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La Dolce Vita: Hedonic Estimates of Quality of Life in Italian Cities*

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Abstract

This paper provides an assessment of quality of life in Italian cities using the hedonic approach. We analyze micro-level data for housing and labor markets to estimate compensating differentials for local amenities within five domains: climate, environment, services, society and economy. The estimated implicit prices are used to construct overall and domain-specific quality of life indices. We find that differences in amenities are reflected in substantial compensating differentials in housing prices, whereas the effects on wages are relatively small. Quality of life varies substantially across space and is strongly related to differences in public services and economic conditions. Overall, quality of life is highest in medium-sized cities of the Center-North, displaying relatively high scores in all the domains considered. Northern cities fare better with respect to services, social and economic conditions, while relatively worse for climate and environmental conditions.

JEL: C4, D5, H4, J3, J6, P2, P3, Q2, R2
Keywords: quality of life, hedonic prices, housing markets.

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1 Introduction

In recent years, as fiscal federalism has come to the forefront of the policy debate in several countries, the comparison of quality of life (QoL) across regions and metropolitan areas has become a key issue for policymakers and the general public. As a consequence, the assessment of living conditions and their determinants has received increasing attention, well beyond the academic debate (Rappaport, 2009). A large body of literature has developed, proposing alternative methods for measuring quality of life in regions and cities on the basis of their observable characteristics (see e.g. Blomquist, 2007, Lambiri et al., 2006, for recent reviews).[1] Within this literature, quality of life is generally defined as the weighted average of a set of local amenities. One of the key issues is therefore how to appropriately weight the different amenities.

Following the theoretical approach proposed by Rosen (1979) and extended by Roback (1982), several variants of the hedonic price method have been used to value amenities and construct quality of life indicators. Within this framework, households' location decisions reveal their preferences for the bundle of attributes that characterize urban areas. The economic value of a local amenity can be determined on the basis of the housing prices households are willing to pay and the wages they are willing to accept to locate in a given area. The basic intuition is that, in a spatial equilibrium, households are willing to pay higher rents, or accept lower wages, to live in areas with better amenities. Quality of life can therefore be measured, and compared across areas, by weighting local amenities with the implicit prices derived from compensating differentials in housing and labor markets. Differences in the quality of life index thus obtained represent the premium that households are willing to pay to live in an area with a given set of amenities.[2]

Over the last decades, several studies have followed this approach, differing in terms of scope, selection of amenities, and spatial disaggregation level. While the seminal contributions to this literature focus on wage differentials, several more recent studies consider either rent differentials (e.g. Cheshire and Sheppard 1995, Giannias, 1998, Shultz and King 2001), or both wage and rent differentials (Roback, 1982, Kahn, 1995, Berger et al., 2003). A number of recent studies link the analysis of quality of life to other fields, such as urban competitiveness and growth (Deller et al., 2001, Monchuk et al., 2007, Wu and Gopinath, 2008), migration (Douglas and Wall, 2000),

[1] See also Luger (1996), Diener and Suh (1997) and Gyourko et al. (1999) for earlier reviews of alternative approaches to the measurement of quality of life.

[2] The Rosen-Roback framework of compensating differentials has been modified to include agglomeration effects (Blomquist et al., 1988), taxation effects (Gyourko and Tracy, 1989, 1991) and distance.

and environmental quality (Brasington and Hite, 2005, Redfearn, 2009).[3]

While several applications of the hedonic approach to the measurement of quality of life across urban areas exist for the United States (e.g. Blomquist et al., 1988, Kahn 1995, Costa and Kahn 2003, Ezzet-Lofstrom, 2004, Shapiro 2006, Rappaport, 2008, 2009, Winters, 2010), there are relatively fewer studies comparing quality of life across cities outside the US (e.g. Giannias, 1998, Berger et al., 2003, Srinivasan and Stewart, 2004, Buettner and Ebertz, 2009). The present study is, to the best of our knowledge, the first application of the hedonic approach to micro-level housing and labor market data to measure and compare quality of life across Italian cities.[4]

We use individual-level data for wages and housing prices, together with city-level data on local amenities to estimate compensating differentials in labor and housing markets. We obtain implicit prices for amenities within five main domains: climate, environment, services, society and economy. The estimated implicit prices are then used to rank the 103 Italian province capitals on the basis of overall and domain-specific quality of life. Our analysis addresses two main questions. First, what are the main determinants of quality of life in Italy? More specifically, what is the value that Italians attribute to, say, climate and environment, as opposed to public services and socio-economic conditions as determinants of their quality of life? Second, how is overall and domain-specific quality of life distributed across Italian cities?

The results indicate that the presence of amenities results in large compensating differentials for the housing market, whereas the effects on wage differentials are relatively small, reflecting the relative rigidity of wages and low regional mobility in the Italian labor market. We find substantial geographical variation in quality of life, with the overall index reflecting different classes of amenities across cities. Quality of life is highest in medium-sized towns of the Center-North. Northern cities generally fare better for services and economic conditions, while relatively worse for climate and environmental conditions. The opposite pattern applies to cities located in the South. The domain-specific indicators are related to the overall index in various degrees. Climatic and environmental conditions are negatively related to

[3]See also Morawetz et al. (1977), Alesina et al. (2001) and Oswald and Wu (2010) for studies linking quality of life and individual well-being.

[4]QoL indicators have been developed in the Italian context using different methodologies. Maddison and Bignamo (2003) estimate the marginal willingness to pay for climate variables in Italian cities. Schifini D'Andrea (1998) relies on socio-economic indicators to assess quality of life in Italy in a comparative perspective. Cicerchia (1996) proposes a set of objective and subjective indicators of quality of life based on land supply and demand, territorial loading, equilibrium and spill-over of urban systems, and critical population mass. Nuvolati (2003) analyses the evolution of QoL in the 103 Italian provinces from 1989 to 2001 following the approach proposed by Bagnasco (1977), who studies the links between socioeconomic development and living conditions in the Italian regions.

overall QoL, while social conditions are positively but weakly related to QoL. Public services and economic conditions are positively and strongly related to overall quality of life.

The remainder of the paper is structured as follows. Section 2 briefly reviews the theoretical framework. Section 3 describes the data. Section 4 discusses the methodology. Section 5 presents the results. Section 6 concludes. Details on the data sets and definition of variables used for the empirical analysis are provided in the Data Appendix.

2 Theoretical Framework

Following Rosen (1979) and Roback (1982), consider a spatial equilibrium model where households and firms compete to locate in areas characterised by different bundles of amenities.

Households derive utility from consuming a composite consumption good, housing and local amenities. Access to local amenities is obtained by living in a given location. Labour income allows the purchase of both the composite consumption good and housing. In city j, a household's indirect utility is:

$$v^j = v(w_j - r_j, A_j) \tag{1}$$

where $v(\cdot)$ is the maximum level of utility that the household can obtain with wage w, housing rent r, and the vector of amenities A_j, with $\partial v/\partial w > 0$, $\partial v/\partial r < 0$ and $\partial v/\partial a_{ij} \gtreqless 0$ depending on whether a_i is a consumption amenity or disamenity. The price of the composite consumption good (x) is normalised to 1, so that $x_j = w_j - r_j$.

The composite consumption good is produced by firms that use a constant returns to scale technology using labour and land as inputs. The consumption good is tradable and its price is fixed by international competition. The unit production cost in city j is:

$$c^j = c(w_j, r_j, A_j) \tag{2}$$

with $\partial c/\partial w > 0$, $\partial v/\partial r > 0$ and $\partial v/\partial a_{ij} \gtreqless 0$ depending on whether a_i is a production amenity or disamenity.

Equilibrium requires the absence of spatial arbitrage, so that household utility and production costs are equal across cities:

$$u^* = v(w_j - r_j, A_j) \tag{3}$$

$$1 = c(w_j, r_j, A_j) \tag{4}$$

In a spatial equilibrium, differences in wages and housing prices should compensate individuals and firms for differences in location-specific characteristics.[5] Figure 2 illustrates the equilibrium determined by equations (3) and (4). Better amenities cause the iso-utility curve to shift up, resulting in higher housing costs and lower wages, under the assumption that amenities do not have productivity effects. If, however, local amenities also affect firms' productivity, the net effect on wages is ambiguous. A higher level of a production amenity would result in an upward shift of the iso-cost curve. While there is no ambiguity in the effect on rents, there can be an increase in equilibrium wages if the effect on firms' labour demand dominates the effect on households' labour supply.

