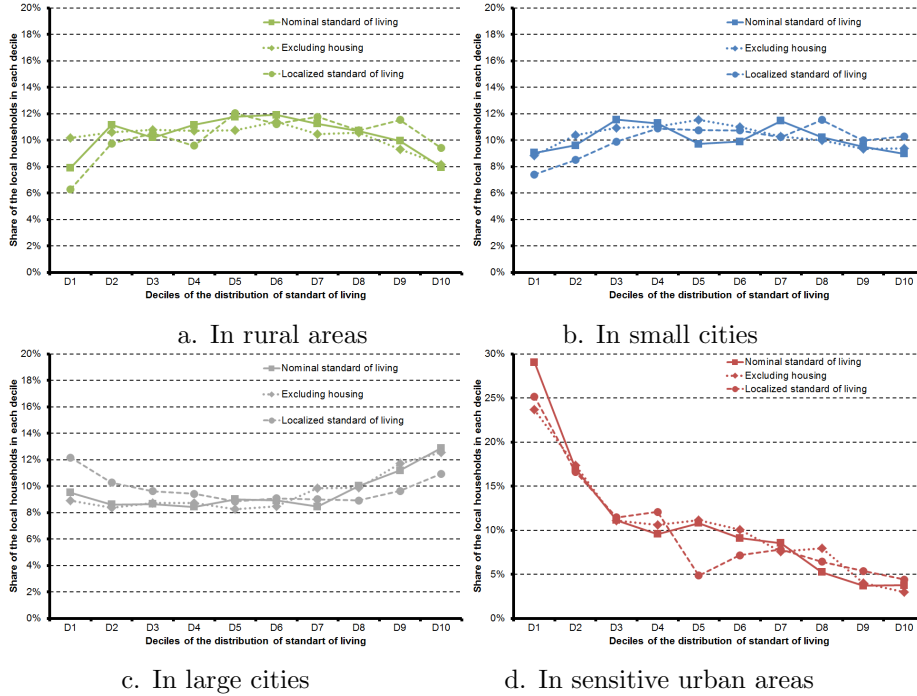
Yet, the main modification induced by PPP estimation does not concern the anonymous change in globally measured inequality but the changes of households’ ordering along the standard of living scale. I draw in each region and urban unit the distribution of the standard of living of the inhabitants, in comparison to the national distribution of standard of living. It consists in computing the proportion of households of one region or urban unit category in each decile of the national distribution of standard of living. If the standard of living distribution of the territory is the same as the national one, the proportion would be ten percents for each decile. This allows not only to see if the region is on average richer or poorer than other regions, but more precisely which part of the distribution of standard of living is over-represented (proportion greater than ten percents) or under-represented (proportion lower than ten percents) and to which extent. Figure 8 presents such distributions per kind of urban units.

It is no surprise to see that sensitive urban zones are home of poor households in a far larger proportion than the rest of the territory (between 137.0% and 190.6% more households of the first decile and between 66.0% and 73.4% more of D2) and of rich households in a far lower proportion (between 14.8% and 24.5% less households of D7, between 20.7% and 47.5% less households of D8, between 46.4% and 63.1% less households of D9 and between 56.0% and 70.0% less households of the top decile). For those households, no substantial change is due to the way of measuring standard of living: neither addition of imputed rents nor correction for local cost of life.

Rural inhabitants are distributed in a manner very close to the general distribution, except the the upper decile which is less represented when using nominal income measures (with or without imputed rents). Including imputed rents in addition to monetary income makes the bottom of the distribution also appear in lower proportion. Indeed, some very poor rural households owned their housing, which is not the case for very poor urban households. Taking local cost of life into account reinforce this under-representation at the bottom of the distribution of standard of living and cancels the under-representation at the top. From a local PPP point of view there are less very poor households in rural areas than elsewhere (37.2% less), but there are not less rich households (only 6.0% less). Nevertheless, it is not possible with the data to look more closely at the very top of the distribution and we do not know for the top centile or even richer households.

The situation of small urban units is very comparable to rural areas, with a small over-representation of the lower middle class and under-representation of both ends of the distribution of standard of living. Adding

Figure 8: Distribution of standard of living per degree of urbanization



Notes: “*Nominal standard of living*”, standard of living - ratio of income over the number of consumption units of the household - based on tax data on all declared income net of all direct taxes (social contribution, personal income tax, housing tax and property tax) ; “*Excluding housing*”, previous standard of living with the addition of imputed rent (net of mortgaged loans’ interest) for owners of their housing ; “*Localized standard of living*”, previous standard of living with income adjusted for local cost of life.

Source: SILC 2011.

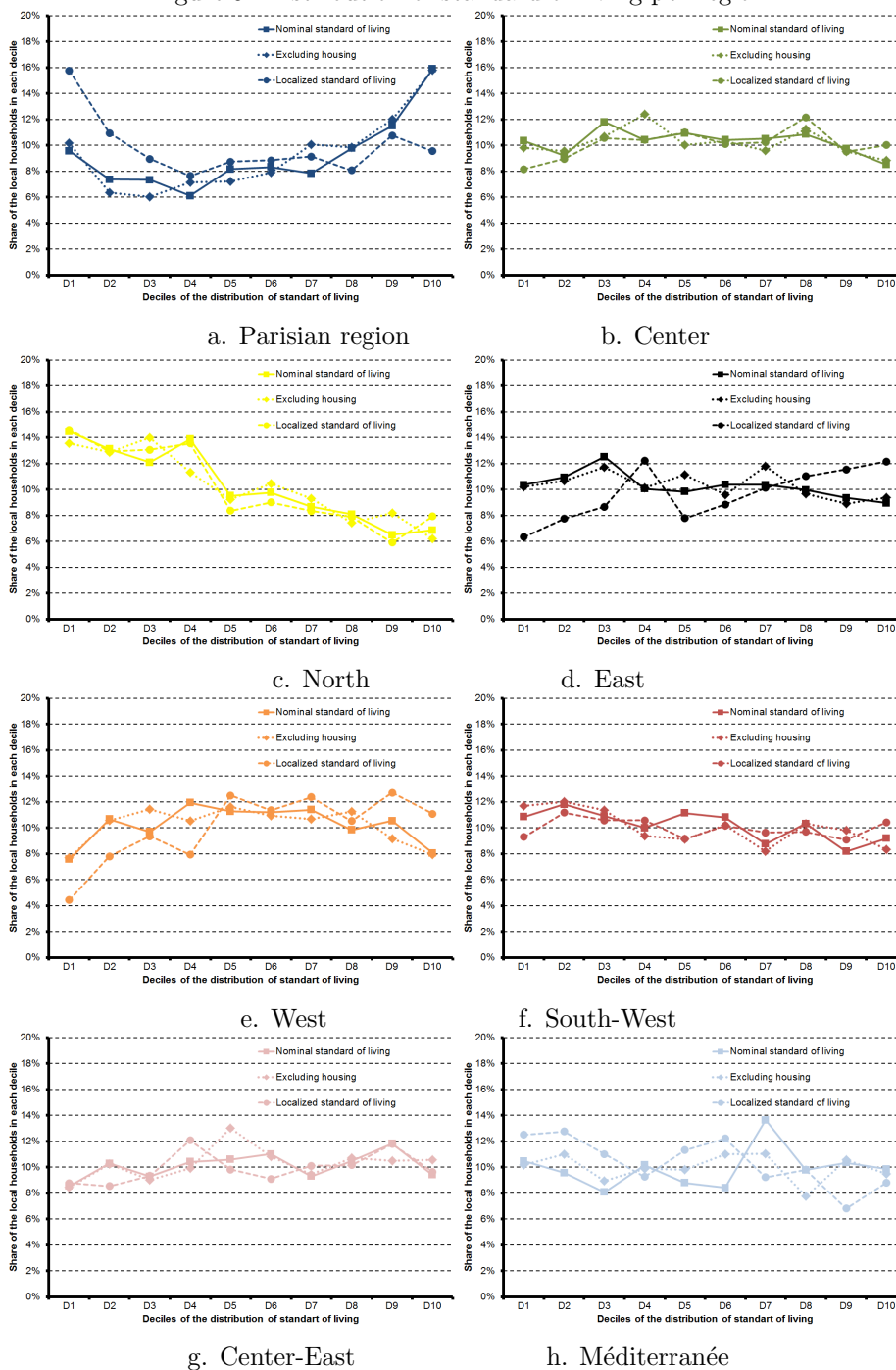
imputed rents to income measures does not change the relative distribution. At the opposite, the local cost of life has a noticeable impact: it reinforces the under-representation at the bottom (and enlarges the range of this under-representation to the second decile, 25.9% less households in D1 and 15.0% less in D2) and cancels the under-representation at the top (2.9% more households in D10).

The large urban units are home of richer households. Whether or not including imputed rents, there is a uniform light under-representation of large urban units’ households in the six bottom deciles although large urban units’ households are over-represented in the ninth and even more in the top decile (respectively 11.8% and 28.8% more households of these deciles). However, taking local cost of life into account mitigates this finding: the middle class keep slightly under-representated but the over-representation at the top is strongly diminished: it is cancelled for D9 and diminished to 9.2% more households for D10. Moreover, a clear over-representation appears at the bottom, 21.5% more households. This makes apparent the much higher inequalities in large urban units.

4.2.4 Distribution of standard of living per region

Similar results may be derived for differences between regions (figure 9). The results are globally the same as those presented in figure 5: the East and West regions appear better off and the Parisian and Mediterranean regions worse off when correcting for the cost of life. The South-West, center and Center-East regions have

Figure 9: Distribution of standard of living per region



Notes: “*Nominal standard of living*”, standard of living - ratio of income over the number of consumption units of the household - based on tax data on all declared income net of all direct taxes (social contribution, personal income tax, housing tax and property tax) ; “*Excluding housing*”, previous standard of living with the addition of imputed rent (net of mortgaged loans’ interest) for owners of their housing ; “*Localized standard of living*”, previous standard of living with income adjusted for local cost of life.

Source: SILC 2011.

a distribution of standard of living similar to the general distribution, whatever the measure of standard of living.

The greater economic difficulties of the North region are clearly apparent: there are from 44.6% to 20.9% more households of bottom four deciles of the general distribution of standard of living, and from 13.3% to 35.0% less households of top four deciles. Local cost of life does not change the picture. Despite it is a deindustrialized and frail region, the North lies in the very center of Europe and cost of life is probably impacted upward by this location.

At the opposite, the cases of the East and West regions are similar. Looking at nominal disposable income (including or not imputed rents), they appear to be middle-class regions, with a small over-representation of deciles second to eighth and an under-representation of the two top deciles (the West region presents also an under-representation of the bottom decile). Though, from a purchasing power standpoint, these are two affluent regions: the two bottom deciles of the global distribution become substantially under-represented (between 55.7% and 22.0% less households than in national distribution) and the two top deciles substantially over-represented (between 10.8% and 26.9% more households) when correcting for the cost life.

