Urbanization and Life Satisfaction:

Evidence from EU Cities

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ABSTRACT

In the last decades the interest towards the determinants of life satisfaction largely increased and a broad literature focused on the relational between self-reported happiness and some individual, institutional and macroeconomic variables. Among the latter, poor attention was devoted to the role of urbanization. In particular, to the best of our knowledge, all the studies focused on this topic analysed the direct effect of urbanization on individual self-reported happiness, i.e. the probability of being satisfied with life for people living in urban settings of different kind, from villages to large cities. What is typically ignored in the literature is that these settings are, in turn, embedded in a variety of territorial contexts. A rural setting, for instance, can be either close to a large city or far from any town of medium or high size. In the former case it is expected to benefit from the positive externalities generated by the city, while in the latter situation it is not. In other words, we assume an indirect effect of urbanization on life satisfaction, related to the proximity between settings of different size. The present paper is aimed at testing this assumption in the case of EU cities, making use of survey data at NUTS3-level collected between 2005 and 2011.

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1. Introduction

A long stream of research investigated the determinants of life satisfaction (Dolan et al., 2008). Representing a proxy for experienced utility, the study of life satisfaction is extremely interesting as it allows testing some of the assumptions on which economic theory rests. From this perspective, the most popular finding is certainly the so-called "Easterlin paradox" (Easterlin, 1973), pointing out how increasing per capita income in developed economies is not associated to a corresponding raise in perceived happiness.

More recently, a branch of this literature focused on the relationship between urbanization and life satisfaction (Okulicz-Kozaryn, 2015). Also in this case, the empirical findings are generally in contrast with the theoretical expectations: while cities are the place where the most intense processes of economic growth take place (Glaeser et al., 1991), urbanization is generally linked to lower levels of life satisfaction (Graham, 2009). These results led to the identification of a urban/rural divide: living outside the city is likely to lead to higher life satisfaction than living within urban areas. The dualism between city and the countryside, however, misses to take into account a relevant aspect of the relationships between these two kinds of settings. The externalities of a city, in fact, are not constrained within the urban boundaries. Rather, they are likely to spread to the rural areas around, with an intensity and a range proportional to the size of the city itself. Similarly, rural areas will be affected by the urban externalities with a very different extent, based on their proximity to the city.

A preliminary evidence of these mechanisms was provided by Lenzi and Perucca (2016b). Their study on life satisfaction in EU NUTS2 regions pointed out an indirect effect of urbanization on life satisfaction: *within the most urbanized regions*, residents in rural settings are more likely to be satisfied, keeping other things constant, than those in cities. It is worth noting that the opposite holds for those living in regions *with a low degree of urbanization*: in this case staying in a rural setting is linked to lower satisfaction than living in a city. Therefore, rurality *per se* is not a source of happiness. Rather, these findings suggest that it is expected to have a positive effect on LS only when rural residents are able to take advantage of the positive externalities of cities, avoiding at the same time the typical diseconomies generated by urbanization, such as congestion, pollution and cost of living.

This result is interesting since it suggests that the relationship between urbanization and life satisfaction goes beyond a simplistic urban/rural divide. Cities are not just sources of displeasure, and their impact on life satisfaction is highly differentiated across space.

This idea is certainly not new and a broad literature focused on the spatial diffusion of cities' externalities (Parr, 2014) and their effect on economic prosperity. Nevertheless, no studies investigated the spatial impact of urbanization economies on individuals' wellbeing. This paper is aimed at filling this gap.

More in details, the present study makes use of an original data set in which individuals, classified according to the NUTS3 region of residence, were asked to report their level of life satisfaction. Compared with the previous works on this topic, generally using data at the NUTS2 level, this implies two advantages. First, the finer geographical scale allows capturing the intensity of urbanization in a more precise way. Second, Geographical Information System (GIS) techniques

allows measuring for each region the accessibility, defined in terms of distance, to the services provided by the closest urbanized areas. The discussion is organized as follows.

2. Central-place theory, agglomeration economies and the hierarchy of cities

One of the first attempts to explain the spatial distribution of settlements of different size was the central-place theory by Christaller (1933). In his model, developed from the empirical study of the urban structure of Southern Germany, Christaller assumed an isotropic space and a uniform distribution of consumers. In such situation, his goal was to understand where the providers of goods and services of different kind would decide to locate. This decision is based on the number of customers that the vendor is able to reach from his localization (market threshold). At the same time, consumers are willing to cover a maximum distance to purchase the good or service, which defines the market range. If the market range is larger than the threshold, then the provider will find profitable to supply the resource. Hence, all the products whose market has a similar range will locate in the same place, so to minimize the access to the potential customers and the travel costs covered by the latter (Shearmur and Doloreux, 2015). The hypothesis underlying this mechanism of location is that both the range and threshold of markets is not the same across different products: for some of them (defined by Christaller as low-order goods) customers are willing to travel shorter distances than for some others (high-order goods). Therefore, an urban hierarchy arises, where the few largest cities provide all kinds of goods and services, while the other centres host fewer and fewer activities as the size shrinks. At the bottom of the hierarchy, villages house only the provision of the goods of the lowest order.

