Differences in Sectoral Price Dynamics among Italian Regions: Effects on Expenditure Composition and Welfare

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This paper analyses the evolution of the consumption expenditure in the Italian regions, investigating the impact of sectoral price dynamics on the aggregate sectoral composition as well as on the representative household's welfare. In line with the structural-change macroeconomic literature, this paper underpins on a parsimonious structural model characterized by non-homothetic preferences and balance growth path. The results confirm that differences in price dynamics do not significantly impact on the evolution of sectoral expenditure shares, while income dynamics play an important role. Yet, the welfare analysis shows that a harmonisation of regional price dynamics may lead to significant welfare improvements. These findings support the relevance of supply-side policies aimed at increasing competitiveness and consequently at bounding inflation in the Italian regions.

JEL classification: E2, O41, O47, R11, R13

Key words: regional economics; consumption expenditure composition; welfare analysis.

1. INTRODUCTION

Regional economies may differ for geographical, socio-demographic, and economic characteristics such as the level of wealth, education, and infrastructure, the structure of the markets, and the sectoral specialisation. Some of these elements can determine significant differences in terms of price dynamics and such differences may have important welfare implications especially if the regions are either part of the same country or belong to an economic area characterised by a common monetary policy.

As highlighted in Beck et al. (2009), aggregate inflation differentials in regions can be the result of imperfections in the input factors market, final goods market, as well as wages and prices stickiness[1]. On the one hand, most of the empirical macroeconomic models (e.g. Clemens, 2006; Lyons, 2009; Chitnis and Hunt, 2011) have generally found that prices do not explain a large part in the pattern of the sectoral composition of the consumption expenditure. This finding implies that differentials in sectoral inflation can not explain cross-region differences in composition of the consumption expenditure. On the other hand, other contributions find that price changes in inelastic categories of expenditure significantly affect household's welfare (see Huang and Huang (2012) for the case of the United States). Hence, there is ground to further explore in what measure disparities in sectoral price dynamics influence consumers' welfare at a regional level.

The present analysis underpins on the structural macroeconomic models that study the determinants of the sectoral composition of an economy (for a detailed literature review, see Herrendorf et al., 2014). This literature, which mostly focuses on the historical evolution of the three main aggregated economic sectors (i.e. agriculture, manufacturing, and services), provides theoretical tools that can be extended to the analysis of multi-sectoral regional economies.

[1] The authors investigate co-movements and heterogeneity in inflation dynamics of different European Union regions in order to acquire a better understanding of the effects of a common monetary policy. The results show differences in regional inflation developments due mainly to the size of a region's agricultural sector, the size of the region, output growth and output volatility.

As a theoretical framework this paper refers to Comin et al. (2017), since the reduced form solution of their model can be estimated through a system of linear equations where the effect of prices, income, and preferences can be estimated separately. On the basis of the model estimation, our paper develops in two directions. On the one hand, the contribution of different components to the regional convergence in the consumption expenditure composition is investigated. On the other hand, the analysis on the representative household's welfare is pursued through the following steps. First, for each sector, the regional time series characterized by the lowest cumulative inflation are selected and used to build a common benchmark scenario. Second, the selected price time series and the preference structure estimated for each region are employed to compute a counterfactual consumption bundle, which represents the highest level of consumption potentially achievable. Finally, given the actual regional prices, the Hicksian compensation variation is assessed for each region.

The empirical application is based on the Italian regional data for the time span 1995-2013 and the classification of the sectoral consumption expenditure according to the twelve COICOP 2-digits categories. Arguably, the Italian economy has experienced important sectoral changes over the last decades and is characterized by remarkable regional disparities especially between the northern and the southern regions (amongst others, see e.g. Trigilia and Burroni, 2009). Hence, this country represents a rather interesting case study to analyse the effect of the price dynamics on the regional sectoral composition and provide indications about the potential impact of regional policies targeting sectoral inflation dynamics. Indeed, the findings show that some regions may obtain significant benefits from a reduction in price dynamics and this outcome is mainly driven by the path in key sectors such as the housing and the food sector.

The paper is structured in the following manner. The next section provides a literature review. In Section 3, the methodology adopted is discussed. Section 4 presents the main empirical outcomes, while concluding remarks are given in the last section.

2. LITERATURE REVIEW

As mentioned in the introduction, the theoretical framework used in the present analysis refers to the macroeconomic literature which investigates the sources of the change in the sectoral composition of the economic system.

This thread of the literature can be divided into two main approaches. The first stream, focusing on the supply-side, is mainly linked to the so-called "Baumol's cost disease". According to this approach, those sectors that are characterised by a lower productivity growth experience an increase in the relative prices as well as in the employment and expenditure shares, due to a low elasticity of substitution amongst goods at an aggregate level (see, Ngai and Pissarides, 2007, and Alvarez-Cuadrado et al., 2017). Yet, focusing only on the sectoral composition of consumption, the variation of the relative prices seems not able to explain a significant part of the variations occurred in the consumption composition. Furthermore, if the elasticity of substitution is estimated with a value lower than unity, supply-side mechanisms are not consistent with the co-movement observed between sectoral volumes and expenditures (see Herrendorf et al., 2014; Addessi, 2014).

The second stream of the literature, focusing on the demand-side, mostly highlights that the elasticity of consumption to income can differ from one sector to another. Stone-Geary preferences have been generally adopted (e.g. Herrendorf et al., 2013) allowing for the sectoral income elasticity to depend on the level of total consumption[2]. Such an approach seems to be rather adequate in explaining the pattern of time series in the long run when referring to the three main aggregate sectors,

[2] An alternative approach, which starts from the definition of the consumer indirect utility, is proposed by Boppart (2014).

although few issues have still remained unsolved (for a further discussion, see Buera and Kaboski, 2009, Comin et al., 2017, and Addessi et al., 2017). Specifically, one important issue, related to the use of Stone-Geary preferences, concerns the difficulty in disentangling the price effect from the income effect when estimating the theoretical model. This issue is addressed by Comin et al. (2017) who introduce a non-homothetic preference structure, characterised by an implicit definition of the consumption bundle and constant sector-specific income elasticity. Likewise, Bems and Di Giovanni (2016) employ a similar preference structure where the income effect, rather than directly affecting the choice between aggregate consumption sectors, it largely explains the choice, within each sector, amongst goods that diverge for their quality.