The distribution of nominal standard of living in the Mediterranean region is the same as at the national level, but the expensive life actually increases the proportion of households at the bottom (respectively +25.0% and +27.5% for D1 and D2) and decreases their proportion at the top (respectively -32.0% and -11.9% for D9 and D10) when considering their purchasing power.

Concerning the Parisian region, the great inequalities already appear for nominal income as there is the same proportion of very poor household and a far larger proportion of very rich households than in the rest of France (and a lower proportion of middle class). The very expensive life makes the picture reverse when looking at the distribution of standard of living corrected for local cost of life: the middle class remains under-represented but the over-representation of very rich households decreases substantially (from +58.9% to -4.7% for the top decile) and a larger proportion of very poor households than at the national level appears (from -4.4% to +57.6% for the bottom decile).

5 Conclusion

The present paper developed an empirical method in order to assess purchasing power parity (PPP) within a country. It is shown that PPP of Euro varies substantially across French territory. When reconsidering overall inequality measures correcting for intra-country PPP, it appears that the anonymous distribution of standard of living are not changed: displacement of Lorentz curves are hardly visible and GINI index decrease of only half a point.

However, the ordering of households in terms of standard of living is strongly impacted. When correcting for PPP while keeping constant the national poverty rate, there is substantial variation of local poverty rates. Globally, it decreases in rural areas (except in Parisian region) and small urban units and increases in large urban units. It decreases also in some regions (East and West) while increasing in others (Paris and Mediterranean coast).

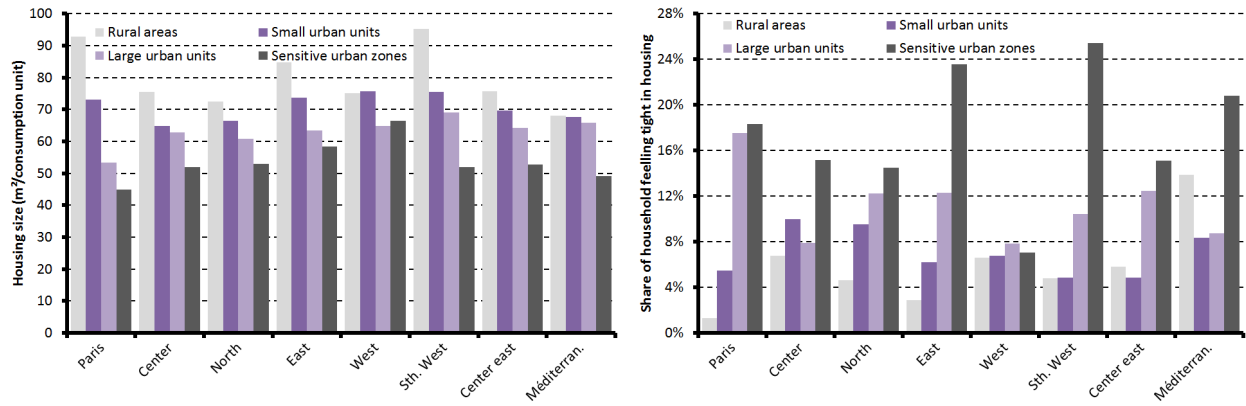
Such results highlight the strong heterogeneity of regions within countries and argue in favor of local adaptation of assistance policies. If PPP of euros differ across the territories, the values of thresholds to be eligible to mean-tested redistribution policies vary locally in real terms.

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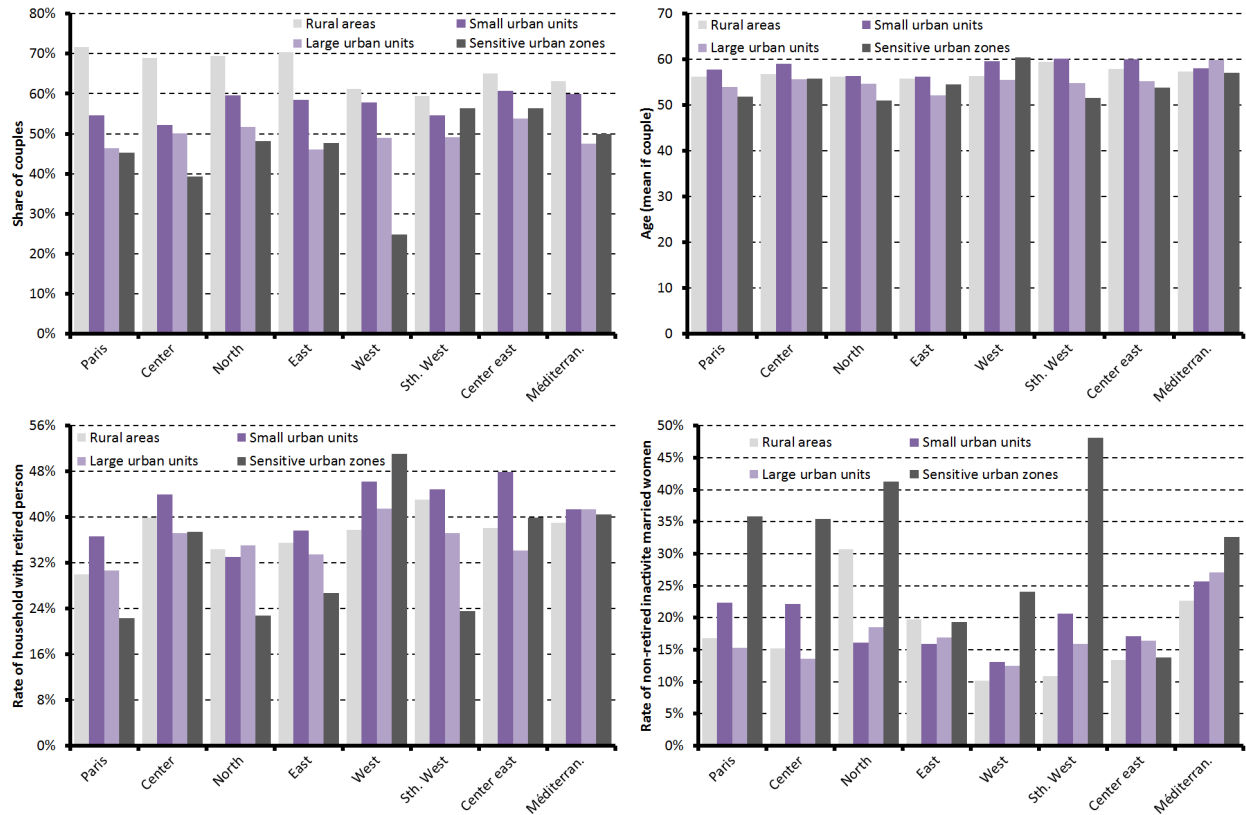
A Complementary figures from SILC base