Loesch (1994) developed a similar model, with some extensions and a stronger microeconomic foundation, allowing for a diversified functional specialization of cities. Other works aimed at the economic formalization of the central-place theory include the contributions by Fujita et al. (1999), Tabuchi and Thisse (2011) and Hsu et al. (2014).

Central-place theory is certainly not the only framework suggesting the occurrence of a hierarchy of cities. The literature on agglomeration economies, for instance, claimed that both firms and consumers co-locate in urban areas since they get three main kinds of benefits (Puga, 2010). First, they have access to services and goods typically provided only in large cities, as they require a minimum pool of potential users (and then close to the high-order goods defined by Christaller). Second, the density of economic agents in cities facilitate human interactions and, as a consequence, the diffusion and accumulation of knowledge. Finally, the presence of a high number of firms and workers eases the matching between supply and demand on the job market. Hence, according to this approach cities are not just a neutral space generated by the regulatory mechanisms of the geography of markets. Instead, urbanization economies constitute an input in both the production and utility function of firms and consumers: respectively by increasing productivity through knowledge diffusion and by raising utility through the availability of amenities. Within this theoretical framework a hierarchy of cities emerges for two main reasons. First of all since the extent of these externalities tend to increase with city size (Melo et al., 2009). Second, because the balancing of positive and negative externalities appears not to be the same across cities of different dimension (Camagni et al., 2014). In particular, the congestion typical of large cities is likely to lead to environmental and social issues that are more difficult to manage than in smaller urban settings (Capello and Camagni, 2000).

While the literature on agglomeration economies extensively discussed the nature and intensity of the externalities generated within cities, less evidence is available about the range of these spillovers outside the urban boundaries. The range of markets was a fundamental component in the model proposed by Christaller, under the assumptions that more distant locations from the urban centres imply higher costs for the customers to access the provision of products. Similarly, a distant-decay effect was pointed out also in the case of urbanization economies, which tend to spread with a lower and lower intensity as distance increases (Van Oort, 2007). Moreover, some authors suggested that the range of positive externalities is broader than the one of urban diseconomies (Meijers and Burger, 2010).

What are the implications of the theories on the hierarchy of cities for the study of individuals' life satisfaction? In the first place, they support the assumption that the degree of urbanization of the settings in which individuals are living matters in explaining their life satisfaction, as urbanization economies (and diseconomies) are likely to affect individuals' utility. Second, since they recognize that these effects (i.e. the cost of access to markets in the Christaller approach and the possibility to catch urbanization benefits in the literature about agglomeration economies) are not constrained within the urban boundaries, but their range goes far beyond them. As it will be discussed in the next section, the former (and direct) mechanism received some attention in the literature on life satisfaction, while the latter one was, at present, almost completely disregarded.

3. Urbanization and life satisfaction: evidence from the literature and hypotheses to be tested

The works devoted to the analysis of the relationship between urbanization and life satisfaction were aimed at understanding whether living in an urban setting is likely to lead to a higher/lower level of self-reported happiness. As anticipated above, the common finding associates cities with lower life satisfaction than urban areas (Hayo, 2007; Knight and Gunatilaka, 2010; Okulicz-Kozaryn 2012; Sørensen 2014).[1] This result has been interpreted as the empirical verification that the diseconomies generated by the urban environment prevail on the positive externalities, at least as far as their impact on residents' wellbeing is concerned. The dualism between rural and urban areas underlying the approach of most of these contributions, however, is too much simplistic, for at least two reasons.

First because cities are not all equal, each of them providing very different kinds of amenities and, therefore, externalities on the resident population. Following this line of reasoning, some authors studied life satisfaction in urban settings of different kind. Shucksmith et al. (2009), Berry Okulicz-Kozaryn (2011), Rodríguez-Pose and Maslauskaite (2012) and Lenzi and Perucca (2016a) classified cities according to their population, based on the assumption that the size of the city reflects the amount of functions hosted. Results generally associate lower levels of wellbeing with the largest cities, while the same does not hold for intermediate urban areas.

