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Do Spatial Price Indices Reshuffle the Italian Income Distribution?

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Abstract

This paper examines how spatial price differentials affect income distribution in Italy. Established results concerning disparities between the Northern and Southern regions of Italy hold up when adjusting incomes for the regional purchasing power. Poverty is still concentrated in the Southern part of the country. Furthermore, the cost-of-living indices that have the highest impact on the Italian income distribution are those accounting for regional differential in housing prices.

1. Introduction

Adjusting for differences in relative price levels is widely recognized as being important in inter-country income comparisons. Analogously, intra-country com- parisons should be adjusted for sub-national purchasing power parities (PPP). Regional cost-of-living[1] adjust- ments affect real wages and public transfers and, to a larger extent, income distribution, poverty and inequality within a country. Nevertheless, PPP estimates require detailed price data which are not usually available at sub-national level. Spatial price variability has been investigated in developing countries, where regional price differences are expected to be wide because of high degrees of market segmentation (e.g. Coondoo *et al.*, 2004; Jolliffe *et al.*, 2004; Gong and Meng, 2008), and relatively few attempts provide evidence for developed countries. For instance, poverty measures adjusted for cost of living differences in US metropolitan and nonmetropolitan areas show a complete reversal of the nonmetro/metro original poverty profile (Jolliffe, 2006). Kosfeld and Eckey (2008) estimated consumer price index (CPI) and housing rent index (HRI) for German NUTS sub-national areas to analyze price disparities across German regions. The authors found that disparities of regional per capita GDP adjusted for PPP reduced but did not eliminate East/West real income gap. Adjustment for regional cost of living of poverty rates in the United Kingdom, induced higher value of poverty in Greater London, South

East, Scotland and Northern Ireland and smaller values in the North and in Yorkshire and Humberside (Borooah *et al.*, 1996). Using regional price indices recently provided by Italian National Institute of Statistics (ISTAT) and by Bank of Italy, this paper checks whether the well-known income disparity between Northern and Southern Italy persists after accounting for regional price differentials. The next section describes the spatial price indices estimated for Italian regions. Section 3 reports the main effects of cost of living adjustment on household disposable income, inequality and poverty. Section 4 concludes.

2. Data

ISTAT in collaboration with Institute Guglielmo Tagliacarne--Union of Italian Chambers of Commerce (Istat, 2008) estimated spatial price indices for Italian regions' capital cities[2] in 2006. Three expenditure items were selected: Food, Clothing & Footwear and Furniture & Furnishings. Based on these indices, Bank of Italy (Cannari and Iuzzolino, 2009) first estimated regional price indices for other consumption categories, and then aggregated all the commodity--group prices into regional cost--of--living indices. Based on alternative hypotheses, which essentially refer to the estimation procedure of additional commodity--group indices and to the weights attached to each item in the aggregation procedure, Bank of Italy finally estimated twelve purchasing power pari-

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[1]Even if PPP and regional cost-of-living are not technically the same, we use these terms interchangeably in this context.

[2]Italian regions are administrative units that correspond to the second level of disaggregation in the Eurostat Nomenclature of the Territorial Units for Statistics, named NUTS2.

ties.

To examine the sensitivity of income distribution to the choice of geographical cost--of--living indices, we selected three out of twelve cost--of--living indices[3] (**Table 1**). Index PPP_1 assumes spatial price variation only for prices related to Food, Clothing & Footwear and Furniture & Furnishings, holding spatial prices of all other goods and services fixed. This index refers only to survey data collected by ISTAT and to consumption categories representative of about one third of the Italian households' consumption budget. Index PPP_2 shares the same hypothesis of PPP_1 but incorporates also an index of house prices provided by Italian Housing Market Agency as a proxy of price variability of housing costs. Regional prices of all other items are assumed not to vary. Index PPP_9, instead, uses actual and imputed rents provided by Bank of Italy's Survey of Household Income and Wealth (SHIW) for housing costs. Moreover, index PPP_9 includes regional price variation also for Health, Maintenance & Repairs and Other commodities and services, using data released by the Italian Ministry of Economic Development. In order not to overestimate the South/North-Center gap, quality differences in both housing costs and expenditure services are controlled for. The remained items, which account for 22% of the Italian average consumption's budget, are assumed fixed. Regardless of the estimation procedure, housing prices represent the major element of variation, accounting for almost 70% of cost--of--living differences between Northern and Southern Italy. It should be noted that Bank of Italy estimation of housing costs, via home property values or via actual and imputed rents, takes into account differences in internal characteristics of houses (like number of bathrooms, size, typology, etc.) but it does not control for external characteristics (like neighborhood socio-economic characteristics, safety, quality of services, infrastructures, etc.). Therefore, housing cost differentials may reflect local characteristics, and, more generally, quality of life differences across regions. We selected different price indices since there is still a debate whether to include housing costs in regional income comparisons (see Siminiski and Saunders, 2004, for a discussion).