Figure 10: Consumption of housing



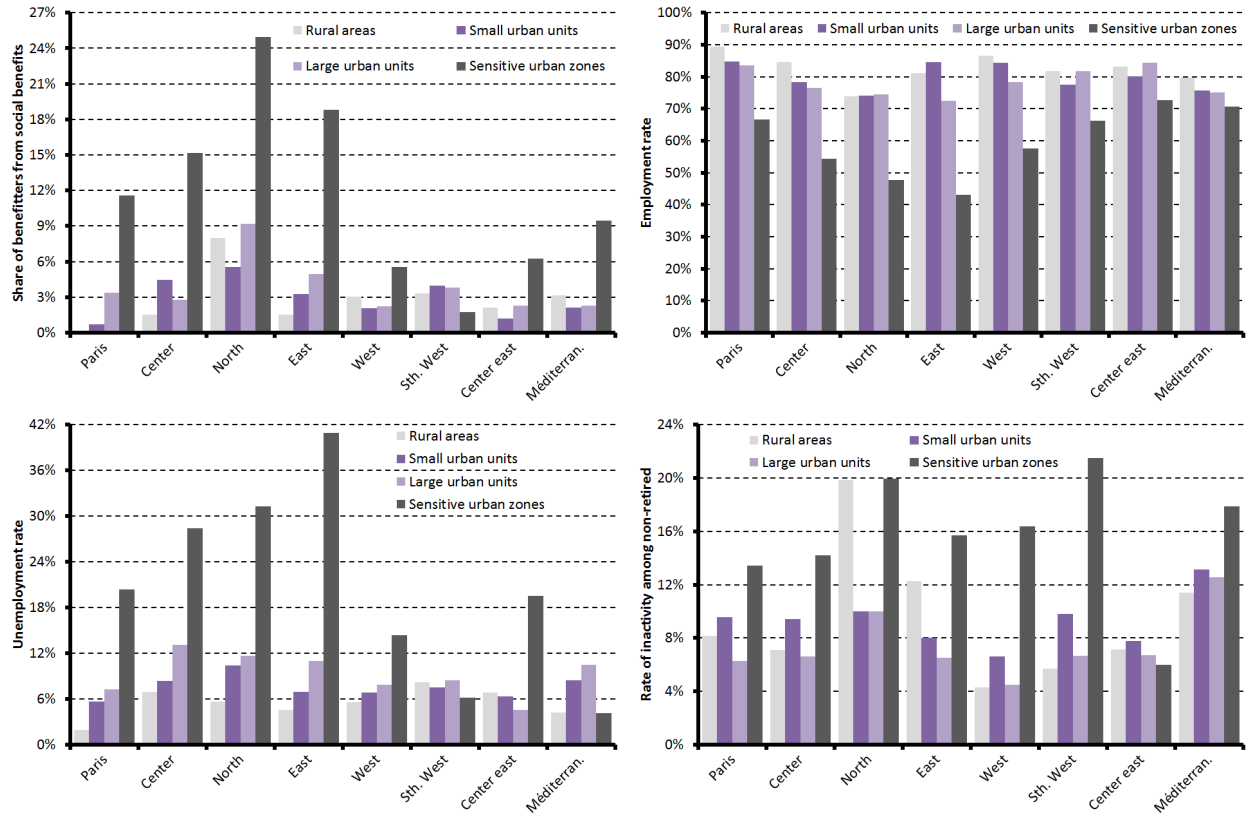
Source: SILC 2011

Figure 11: Demographics geographical statistics



Source: SILC 2011

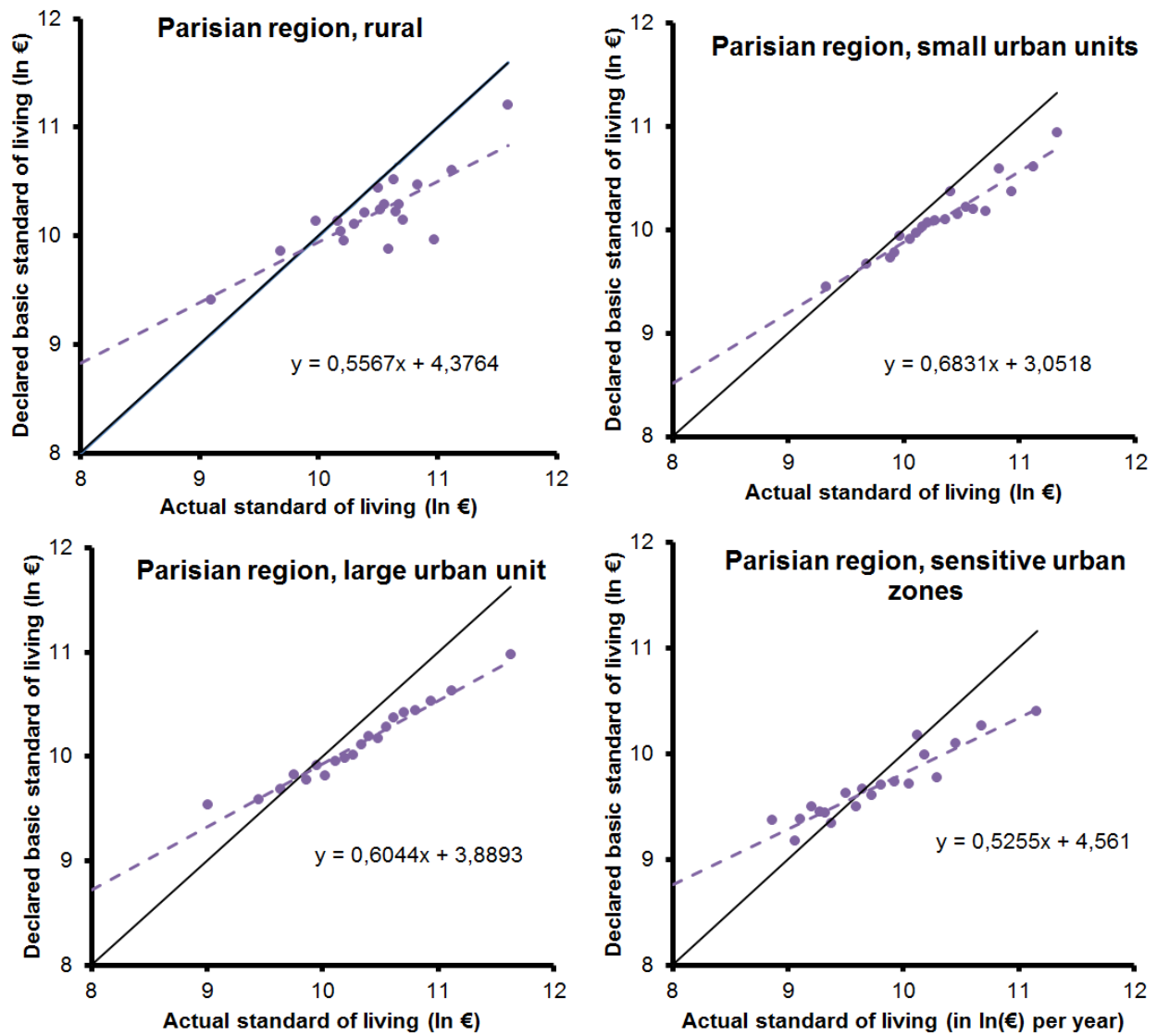
Figure 12: Socio-economic geographical statistics



Source: SILC 2011

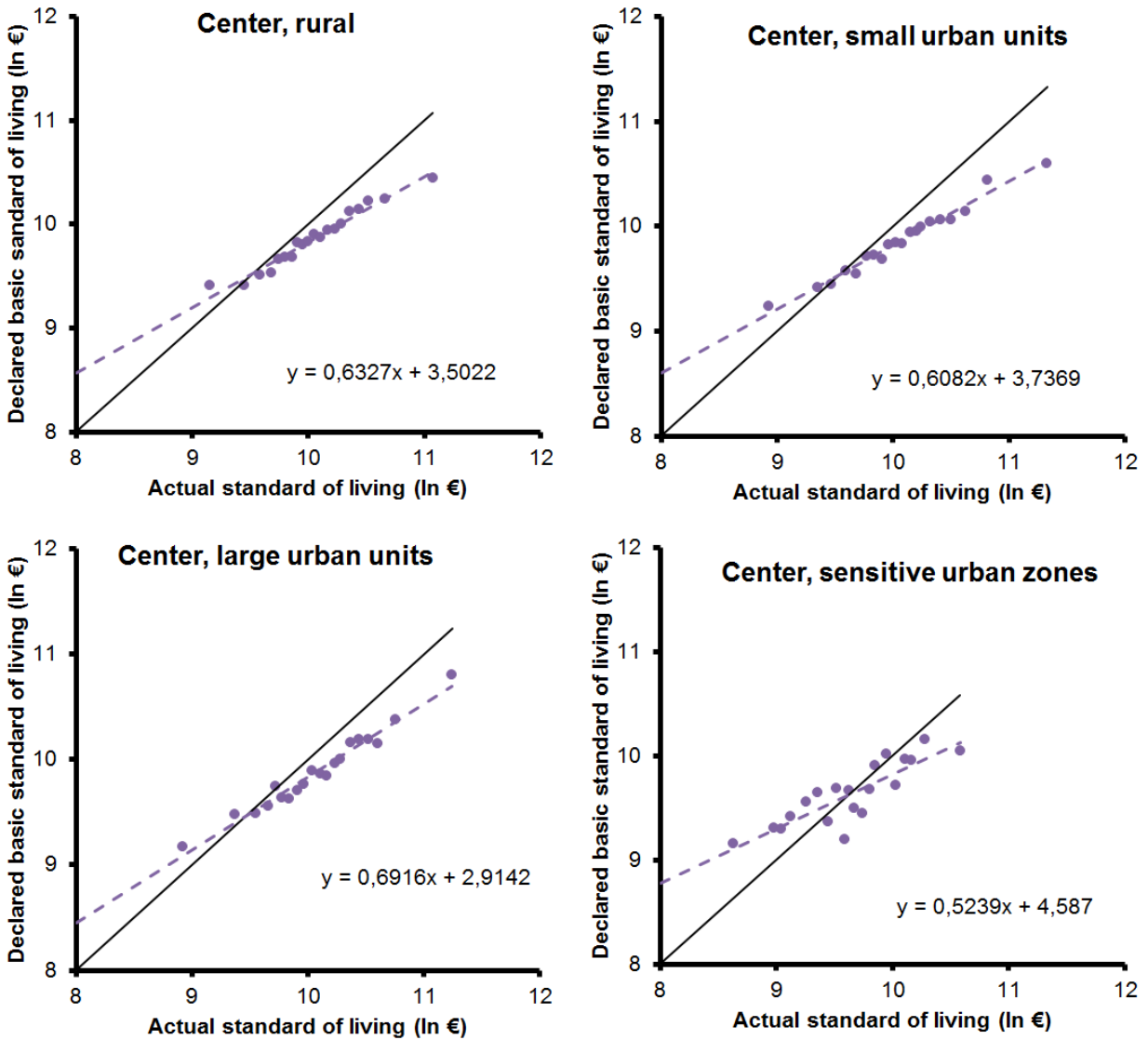
B Estimating the local cost of life

Figure 13: Impact on actual standard of living on declared basic standard of living, Parisian region



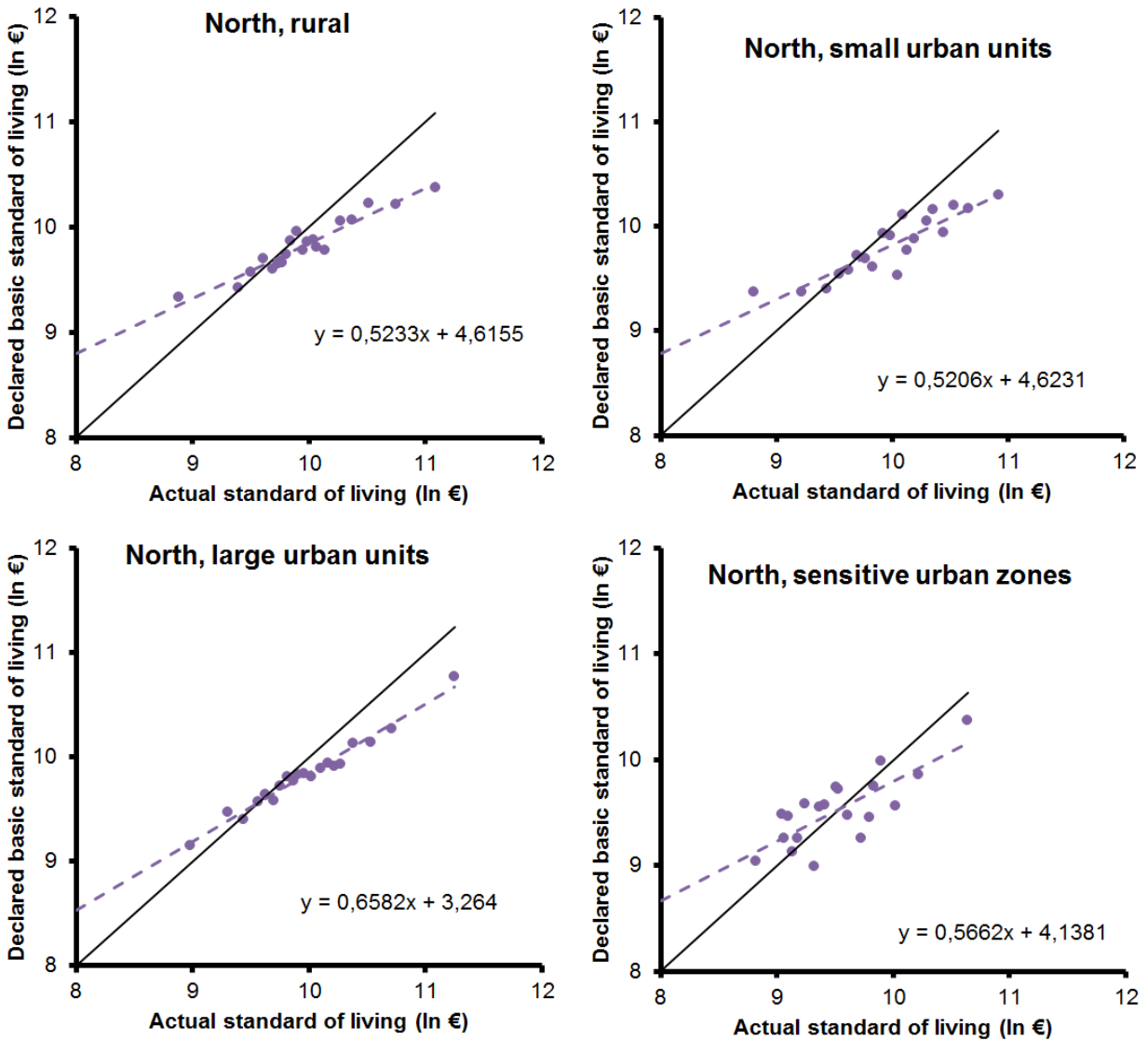
Source: SILC 2011

Figure 14: Impact on actual standard of living on declared basic standard of living, Center