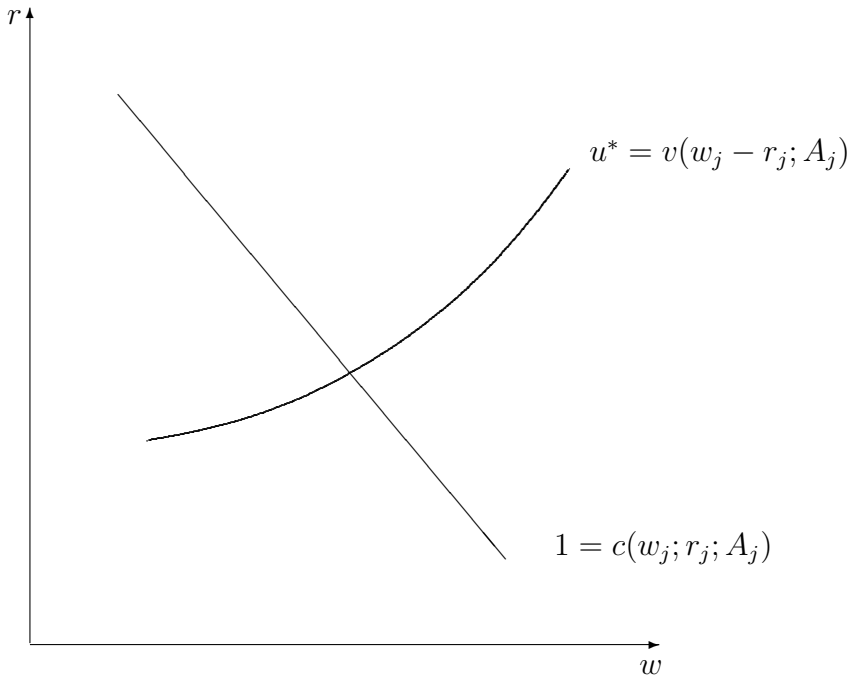

Figure 1: Spatial equilibrium with rents and wages

Wages and housing costs can be used to obtain implicit prices for amenities. Taking the total differential of (3), and rearranging, we obtain:

$$f_i = \frac{\partial V}{\partial a_{ij}} / \frac{\partial V}{\partial x_j} = \frac{dr_j}{da_{ij}} - \frac{dw_j}{da_{ij}} \tag{5}$$

[5]Rosen (1979) points out how this approach is related to the theory of local public goods (Tiebout, 1956, and Stigler, 1957): *The observed combinations of urban amenities, wage rates and costs of living among different cities satisfy an equilibrium condition reminiscent of a "voting with your feet" criterion; each household's locational choice maximises its welfare and no family can be made better off by moving to another city.* (Rosen 1979, p.74).

where dr_j/da_{ij} is the equilibrium compensating differential for housing costs and dw_j/da_{ij} is the equilibrium wage compensating differential. The marginal valuation of an amenity can therefore be obtained from the marginal responses of housing costs and wages.

Given the estimates of the implicit prices f_i, an index of quality of life for city j can be constructed as the weighted sum of each amenity i, with weights given by the implicit prices f_i that reflect households' preferences.

$$QoL_j = \sum_i f_i a_{ij} \tag{6}$$

Urban QoL indices thus constructed can be interpreted as the monetary value that the representative household attributes to the bundle of amenities available in each city.

3 Data

The empirical analysis relies on three different data sets covering a period between 2001 and 2009. Two data sets provide individual-level information on the housing market and the labor market, respectively. The third data set provides city-level information on amenities. A detailed description of the variables and sources is provided in the Data Appendix. We focus on cities defined as the municipalities of province capitals. The unit of analysis is therefore the municipal area of province capitals, rather than the whole provincial territory.[6]

Housing market data are from the Real Estate Observatory of the *Agenzia del Territorio* (AT), and refer to individual house transactions in Italian cities (province capitals) between 2004 and 2009 at semi-annual frequency.[7] In addition to house sale prices, the data set provides a detailed description of structural and neighbourhood characteristics, such as surface area, age, number of bedrooms and bathrooms, floor level, number of garages or car parks, location (center, semi-center, suburb), quality of building (good, average, bad) quality of the area, and distance from transport system. Table 11 in the Data Appendix provides a detailed description of housing characteristics, while Table 12 reports average housing prices at 2004 constant prices by city.

Labour market data are from the Italian National Social Security Institute (Inps) at annual frequency between 2001 and 2002, and refer to individual workers in the private sector. The data set provides information

[6]This definition should be considered when interpreting city rankings and geographical representations, as in Figure 2.

[7]The present study focuses only on sales, while excluding the rental market. It should be observed that 70.2% of Italian households own their house (Istat, 2008).

on annual earnings, type of occupation, full time or part-time work status, contract length, province of work. The employee's longitudinal records are linked to the demographic and firms archives in order to have information on worker characteristics (gender, age, nationality, province of residence, etc.) and firm characteristics (size and sector of activity). We restrict the sample to all employees aged between 16 and 75, who live in the same city where they work for at least 30 weeks in a year.[8] Seasonal workers are not included in the sample.[9] Annual earnings are total yearly wages net of social contributions paid by firms, but gross of social contributions and income taxes paid by workers. Table 13 in the Data Appendix reports descriptive statistics for worker and firm characteristics, while Table 14 displays average wages at 2004 constant prices by city.

Information on local amenities and characteristics for the municipalities of the 103 Italian provinces has been collected for the period 2001-2008 from Istat and other sources (see table 10 in the Data Appendix for details). We consider 15 city-level amenities, that fall within five different domains: climate, environment, services, society and economy. Climate is proxied by three indicators: temperature (yearly average), precipitation (monthly average), humidity (yearly average). The environmental domain is based on both physical features of the territory (percentage of green areas of the city and a dummy variable indicating a coastal city) and pollution (number of polluting agents present in the air). Indicators for the quality of services focus on education (teacher-pupil ratio), culture (index of cultural infrastructure, measuring several dimensions of the city's cultural offerings, such as museums, cinemas, theaters, etc.), and transport (multi-modal indicator that considers accessibility by air, train and car). The society domain refers to the characteristics of those who live in the city: we include a measure of violent crime, human capital (tertiary education), civicness of the population (voters' turnout in local elections), and the share of foreigners in total population. Economic conditions are measured by value added per head and the unemployment rate. Summary statistics for the amenities are provided in Table 1.

[8] Almost all workers (from the 5th to the 95th percentile) are between 22 and 55 years old. However, we consider younger and older people still at work to account for different preferences for amenities.

[9] Wages of part-time workers have been converted to full-time equivalent using a 1.4 multiplicative factor. This conversion is based on the average number of hours worked in a part-time job that generally range between 4 and 6 (about two thirds of the daily total number of hours worked for a full-time job).

Table 1: Local amenities, 2001-2008

Variable	Mean	Std. Dev.	Min.	Max.
Precipitation (mm per month)	68.6	22.4	28.9	139.7
Temperature (degrees, average)	15.7	1.8	12.8	19.9
Humidity (per cent)	72	4	57.3	79.9
Coast (dummy)	0.3	0.5	0	1
Green areas (per cent)	6.9	11.2	0.1	71.9
Air Pollution (number of agents)	7.7	2.6	1.3	15.4
Education (TPR, per cent)	9.9	1.6	8.3	22.6
Transport (accessibility index)	91.6	24	47	161
Cultural Infrastructure (index)	87.3	77.6	18.9	579.2
Violent Crime (per 1000)	4.1	1.5	1.1	9.9
Civicness (voting turnout, per cent)	75.4	5	50.1	84.8
University Enrollment (per cent)	5.4	8.3	0	40
Foreigners (per cent)	6.3	3.7	0.4	15.4
Value Added per Head (th. euros)	17.6	3	12.1	24
Unemployment Rate (per cent)	11.1	7.5	2.8	31.4

See the Data Appendix for details on sources and definitions of variables.

4 Methods

We measure the implicit price of amenities by estimating two separate equations for housing prices and wages:

$$p_{hjt} = \beta_0 + \beta_1 X_{ht} + \beta_2 A_{jt} + \varepsilon_{hjt} \tag{7}$$

$$w_{zjt} = \gamma_0 + \gamma_1 Z_{zt} + \gamma_2 A_{jt} + \eta_{zjt} \tag{8}$$

where p_{hjt} is the annual expenditure for housing unit h in city j at time t, X_{hj} is a vector of housing characteristics, A_{jt} is a vector of amenities, w_{zjt} is the wage of individual z in city j at time t, Z_{zj} is a vector of individual characteristics, $\varepsilon_{hjt} \backsim N(0, \sigma_\varepsilon^2)$ and $\eta_{zjt} \backsim N\left(0, \sigma_\eta^2\right)$.