Income data are from 2006 SHIW. We use annual disposable income of all household members, which is the sum of wages and salaries, income from self-employment, pensions, public assistance, private transfers, income from real properties, imputed rental income from owner-occupied dwellings, and yields on financial assets net of interest paid on mortgages, net of tax and social security transfers. Household is defined as a group of

Table 1. Estimated regional cost--of--living indices in 2006.

Regions/Areas	PPP_1	PPP_2	PPP_9
Piemonte	100.7	100.7	105.1
Valle d'Aosta	101.2	112.7	106.4
Lombardia	103.4	109.5	114.1
Liguria	101.9	120.8	112.9
North West	**101.8**	**110.7**	**109.6**
Trentino Alto Adige	103.0	119.2	112.3
Veneto	101.4	102.9	101.0
Friuli Venezia Giulia	102.1	98.5	106.9
Emilia-Romagna	101.5	109.8	108.9
North East	**102.0**	**107.3**	**107.2**
Toscana	99.8	112.9	111.8
Umbria	100.1	96.3	106.5
Marche	99.8	100.7	96.9
Lazio	100.0	119.1	112.4
Center	**99.9**	**106.9**	**106.7**
Abruzzo	99.1	92.2	92.6
Molise	96.7	82.9	85.1
Campania	96.6	100.2	91.5
Puglia	98.2	90.9	91.9
Basilicata	98.5	82.1	85.1
Calabria	99.1	81.9	85.2
Sicilia	97.9	88.4	92.8
Sardegna	99.4	92.9	90.7
Southern Italy	**98.2**	**88.7**	**89.3**
North-Center	**101.2**	**108.3**	**107.8**
Italy	**100.0**	**100.0**	**100.0**
South/North-Center	**97.0**	**82.0**	**82.8**

Source: Cannari and Iuzzolino, Bank of Italy 2009.

individuals living together who, independently of their kinship, share their income wholly or in part. To take into account household composition, incomes are adjusted by an equivalence scale. We use the OECD- modified scale (Hagenaars, 1994) which assigns a value of 1 to the household head, a value of 0.5 to each additional adult member and a value of 0.3 to each child under the age of 15.

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[3]Subscripts refer to column's number in Table A2.1 in Cannari and Iuzzolino, 2009, pp.33-34.

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3. Effects of Regional Cost--of--Living on Income Distribution

Table 2 provides summary measures for household incomes in 2006, both in nominal terms (second column) and in PPP terms (third to fifth columns). Regardless of PPP's definition, household income adjusted for cost--of--living differences is, on average, lower than actual income. Concentration decreases, narrowing the gap between rich and poor households, mainly due to a reduction of the ratio between median and first decile. Discrepancies are more clear-cut when housing related costs are considered. For instance, the Gini coefficient is 31.62% for nominal incomes and equal to 31.30% for incomes adjusted with PPP_1. For income deflated by PPP_2 and PPP_9 Gini coefficients are instead 30.36% and 30.20%, respectively, corresponding to a reduction of 4.5% . There are negligible differences between incomes deflated by PPP_2 and by PPP_9, suggesting, on one hand, that the inclusion of other goods and services price estimates does not alter the variability of regional cost-of-living and, on the other hand, that results are robust to different housing price estimation procedures. Note that the PPP-adjusted summary measures reported in **Table 2** and those computed on nominal income are all significantly different[4].