Not strictly linked to a general equilibrium macroeconomic framework, some studies analyse the determinants of changes occurring in consumption patterns amongst different economic sectors. Generally, the findings show that relative prices are not the main drivers of consumption evolution, while income effect can play a relevant role and preference heterogeneity is crucial to explain cross countries and temporal differences[3]. Interestingly, Blundell et al. (1993) compare outcomes obtained from a micro and macro framework for several commodity groups in the United Kingdom (UK). The authors find that in terms of forecast, and hence policy implications, the analysis developed on aggregate data performs similarly to the micro-based analysis, given that the distributional dynamics are difficult to predict. Clements et al. (2006), within eight commodity categories, investigate heterogeneity in consumption and in preferences for a large sample of countries. They find that consumer preferences tend to be different across countries, even for broad aggregates such as food, clothing and housing. Besides, Lyons et al. (2009) explore the evolution of consumption patterns for six categories of goods. The authors find that the difference in the composition of the consumption expenditure between Ireland and other richer OECD countries (e.g. United States (US), Austria,

[3] Other studies analyse consumption patterns focusing on a specific economic sector, such as: food demand (Manhertz, 1970; Seale and Regmi, 2006; Nzuma and Sarker, 2010; Vassilopoulos et al. 2012; Lasarte Navamuel *et al.*, 2017); alcohol or tobacco consumption (Moosa and Baxter, 2002; Eakins and Gallagher, 2003; Duffy 2006); multi aquaculture products (Fofana and Jeffry, 2015); energy consumption (Shirani-Fakhr et al., 2015); tourism demand (Cortés-Jimenez et al., 2009; Wu et al., 2011; Bernini et al., 2017).

Australia, Italy) is mostly explained by the different pattern in the per capita expenditure rather than in the sectoral prices. Chitnis and Hunt (2011) analyse household expenditure for twelve COICOP categories, in the UK, through a Structural Time Series Model and find that the contribution of the non-economic factors - for housing, water, electricity, gas and other fuels, as well as for health, communication and education - have generally a higher impact on expenditure changes than income and price. Huang and Huang (2012), employing US personal consumption expenditure aggregated into eleven categories, find that a rise in prices in food and energy would increase compensated expenditures or incur in a remarkable consumer welfare loss resulting in 7.1% of the poor households income.

While some well-established results have been achieved focusing on country-level data, only a few studies analyse consumer budget allocation across economic sectors at a regional level. For example, Hampton and Giles (1988) analyse income elasticity of demand for eight commodity groups, finding significant variations amongst three major New Zealand regions. Given the relevant importance of household consumption in regional economics, Wakabayashi and Hewings (2007) find that life-cycle changes have an impact in the Japanese economy with remarkable differences in consumers' age and by province.

3. METHODOLOGY

Preference structure and econometric procedure

As stated in the introduction, the methodology adopted in the present paper is based on the approach developed by Comin et al. (2017). In this manner, it is possible to define a system of linear equations where the impact of relative prices and income are independent. Specifically, in each region the aggregate consumption bundle, C_t (for the moment, the subscript to indicate the region is not included), is implicitly defined as follows:

$$\sum_{i=1}^{n} \omega_{i,t}^{\frac{1}{\sigma}} C_t^{\frac{\varepsilon_i}{\sigma}} C_{i,t}^{\frac{\sigma-1}{\sigma}} = 1 \qquad (1)$$

where i indicates the sector, n the number of sectors (in our case $n = 12$), t refers to the time period, σ is the elasticity of substitution, ε_i is the sectoral income elasticity, $C_{i,t}$ is the consumption of sector i goods at time t, and $\omega_{i,t}$ is the sectoral preference weight, which is assumed to be given by a constant and a stochastic component, $\omega_{i,t} = \omega_i (1+ \eta_{i,t})$ where $\eta_{.,t}$ are *i.i.d.* white noise. Assuming rational agents characterized by a time-separable utility function, it is straightforward to obtain that (the logarithm of) the relative expenditure share between any two sectors i and j is given by the following equation:

$$\log(s_{ij,t}) = \log(\omega_{ij}) + (1-\sigma)\log(p_{ij,t}) + \varepsilon_{ij}\log(C_t) + \mu_{ij,t} \quad (2)$$

where $s_{ij,t}$, $p_{ij,t}$ and ω_{ij} represent, the ratio between sector i and j expenditure shares, prices, and preference weights (the constant part), respectively; ε_{ij} is the difference between income elasticities. In the econometric exercise, $\mu_{ij,t}$ is measured by the regression residual which can be interpreted as the time varying stochastic component of the preference weights[4]. Eq. (2) indicates that the ratio between the expenditure shares of sectors i and j depends positively (negatively) on the relative price if the elasticity of substitution is lower (higher) than unity, and on the total level of consumption according to the difference in the income elasticity. Once a specific sector is chosen as reference, Eq. (2) defines a system of $n-1$ linear equations which can be estimated simultaneously in order to obtain the estimates for the unknown parameters $\log(\omega_{ij})$, σ, and ε_{ij} (later indicated by the vector **u**). On the basis of such estimates, it is possible to assess the contribution of the different factors to the cross-regional differences in the consumption expenditure composition.