The application of the hedonic approach is based on the assumption that there are no unobserved characteristics for housing units, workers and cities, that are correlated with observable local amenities. The detailed information on housing and individual characteristics (X_{hjt} and Z_{ijt}) is used to control for the heterogeneity of houses and workers. Structural characteristics in X_{hjt} include flat size, age of building, number of bedrooms and bathrooms, floor level, number of floors, number of lifts, number of garages or car parks, housing type, unit conditions, housing features, value type and location, quality of building. Neighbourhood characteristics include quality of the area, distance from transport system, distance from public services and commercial services. Worker and firm characteristics in Z_{ijt} include gender,

age, nationality, province of residence, type of occupation, contract length, size of the firm and sector of activity. We control for cities' unobserved heterogeneity by including indicators for urban density and population size, a proxy for economic structure (the share of services in total value added) and a dummy for region capitals. Year dummies are also included to account for time fixed effects.[10] Nominal values for both housing prices and wages are converted to 2004 constant prices.

Equations (7) and (8) are estimated by OLS using approximately 128,000 and 158,000 observations, respectively. Robust standard errors are used with clustering at city-level. In order to obtain the full price of each amenity the estimated coefficients $\widehat{\beta}_2$ and $\widehat{\gamma}_2$ in (7) and (8) must be converted into annual household expenditures. Estimated coefficients for the housing price equation are converted into imputed annual rents applying a 7.85 per cent discount rate, as in Blomquist et al. (1988). The estimated coefficients for the wage equation are multiplied by 1.64, the average number of workers per household (Bank of Italy, 2008), in order to obtain household wages comparable to housing expenditures. This allows the computation of the full price f_i for each amenity. As in equation (6) they are multiplied by the value of each amenity in each city j, relative to the overall mean, obtaining a value of the quality of life index.

Finally, we rank the 103 Italian provinces according to the overall index. In addition to the overall index, we also obtain QoL sub-indices and rankings for individual domains (climate, environment, services, society, economy) and the respective contribution of each sub-index to the overall index.

5 Results

This section presents the results of the empirical analysis. We start by discussing the implicit prices estimated from housing price and wage equations. We then present the overall quality of life index for the 103 province capitals. Finally, we consider quality of life rankings for individual domains and their contributions to the overall index.

5.1 Implicit prices

Table 2 reports estimation results for equations (7) and (8). For both equations, we consider two alternative specifications with the dependent variable expressed either in levels or logarithms. As the results for the two specifications are in all cases qualitatively similar, for brevity and ease of inter-

[10] Gyourko and Tracy (1991) also include local taxes in the set of amenities locally produced. We neglect this component since the Italian fiscal system leaves very limited room for local authorities in affecting the tax system.

pretation in the following we focus on the results for the specification in levels.

In the housing price equation (columns 1-2), the coefficients for all the 15 amenities have the expected sign and jointly statistically signficant. Controlling for structural and neighborhood characteristics, housing prices are higher in cities with higher temperature, lower humidity and lower precipitations. Housing prices are also higher in cities with less pollution, more green areas, located on the coast. Focusing on services, positive differentials are observed in cities with higher teacher-pupil ratio, better transports and better cultural infrastructure. Regarding social conditions, housing prices are lower in cities with higher crime rates and shares of foreigners, while they are positively related to civicness and university enrollment. Economic conditions are associated to substantial differentials: housing prices are significantly higher in cities with higher value added per head and lower unemployment rate (-3866 euros for one additional percentage point). Although standard errors are relatively large, so that only 6 amenities are individually statistically significant, amenities are jointly significant for each of the five domains considered.

The coefficients for the amenities in the wage equation (columns 3-4), instead, in many cases do not have the expected sign and are generally not statistically significant.[11] For most amenities, the sign of the estimated coefficient in the wage equation is the same as for the housing equation. This may indicate that the local amenities may be affecting not only households, but also firms, so that the net effect on wages is ambiguous. For example, to the extent that crime is a disamenity for both households and firms, higher rates of violent crime in a given city will result in both lower labor supply by households and lower labor demand by firms. An Alternative interpretation lies in the well known rigidities of the Italian labor market. Wage rigidity and low labor mobility imply that wages may not adjust to compensate for different amenities across cities. Our data set refers to wages for dependent employment, regulated by sectoral nation-wide contracts that impose strong limitations to regional wage differences for a given occupation. The relatively low interregional mobility of labor in Italy is also well documented in several studies (see e.g. Cannari et al., 2000, and Eurofound, 2006).[12]

Table 3 presents the implicit prices of amenities derived from the esti-

[11] Similar results for the effect of amenities on household income are obtained in Buettner and Ebertz (2009).

[12] The choice of including only dependent workers in our sample, while excluding self-employed workers, was made to obtain higher reliability of statistical information concerning declared wages. The empirical evidence indicates a low tax evasion rate for dependent workers that is instead much higher for the self-employed (see, for example, Bordignon and Zanardi, 1997, and Marino and Zizza, 2008). As a consequence, the wage equation would not be informative for the latter category of workers.

Table 2: Estimated compensating differentials, housing and wage equations

	Housing equation		Wage equation	
	Level	Log	Level	Log
Precipitation	-155.56	-0.09	-5.08	-0.02
	(-0.46)	(-0.63)	(-1.66)	(-1.07)
Temperature	6287.14	2.38	33.57	0.08
	(1.20)	(0.99)	(0.60)	(0.27)
Humidity	-1531.11	-0.90	-38.94	-0.19
	(-1.68)	(-2.07)	(-3.62)	(-3.33)
Coast dummy	25562.69	12.68	87.54	0.32
	(1.71)	(1.81)	(0.61)	(0.42)
Green areas	421.64	0.30	0.14	0.01
	(1.11)	(1.63)	(0.03)	(0.30)
Air Pollution	-2508.11	-1.22	19.53	0.13
	(-1.96)	(-2.03)	(0.93)	(1.17)
Education (Teacher-Pupil Ratio)	1777.39	-0.33	357.94	1.92
	(0.24)	(-0.09)	(4.13)	(4.03)
Transport	592.89	0.32	10.09	0.06
	(1.79)	(2.18)	(2.85)	(3.03)
Cultural Infrastructure	78.18	0.03	-0.29	-0.00
	(1.05)	(0.84)	(-0.57)	(-0.15)
Violent Crime	-6798.83	-2.74	-19.25	-0.11
	(-2.32)	(-1.96)	(-0.65)	(-0.68)
Civicness	1586.79	0.65	6.87	0.01
	(1.54)	(1.39)	(0.56)	(0.16)
University Enrollment	505.47	0.13	18.83	0.08
	(0.54)	(0.35)	(1.64)	(1.36)
Foreigners	-466.51	-0.53	116.82	0.54
	(-0.22)	(-0.53)	(2.62)	(2.25)
Value Added per Head	2800.63	1.20	78.72	0.28
	(1.79)	(1.72)	(1.77)	(1.17)
Unemployment Rate	-3866.34	-2.04	-31.43	-0.16
	(-2.49)	(-2.93)	(-1.59)	(-1.64)
R^2	0.63	0.72	0.53	0.60
Number of observations	128355	128355	158066	158066

Note: Dependent variable: house prices (columns 1-2) and wages (column 3-4). OLS estimates, t-statistics reported in brackets (heteroskedasticity-robust standard errors, with clustering at city-level). The set of regressors at city-level also includes population size, urban density, share of service sector and a regional capital dummy variable. The housing and wage equations also include structural and neighbourhood characteristics and firm-worker characteristics, respectively, as described in Section 4.

mates for the linear specifications in Table 2. As illustrated in Section 4, the estimated coefficients for the housing price equation are converted into imputed annual rents using a 7.85 per cent discount rate, while those of the wage equation are multiplied by 1.64, the average number of workers per household. The resulting figures provide the compensating differentials, expressed in euros at constant 2004 prices, of a one-unit change in the corresponding amenity. For example, implicit prices from the housing price equation (column 1) indicate that households are willing to pay 493.5 Euros per year to for additional degree of temperature. Since the implicit price from the wage equation (column 2) is also positive (53.7), the full implicit price (column 3) is 493.5-53.7=439.8 euros. The comparison between columns 1 and 2 indicates that the implicit prices from the housing equation are generally larger than those from the wage equation, so that the full implicit price has always the expected sign, with the only exception of the teacher pupil ratio.