Income is adjusted with the OECD-modified equivalence scale. difference significant at 1% level. difference significant at 5% level.

To detect magnitude and sign of distributional changes,

Table 2. Summary measures of household income distribution.

	Nominal	Income deflated by					
	income	PPP_1		PPP_2		PPP_9	
Mean (euro)	18,970	18,839	(**)	18,166	(**)	18,152	(**)
Median (euro)	16,224	16,134	(*)	15,674	(**)	15,607	(**)
Gini (%)	31.62	31.30	(**)	30.36	(**)	30.20	(**)
Theil (%)	19.96	19.64	(**)	18.80	(**)	18.73	(**)
P9010	4.08	4.00	(**)	3.70	(**)	3.69	(**)
P9050	1.95	1.93	(*)	1.89	(**)	1.89	(**)
P5010	2.09	2.07	(*)	1.96	(**)	1.95	(**)

Note: authors' calculation on weighted household income data from 2006 SHIW.

[4]We assessed the significance of the differences with paired difference tests. In case of complex non-linear statistics, such as the Gini coefficient, we used a bootstrap procedure with 500 draws. For details see Longford *et al.*, 2010.

we made use of the relative distribution method (Handcock and Morris, 1999), which focuses on the comparison between two income distributions, one chosen as baseline (reference) and the other as comparison. Our baseline distribution is the nominal income distribution. The baseline distribution is partitioned in quantiles[5]. The comparison distribution is the PPP--adjusted income distribution. The relative distribution is simply given by the the ratio of the percentage of households in the comparison distribution to the percentage of households in the baseline income distribution in each baseline decile. When the percentage of households in a decile is higher (lower) than the percentage in the reference distribution, the relative distribution will be higher (lower) than one. When there is no change, the relative distribution will be flat at the value of 1. To put it another way, the probability of being in correspondence of a decile of the reference distribution is higher (lower) for households belonging to the comparison population. **Figure 1** reports the relative densities of the income distributions in PPP terms compared to the nominal income distribution.[6]

When we consider income distribution deflated by PPP_1 as comparison distribution (panel (a)) there is a slight gathering of the relative density toward the median, reflecting an increase of the mass of the comparison distribution in the middle classes and a corresponding decrease at both tails, with respect to the income distribution not adjusted. However, overall differences between the two distributions are slightly noticeable.

On the contrary, when we compare income distribution adjusted for PPP_2 to income distribution in nominal terms (panel (b)) we observe a huge increase of the mass of the distribution between first and fourth income decile and, to a lesser extent, between fifth and sixth, counterbalanced by a sizable reduction at the bottom decile and, especially, at the top of the distribution. The same conclusions, besides a slight raise between fourth and fifth decile, not previously recorded, are reached when using PPP_9 (panel (c)). As an example, the percentage of households whose PPP_1--adjusted income falls between the third and fourth deciles of the nominal income distribution is 7% higher than the corresponding share in the reference distribution, while it is 19% higher when we compare the PPP_9--adjusted income distribution to the nominal income distribution. On the contrary, 9.6% of households whose income is PPP_1--adjusted falls in the top income decile of the nominal income distribution, and this percentage falls to 7.6% when income distribution is deflated by PPP_9.