Welfare Analysis: theoretical framework

The estimates obtained from the econometric procedure are then used to evaluate the effect of regional differences in sectoral inflation on the representative household's welfare. Specifically, for each sector, the regional time series characterized by the lowest cumulated inflation are selected[5]. Such set

[4] Referring to Eq. (1), $\mu_{ij,t}$ represents the $\log\frac{1+\eta_{i,t}}{1+\eta_{j,t}}$.

[5] More details about the selection of the sectoral price time series are reported in Table A.1 of the Appendix.

of sectoral prices is used to build a benchmark counterfactual scenario, which reasonably represents the lowest achievable inflation in all the regions. Maintaining constant the total expenditure observed in each region, we simulate how the aggregate consumption would have evolved, in terms of both levels and composition, under the benchmark scenario and calculate the impact in terms of welfare. Finally, the Hicksian composition variation is calculated as the compensating variation in income that would have granted the same level of welfare of the benchmark scenario, given the actual sectoral prices.

To carry out the welfare analysis, the characterisation of the preference structure has to be further developed because some elements are not exactly identified by the econometric model. With regard to the sectoral income elasticities, the estimation procedure leaves one degree of freedom, since income elasticities are estimated in relative terms. As explained in Comin et al. (2017), in order to obtain a well-defined utility function, when the elasticity of substitution is lower than 1 (as in this case), it is necessary that all the income elasticities are higher than the elasticity of substitution. We enforce this condition by imposing that the lowest sectoral elasticity to consumption is slightly higher than the elasticity of substitution. Furthermore, in line with most of the macroeconomic calibrations, the annual subjective discount factor is set equal to 0.96 and the Constant Relative Risk Aversion (CRRA) preferences are assumed equal to 3[6].

Once defined all the necessary elements, we simulate the counterfactual aggregate consumption in each region and calculate the corresponding welfare. Specifically, $W_r^*(\mathbf{p}^*, \boldsymbol{e}_r, \widehat{\boldsymbol{u}}_r)$ defines the welfare of the representative household in region *r*, in presence of the benchmark prices $\mathbf{p}^*$, given the actual level of consumption expenditure $\boldsymbol{e}_r$, according to the estimated parameters $\widehat{\boldsymbol{u}}_r$. Hence, we reintroduce the original regional price series, $\boldsymbol{p}_r$, and calculate the average income transfer $\boldsymbol{x}_r$ required to obtain the level of welfare achieved in the benchmark scenario. Specifically, $\boldsymbol{x}_r$ solves the following equation for each region:

[6] Robustness analyses have been run with CRRA equal to 1 and 5 and no relevant changes emerged.

$$W_r(\mathbf{p_r}, (1+x_r)\mathbf{e_r}, \widehat{\boldsymbol{u}}_\mathbf{r}) = W_r^*(\mathbf{p}^*, \mathbf{e_r}, \widehat{\boldsymbol{u}}_\mathbf{r}) \qquad (3)$$

4. EMPIRICAL ANALYSIS

Data and descriptive statistics

The data used in this study refer to the Italian household consumption expenditure at both regional and national level, classified according to the COICOP 2-digit classification (12 sectors), where each sector identifies a specific purpose of consumption. The Italian National Institute of Statistics (ISTAT) publishes consumption time series measured at both current and constant prices from 1995 to 2013 for each of the administrative areas (i.e. the twenty regions as well as the country level).[7]

In order to compare the consumption composition of the different Italian regions, we define a measure of distance, given by the sum of the absolute values of the difference between the sectoral expenditure shares observed in each region and the corresponding value observed at the national level. Hence, the overall distance, *D,* is given by Eq. (4), as follows:

$$D = \sum_{r=1}^{20} D_r = \sum_{r=1}^{20}\sum_{i=1}^{12} D_{r,i} = \sum_{r=1}^{20}\sum_{i=1}^{12}\sum_{t=1996}^{2013}\left|s_{ri,t} - s_{i,t}\right| \qquad \forall\, r = 1, 2, \dots, 20 \quad (4)$$

where r indicates the region, i indicates the COICOP sector, t is the time reference, so that $s_{ri,t}$ represents the expenditure share in region r for COICOP i at time t, while $s_{i,t}$ is the corresponding value at national level, which implies that D_r is the sum of the sectoral distances recorded in region r over time.[8]

[7] Data are available at http://dati.istat.it/?lang=en.

[8] The analysis that follows is robust to the use of an alternative measure of distance, given by the sum of the squares of the differences in the expenditure shares (as in Lyons et al., 2009).

Figure 1 reports the average and the standard deviation of the distance characterising each region over the considered time span[9] (see Table A.1: list of abbreviations for the Italian regions).

FIGURE 1 HERE

The regional indicators of distance can differ substantially amongst the regions and over time. The composition of the consumption expenditure diverges from the national benchmark especially in Trentino Alto Adige, which also denotes the highest gross domestic product per capita in the country (Banca d'Italia, 2017), while Valle d'Aosta denotes a rather high volatility.

Figure 2 depicts the dispersion of the overall regional inflation that suggests that there is no convergence, in line with the evidence provided by Beck et al. (2009) for a sample of European regions.

FIGURE 2 HERE

Similar conclusions emerge when analysing the regional dispersion of the inflation sector by sector (see Figure 3).

FIGURE 3 HERE

As a preliminary further investigation, it is worthwhile analysing the correlation between the explanatory variables employed in the estimated equations (Eq. 2), that is per capita real consumption growth rate and sectoral relative inflation. The correlations between the regional and national time series are generally rather high. In the case of the per capita real consumption growth rate, the value ranges from 0.71 in Molise to 0.98 in Emilia Romagna. With regard to relative prices, the correlation ranges from 0.68 in Molise to 0.97 in Veneto.

TABLE 1 HERE

[9] A similar graph showing the distance by COICOP is reported in Appendix, Figure A.1.