Table 3: Estimated implicit prices of amenities

	Implicit prices			Standardized		Share	
	Housing	Wage	Total	Total	Housing	Total	Housing
Precipitation	-12.2	-8.1	-4.1	-91.2	-273.1	1.0	2.7
Temperature	493.5	53.7	439.8	780	875.3	8.7	8.8
Humidity	-120.2	-62.3	-57.9	-231.7	-481.1	2.6	4.8
Coast	2006.7	140.1	1866.6	888.4	955.1	9.9	9.6
Green Areas	33.1	0.2	32.9	368.6	371.1	4.1	3.7
Pollution	-196.9	31.2	-228.1	-596.8	-515	6.7	5.2
Education	139.5	572.7	-433.2	-392.7	126.5	4.4	1.3
Transport	46.5	16.1	30.4	730.8	1118.9	8.2	11.2
Cultural Infr.	6.1	-0.5	6.6	511.8	475.9	5.7	4.8
Crime	-533.7	-30.8	-502.9	-730.9	-775.7	8.2	7.8
Turnout	124.6	11	113.6	568	623	6.3	6.2
University	39.7	30.1	9.5	79.1	329.1	0.9	3.3
Foreigners	-36.6	186.9	-223.5	-817	-133.9	9.1	1.3
Value Added	219.8	126	93.9	279.7	654.9	3.1	6.6
Unemployment	-303.5	-50.3	-253.2	-1892.8	-2268.7	21.1	22.7

Note: columns 1-3 report the compensating differentials, expressed in euros at constant 2004 prices, of a one unit change in the corresponding amenity. Columns 4 and 5 report the change in QoL associated to a one-standard deviation in the corresponding amenity. Columns 6 and 7 report the relative contribution of each variable to the determination of the overall QoL index. See Section 5.1 for details.

In order to compare the relative size of the effects of different amenities, Table 3 also reports, in columns 4 and 5, the change in QoL associated to a one-standard deviation in the corresponding amenity, using full and

housing-only implicit prices, respectively. The results for the housing equation indicate that, among disamenities, unemployment has the largest effect on QoL, followed by violent crime and air pollution. Among amenities, transport, coastal location and temperature have the largest effects on quality of life. The last two columns of Table 3 report the relative contribution of each variable to the overall QoL index.[13] This also allows us to assess the relative importance of different groups of amenities. For example, climate and environmental variables account for 16.33% of the overall QoL index and 18.33% of the housing-only QoL index.

5.2 City Rankings

The estimated implicit prices in Table 3, multiplied by the average values for the corresponding amenity in each city, provide quality of life indices at city-level. Tables 4 and 5 report the QoL indices based on full implicit prices and housing equation only, respectively. These overall QoL indices are normalized with respect to the country average, so that they can be interpreted as the amount, in 2004 euros, that households would be willing to pay to live in a city with a given bundle of amenities, relative to a city with the average set of amenities. A comparison of the two indicators indicates that the rankings are very similar. Therefore, given the ambiguities of the implicit prices obtained from the wage equation, in the following we will focus mainly on the results based on the housing equation.

The results indicate that amenities account for substantial variation in quality of life. In Table 5, the city with the highest quality of life is Pisa, with a score of 6,502. This indicates that, on average, Italians are willing to pay 6,502 euros for living in a city with a corresponding bundle of amenities, relative to a city with average levels of amenities. This is a considerable compensating differential, when compared with the average annual real wage of approximately 20,000 Euros in our sample. Negative values reflect the price individuals are willing to pay for not living in a given city. At the bottom of our ranking is Enna, with an overall quality of life index of -8,349. This indicates that households would be willing to give up approximately 40% of their average annual wage for not living in a city with a corresponding bundle of amenities.

Overall, quality of life is highest in the Center-North, in large (e.g. Bologna, Firenze, Venezia) or medium-sized cities (e.g. Pisa, Trieste, Im-

[13] The relative contribution is constructed with respect to the sum of the absolute values of figures in columns 4 and 5. For example, summing the absolute values of figures in column 5 we obtain 9977.3: this is to be interpreted as the absolute value of the change in QoL associated to a one-standard deviation in every amenity. The weight of each component is therefore calculated with respect to that value. For example, Temperature has a relative contribution of 8.77% = 875.3/9977.3.

Table 4: QoL overall index, full implicit prices, by city

N	City	Val.	N	City	Val.	N	City	Val.
1	Pisa	5070	36	Pistoia	1006	71	Rieti	-1148
2	Trieste	4583	37	Biella	1001	72	Perugia	-1180
3	Ancona	3989	38	Treviso	916	73	Aosta	-1288
4	Bologna	3868	39	Sassari	802	74	Bolzano	-1349
5	Firenze	3775	40	Sondrio	795	75	Trento	-1390
6	Pesaro	3454	41	Piacenza	741	76	Alessandria	-1401
7	Venezia	3343	42	Prato	718	77	Vercelli	-1416
8	Ferrara	2972	43	Rovigo	528	78	Matera	-1618
9	Imperia	2857	44	Cuneo	511	79	Messina	-1693
10	Siena	2809	45	Belluno	500	80	Catanzaro	-1749
11	Massa	2804	46	Brescia	455	81	Avellino	-1767
12	Lodi	2763	47	Bari	437	82	Benevento	-1794
13	Lecco	2643	48	Brindisi	420	83	Napoli	-1847
14	Livorno	2429	49	Arezzo	417	84	Verbania	-1966
15	Pavia	2277	50	Verona	279	85	Asti	-2056
16	Bergamo	2253	51	Oristano	258	86	Terni	-2111
17	Forli	2113	52	Genova	168	87	Reggio C.	-2437
18	Grosseto	2091	53	Teramo	126	88	Trapani	-2470
19	Parma	2083	54	Viterbo	120	89	Nuoro	-2481
20	Reggio E.	2004	55	Modena	68	90	Palermo	-2506
21	Vicenza	1936	56	L'Aquila	68	91	Siracusa	-2737
22	Cremona	1785	57	Cagliari	-37	92	Isernia	-2927
23	Chieti	1669	58	Pescara	-122	93	Catania	-2998
24	Lucca	1624	59	Udine	-128	94	Agrigento	-3076
25	Varese	1556	60	Pordenone	-158	95	Torino	-3402
26	Padova	1511	61	Savona	-204	96	Cosenza	-3415
27	Gorizia	1465	62	Ascoli P.	-240	97	Vibo V.	-3449
28	Como	1409	63	Caserta	-275	98	Campobasso	-3751
29	Latina	1267	64	Taranto	-346	99	Foggia	-3948
30	Macerata	1256	65	Milano	-360	100	Crotone	-4023
31	Ravenna	1254	66	Frosinone	-390	101	Potenza	-4331
32	Mantova	1157	67	Ragusa	-588	102	Caltanissetta	-4963
33	Salerno	1080	68	Rimini	-757	103	Enna	-7206
34	La Spezia	1059	69	Roma	-973			
35	Lecce	1047	70	Novara	-1120			

Note: Source: Istat, Inps and Agenzia del Territorio.

Table 5: QoL overall index, housing only, by city

N	Province	Val.	N	Province	Val.	N	Province	Val.
1	Pisa	6502	36	Cuneo	1389	71	Brindisi	-1326
2	Trieste	6091	37	Ravenna	1372	72	Rieti	-1496
3	Bologna	5860	38	Genova	1365	73	Rimini	-1513
4	Firenze	5053	39	Macerata	1343	74	Frosinone	-1692
5	Imperia	4772	40	Modena	1341	75	Ragusa	-1829
6	Venezia	4636	41	Brescia	1309	76	Ascoli P.	-1881
7	Ancona	4402	42	Piacenza	1246	77	Asti	-1892
8	Siena	3905	43	La Spezia	1062	78	Verbania	-1943
9	Pesaro	3750	44	Verona	1027	79	Messina	-2034
10	Parma	3578	45	Udine	944	80	Taranto	-2474
11	Lodi	3558	46	Arezzo	836	81	Torino	-2535
12	Ferrara	3508	47	Sondrio	816	82	Avellino	-2536
13	Reggio E.	3443	48	Pordenone	671	83	Catanzaro	-2587
14	Pavia	3304	49	Rovigo	587	84	Benevento	-2600
15	Bergamo	3146	50	Latina	479	85	Terni	-2687
16	Lecco	3116	51	Chieti	371	86	Reggio C.	-2814
17	Forli	2822	52	L'Aquila	228	87	Matera	-2909
18	Livorno	2758	53	Roma	225	88	Nuoro	-3279
19	Massa	2276	54	Lecce	120	89	Isernia	-3711
20	Vicenza	2216	55	Salerno	79	90	Napoli	-3770
21	Padova	2211	56	Cagliari	73	91	Cosenza	-3998
22	Gorizia	2200	57	Belluno	19	92	Siracusa	-4107
23	Milano	2158	58	Savona	18	93	Vibo V.	-4236
24	Grosseto	2154	59	Viterbo	-143	94	Trapani	-4331
25	Varese	2079	60	Vercelli	-292	95	Catania	-4334
26	Treviso	1970	61	Sassari	-463	96	Palermo	-4356
27	Cremona	1896	62	Bari	-529	97	Campobasso	-4714
28	Como	1889	63	Novara	-626	98	Agrigento	-5127
29	Mantova	1817	64	Pescara	-665	99	Potenza	-5398
30	Lucca	1815	65	Aosta	-707	100	Crotone	-5827
31	Pistoia	1807	66	Oristano	-879	101	Foggia	-6030
32	Prato	1716	67	Alessandria	-1072	102	Caltanissetta	-6936
33	Bolzano	1553	68	Teramo	-1080	103	Enna	-8349
34	Trento	1534	69	Caserta	-1095			
35	Biella	1492	70	Perugia	-1105			