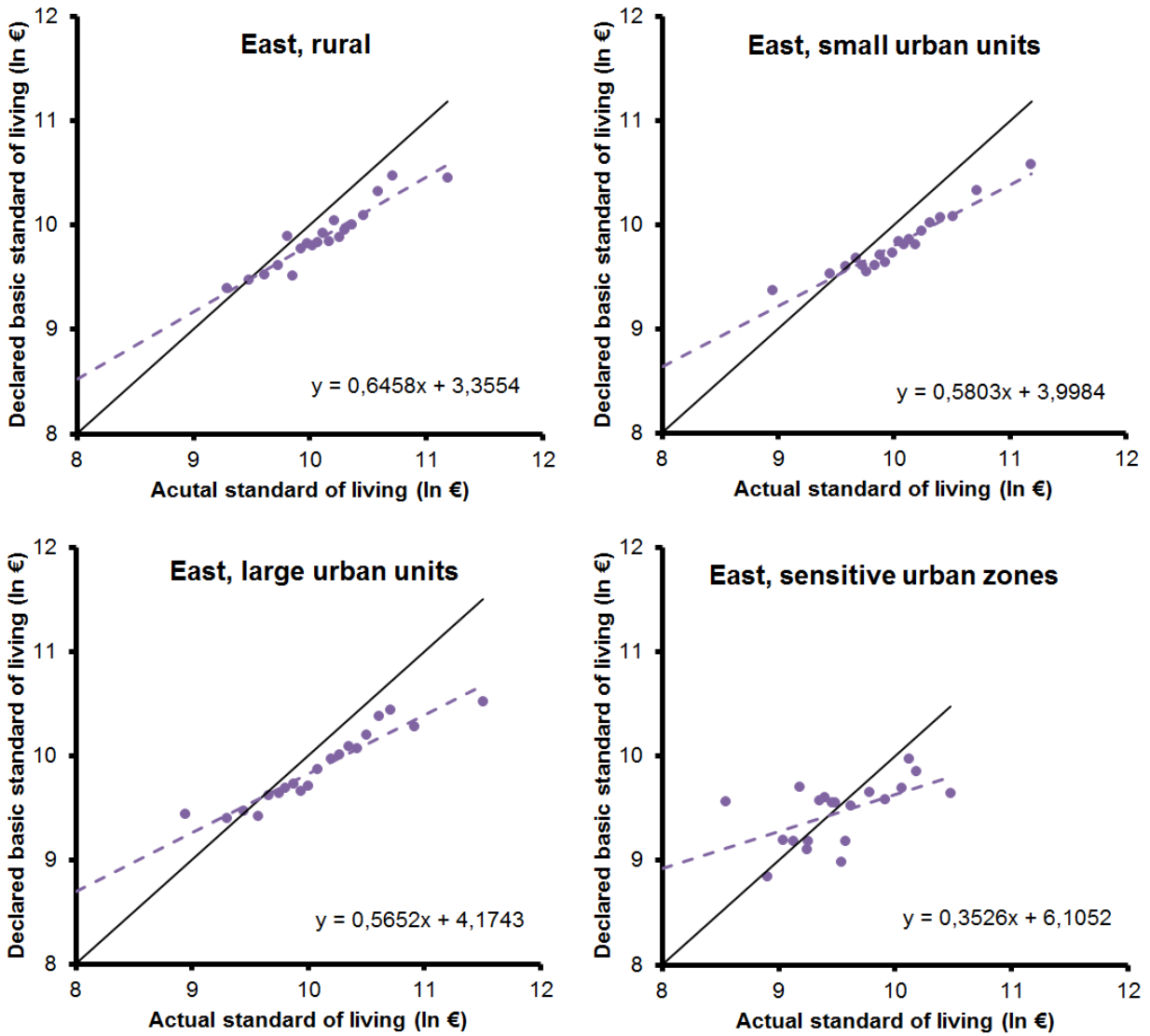
Source: SILC 2011

Figure 15: Impact on actual standard of living on declared basic standard of living, North



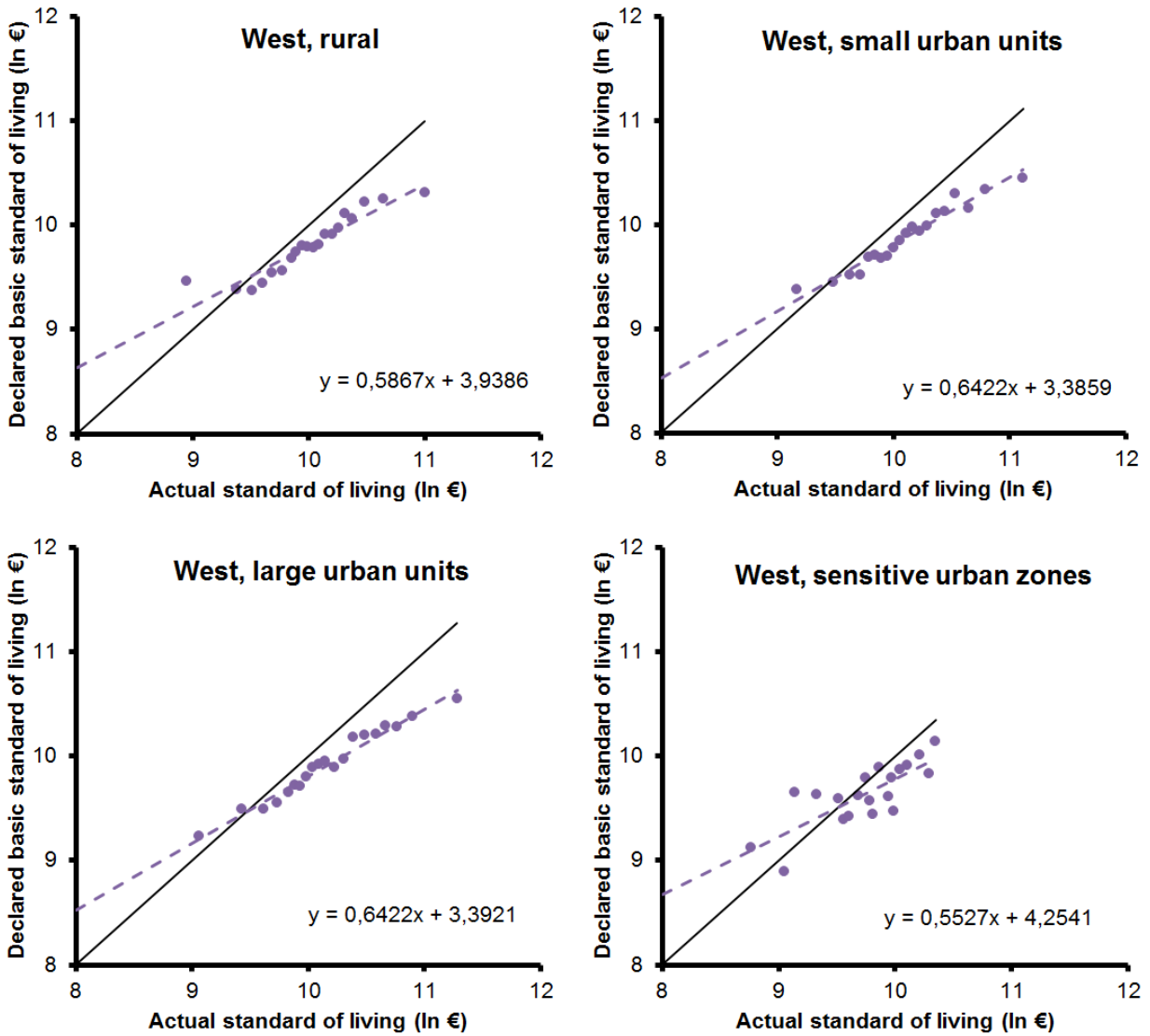
Source: SILC 2011

Figure 16: Impact on actual standard of living on declared basic standard of living, East