Econometric Estimation

The econometric analysis is based on the system of equations described in Eq. (2). As benchmark procedure, each regional system is estimated separately, and as an assumption the elasticity of substitution between consumption goods is the same in all regions and equal to the estimate, $\hat{\sigma}$, obtained from the analysis of national data[10]. Then, we transform the system of equations and run the regressions separately for each region as follows:

$$v_{ij,t} = \log(\omega_{ij}) + \varepsilon_{ij} \log(C_t) + \mu_{ij,t} \quad (5)$$

where $v_{ij,t} = \log(s_{ij,t}) - (1 - \hat{\sigma}) \log(p_{ij,t})$.[11] The estimated values are transformed in the corresponding theoretical parameters imposing that the sum of the preference weights is equal to 1. Table 2 reports the unweighted average of the estimates obtained in each region and the standard deviation for both preference weights and income elasticities[12].

TABLE 2 HERE

Previous contributions (e.g. Herrendorf *et al.*, 2014) have generally found a negative effect of total expenditure per capita on the expenditure share of Agriculture. This is also confirmed in the present analysis, since the income elasticities, expressed in relative terms with respect to Food sector, are generally positive[13]. The standard deviations highlight heterogeneity in the regional estimates.

[10] Such a restriction simplifies the implementation of the welfare analysis and grants uniformity in the interpretations of the effects of relative-price dynamics. Concerning the choice of imposing no cross-regional restriction on sectoral preference weights, regression results seem to support such choice since preference estimates vary significantly among regions (see also Clements *et al*., 2006). Similar argument supports the choice of not imposing cross regional restrictions on the sectoral income elasticities.

[11] All the regressions are run taking Food (COICOP 01) as the reference sector.

[12] For completeness, the average of the elasticities of substitution estimated at regional level is equal to 0.9, very close to the value obtained from national level data.

[13] Regional specific estimates are available upon request.

Evolution of the regional distance

One of the aims of the present study is to uncover the contribution of the different factors (prices, income, preference weights, and preference shocks) to the differences in the composition of the consumption expenditure amongst the Italian regions. As an indicator of the overall distance, we choose the unweighted average of the regional distances calculated in each year, in line with the definition reported in Eq. (3). The evolution of the overall distance observed in the data is then compared with the overall distance predicted by the theoretical model on the basis of the econometric estimates. Specifically, two simulations are run: the first simulation underpins to the theoretical equations with both the observed sectoral price dynamics and aggregate consumption dynamics. The second simulation assumes constant prices and allows for variation only in the aggregate consumption. Figure 5 shows the evolution of the observed and simulated distances.

FIGURE 5 HERE

The comparison between the two simulated series indicates the importance of price dynamics in the evolution of the distance. It emerges clearly that the price dynamics do not have a relevant impact, since the two series almost overlap. Notably, this outcome is consistent with Lyons et al. (2009), and Chitnis and Hunt (2011) who find that only a small part of the changes in consumption expenditure composition is explained by prices.

The comparison between the observed distance and the distances drawn by the simulations indicates the ability of the model to replicate the U-shaped path observed in the data[14]. The average distance obtained from the simulations is generally lower than the observed one. This outcome suggests that the model may miss to capture a source of heterogeneity which positively contributes to increase the distance between regions[15]. This is particularly evident in the period 2008-2011, although the acceleration started in 2011 is well replicated. The deterministic constant part of the

[14] Data suggest that the average distance has been decreasing during the first part of the considered time span, while has started to increase since 2005.

[15] According to the underlying theoretical model, such time-varying heterogeneity, related to estimation residuals, could be interpreted as shocks to the sectoral preference weights (for a discussion on this issue, see Chitnis and Hunt, 2011).

sectoral preferences explains 58.8% of the distance, the stochastic part explains 3.9%, while income dynamics explain the remaining 37.3%. Similar considerations emerge when looking at the evolution of the distance region by region[16].

FIGURE 3 HERE

Welfare analysis

In the previous sections, it has been shown that the correlation among regional relative prices is rather strong. Furthermore, the analysis has indicated that price dynamics do not play a role on the regional differences in the consumption expenditure composition. At first sight, these elements may suggest that regional differences in sectoral price dynamics may also have a low impact on households' welfare.

To assess such a potential impact, for each sector, the regional dynamics characterised by the lowest cumulated inflation have been selected as a benchmark[17]. Hence, on the basis of the estimates obtained in the previous section, we further simulate the consumption path and the welfare impact by taking into account such a benchmark in each region[18]. Then, the Hicksian variation compensation necessary to obtain the same level of welfare in presence of the actual set of prices is calculated (i.e. the average percentage increase in expenditure income; see Table 3). This analysis shows that Abruzzo and Puglia are the regions which would require the highest income compensation (20.3% and 17.6%, respectively); while Basilicata, Valle d'Aosta, and Molise are the regions where the compensation would be minimal (2.0%, 2.6%, and 2.8%, respectively). On average, the compensation would be approximately 7.9%.

[16] More details are available upon request.

[17] The following analysis has been developed also assuming no inflation at all, and the results are available upon request. We consider such alternative scenario less relevant since sectoral inflation can emerge in all regions due to common macroeconomic causes (see Beck et al., 2009), while the regional differences in sectoral inflation, can be due to regional supply side policies.

[18] The underlying assumption is that sectoral goods are homogenous among regions, so that higher sectoral inflation represents a loss of efficiency.