Note: Source: Istat, Inps and Agenzia del Territorio.

peria, Ancona, Siena, Pesaro, Parma). The largest cities display average scores, with Milan and Rome ranking 23 and 53, respectively. Cities in the South generally display low ranks, with 6 out of 10 of the last cities in the ranking belonging to Sicily.

5.3 Quality of Life by Domain

The indicators presented in Tables 4 and 5 are constructed using all the 15 amenities included in the analysis. We now turn to domain-specific indicators. Figure 2 reports the geographical distribution of the overall and domain-specific quality of life indicators, based on the housing equation implicit prices. Cities in the North generally fare better with respect to services and economic conditions, while relatively worse with respect to climatic and environmental conditions. The opposite applies to the South, while cities located in the center-North are generally characterized by relatively high scores in all the domains considered.

Figure 2: QoL Indices, housing only, by domain

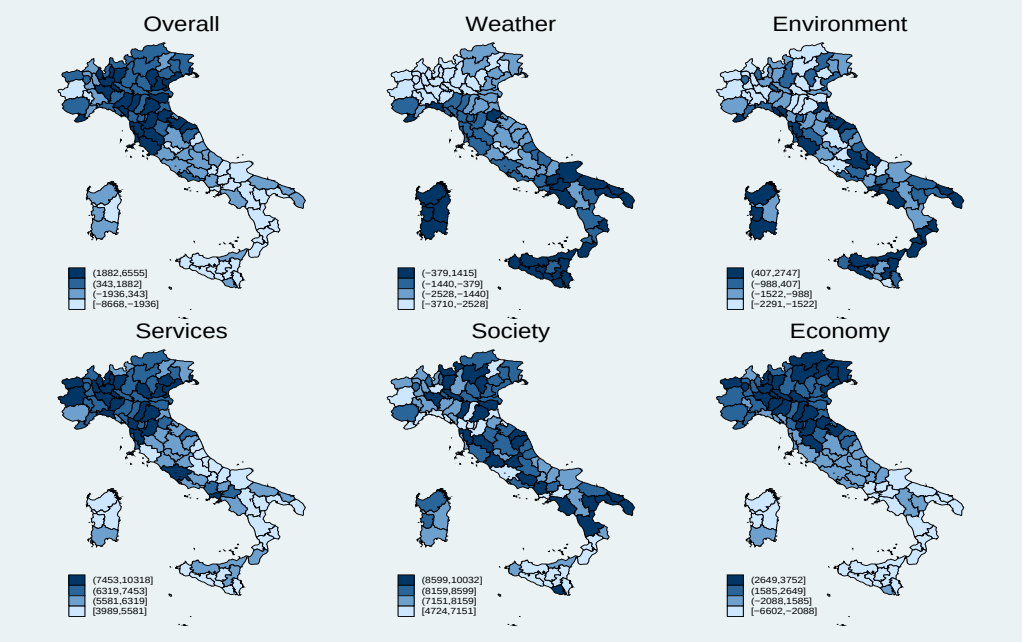

Table 6 displays pairwise correlations between overall and domain-specific quality of life indices. Climatic and environmental conditions are positively related. Similarly, services and economic conditions are strongly positively related. However, climatic and environmental conditions are negatively related to economic and social conditions. As a result, the domain-specific indicators are related to the overall index in various degrees. The climate and environment indices are negatively related to overall QoL, while the

society index is positively but weakly related to quality of life. The index for services and, to a larger extent, the index for economic conditions are strongly related to overall quality of life.

Table 6: Domain QoL indices, pairwise correlations

Bundle of amenities	Weather	Environment	Services	Society	Economy
Environment	0.48				
Services	-0.43	-0.30			
Society	-0.15	-0.12	-0.12		
Economy	-0.69	-0.50	0.58	0.13	
Overall	-0.30	-0.07	0.66	0.32	0.78

Note: Source: Istat, Inps and Agenzia del Territorio.

Tables 7-9 display the corresponding city rankings by individual domain. The results indicate that the overall quality of life index reflects different classes of amenities in different cities. Overall, the highest ranked cities are characterised by a rather even distribution of amenities, as they score well on almost all of them and the relative importance of different amenities is balanced. These rankings also help to illustrate which factors contribute to an individual city's ranking. For example, Table 7 indicates that Pisa and Trieste, the first and second top-ranked cities, have high ranks in all of the QoL domains considered. Bologna, the third top-ranked city, is among the top 10 cities for Services, Society and the Economy, but has a relatively low ranking for environmental quality.

Table 7: QoL ranks by amenity bundle, housing only (1-35)

City	Overall	Weather	Environment	Services	Society	Economy
Pisa	1	48	9	8	29	57
Trieste	2	31	31	14	31	41
Bologna	3	55	97	6	9	2
Firenze	4	40	71	1	96	24
Imperia	5	2	14	44	93	49
Venezia	6	75	48	4	37	20
Ancona	7	65	12	31	30	39
Siena	8	41	39	56	45	4
Pesaro	9	63	7	53	52	14
Parma	10	25	73	30	79	5
Lodi	11	87	47	9	41	22
Ferrara	12	51	92	35	1	33
Reggio E.	13	26	95	36	27	17
Pavia	14	86	79	5	44	27
Bergamo	15	78	57	17	49	16
Lecco	16	79	51	20	32	7
Forli	17	10	68	40	67	11
Livorno	18	32	28	29	53	64
Massa	19	52	1	58	69	69
Vicenza	20	81	45	34	33	21
Padova	21	74	85	15	55	34
Gorizia	22	67	89	10	64	38
Milano	23	88	77	3	101	9
Grosseto	24	33	11	89	40	52
Varese	25	100	46	18	50	37
Treviso	26	61	102	24	46	18
Cremona	27	99	74	22	23	12
Como	28	84	86	12	65	26
Mantova	29	82	82	27	48	8
Lucca	30	49	50	13	88	43
Pistoia	31	39	37	32	98	25
Prato	32	42	61	23	95	40
Bolzano	33	60	99	97	47	1
Trento	34	59	94	98	38	6
Biella	35	101	41	43	28	32

Note: Source: Istat, Inps and Agenzia del Territorio.

Table 8: QoL ranks by amenity bundle, housing only (36-70)

City	Overall	Weather	Environment	Services	Society	Economy
Cuneo	36	44	75	70	36	23
Ravenna	37	73	25	37	90	30
Genova	38	24	56	11	99	56
Macerata	39	64	44	48	35	42
Modena	40	54	101	16	94	10
Brescia	41	85	38	28	92	28
Piacenza	42	98	62	26	63	15
La Spezia	43	53	16	57	89	58
Verona	44	83	98	21	68	31
Udine	45	77	70	67	62	29
Arezzo	46	62	59	66	43	36
Sondrio	47	90	66	59	10	35
Pordenone	48	96	69	62	60	13
Rovigo	49	69	60	61	24	45
Latina	50	34	30	50	25	70
Chieti	51	45	2	72	58	68
L'Aquila	52	70	10	88	39	65
Roma	53	35	88	2	103	60
Lecce	54	23	18	71	4	83
Salerno	55	27	13	60	13	84
Cagliari	56	16	20	75	42	79
Belluno	57	97	43	68	72	3
Savona	58	71	34	41	91	55
Viterbo	59	50	65	45	11	66
Vercelli	60	91	103	42	57	44
Sassari	61	13	6	73	18	87
Bari	62	19	35	38	20	82
Novara	63	102	91	25	82	47
Pescara	64	47	33	65	71	67
Aosta	65	95	96	55	70	19
Oristano	66	11	8	101	15	77
Alessandria	67	94	87	46	77	46
Teramo	68	46	36	81	34	61
Caserta	69	37	52	51	6	81
Perugia	70	68	90	63	66	50

Note: Source: Istat, Inps and Agenzia del Territorio.