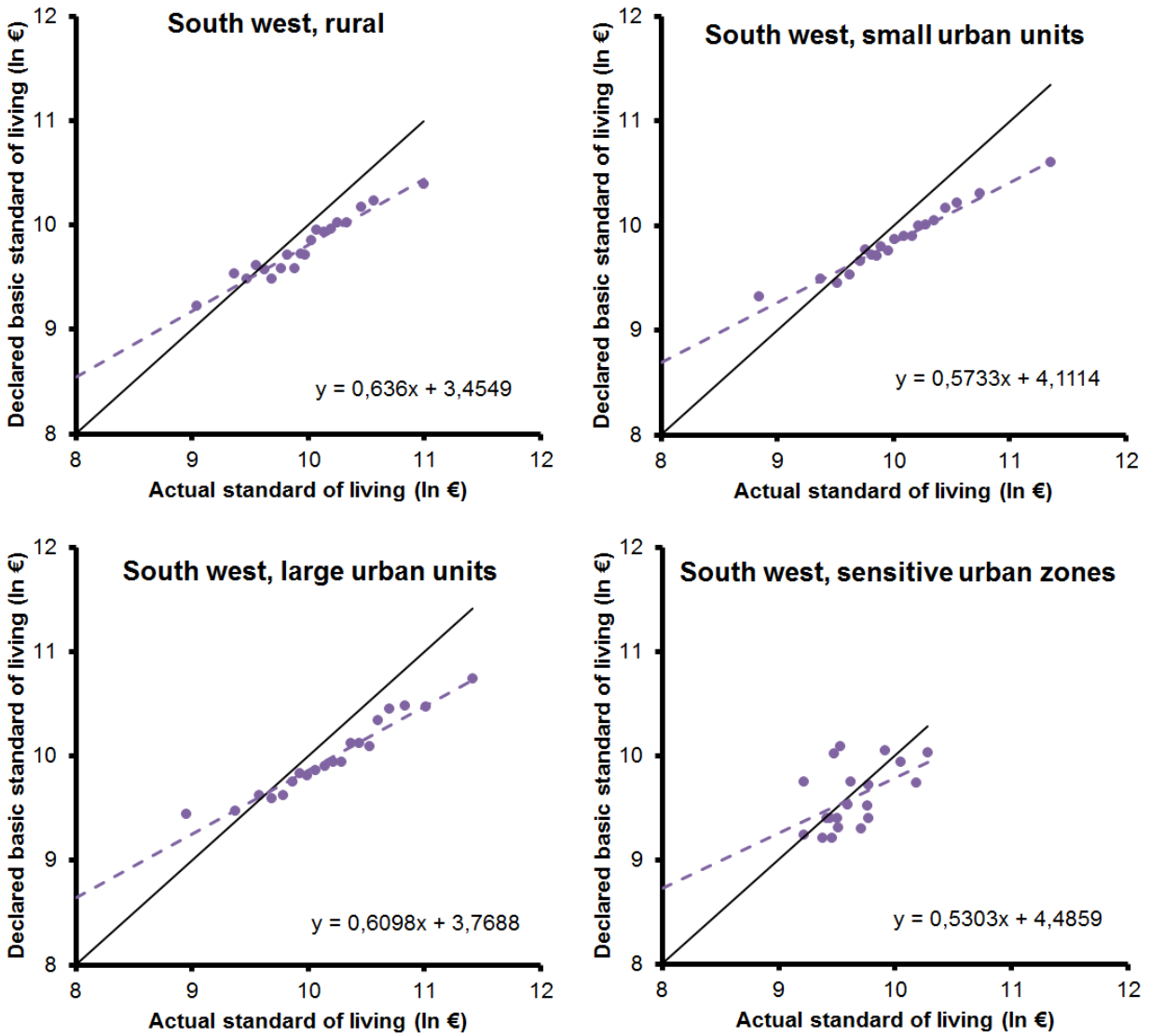
Source: SILC 2011

Figure 17: Impact on actual standard of living on declared basic standard of living, West



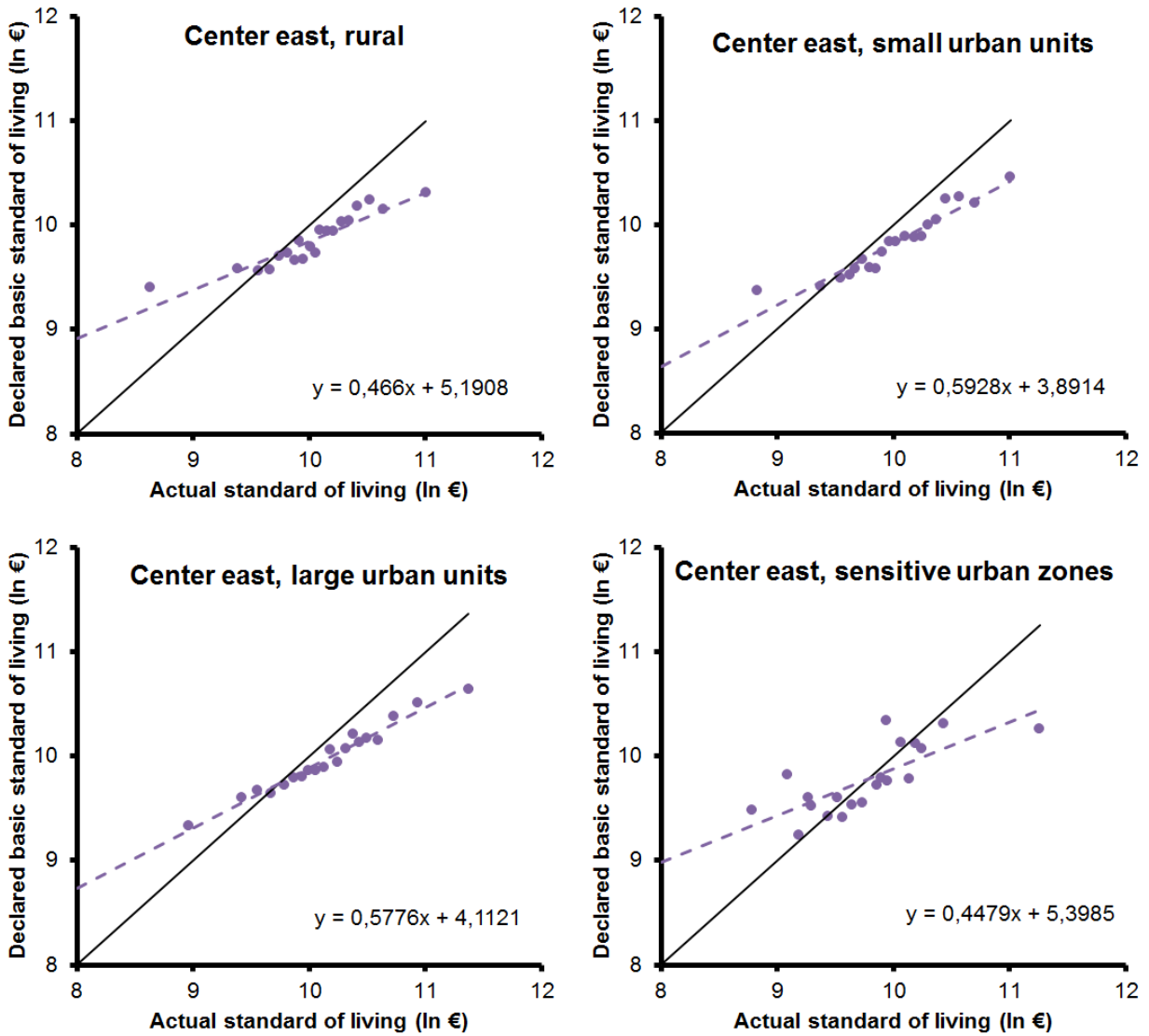
Source: SILC 2011

Figure 18: Impact on actual standard of living on declared basic standard of living, South west



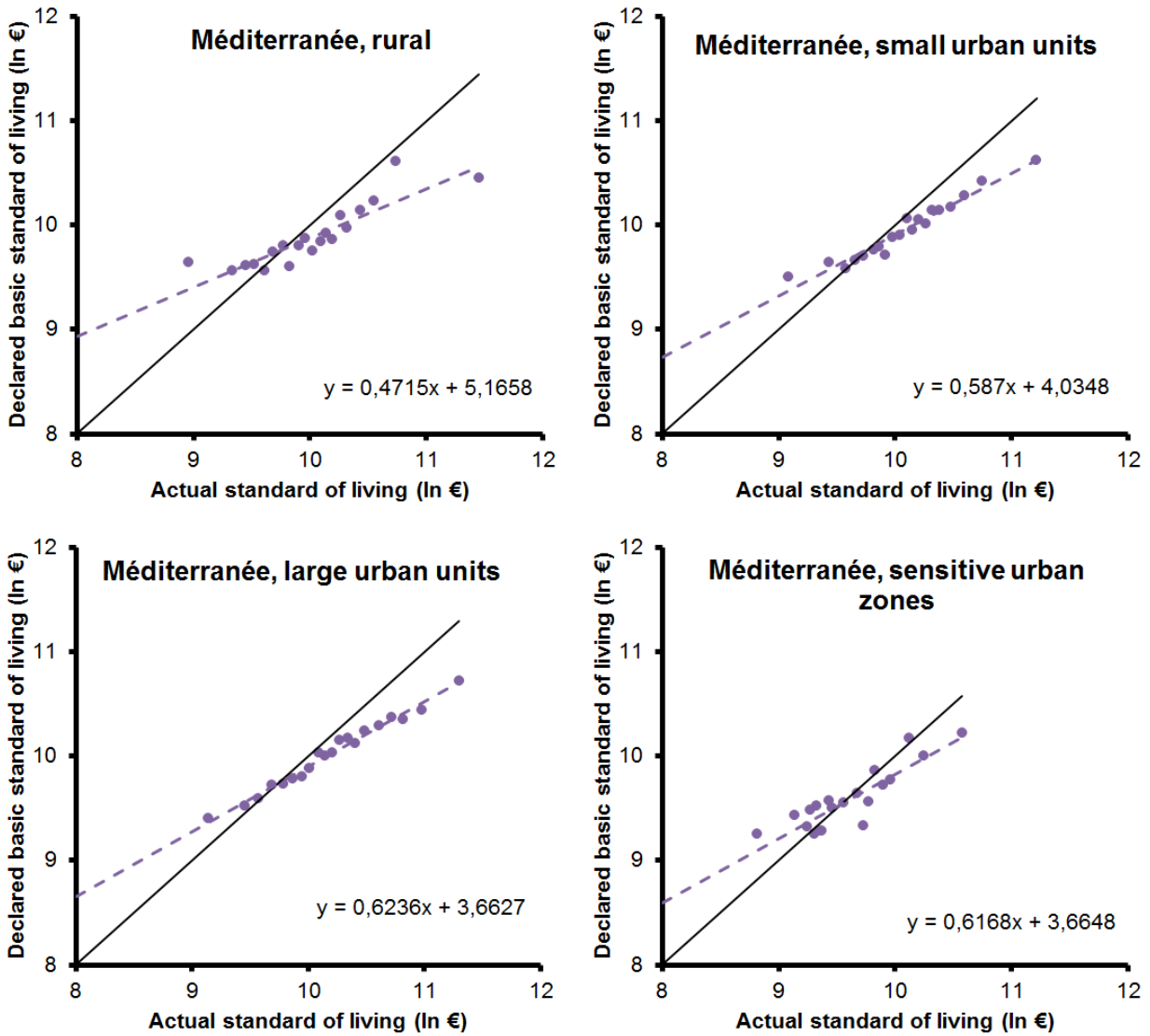
Source: SILC 2011

Figure 19: Impact on actual standard of living on declared basic standard of living, Center east