[5]The distribution can be broken into any number of quantiles. Here we adopted the decile breakdown.
[6]The continuous dotted line is estimated with a nonparametric regression. See Massari *et al.* (2009) for a recent application of relative density on income distribution.
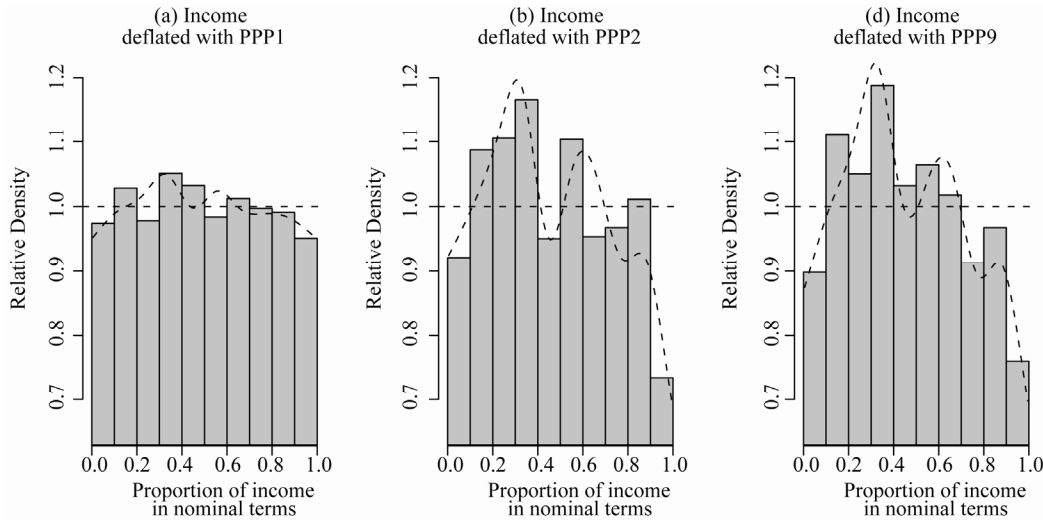
Figure 1. Relative distribution. The y-axis measures the relative fraction of households ranked by PPP adjusted income distributions that falls in each nominal income distribution decile.

To observe what happens in terms of inequality and poverty between and within Italian regions before and after price-adjustment, we consider only PPP_1 and PPP_9, since the results obtained with PPP_2 largely overlap those achieved with PPP_9.

First, the decomposition of Theil index into between-region and within-region, reported in Table 3, reveals a significant reduction in the between-region component when PPP-adjusted income is accounted for. Thus, since the within-region component remains stable[6] the percentage contribution of the between-region component drops from 14.4% for nominal income to 8.1% for income PPP_9-adjusted.

The percentage of households at-risk-of-poverty in NUTS1 macro-areas is reported in **Table 4**. Households at-risk-of-poverty are those below a low-income threshold, which is defined as 60 per cent of the median equivalent income. The overall percentage of households at risk of poverty decreases from 18% to 15.7%. This reduction is due to a significant decrease of the rate of

poverty in Southern Italy (South and Islands) which is not fully counterbalanced by households at-risk-of-poverty in North-West and Central Italy. After adjusting for PPP_9, however, households at-risk-of-poverty are still concentrated in Southern Italy (almost 60% with respect to 68% in the nominal scale).

We now analyze how mean income changes in each region when income is deflated by PPP_1 (**Figure 2(a)**) or by PPP_9 (**Figure 2(b)**). The magnitude of percentage changes is displayed with varying degree of gray. The lighter (darker) the color, the higher is the increase (decrease) of regional mean income after controlling for regional PPP's. The evidence in **Figure 2(a)** is rather mixed, with positive changes mainly concentrated in the Southern Italy, but with different degrees. Only Campania and Molise experience a percentage change higher than 3% . In the North-Central Italy, Tuscany and Marche display positive changes of mean income, while for the remaining regions we observe a decrease of the mean, which ranges to very low values (Umbria and Lazio), to a reduction of 3% in Lombardy.

Results are more definite in **Figure 2(b)**, with a polarization between Southern regions which display an increase higher than 3% , and North-Central regions that experience a decline in mean income of over 3% , with the exception of Veneto (-1%).

Finally, **Figure 3** reports the relative distribution of households living in North-Central Italy (comparison distribution) with respect to the distribution of those living in Southern Italy (reference distribution), according to different deflation adjustments. The gap between North-Central and Southern Italy reduces, after adjusting with PPP_9, but remains wide. For a household living in North-Central Italy the probability of falling between

Table 3. Decomposition of Theil index between and within regions. Estimated values and percentage contribution.

Income	Theil	Between	Within	Between	Within
	index	component	component	% contribution	
Nominal	19.96	2.88	17.08	14.4	85.6
PPP_1-*deflated*	19.64	2.55	17.09	13.0	87.0
PPP_9-*deflated*	18.73	1.51	17.22	8.1	91.9

[6]Small differences in the within-regions component are due to small changes in the income shares of the regions used as weights in computing the component.