Table 9: QoL ranks by amenity bundle, housing only (71-103)

City	Overall	Weather	Environment	Services	Society	Economy
Brindisi	71	18	24	49	3	95
Rieti	72	80	81	79	8	63
Rimini	73	72	26	33	100	48
Frosinone	74	58	49	69	5	72
Ragusa	75	4	84	84	12	71
Ascoli P.	76	66	58	76	16	59
Asti	77	92	100	39	81	51
Verbania	78	103	83	54	78	54
Messina	79	3	19	83	61	98
Taranto	80	14	29	80	2	91
Torino	81	93	93	19	102	53
Avellino	82	21	40	64	76	78
Catanzaro	83	28	4	92	74	88
Benevento	84	20	42	77	14	86
Terni	85	89	67	74	59	62
Reggio C.	86	1	23	78	84	99
Matera	87	43	53	87	7	75
Nuoro	88	12	55	103	19	80
Isernia	89	56	80	85	17	73
Napoli	90	38	5	7	80	103
Cosenza	91	29	54	93	22	90
Siracusa	92	6	32	82	73	96
Vibo V.	93	30	21	96	87	89
Trapani	94	17	27	91	54	92
Catania	95	5	22	52	83	100
Palermo	96	15	17	47	75	101
Campobasso	97	57	78	86	51	74
Agrigento	98	7	15	94	86	97
Potenza	99	76	63	99	21	76
Crotone	100	9	3	100	56	102
Foggia	101	22	64	90	26	93
Caltanissetta	102	8	76	95	85	94
Enna	103	36	72	102	97	85

Note: Source: Istat, Inps and Agenzia del Territorio.

6 Conclusions

This paper uses the hedonic approach to measure and compare quality of life across Italian cities on the basis of compensating differentials in housing and labor markets. We analyze micro-level data on house transactions from the Real Estate Observatory of the Agenzia del Territorio and on wages and job characteristics from the Italian National Social Security Institute, merged with city-level characteristics for the municipalities of the 103 Italian provinces for the period 2001-2008. We find that the presence of amenities results in large compensating differentials in the housing market. On the other hand, there is no clear evidence of compensating differentials in the labor market. This might reflect the productivity effects of amenities or, more plausibly, the relative rigidity of wages and low regional mobility in the Italian labor market.

Local amenities account for substantial variation in quality of life. The bundle of amenities available in the cities with the highest quality of life command a premium, relative to the average, of about one third of the average annual salary for an Italian household. Indeed, a representative household would be willing to give up approximately 40 per cent of its average annual wage for not living in a city with the worst bundle of amenities. Overall, quality of life is highest in medium-sized towns of the Center-North. Cities located in the South generally display low quality of life, with 6 out of 10 of the last cities in the ranking being located in Sicily.

Focusing on quality of life domains, cities in the North generally fare better with respect to services and socioeconomic conditions, while relatively worse for climatic and environmental conditions. The opposite pattern applies to cities located in the South. Cities in the Center-North are generally characterized by relatively high scores in all the domains considered. The domain-specific indicators are related to the overall index in various degrees. The climate and environment indices are negatively related to overall QoL, while the society index is positively but weakly related to QoL. Services and, to a larger extent, economic conditions are strongly related to overall QoL.

Overall, our comparisons of quality of life across cities on the basis of revealed preferences provide objective information that is particularly relevant to inform the debate on fiscal federalism, while also indicating specific directions for economic, urban, and environmental policy. More generally, they highlight the importance for the municipal, regional and central governments of establishing information systems for monitoring the variables affecting urban quality of life. This would significantly improve our ability to detect disparities in quality of life across cities and to identify their main causes.

Data Appendix

House prices are from the Real Estate Observatory of the "Agenzia del Territorio" (AT), a public agency within the Ministry of the Economy. AT is responsible for classifying houses and land in the entire Italian territory. We have selected the data on individual house transactions in Italian cities (municipalities of province capitals) from 2004 to 2009. In addition to house transaction prices, the data set provides a detailed description of housing characteristics, such as floor surface area, number of bathrooms, floor level, number of garages or car parks, location (center, semi-center, suburb), quality of building (good, average, bad) quality of the area, distance from transport system.

Labor market data are obtained from the Italian National Social Security Institute (Inps). We use the Employee's archive, containing information on workers employed in the private sector who are insured with Inps. Wages refer to private sector workers' annual earnings. In addition, the data set provides information on the type of occupation, whether the job is full time or part-time, contract length, province of work, sector of economic activity. Personal and demographic characteristics include gender, age, nationality, province of residence.

Information on city characteristics and amenities have been collected from several sources, as detailed in Table 10. Climatic data are from Istat and other specific sources (www.ilmeteo.it). The variables refer to monthly temperature, monthly millimetres of precipitations and annual average humidity. Environmental variables are collected from Istat and include the share of green areas of the total city area and to the number of polluting agents in the air. A dummy variable identifies cities bordering with the sea (the dummy is coded 1 if the centre of the city is less than 10 kilometres from the coast). We measure services as education, transport and culture. For education we include a measure of the teacher/pupil ratio (average of primary and secondary schools), from Italian Ministry of Education): For transport we include an accessibility measure (multimodal measure that considers accessibility by air, train and car, index= 100 for the European average, source ESPON project (www.espon.eu). Finally, we measure cultural conditions with an index of the cultural infrastructure of the city (accounting for museums, theatres, cinemas, libraries, gyms). The index is set to 100 for the Italian average (source: Istituto Tagliacarne).

The number of violent crime acts per capita is from the Ministry of Justice, while we use the voters' turnout in local elections (Ministry of Interior) as a measure of the degree of participation of the society in public decisions. Finally we measure for the share of population enrolled in university (source Ministry of Education) and the share of foreigners in resident population (source Istat). We account for demographic factors by including a measure

of urban density and of population size. Economic conditions are measured by value added per capita and the unemployment rate. We also include among control variables an indicator of the economic structure (share of service sector). All variables are from Istat.

Table 10: Description and sources of variables

Variable	**Description**
Precipitation	Millimeters of rain per month, average over 12 months. Source: ilmeteo.it and Istat
Temperature	Average temperature over the year. Source: ilmeteo.it and Istat
Humidity	Air humidity, percentage, yearly average. Source: www.ilmeteo.it and Istat
Coast	Dummy equal to 1 if city within 10 kilometers from the coast. Source: authors' calculation
Green areas	Percentage of urban green over urban area. Source: Istat
Air Pollution	Nunber of polluting agents in the air. Source: Istat
Education	Teacher/pupil ratio, per cent, average of primary, secondary and upper secondary schools. Source: Italian Ministry of Education
Transport	Multimodal (train, air, car) accessibility index, Espon space = 100. Source: Espon
Culture	Index of cultural infrastructure, Italian average = 100. Source: Istituto Tagliacarne
Crime	Number of violent crimes per 1000 inhabitants. Source: Istat.
Civicness	Voting turnout in administrative elections, per cent. Source: Italian Interior Ministry and Istat
University Enrollment	Per cent of resident population. Source: Istat and Italian Education Ministry.
Foreigners	Share of foreign residents. Source: Istat.
Value Added	Per head, thousand euros. Source: Istat.
Unemployment	Percentage rate. Source: Istat.