Source: SILC 2011

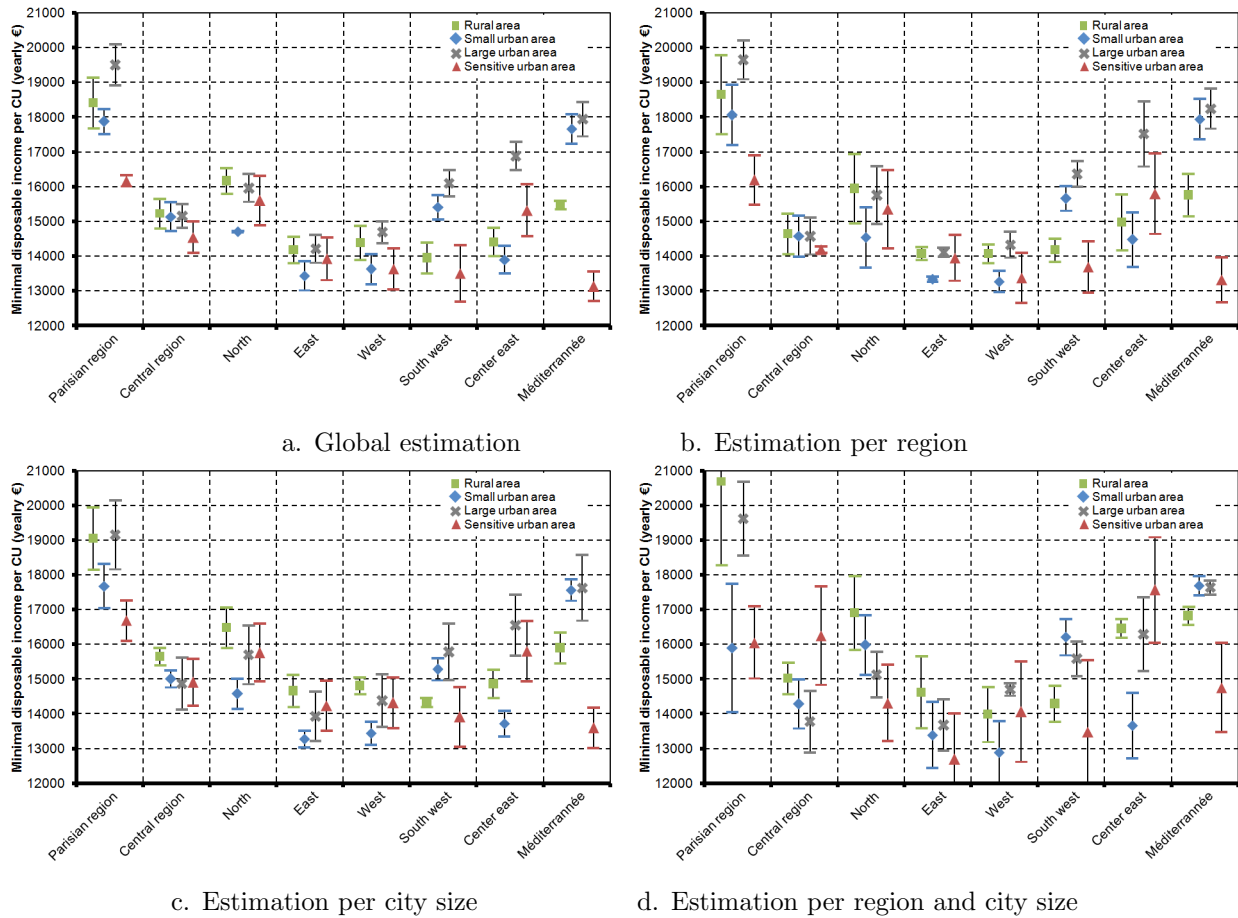
Figure 20: Impact on actual standard of living on declared basic standard of living, Méditerranée



Source: SILC 2011

C Results of the estimations

Figure 21: Basic standard of life per region and urban properties



Note: Results from the estimations of basic standard of living whose full results are presented in table 1 to 4.

Source: SILC 2011

Table 1: Regression of declared necessary income on actual income (global)

Region	Income Group	East		Central		North		West		South West		Central East		Midwest	
		beta	std	beta	std	beta	std	beta	std	beta	std	beta	std	beta	std
East	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Central	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
North	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
West	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
South West	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Central East	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Midwest	Low	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	High	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Table 2: Regression of declared necessary income on actual income (per region)

	Intercept	Ln(income)	Small city	Large city	SUA	2008	2009	2010
Estimate Paris	4.3166	0.56104	-0.014241	0.022908	-0.062112	0.003151	-0.026878	-0.009843
Intercept	0.00711	-0.00062	-0.000658	-0.000687	-0.000907	-0.000127	-0.000095	-0.000082
Ln(income)	-0.00062	0.00006	0.000008	0.000011	0.000032	0.000004	0.000001	0
Small city	-0.00066	0.00001	0.000882	0.000574	0.000577	0.000001	0.000001	-0.000003
Large city	-0.00069	0.00001	0.000574	0.000599	0.000578	0.000005	0.000005	0.000001
SUA	-0.00091	0.00003	0.000577	0.000578	0.000835	0.000001	0.000005	-0.000001
2008	-0.00013	0	0.000001	0.000005	0.000001	0.000162	0.00008	0.00008
2009	-0.0001	0	0.000001	0.000005	0.000005	0.00008	0.00016	0.00008
2010	-0.00008	0	-0.000003	0.000001	-0.000001	0.00008	0.00008	0.000159
Estimate Center	3.92602	0.5907	-0.002133	-0.002053	-0.013078	-0.000975	0.005716	-0.004804
Intercept	0.00649	-0.00064	-0.000051	-0.000046	-0.000262	-0.000109	-0.000088	-0.000076
Ln(income)	-0.00064	0.00006	0.000001	0.000001	0.000023	0.000005	0.000003	0.000001
Small city	-0.00005	0	0.00008	0.000037	0.000037	0	0.000001	0
Large city	-0.00005	0	0.000037	0.000121	0.000037	-0.000002	-0.000002	-0.000001
SUA	-0.00026	0.00002	0.000037	0.000037	0.000341	-0.000002	-0.000001	0.000001
2008	-0.00011	0	0	-0.000002	-0.000002	0.000123	0.000062	0.000062
2009	-0.00009	0	0.000001	-0.000002	-0.000001	0.000062	0.000123	0.000062
2010	-0.00008	0	0	-0.000001	0.000001	0.000062	0.000062	0.000123
Estimate North	4.20604	0.56537	-0.040399	-0.005385	-0.01661	0.003911	-0.010196	0.001108
Intercept	0.01376	-0.00135	-0.000166	-0.000234	-0.000645	-0.00019	-0.000146	-0.000177
Ln(income)	-0.00135	0.00014	-0.000011	-0.000005	0.000037	0.000004	0	0.000003
Small city	-0.00017	-0.00001	0.000471	0.000284	0.000281	-0.00001	-0.000011	-0.000003
Large city	-0.00023	0	0.000284	0.000352	0.000282	-0.000001	-0.000002	0
SUA	-0.00064	0.00004	0.000281	0.000282	0.000858	0.000003	-0.000003	-0.000001
2008	-0.00019	0	-0.00001	-0.000001	0.000003	0.000321	0.000152	0.000152
2009	-0.00015	0	-0.000011	-0.000002	-0.000003	0.000152	0.000317	0.000152
2010	-0.00018	0	-0.000003	0	-0.000001	0.000152	0.000152	0.000302
Estimate East	4.03259	0.57785	-0.02292	0.00106	-0.003776	-0.018955	-0.005391	-0.010245
Intercept	0.01377	-0.00134	-0.000259	-0.000199	-0.000774	-0.0002	-0.000152	-0.000152
Ln(income)	-0.00134	0.00013	0.000014	0.000008	0.000065	0.000007	0.000002	0.000003
Small city	-0.00026	0.00001	0.000204	0.000117	0.000123	0.000006	0.000004	0
Large city	-0.0002	0.00001	0.000117	0.00023	0.00012	0.000005	0.000004	0.000002
SUA	-0.00077	0.00006	0.000123	0.00012	0.000674	0.000002	0.000013	0.000007
2008	-0.0002	0.00001	0.000006	0.000005	0.000002	0.000252	0.000125	0.000125
2009	-0.00015	0	0.000004	0.000004	0.000013	0.000125	0.000257	0.000125
2010	-0.00015	0	0	0.000002	0.000007	0.000125	0.000125	0.00026
Estimate West	3.97544	0.58381	-0.024362	0.007364	-0.021078	-0.004355	-0.008452	-0.004618
Intercept	0.00924	-0.00091	0.000007	0.00004	-0.00023	-0.000111	-0.000077	-0.000091
Ln(income)	-0.00091	0.00009	-0.000006	-0.00001	0.000018	0.000003	-0.000001	0.000001
Small city	0.00001	-0.00001	0.000117	0.000061	0.000059	-0.000002	-0.000002	-0.000002
Large city	0.00004	-0.00001	0.000061	0.000162	0.000058	-0.000001	0	0
SUA	-0.00023	0.00002	0.000059	0.000058	0.000547	-0.000012	-0.000007	-0.000001
2008	-0.00011	0	-0.000002	-0.000001	-0.000012	0.000172	0.000085	0.000085
2009	-0.00008	0	-0.000002	0	-0.000007	0.000085	0.000172	0.000085
2010	-0.00009	0	-0.000002	0	-0.000001	0.000085	0.000085	0.000172
Estimate South-West	4.1365	0.5673	0.042818	0.061984	-0.015372	-0.01429	-0.01317	-0.028201
Intercept	0.00926	-0.00092	-0.000004	0.000088	-0.000341	-0.000134	-0.000095	-0.000095
Ln(income)	-0.00092	0.00009	-0.000006	-0.000015	0.000028	0.000005	0.000001	0.000001
Small city	0	-0.00001	0.000144	0.000067	0.000064	-0.000002	-0.000003	-0.000001
Large city	0.00009	-0.00002	0.000067	0.00014	0.000061	-0.000003	-0.000002	-0.000001
SUA	-0.00034	0.00003	0.000064	0.000061	0.000794	-0.000007	-0.000011	-0.000003
2008	-0.00013	0	-0.000002	-0.000003	-0.000007	0.000188	0.000089	0.000089
2009	-0.0001	0	-0.000003	-0.000002	-0.000011	0.000089	0.000179	0.000089
2010	-0.00009	0	-0.000001	-0.000001	-0.000003	0.000089	0.000089	0.000181
Estimate Center-East	4.23167	0.55985	-0.01491	0.069055	0.023611	-0.038479	-0.020313	-0.022352
Intercept	0.01098	-0.00107	-0.000108	-0.000027	-0.000389	-0.00009	-0.000098	-0.000088
Ln(income)	-0.00107	0.00011	0.000001	-0.000007	0.000029	-0.000002	-0.000001	-0.000002
Small city	-0.00011	0	0.000188	0.000102	0.000103	-0.000008	-0.000006	-0.000005
Large city	-0.00003	-0.00001	0.000102	0.000176	0.0001	-0.000004	-0.000004	-0.000002
SUA	-0.00039	0.00003	0.000103	0.0001	0.00069	-0.000006	-0.000009	-0.00001
2008	-0.00009	0	-0.000008	-0.000004	-0.000006	0.000218	0.00011	0.00011
2009	-0.0001	0	-0.000006	-0.000004	-0.000009	0.00011	0.000217	0.00011
2010	-0.00009	0	-0.000005	-0.000002	-0.000001	0.00011	0.00011	0.000221
Estimate Méditerranée	4.24851	0.56044	0.056894	0.064176	-0.074113	-0.030956	-0.007799	-0.012265
Intercept	0.00929	-0.0009	-0.000161	-0.000119	-0.00049	-0.000165	-0.000161	-0.000124
Ln(income)	-0.0009	0.00009	0	-0.000004	0.000033	0.000007	0.000006	0.000003
Small city	-0.00016	0	0.000232	0.000159	0.000159	0.000002	0.000004	0.000003
Large city	-0.00012	0	0.000159	0.000213	0.000157	-0.000003	-0.000001	0.000001
SUA	-0.00049	0.00003	0.000159	0.000157	0.000492	-0.000002	-0.000002	-0.000001
2008	-0.00017	0.00001	0.000002	-0.000003	-0.000002	0.000196	0.000097	0.000097
2009	-0.00016	0.00001	0.000004	-0.000001	-0.000002	0.000097	0.00019	0.000097
2010	-0.00012	0	0.000003	0.000001	-0.000001	0.000097	0.000097	0.000193