Table 4. Households at-risk-of-poverty in NUTS1 regions. Percentage values and percentage contribution.

Income	NUTS1 regions					Italy
	North-West	North-East	Center	South	Islands	
Nominal	6.73	9.47	9.75	38.67	38.50	18.00
PPP_1 *-deflated*	7.00	9.76	9.62	36.46	36.57	17.43
PPP_9 *-deflated*	8.85	8.95	11.06	28.90	29.72	15.74
percentage contribution to aggregate poverty						
Nominal	10.37	10.87	10.81	46.89	21.07	100.00
PPP_1 *-deflated*	11.15	11.56	11.01	45.63	20.65	100.00
PPP_9 *-deflated*	15.60	11.73	14.02	40.06	18.59	100.00

(a)   (b)
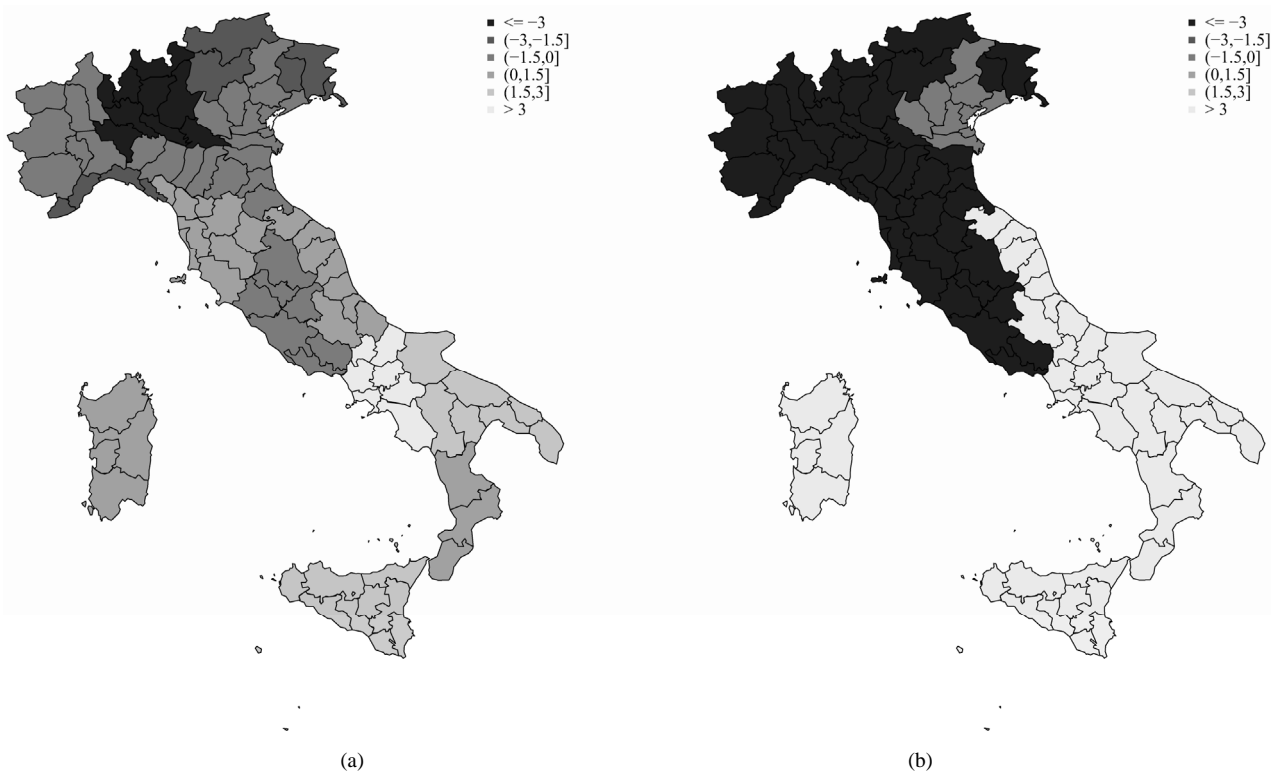
Figure 2. Percentage changes of the regional mean income between the income distribution deflated by PPP_1 (a), and by PPP_9 (b) and the income distribution in nominal terms.