In line with the contributions which emphasize the crucial role of specific sectors in the overall inflation path (see Huang and Huang, 2012), the analysis is further extended to focus on the welfare impact of the price dynamics by sector. That is, we maintain the actual sectoral price dynamics except for one sector at time. For that sector we impose the regional series with the lowest cumulated inflation and then we calculate the Hicksian compensating variation corresponding to this specific change (Table 4). It emerges that food and housing are generally those sectors whose price dynamics have the highest impact. On the one hand, housing expenditure represents the highest share of households' budget (currently around a quarter) either as tenants or homeowners who have to pay for their mortgage together with accrued interests. Besides, this outcome is compatible with the housing bubble that drove inflation in the sector before the economic crisis. On the other hand, food can be regarded as one of the key sectors that also presents rather high average regional differences in terms of price dynamics (Table A.2). Notably, as remarked by Rondinelli (2014), in Italy, the expenditure share in housing and food had a further boost in the aftermath economic crisis and, as for the food sector, especially for younger households.

Besides, the findings show that health and education are characterized by a high cumulated inflation and heterogeneity amongst the regions. In these sectors, a key role is exerted by the government in the supply of goods and services. The healthcare in Italy is based on a mixed private and universalistic public mode; notably, the COICOP data used in this paper include only private healthcare expenditure is considered (e.g. medical products, appliances and equipment, hospital services). The empirical results show that the lowest cumulated inflation occurred in the southern regions, such as Calabria (used as a benchmark) but also Campania, Puglia, Sardegna and Basilicata (less than 0.10), while the northern regions, such as Piemonte (0.32) and Emilia Romagna (0.24) experience higher inflation. This finding seems to resemble the differences in socio-demographic and economic characteristics of these geographical areas.

5. Conclusions

The aim of this investigation was twofold. On the one hand, a macroeconomic approach was adopted to assess the contribution of price and income effect on the sectoral composition of the final consumption expenditure of Italian households over the time span 1995-2013. The focus of the research was on the differences of such compositions in the Italian regions. It emerged that after a decreasing trend, the distance in the composition has increased in the recent years. This path can be mainly explained by the dynamics of the regional consumption per capita as well as consumers' preferences. On the other hand, the price dynamics denoted a rather negligible impact. These results are in line with previous studies such as Chitnis and Hunt (2011), and Lyons et al. (2009).

Yet, a further aim of this paper was to evaluate the welfare loss driven by sectoral inflations in all the regions. The estimated impact of *ad hoc* policies aimed at constraining regional sectoral inflation (gap) would be equivalent to an average income transfer of 7.9%. Sometimes, most of this transfer is due to the cumulated inflation registered in key specific sectors (Table A.2 in Appendix). From an in-depth investigation on each of the sectors, as expected, the housing sector is characterised by the highest cumulated inflation, the highest welfare impact, and the highest heterogeneity amongst the regions.

On the whole, the present research suggests that, in line with previous studies, although price dynamics do not seem to exert a significant impact on sectoral expenditure composition, there is ground to encourage the implementation of adequate policies aimed at a higher harmonization of aggregate inflation dynamics that would favour higher welfare in many regions.

Finally, it is also important to highlight a few shortcomings of the proposed analysis that can be also considered as opportunities for future research. First, price data are indexes and, hence, do not provide information about the level comparison among regions[19]. Second, as highlighted in Klaus Adam's comments reported in Beck et al. (2009), the observation of higher inflation in those sectors

[19] To the best of the authors' knowledge a project run by ISTAT, Unioncamere, and Instituto Tagliacarne, whose results are reported in ISTAT (2009), provides estimates of the price levels for only eight consumption categories and data are surveyed only in the regional capitals.

which are mainly composed of non-tradable goods may be due to other structural factors rather than mere inefficiency. Third, although within the welfare analysis the functional form of the preferences has been chosen to be consistent with the general equilibrium model literature, the counterfactual scenarios have been built not considering the general equilibrium effect on labour supply and total household income. Aware of such shortcomings, worth to be addressed in future researches, we consider the present analysis an original and relevant study, which contributes to the identification of some of the main sources of heterogeneity in regional consumption expenditure composition and welfare

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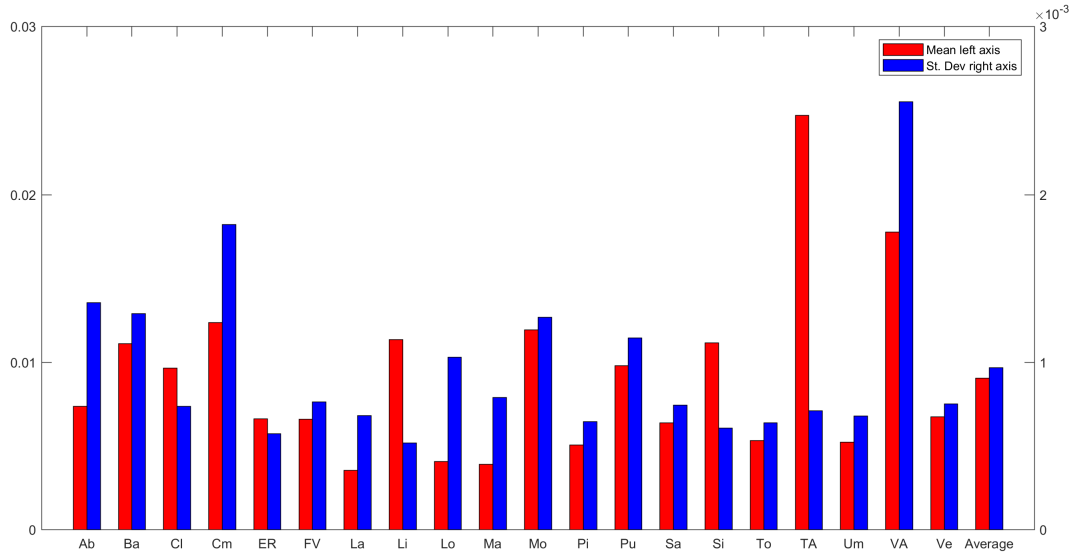
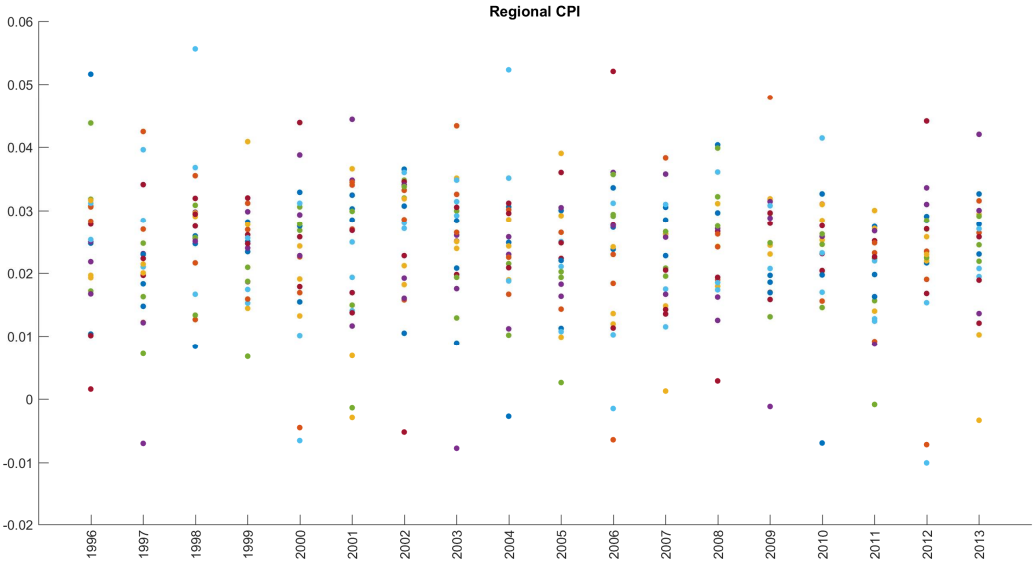
FIGURES AND TABLES