Table 3: Regression of declared necessary income on actual income (per urbanization)

	Intercept	Ln(income)	Center	North	East	West	South-West	Center-East	Méditerrann	year08	year09	year10
Estimate rural	4.40997	0.55253	-0.08807	-0.064953	-0.1173	-0.11287	-0.1273	-0.11119	-0.08102	-0.021326	-0.015588	-0.0172
Intercept	0.00604	-0.00053	-0.00065	-0.000717	-0.00061	-0.00066	-0.00069	-0.00063	-0.000639	-0.000073	-0.000059	-0.000038
Ln(income)	-0.00053	0.00005	0.00002	0.000025	0.00002	0.00002	0.00002	0.00002	0.000018	0.000003	0.000001	-0.000001
Center	-0.00065	0.00002	0.0005	0.000463	0.00046	0.00046	0.00046	0.00046	0.000461	0.000003	0.000003	0
North	-0.00072	0.00003	0.00046	0.000746	0.00046	0.00046	0.00047	0.00046	0.000463	0.000005	0.000005	0
East	-0.00061	0.00002	0.00046	0.000462	0.00057	0.00046	0.00046	0.00046	0.00046	0.000002	0.000002	0.000001
West	-0.00066	0.00002	0.00046	0.000464	0.00046	0.00052	0.00046	0.00046	0.000461	0.000004	0.000003	0.000001
South-West	-0.00069	0.00002	0.00046	0.000466	0.00046	0.00046	0.00054	0.00046	0.000462	0.000005	0.000004	0.000001
Center-East	-0.00063	0.00002	0.00046	0.000463	0.00046	0.00046	0.00046	0.00056	0.00046	0.000004	0.000004	0.000001
Méditerrannée	-0.00064	0.00002	0.00046	0.000463	0.00046	0.00046	0.00046	0.00046	0.000622	0.000003	0.000002	0
2008	-0.00007	0	0	0.000005	0	0	0	0	0.000003	0.00009	0.000043	0.000043
2009	-0.00006	0	0	0.000005	0	0	0	0	0.000002	0.000043	0.000088	0.000043
2010	-0.00004	0	0	0	0	0	0	0	0	0.000043	0.000043	0.000089
Estimate small city	4.07554	0.58327	-0.06831	-0.080377	-0.11938	-0.1142	-0.06071	-0.10569	-0.002531	-0.01163	-0.012694	-0.012294
Intercept	0.00442	-0.00041	-0.00033	-0.00034	-0.00034	-0.0003	-0.00033	-0.00031	-0.000316	-0.000057	-0.000043	-0.000041
Ln(income)	-0.00041	0.00004	0.00001	0.00001	0.00001	0.00001	0.00001	0.00001	0.000008	0.000002	0	0
Center	-0.00033	0.00001	0.00028	0.000234	0.00023	0.00023	0.00023	0.00023	0.000234	0.000002	0.000002	0.000002
North	-0.00034	0.00001	0.00023	0.000408	0.00023	0.00023	0.00023	0.00023	0.000234	0.000001	0.000001	0.000001
East	-0.00034	0.00001	0.00023	0.000235	0.00031	0.00023	0.00023	0.00023	0.000234	0.000002	0.000002	0.000002
West	-0.0003	0.00001	0.00023	0.000234	0.00023	0.00028	0.00023	0.00023	0.000233	0.000001	0.000001	0.000001
South-West	-0.00033	0.00001	0.00023	0.000234	0.00023	0.00023	0.00031	0.00023	0.000234	0.000002	0.000001	0.000002
Center-East	-0.00031	0.00001	0.00023	0.000234	0.00023	0.00023	0.00023	0.00032	0.000233	0	0.000001	0.000001
Méditerrannée	-0.00032	0.00001	0.00023	0.000234	0.00023	0.00023	0.00023	0.00023	0.000304	0.000003	0.000002	0.000002
2008	-0.00006	0	0	0.000001	0	0	0	0	0.000003	0.000076	0.000038	0.000038
2009	-0.00004	0	0	0.000001	0	0	0	0	0.000002	0.000038	0.000076	0.000038
2010	-0.00004	0	0	0.000001	0	0	0	0	0.000002	0.000038	0.000038	0.000075
Estimate Large city	4.15804	0.57831	-0.10697	-0.08395	-0.13446	-0.12095	-0.08162	-0.0615	-0.035108	-0.001657	-0.004704	-0.005815
Intercept	0.00269	-0.00026	-0.00007	-0.000092	-0.00007	-0.00005	-0.00005	-0.00004	-0.000053	-0.000047	-0.000039	-0.000039
Ln(income)	-0.00026	0.00003	0	0.000007	0	0	0	0	0.000003	0.000002	0.000001	0.000001
Center	-0.00007	0	0.00013	0.000024	0.00002	0.00002	0.00002	0.00002	0.000023	-0.000001	-0.000001	0
North	-0.00009	0.00001	0.00002	0.000101	0.00002	0.00002	0.00002	0.00002	0.000023	0.000001	0.000001	0
East	-0.00007	0	0.00002	0.000024	0.00014	0.00002	0.00002	0.00002	0.000023	0	0.000001	0.000001
West	-0.00005	0	0.00002	0.000023	0.00002	0.00013	0.00002	0.00002	0.000023	0	0	0
South-West	-0.00005	0	0.00002	0.000023	0.00002	0.00002	0.00011	0.00002	0.000023	0	0	0
Center-East	-0.00004	0	0.00002	0.000023	0.00002	0.00002	0.00002	0.00011	0.000023	-0.000001	0	0
Méditerrannée	-0.00005	0	0.00002	0.000023	0.00002	0.00002	0.00002	0.00002	0.000085	-0.000001	-0.000001	0
2008	-0.00005	0	0	0.000001	0	0	0	0	-0.000001	0.000065	0.000032	0.000032
2009	-0.00004	0	0	0.000001	0	0	0	0	-0.000001	0.000032	0.000064	0.000032
2010	-0.00004	0	0	0	0	0	0	0	0	0.000032	0.000032	0.000064
Estimate Sensitive urban area	4.6871	0.51791	-0.05442	-0.027551	-0.0769	-0.07396	-0.08788	-0.02618	-0.09874	-0.027653	-0.02063	-0.014166
Intercept	0.01988	-0.00198	-0.00056	-0.000639	-0.0007	-0.00027	-0.00061	-0.0003	-0.000558	-0.000212	-0.000168	-0.000249
Ln(income)	-0.00198	0.0002	0.00004	0.000043	0.00005	0.00001	0.00004	0.00001	0.000036	-0.000001	-0.000005	0.000002
Center	-0.00056	0.00004	0.00054	0.000212	0.00021	0.00021	0.00021	0.00021	0.000212	-0.000001	-0.000009	0.000006
North	-0.00064	0.00004	0.00021	0.000799	0.00022	0.00021	0.00021	0.00021	0.000213	0.00002	0.000004	0.000003
East	-0.0007	0.00005	0.00021	0.000215	0.00073	0.00021	0.00021	0.00021	0.000213	0.000004	0.000015	0.000018
West	-0.00027	0.00001	0.00021	0.000205	0.00021	0.00066	0.00021	0.0002	0.000206	-0.000016	-0.000015	0.000005
South-West	-0.00061	0.00004	0.00021	0.000214	0.00021	0.00021	0.00104	0.00021	0.000213	0	-0.000023	0
Center-East	-0.0003	0.00001	0.00021	0.000208	0.00021	0.0002	0.00021	0.00082	0.000207	0.000006	-0.000013	-0.000007
Méditerrannée	-0.00056	0.00004	0.00021	0.000213	0.00021	0.00021	0.00021	0.00021	0.000555	0.000002	-0.000016	-0.000003
2008	-0.00021	0	0	0.00002	0	-0.00002	0	0.00001	0.000002	0.000411	0.000223	0.000222
2009	-0.00017	-0.00001	-0.00001	0.000004	0.00002	-0.00002	-0.00002	-0.00001	-0.000016	0.000223	0.000427	0.000223
2010	-0.00025	0	0.00001	0.000003	0.00002	0.00001	0	-0.00001	-0.000003	0.000222	0.000223	0.000434

Table 4: Regression of declared necessary income on actual income (per region and urbanization)