Table 11: Descriptive statistics, housing characteristics

Variable	Mean	Std. Dev.	Min.	Max.	N
Total surface (log)	4.61	0.39	2.56	6.21	134315
Age of building	38.8	34.3	0	505	134369
Floor	2.11	1.73	0	27	131508
Number of floors	4.60	2.26	0	29	134369
Number of bathrooms	3.35	2.7	1	7	134369
Penthouse	0.01	0.12	0	1	134369
Elevator	0.55	0.5	0	1	134369
Housing type: flat	0.74	0.44	0	1	134369
Housing type: economic	0.22	0.41	0	1	134369
Housing type: luxury	0.01	0.09	0	1	134369
Housing type: house	0.03	0.18	0	1	134369
Value type: offer price	0.45	0.5	0	1	134369
Value type: sale price	0.39	0.49	0	1	134369
Value type: market price	0.16	0.37	0	1	134369
Conditions: normal	0.87	0.34	0	1	134369
Conditions: good	0.11	0.31	0	1	134369
Conditions: poor	0.02	0.16	0	1	134369
Features: exclusive area	0.08	0.26	0	1	134369
Features: garage	0.16	0.37	0	1	134369
Features: balcony	0.11	0.31	0	1	134369
Features: attic	0.04	0.19	0	1	134369
Features: basement	0.23	0.42	0	1	134369
Location: central	0.24	0.43	0	1	134369
Location: peripheric	0.31	0.46	0	1	134369
Location: rural	0	0.03	0	1	134369
Location: semi-central	0.28	0.45	0	1	134369
Location: sub-urban	0.17	0.38	0	1	134369
Location qual.: very poor	0.01	0.11	0	1	134369
Location qual.: normal	0.9	0.31	0	1	134369
Location qual.: very good	0.09	0.29	0	1	134369
Location qual.: poor	0	0	0	0	134369
Public transport: absent	0.01	0.12	0	1	134369
Public transport: distant	0.1	0.3	0	1	134369
Public transport: near	0.88	0.32	0	1	134369
Services: absent	0.02	0.15	0	1	134369
Services: distant	0.21	0.41	0	1	134369
Services: near	0.76	0.43	0	1	134369
Comm. services: absent	0.01	0.11	0	1	134369
Comm. services: distant	0.13	0.34	0	1	134369
Comm. services: near	0.85	0.35	0	1	134369

Table 12: Average real housing prices, 2004-2009, by city

N	Province	Val.	N	Province	Val.	N	Province	Val.
1	Siena	384028	36	Latina	200666	71	Isernia	153963
2	Salerno	369168	37	Torino	199239	72	Agrigento	152373
3	Roma	363078	38	Vicenza	198772	73	Matera	151880
4	Firenze	356853	39	Arezzo	198665	74	Crotone	150062
5	Milano	325199	40	Lecco	198513	75	Sondrio	149523
6	Napoli	311194	41	Aosta	196649	76	Asti	147828
7	Bologna	299648	42	Pescara	193765	77	Teramo	145778
8	Lucca	292125	43	Brescia	192055	78	Viterbo	145587
9	Bolzano	290317	44	Piacenza	191146	79	Rieti	144907
10	Venezia	280966	45	Mantova	186851	80	Sassari	143912
11	Caserta	280165	46	Potenza	185259	81	Cremona	142159
12	Treviso	278096	47	Catania	183942	82	Novara	141863
13	Trento	266586	48	Ravenna	182270	83	Pordenone	138692
14	Prato	264490	49	Belluno	181136	84	Ferrara	135895
15	Palermo	262354	50	Pistoia	180367	85	Catanzaro	135514
16	Pisa	248328	51	Frosinone	178320	86	Nuoro	135224
17	Massa	244877	52	Perugia	177813	87	Messina	132253
18	Rimini	238485	53	Udine	174520	88	Reggio C.	130105
19	Cagliari	238229	54	Trieste	171415	89	Taranto	129706
20	Pesaro	235704	55	Verbania	170906	90	Rovigo	128351
21	Savona	235328	56	Campobasso	170183	91	Brindisi	128272
22	Como	232349	57	Cuneo	168619	92	Enna	128057
23	Bari	228996	58	Lodi	167080	93	Chieti	125012
24	Livorno	226524	59	Foggia	166678	94	Ragusa	124624
25	Avellino	225124	60	La Spezia	166126	95	Biella	122036
26	Parma	224648	61	Reggio E.	163582	96	Terni	120924
27	Ancona	223659	62	Ascoli P.	163429	97	Siracusa	120882
28	Bergamo	221429	63	Alessandria	163177	98	Oristano	120205
29	Padova	221151	64	Macerata	162612	99	Gorizia	116406
30	Imperia	220803	65	Lecce	160142	100	Vercelli	115559
31	Grosseto	220054	66	Forli	159983	101	Caltanissetta	109018
32	Genova	208728	67	Benevento	159860	102	Vibo V.	104547
33	Modena	207094	68	Cosenza	159558	103	Trapani	99095
34	Verona	202475	69	Varese	158171			
35	Pavia	200759	70	L'Aquila	154560			

Note: Source: Agenzia del Territorio.

Table 13: Descriptive statistics, worker-firm characteristics

Variable	Mean	Std. Dev.	Min.	Max.	N
Male	0.66	0.47	0	1	168255
Age	37.65	10.15	16	75	168255
Age squared	1520.61	801.41	256	5625	168255
Number of paid days	291.32	37.27	151	365	168255
Nationality: Asia	0.01	0.09	0	1	168255
Nationality: Africa	0.02	0.14	0	1	168255
Nationality: Latin America	0	0.06	0	1	168255
Executive	0	0.06	0	1	168255
Manager and white collar	0.39	0.49	0	1	168255
Blue collar	0.56	0.5	0	1	168255
Apprentice	0.04	0.21	0	1	168255
Temporary contract	0.06	0.23	0	1	168255
Small firm	0.27	0.44	0	1	168257
Medium firm	0.44	0.5	0	1	168257
Large firm	0.26	0.44	0	1	159983
Agriculture	0	0.06	0	1	159983
Electricity	0.02	0.13	0	1	159983
Chemistry	0.06	0.24	0	1	159983
Metalworking	0.2	0.4	0	1	159983
Food, textile, wood	0.17	0.37	0	1	159983
Building materials	0.08	0.27	0	1	159983
Commerce and services	0.19	0.39	0	1	159983
Tranport and commun.	0.06	0.23	0	1	159983
Credit, insurance	0.12	0.33	0	1	159983
Public admin.	0.1	0.3	0	1	159983

Table 14: Average real wages, 2001-2002, by city

N	Province	Val.	N	Province	Val.	N	Province	Val.
1	Milano	21682	36	Cagliari	18104	71	Viterbo	16811
2	Roma	21300	37	L'Aquila	18082	72	Isernia	16786
3	Torino	20263	38	Pordenone	18056	73	Pescara	16769
4	Bologna	20121	39	Vercelli	17931	74	Taranto	16702
5	Trieste	20014	40	Rieti	17886	75	Cosenza	16668
6	Parma	20014	41	Vicenza	17833	76	Brindisi	16654
7	Genova	19927	42	Napoli	17723	77	Verbania	16571
8	Bolzano	19771	43	Terni	17709	78	Ascoli P.	16555
9	Modena	19623	44	Ferrara	17706	79	Chieti	16522
10	Reggio E.	19513	45	Alessandria	17694	80	Grosseto	16474
11	Lecco	19295	46	Padova	17690	81	Perugia	16460
12	Pesaro	19259	47	Treviso	17671	82	Salerno	16448
13	Pistoia	19259	48	Palermo	17648	83	Agrigento	16415
14	Prato	19179	49	Latina	17643	84	Imperia	16318
15	Piacenza	19092	50	Reggio C.	17636	85	Arezzo	16310
16	Livorno	19008	51	Novara	17634	86	Bari	16287
17	Firenze	18942	52	Gorizia	17629	87	Macerata	16237
18	Verona	18931	53	Pisa	17628	88	Potenza	16204
19	Como	18829	54	Campobasso	17570	89	Trapani	16097
20	Varese	18792	55	Siracusa	17525	90	Rovigo	16065
21	Trento	18764	56	Rimini	17469	91	Catanzaro	16052
22	Brescia	18632	57	Lucca	17462	92	Matera	15877
23	Siena	18601	58	Biella	17437	93	Oristano	15770
24	Aosta	18535	59	Asti	17426	94	Teramo	15755
25	Bergamo	18461	60	Massa	17371	95	Caserta	15752
26	Pavia	18458	61	Frosinone	17279	96	Avellino	15690
27	Cremona	18446	62	Sondrio	17243	97	Nuoro	15461
28	La Spezia	18389	63	Catania	17210	98	Vibo V.	15300
29	Venezia	18355	64	Ancona	17148	99	Crotone	15262
30	Savona	18354	65	Messina	17089	100	Lecce	15238
31	Cuneo	18324	66	Foggia	17073	101	Benevento	15196
32	Ravenna	18234	67	Caltanissetta	17030	102	Ragusa	15155
33	Udine	18163	68	Belluno	16935	103	Enna	14940
34	Lodi	18158	69	Sassari	16891			
35	Mantova	18148	70	Forli	16876			

Note: Source: Inps.