Figure 1. Distance between regional and national composition of consumption expenditure, by region



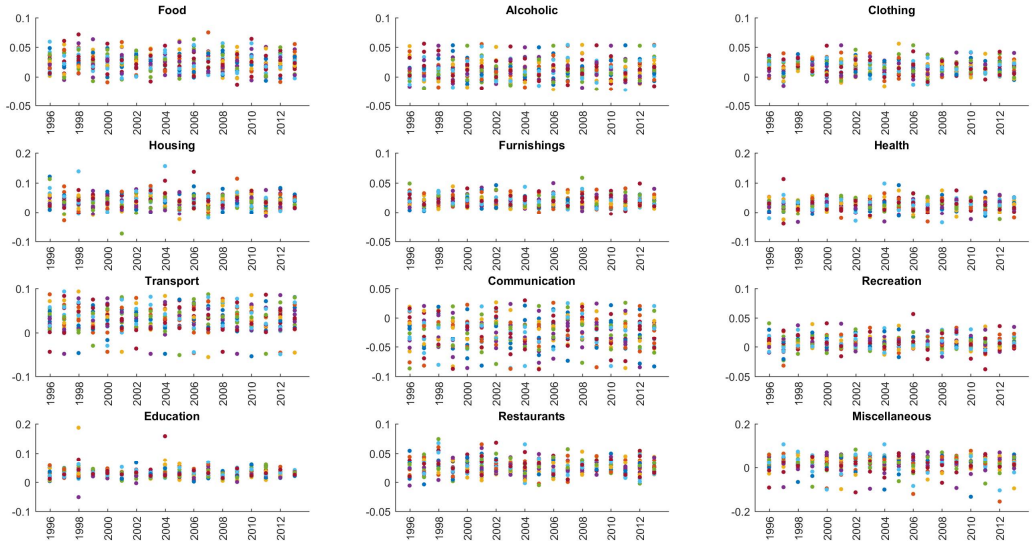
Notes: Distance is calculated as reported in Eq. (2). Average is calculated as the unweighted average value among regions. The legend for the abbreviations used to indicate the Italian regions is reported in Appendix A.

Figure 2. Annual inflation rates (CPI) in the Italian regions: 1996 – 2013.



Notes: Every dot represents a region.

Figure 3. Annual inflation rates in the Italian regions by COICOP 2-digits sector: 1996 – 2013.



Notes: Every dot represents a region.

Table 1. Correlations between regional and national time series: Real consumption growth rate; Relative prices

	Consumption	Rel. Prices			Consumption	Rel. Prices
Abruzzo	0.94	0.90		Molise	0.71	0.68
Basilicata	0.81	0.83		Piemonte	0.97	0.92
Calabria	0.95	0.85		Puglia	0.96	0.90
Campania	0.91	0.76		Sardegna	0.94	0.87
Emilia Romagna	0.98	0.95		Sicilia	0.93	0.95
Friuli Venezia Giulia	0.77	0.87		Toscana	0.95	0.95
Lazio	0.95	0.92		Trentino	0.74	0.88
Liguria	0.97	0.93		Umbria	0.96	0.91
Lombardia	0.97	0.93		Valle d'Aosta	0.89	0.86
Marche	0.96	0.93		Veneto	0.95	0.97