sixth and tenth decile of the income distribution of the South is much higher than that of the corresponding household in the reference population. The reduction of the gap between the two areas is mainly due to a decrease in the mass in the top income class. Indeed, a household in the top income decile of the nominal income distribution has a probability more than three times higher to live in North-Center than in Southern Italy. This probability is "only" two times higher, when PPP_9 -adjusted income distribution is considered. In addition, there is a slight increase of the density between

sixth and eighth decile. Hence, the shrinkage of the gap between South and North-Center is mainly due to a loss in terms of purchasing power incurred by richer households, while for households just above the median there is a modest, but significant, widening of the gap.

4 Concluding Remarks

Overall, the distribution of household income is "reshuffled" after controlling for the purchasing power of households residents in different regions. Higher income
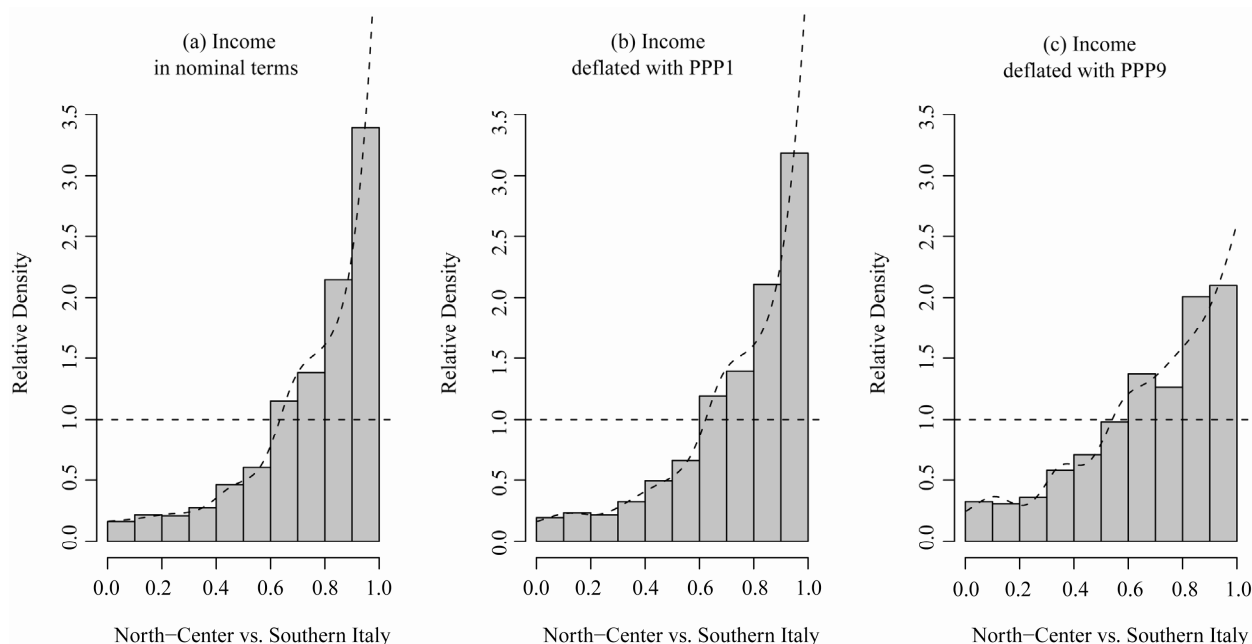
Figure 3. Relative distribution. The y-axis measures the relative fraction of households living in North-Central Italy that falls in each Southern Italy income decile, according to different deflation adjustments.

regions tend to be higher price level regions, therefore inequality between regions and overall inequality across households reduces after adjusting for prices. The apparent living standards of households living in the South improve when the regional price index is used, but only when housing price variations are included in the index. Despite this, poverty is still concentrated in the South whichever regional price index is used. An issue left for further research regards the relationship between quality of life and cost-of-living. Had housing costs been positively correlated with quality of life, the gain in terms of purchasing power experienced by households living in poorer areas, where housing prices are typically lower, could be interpreted as a compensation for the loss in terms of quality of life.

5. Acknowledgments

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