	Intercept	Ln(income)	2008	2009	2010		Intercept	Ln(income)	2008	2009	2010
Estimate Paris rural	4.5626	0.54088	-0.03275	-0.058583	-0.089755	Estimate West rural	4.13793	0.56652	0.00733	0.001231	0.015959
Intercept	0.16577	-0.0157	-0.00514	-0.00338	-0.00754	Intercept	0.03596	-0.00357	-0.00035	-0.000219	-0.000158
Ln(income)	-0.0157	0.00151	0.00029	0.000133	-0.000134	Ln(income)	-0.00357	0.00036	0.00001	-0.000007	-0.000013
2008	-0.00514	0.00029	0.000405	0.002176	0.002126	2008	-0.00035	0.00001	0.0006	0.000287	0.000287
2009	-0.00338	0.00013	0.00218	0.003947	0.002139	2009	-0.00022	-0.00001	0.00029	0.000597	0.000288
2010	-0.00754	-0.00013	0.00213	0.002139	0.004235	2010	-0.00016	-0.00001	0.00029	0.000288	0.000594
Estimate Paris small cities	3.33604	0.65516	0.04939	-0.036008	-0.033253	Estimate West small cities	3.56589	0.62322	-0.02558	-0.030976	-0.007205
Intercept	0.09416	-0.00904	-0.00237	-0.001867	-0.001239	Intercept	0.02205	-0.00217	-0.00023	-0.000206	-0.000254
Ln(income)	-0.00904	0.00088	0.00014	0.00009	0.000029	Ln(income)	-0.00217	0.00022	0	0.000001	0.000006
2008	-0.00237	0.00014	0.00177	0.000951	0.000941	2008	-0.00023	0	0.00039	0.000198	0.000198
2009	-0.00187	0.00009	0.00095	0.001735	0.000939	2009	-0.00021	0	0.0002	0.000391	0.000198
2010	-0.00124	0.00003	0.00094	0.000939	0.001711	2010	-0.00025	0.00001	0.0002	0.000198	0.000387
Estimate Paris large cities	4.34728	0.56019	0.00025	-0.02317	-0.007332	Estimate West large cities	4.28972	0.55294	0.01935	0.01352	-0.029526
Intercept	0.00798	-0.00077	-0.00015	-0.000111	-0.000105	Intercept	0.02733	-0.00267	-0.00053	-0.000289	-0.000424
Ln(income)	-0.00077	0.00008	0.00001	0.000001	0	Ln(income)	-0.00267	0.00026	0.00002	-0.000002	0.000011
2008	-0.00015	0.00001	0.00021	0.0001	0.0001	2008	-0.00053	0.00002	0.00064	0.000308	0.00031
2009	-0.00011	0	0.0001	0.000203	0.0001	2009	-0.00029	0	0.00031	0.00064	0.000308
2010	-0.00011	0	0.0001	0.0001	0.000202	2010	-0.00042	0.00001	0.00031	0.000308	0.000636
Estimate Paris SUA	4.57024	0.52804	0.01699	-0.038612	0.019385	Estimate West SUA	4.01736	0.57938	-0.04475	-0.006338	-0.038932
Intercept	0.06354	-0.00638	-0.00075	-0.000805	-0.00085	Intercept	0.19141	-0.01933	-0.00219	-0.001662	-0.002225
Ln(income)	-0.00638	0.00065	-0.00002	-0.000104	-0.00001	Ln(income)	-0.01933	0.00197	0.00003	-0.00002	0.000037
2008	-0.00075	-0.00002	0.00172	0.000948	0.000948	2008	-0.00219	0.00003	0.001	0.001859	0.00186
2009	-0.00085	-0.00001	0.00095	0.001913	0.000948	2009	-0.00166	-0.00002	0.00186	0.003265	0.001859
2010	-0.00085	-0.00001	0.00095	0.000948	0.001806	2010	-0.00223	0.00004	0.00186	0.001859	0.003747
Estimate Center rural	4.07431	0.57636	-0.01256	0.000227	-0.006307	Estimate South-West rural	4.10217	0.57125	-0.03018	-0.016997	-0.029666
Intercept	0.01677	-0.00165	-0.0003	-0.000249	-0.000161	Intercept	0.03199	-0.00319	-0.00035	-0.00033	-0.000209
Ln(income)	-0.00165	0.00016	0.00002	0.000011	0.000002	Ln(income)	-0.00319	0.00032	0.00001	0.000011	-0.000001
2008	-0.0003	0.00002	0.00028	0.00014	0.000139	2008	-0.00035	0.00001	0.00049	0.000224	0.000224
2009	-0.00025	0.00001	0.00014	0.00028	0.000139	2009	-0.00033	0.00001	0.00022	0.000467	0.000224
2010	-0.00016	0	0.00014	0.000139	0.00028	2010	-0.00021	0	0.00022	0.000224	0.000462
Estimate Center small cities	4.01726	0.58007	0.02046	0.025362	0.006519	Estimate South-West small cities	4.8239	0.50235	-0.00044	-0.026424	-0.006558
Intercept	0.01801	-0.00178	-0.00031	-0.000209	-0.000204	Intercept	0.02743	-0.00271	-0.00042	-0.000284	-0.000341
Ln(income)	-0.00178	0.00018	0.00001	0.000003	0.000003	Ln(income)	-0.00271	0.00027	0.00001	0	0.000006
2008	-0.00031	0.00001	0.00036	0.00178	0.000178	2008	-0.00042	0.00001	0.00058	0.000279	0.00028
2009	-0.00021	0	0.00018	0.000363	0.000178	2009	-0.00028	0	0.00028	0.00055	0.000279
2010	-0.0002	0	0.00018	0.000178	0.000356	2010	-0.00034	0.00001	0.00028	0.000279	0.000566
Estimate Center large cities	3.43089	0.64001	0.00573	0.003252	0.008881	Estimate South-West large cities	3.73703	0.61291	-0.00732	0.000835	-0.04478
Intercept	0.03147	-0.0031	-0.00054	-0.000562	-0.000554	Intercept	0.02709	-0.00265	-0.00047	-0.000278	-0.000324
Ln(income)	-0.0031	0.00031	0.00002	0.000018	0.000017	Ln(income)	-0.00265	0.00026	0.00001	-0.000005	0
2008	-0.00054	0.00002	0.00072	0.000382	0.000382	2008	-0.00047	0.00001	0.00067	0.000325	0.000326
2009	-0.00056	0.00002	0.00038	0.000717	0.000382	2009	-0.00028	0	0.00033	0.000651	0.000326
2010	-0.00055	0.00002	0.00038	0.000382	0.000741	2010	-0.00032	0	0.00033	0.000326	0.000655
Estimate Center SUA	4.23229	0.56349	-0.08781	-0.07499	-0.052126	Estimate South-West SUA	3.59633	0.62179	-0.03786	0.025068	-0.053288
Intercept	0.12962	-0.0133	-0.00109	-0.00055	-0.001694	Intercept	0.04864	-0.06645	-0.01154	-0.008993	-0.009791
Ln(income)	-0.0133	0.00138	-0.00002	-0.000076	0.000043	Ln(income)	-0.06645	0.00084	0.00062	0.000554	0.000636
2008	-0.00109	-0.00002	0.00232	0.001382	0.00128	2008	-0.01154	0.00032	0.000685	0.003685	0.003685
2009	-0.00055	-0.00008	0.00128	0.002386	0.001278	2009	-0.00899	0.00055	0.00368	0.00611	0.00367
2010	-0.00169	0.00004	0.00128	0.001278	0.002588	2010	-0.00979	0.00064	0.00369	0.00367	0.006916
Estimate North rural	4.60142	0.52737	-0.00394	-0.062576	-0.020551	Estimate Center-East rural	5.16702	0.4678	-0.06101	-0.028028	-0.032589
Intercept	0.06508	-0.00651	-0.00099	-0.00095	-0.000425	Intercept	0.03806	-0.00376	-0.00025	-0.000282	-0.000122
Ln(income)	-0.00651	0.00066	0.00005	0.000042	-0.000011	Ln(income)	-0.00376	0.00037	-0.00001	-0.000005	-0.000021
2008	-0.00099	0.00005	0.00117	0.000539	0.000535	2008	-0.00025	-0.00001	0.00072	0.000333	0.000333
2009	-0.00095	0.00004	0.00054	0.001178	0.000535	2009	-0.00028	-0.00001	0.00033	0.000705	0.000333
2010	-0.00042	-0.00001	0.00054	0.000535	0.001073	2010	-0.00012	-0.00002	0.00033	0.000333	0.000701
Estimate North small cities	4.4053	0.54487	-0.06772	-0.048482	-0.027613	Estimate Center-East small cities	3.80792	0.60009	-0.03063	-0.010901	-0.022441
Intercept	0.08013	-0.00798	-0.00083	-0.000491	-0.000145	Intercept	0.03829	-0.00378	-0.00035	-0.000208	-0.000197
Ln(income)	-0.00798	0.00008	0.00001	-0.000027	-0.000062	Ln(income)	-0.00378	0.00038	0	-0.000018	-0.000019
2008	-0.00083	0.00001	0.00147	0.00076	0.000759	2008	-0.00035	0	0.00072	0.000389	0.000389
2009	-0.00049	-0.00003	0.00076	0.001448	0.000762	2009	-0.00021	-0.00002	0.00039	0.000737	0.00039
2010	-0.00014	-0.00006	0.00076	0.000762	0.001466	2010	-0.0002	-0.00002	0.00039	0.00039	0.000754
Estimate North large cities	4.01692	0.58262	0.02795	0.012369	0.007351	Estimate Center-East large cities	3.78572	0.60965	-0.01392	-0.016109	-0.007583
Intercept	0.0341	-0.00239	-0.00039	-0.000296	-0.000439	Intercept	0.02982	-0.00291	-0.00029	-0.000397	-0.00039
Ln(income)	-0.00239	0.00024	0.00001	-0.000001	0.000014	Ln(income)	-0.00291	0.00029	0	0.00009	0.000008
2008	-0.00039	0.00001	0.00065	0.000302	0.000303	2008	-0.00029	0	0.0006	0.000304	0.000304
2009	-0.0003	0	0.0003	0.000644	0.000302	2009	-0.0004	0.00001	0.0003	0.0006	0.000304
2010	-0.00044	0.00001	0.0003	0.000302	0.000608	2010	-0.00039	0.00001	0.0003	0.000304	0.000618
Estimate North SUA	4.80196	0.49817	0.03967	0.010808	0.077115	Estimate Center-East SUA	5.38758	0.44878	-0.14581	-0.061919	-0.055601
Intercept	0.17573	-0.0181	-0.00066	-0.001131	-0.002834	Intercept	0.15756	-0.01588	-0.01111	-0.002508	-0.003264
Ln(income)	-0.0181	0.00188	-0.00012	-0.000071	0.000085	Ln(income)	-0.01588	0.00162	-0.00016	-0.000015	0.000069
2008	-0.00066	-0.00012	0.00408	0.001818	0.001809	2008	-0.01111	-0.00016	0.00519	0.002653	0.002645
2009	-0.00113	-0.00007	0.00182	0.003826	0.001811	2009	-0.00251	-0.00001	0.00265	0.004772	0.002651
2010	-0.00263	0.00009	0.00181	0.001811	0.003551	2010	-0.00326	0.00006	0.00265	0.002651	0.004762
Estimate East rural	3.89454	0.59391	-0.06094	-0.028625	-0.039049	Estimate Méditerranée rural	5.00297	0.48587	0.00844	-0.039191	-0.040673
Intercept	0.05232	-0.00513	-0.00078	-0.000603	-0.000638	Intercept	0.06238	-0.00617	-0.00072	-0.000452	-0.000638
Ln(income)	-0.00513	0.00051	0.00003	0.000013	0.000017	Ln(income)	-0.00617	0.00061	0.00002	-0.00001	-0.000008
2008	-0.00078	0.00003	0.00091	0.000471	0.000472	2008	-0.00072	0.00002	0.00014	0.000557	0.000557
2009	-0.0006	0.00001	0.00047	0.000918	0.000471	2009					