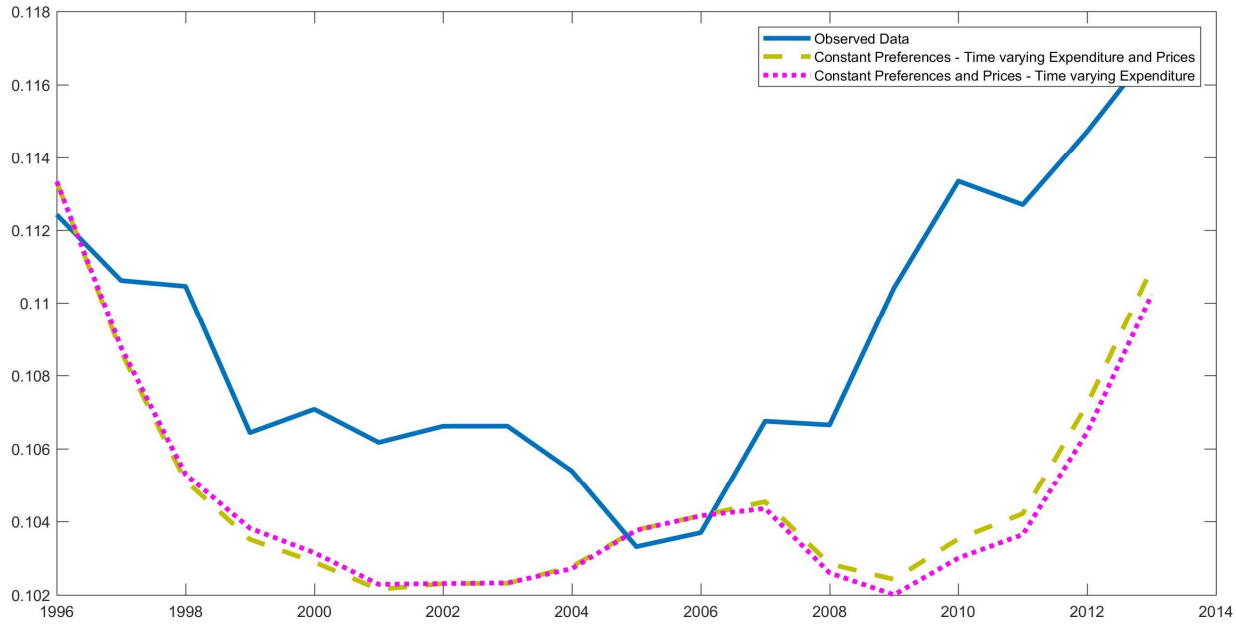
Notes: The correlation for relative prices is calculated as the regional average of the correlations among the 11 time series of relative prices. In line with the rest of the paper, sectoral relative prices are calculated with respect to the food sector price index.

Table 2. Estimation Results

	Average	Std			Average	Std
ω_1	0.27	0.13		$\varepsilon_{2,1}$	0.25	0.52
ω_2	0.06	0.04		$\varepsilon_{3,1}$	0.27	0.30
ω_3	0.08	0.07		$\varepsilon_{4,1}$	0.56	0.78
ω_4	0.20	0.21		$\varepsilon_{5,1}$	0.31	0.41
ω_5	0.08	0.07		$\varepsilon_{6,1}$	0.05	0.47
ω_6	0.07	0.05		$\varepsilon_{7,1}$	0.70	0.40
ω_7	0.06	0.07		$\varepsilon_{8,1}$	2.48	0.82
ω_8	0.0002	0.0003		$\varepsilon_{9,1}$	0.49	0.60
ω_9	0.07	0.13		$\varepsilon_{10,1}$	0.28	0.57
ω_{10}	0.02	0.04		$\varepsilon_{11,1}$	1.00	0.75
ω_{11}	0.05	0.11		$\varepsilon_{12,1}$	0.75	0.45
ω_{12}	0.04	0.04		σ	0.92	0.00

Notes: Average reports the average of the estimates obtained in the different regions. Std is the standard deviation of the regional estimates. ω_i and $\varepsilon_{i,j}$ are, respectively, the sectoral preference weights and the relative income elasticities (relative with respect to sector 1, food), and σ represents the elasticity of substitution (see Eq. (1)).

Figure 3. Observed and simulated average regional distance.



Notes: Distances are calculated according to Eq. (4). Distances are calculated on the base of: *i*) empirical data; *ii*) data generated simulating the econometric model, excluding the role of residuals; *iii*) data generated simulating the econometric model, excluding the role of residuals and maintaining constant prices.

Table 3 Hicksian compensating variation in income (HC)

Region	HC		Region	HC
Abruzzo	20.30%		Piemonte	7.00%
Basilicata	2.00%		Puglia	17.60%
Calabria	4.70%		Sardegna	3.90%
Campania	15.50%		Sicilia	6.60%
Emilia Romagna	5.70%		Toscana	3.30%
Friuli Venezia Giulia	6.10%		Trentino Alto Adige	15.10%
Lazio	5.60%		Umbria	6.20%
Liguria	10.20%		Valle d'Aosta	2.60%
Lombardia	5.20%		Veneto	4.20%
Marche	12.70%		Average	7.87%
Molise	2.80%			

Notes: The Hicksian compensating variation is calculated as the average percentage increase in income allowing to achieve the same level of satisfaction that would have been obtained with the whole benchmark set of prices.

Table 4 Hicksian compensating variation in income for sectoral inflation

Region	Sector	Sector HC
Abruzzo	Housing	18.00%
Basilicata	Food/Housing	0.60%
Calabria	Recreation	2.50%
Campania	Housing	10.10%
Emilia Romagna	Food/Housing	1.60%
Friuli Venezia Giulia	Food	2.10%
Lazio	Food	1.60%
Liguria	Housing	8.30%
Lombardia	Clothing	2.00%
Marche	Housing	9.20%
Molise	Food	1.00%
Piemonte	Health	1.80%
Puglia	Housing	15.10%
Sardegna	Food	1.20%
Sicilia	Housing	4.30%
Toscana	Food	1.50%
Trentino Alto Adige	Housing	8.30%
Umbria	Housing	2.80%
Valle d'Aosta	Housing	0.90%
Veneto	Food	1.50%
Average		4.72%

Notes: The Hicksian compensating variation is calculated as the average percentage increase in income allowing to achieve the same level of satisfaction that would have been obtained with the benchmark prices of the selected sector. For each region, the Hicksian compensating variation is reported for the sector having the highest impact.