References

Alesina, A., Di Tella, R. and McCulloch, R. (2001) "Inequality and happiness: Are European and American different?", NBER Working Paper n. 8198, Cambridge.

Bagnasco, A. (1977) *Tre Italie*, Il Mulino, Bologna.

Berger, M.C., Blomquist, G., Sabirianova K. (2008) "Compensating differentials in emerging labor and housing markets: Estimates of quality of life in Russian cities", *Journal of Urban Economics*, 63, 25-55.

Blomquist, G., Berger, M. and Hoehn, J. (1988) "New Estimates of Quality of Life in Urban Areas," *American Economic Review*, 78(1), 89-107.

Blomquist, G. (2007) "Measuring Quality of Life", in Arnott, R., and McMillen, D., Eds., *A Companion to Urban Economics*, Oxford: Blackwell-Synergy, 483-501.

Brasington, D.M. and Hite, D. (2005) "Demand for environmental quality: a spatial hedonic analysis", *Regional Science and Urban Economics*, 35, 57-82.

Bordignon, M. and Zanardi, A. (1997) "Tax Evasion in Italy", *Giornale degli Economisti e Annali di Economia*, 56, 169-210.

Buettner, T., and Ebertz, A. (2009) "Quality of life in the regions: results for German Counties", *Annals of Regional Science*, 43, 89-112.

Cannari, L., Nucci, F., and Sestito, P. (2000) "Geographic Labor Mobility and the Cost of Housing: Evidence from Italy", *Applied Economics*, 32, 1899-1906.

Cheshire, P. and Sheppard, S. (1995) "On the price of land and the value of amenities", *Economica*, 62, 247-67.

Chowhan, J., and Prud'homme, M. (2000) "City Comparisons of Shelter Costs in Canada: A Hedonic Approach". Ottawa: Statistics Canada.

Cicerchia, A. (1996) "Indicators for the measurement of the quality of urban life", *Social Indicators Research*, 39(3), 321-358.

Costa, D.L. and Kahn, M.E. (2003) "The Rising Price of Nonmarket Goods", *American Economic Review*, 93(2), 227-232.

Deller, S.C., Tsai, T.-H., Marcouiller, D.W., and English, D.B.K. (2001) "The role of amenities and quality of life in rural economic growth", *American Journal of Agricultural Economics*, 83, 352-365.

Diener, E. and Suh, E. (1997) "Measuring quality of life: economic, social and subjective indicators", *Social Indicators Research*, 40, 189-216.

Douglas, S. and Wall, H.J. (2000) "Measuring relative quality of life from a cross-migration regression, with an application to Canadian provinces", *Research in Labor Economics*, 19, 191-214.

Englund, P., Quigley, J. M., and Redfearn, C.L. (1998) "Improved Price Indexes for Real Estate: Measuring the Course of Swedish Housing Prices", *Journal of Urban Economics,* 44(2), 171-96.

Eurofound (2006) Mobility in Europe, European Foundation for the Improvement of Living and Working Conditions

Ezzet-Lofstrom, R. (2004) "Valuation of Metropolitan Quality of Life in Wages and Rents", Cityscape: A Journal of Policy Development and Research, 7(1), 23-37.

Follain, J. R., Ozanne,L., and Alberger, V. (1979). "Place to Place Indexes of the Price of Housing". Urban Institute.

Follain, J.R. and Malpezzi, S. (1980). "Estimates of Housing Inflation for Thirty-Nine SMSAs: An Alternative to the Consumer Price Index.", *Annals of Regional Science*, 41-56.

Gabriel, S.A., Rosenthal, S. (2004) "Quality of the business environment versus the quality of life: Do firms and households like the same cities?" *Review of Economics and Statistics*, 86, 438–444.

Giannias, D.A. (1998) "A Quality of Life Based Ranking of Canadian Cities", *Urban Studies*, 35, 2241-2251.

Gyourko, J., Tracy, J. (1989), "The Importance of Local Fiscal Conditions in Analyzing Local Labor Markets", *Journal of Political Economy*, 97, 1208-1231.

Gyourko, J., Tracy, J. (1991), "The structure of local pubic finance and the quality of life", *Journal of Political Economy*, 99, 774-806.

Gyourko, J., Kahn, M. Tracy, J. (1999) Quality of life and environmental comparisons, in: E.S. Mills, P. Cheshire (Eds.), *The Handbook of Applied Urban Economics*, North-Holland, Amsterdam.

Istat (2006). "Ambiente e territorio: Statistiche Metereologiche: anni 2000-2002".

Istat (2007). "Ambiente e territorio: Indicatori Ambientali Urbani".

Kahn, M.E. (1995) "A Revealed Preference Approach to Ranking City Quality of Life", *Journal of Urban Economics*, 38, 221-235.

Lambiri, D., Biagi, B., and Royuela, V. (2007) "Quality of life in the economic and urban economic literature"; *Social Indicators Research*, 84, 1-25.

Luger, M.I. (1996) "Quality-of-Life Differences and Urban and Regional Outcomes: A Review", *Housing Policy Debate*, 7, 749-771.

Maddison, D. and Bigano, A. (2003) "The amenity value of the Italian climate", *Journal of Environmental Economics and Management*, 45(2), 319-332.

Marino, R. and Zizza, R. (2008) "L'evasione dell'IRPEF: una stima per tipologia di contribuente" Paper presented at the XX Conference SIEP, September 2008.

Monchuk, D. C. and Miranowski, J.A., Hayes, D.J., and Babcock, B.A. (2007) "An Analysis of Regional Economic Growth in the U.S. Midwest", *Review of Agricultural Economics*, 29(1), 17-39.

Morawetz, D., et al. (1977) "Income Distribution and Self-Rated Happiness: Some Empirical Evidence", *Economic Journal*, 87, 511-522.

Moulton, B.R. (1995). "Inter-area Indexes of the Cost of Shelter Using Hedonic Quality Adjustment Techniques", *Journal of Econometrics*, 68(1), pp. 181-204.

Nuvolati, G. (2003) "Socioeconomic development and quality of life in Italy", in Sirgy, M.J et al. (eds.), *Advances in Quality-of-Life Theory and Research*, Kluwer Academic Publishers, 81-98.

Oswald, A. and Wu, S. (2010) "Objective confirmation of subjective measures of human well-being: evidence from the USA", IZA Discussion Paper n. 4695.

Rappaport, J. (2008) "Consumption amenities and city population density", *Regional Science and Urban Economics*, 38(6), 533-552.

Rappaport, J. (2009) "The increasing importance of quality of life", *Journal of Economic Geography*, 9(6), 779-804.

Redfearn, C.L. (2009) "How informative are average effects? Hedonic regression and amenity capitalization in complex urban housing markets", *Regional Science and Urban Economics*, 39, 297-306.

Roback, J. (1982) "Wages, Rents, and the Quality of Life" *Journal of Political Economy*, 90(6), 1257-78.

Rosen, S. (1974) "Hedonic Prices and Implicit Markets: Product Differentiation in Pure Competition", *Journal of Political Economy*, 82, 34-55.

Rosen, S. (1979). "Wage-based indexes of urban quality of life", 74-104, in P. Mieszkowsi and M. Stratzheim (eds.) *Current issues in urban economics*, John Hopkins Press, Baltimore.

Schifini D'Andrea, S. (1998) "Italian quality of life", *Social Indicators Research*, 44, 5-39.

Shapiro, J.M. (2006) "Smart Cities: Quality of Life, Productivity, and the Growth Effects of Human Capital", *Review of Economics and Statistics*, 88(2), 324-335.

Shultz, S.D. and King, D.A. (2001) "The Use of Census Data for Hedonic Price Estimates of Open-Space Amenities and Land Use", *Journal of Real Estate Finance and Economics*, 22, 239-252.

Srinivasan, S. and Stewart, G. (2004) "The Quality of Life in England and Wales", *Oxford Bulletin of Economics and Statistics*, 66(1), 1-22.

Stigler, G. (1957) "The Tenable Range of Functions of Local Government", *Joint Economic Committee Symposium*, Washington, D.C.: U.S. Government Printing Office.

Tiebout, C.M. (1956) "The Pure Theory of Local Expenditures", *Journal of Political Economy*, 64, 416-424.

Winters, J. (2010) "Differences in Quality of Life Estimates Using Rents and Home Values", Munich Personal RePEc Archive Paper n. 22455.

Wu, J. and Gopinath, M. (2008) "What Causes Spatial Variations in Economic Development in the United States?", *American Journal of Agricultural Economics*, 90(2), 392-408.