Appendix

Table A.1 Italian regions: list of abbreviations

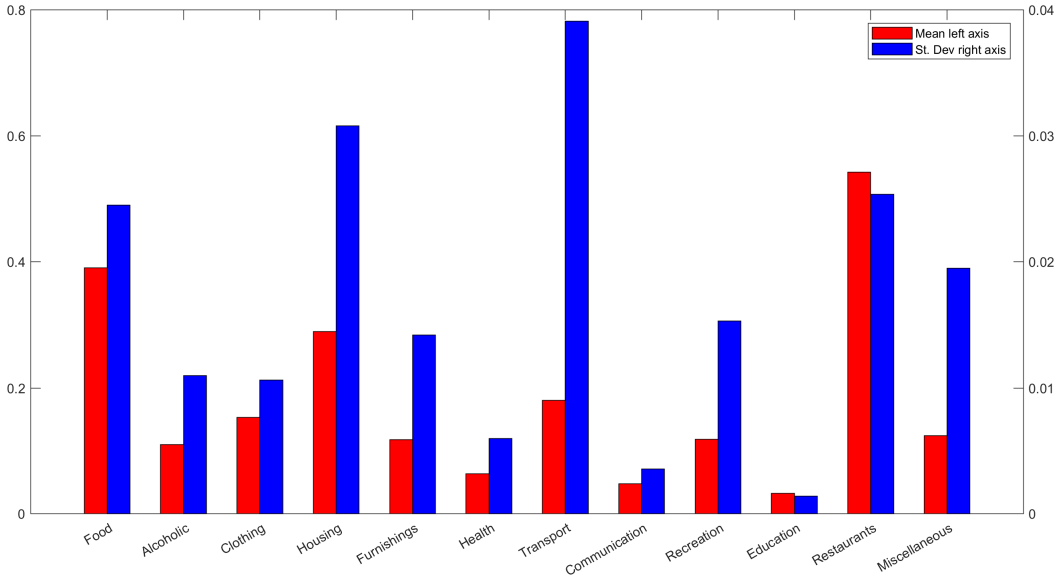
List of Abbreviations

Ab = Abruzzo; Ba = Basilicata; Cl = Calabria; Cm = Campania; ER = Emilia Romagna; FV = Friuli Venezia Giulia; La = Lazio; Li = Liguria; Lo = Lombardia; Ma = Marche; Mo = Molise; Pi = Piemonte; Pu = Puglia; Sa = Sardegna; Si = Sicilia; To = Toscana; TA = Trentino Alto Adige; Um = Umbria; VA = Valle d'Aosta; Ve = Veneto.

Table A.2 Cumulated inflation difference with respect to the sectoral minimum (1996-2013)

	food	alchol	clothing	housing	furnishing	health	transport	communication	recreation	education	restaurants	miscellaneous
Abruzzo	0.121	0.045	0.273	0.519	0.117	0.125	0.175	0.047	0.093	0.099	0.090	0.156
Basilicata	0.098	0.022	0.000	0.222	0.076	0.077	0.277	0.042	0.000	0.114	0.106	0.100
Calabria	0.143	0.065	0.393	0.161	0.096	0.000	0.219	0.127	0.099	0.327	0.119	0.302
Campania	0.283	0.073	0.365	0.380	0.109	0.007	0.276	0.076	0.195	0.247	0.234	0.091
Emilia Romagna	0.063	0.032	0.188	0.284	0.056	0.240	0.140	0.033	0.157	0.212	0.160	0.273
Friuli Venezia Giulia	0.091	0.038	0.183	0.265	0.101	0.219	0.198	0.041	0.095	0.116	0.230	0.147
Lazio	0.111	0.028	0.229	0.149	0.114	0.178	0.172	0.069	0.087	0.000	0.360	0.121
Liguria	0.122	0.024	0.192	0.351	0.088	0.114	0.146	0.121	0.144	0.133	0.155	0.109
Lombardia	0.037	0.044	0.178	0.433	0.111	0.198	0.127	0.000	0.138	0.174	0.234	0.244
Marche	0.069	0.030	0.195	0.423	0.092	0.114	0.240	0.087	0.098	0.147	0.040	0.218
Molise	0.135	0.021	0.071	0.335	0.000	0.209	0.073	0.047	0.075	0.355	0.000	0.041
Piemonte	0.077	0.040	0.313	0.276	0.144	0.322	0.201	0.011	0.164	0.182	0.202	0.167
Puglia	0.119	0.018	0.201	0.611	0.099	0.065	0.219	0.230	0.174	0.013	0.125	0.151
Sardegna	0.144	0.046	0.071	0.000	0.094	0.074	0.178	0.172	0.075	0.234	0.122	0.180
Sicilia	0.043	0.043	0.172	0.252	0.062	0.191	0.232	0.133	0.124	0.023	0.144	0.174
Toscana	0.044	0.019	0.140	0.291	0.036	0.183	0.104	0.049	0.161	0.170	0.164	0.148
Trentino Alto Adige	0.049	0.022	0.171	0.490	0.147	0.182	0.131	0.075	0.123	0.157	0.234	0.140
Umbria	0.084	0.004	0.221	0.207	0.088	0.176	0.093	0.029	0.024	0.319	0.097	0.247
Valle d'Aosta	0.000	0.023	0.194	0.070	0.077	0.227	0.000	0.130	0.159	0.136	0.013	0.000
Veneto	0.060	0.000	0.131	0.339	0.071	0.115	0.140	0.027	0.078	0.195	0.167	0.186
Average	0.095	0.032	0.194	0.303	0.089	0.151	0.167	0.077	0.113	0.168	0.150	0.160
Standard Deviation	0.058	0.018	0.092	0.146	0.033	0.079	0.068	0.057	0.049	0.096	0.083	0.073

Figure A.1. Distance between regional and national composition of consumption expenditure, by COICOP



Notes: Distance is calculated as reported in Eq. (2). Average is calculated as the unweighted average value among regions.