Second, because rural areas are not all equal, being each of them able to capture to a different extent the externalities generated by cities. A rural setting, for instance, can be either close to a large city or far from any town of medium or high size. In the former case it is expected to be affected by the externalities generated by the city, while in the latter situation it is not. Surprisingly enough, this

[1] Some exceptions are represented by the analyses of Hudson (2006) and Appleton and Song (2008), finding no significant relationship between urbanization and life satisfaction.

topic has been disregarded by the literature on life satisfaction. Recently, Lenzi and Perucca (2016b) focused on this issue in a study on the determinants of self-reported wellbeing in EU NUTS2 regions. Using survey data, it was possible to discriminate people who reported to live in a rural setting from those residing in an urban setting. Results pointed out that individuals living in rural settings embedded in urbanized regions where more likely to be satisfied than those in urban settings embedded in the same kind of region. On the other hand, considering regions characterized by lower levels of urbanization, the opposite holds and living in a rural context is associated with less satisfaction than residing in an urban setting. This evidence suggests the occurrence of an indirect and spatially diversified impact of cities on individuals' life satisfaction: the point is not just whether people live in urban vs rural communities but, rather, how much the accessibility to the city's amenities matter in determining wellbeing.

The role of space in this context is the one assumed in the theories of urban hierarchy discussed above: it mitigates the impact of cities on residents' wellbeing. According to the Christaller approach, longer distances from the urban centres imply higher travel cost to access the provision of goods and services of higher order. Based on the findings from the literature on agglomeration economies, increasing distance reduces the accessibility to the benefits supplied by the urban environment. The scope of this paper is to investigate this issue. More in details we want to test the following five hypotheses:

H1: consistently with previous literature on this topic, living in cities is associated to lower satisfaction and this relationship is reinforced as city size increases;

H2: the distance from cities of higher order is negatively related to life satisfaction, i.e. the higher the distance the lower the subjective wellbeing;

H3: the higher the rank of the city (and therefore the amenities provided) the broader its range;

H4: the distance from cities of the same rank does not affect life satisfaction, based on the assumption that towns of the same size are providing similar varieties of amenities;

H5: cultural proximity reinforces the effects of physical accessibility on life satisfaction.

The test of these hypotheses is based on a data set from several survey studies conducted in EU regions. The next section is devoted to a description of the data and methodology.

4. Data and method

4.1. Eurobarometer surveys

The database employed in the empirical analysis is made up by several waves of Eurobarometer survey studies. Since 1973 the European Commission has been monitoring the evolution of the public opinion in Member States on a broad variety of issues. Among the latter, a recurrent question concerns the degree of life satisfaction of EU citizens. Respondents are typically asked to report their satisfaction with life on a four-point scale: from "Very unsatisfied", to "Rather unsatisfied", to "Rather satisfied", to "Very satisfied". A question on self-reported happiness was included in 19 editions of the survey between 2004 and 2011.

Jointly with their self-reported happiness, individuals have to provide some information on their demographic and socioeconomic status, such as age, gender, occupation and marital status. As

pointed out by the previous literature (Dolan et al., 2008) these individual characteristics are among the most significant determinants of life satisfaction.

Finally, each respondent is associated to the region of residence. For some countries, only the NUTS2 region is recorded in official data. Our data set makes use of observations at the NUTS3 level[2], which allows us to capture in a much finer way the degree of urbanization of the setting in which respondents are living.[3] Pooling all these Eurobarometer waves allows for the creation of a broad data set (more than 200,000 observation) on individual life satisfaction.

4.2. The empirical model

The measurement of the dependent variable is based on the Eurobarometer question asking respondents to indicate their level of life satisfaction among four options: very satisfied, rather satisfied, fairly dissatisfied or very dissatisfied. In this paper, self-reported level of satisfaction has dichotomized; the deriving dummy variable takes a value of 1 if the individual is very or rather satisfied and equal to 0 otherwise.

Therefore, the empirical model to be estimated for any individual *i* in any NUTS3 *r* is as follows:

$$(Life\ satisfaction = 1) = F(age_i, gender_i, marital\ status_i, education_i, occupation_i, per\ capita\ GDP_r, city\ rank_r, distance\ from\ a\ city\ of\ higher\ rank_r, year\ dummy, country\ dummy) \quad [1]$$

The set of regressors include three main typologies of variables, described in Table 1.

The first group is represented by controls at the individual level. Age, gender, level of education, occupational and marital status are presumably determinants of well-being.

The second group of controls include three variables defined at the regional (NUTS3) level. The first one is per capita income. Eurobarometer surveys do not provide any information about the income of the respondents. Hence, controlling for the overall level of wealth in the region of residence allows mitigating the issue raised by the omission of this individual characteristic. The second regional control is a categorical variable for the rank of the city of residence of the respondents. The taxonomy employed in the present work comes from the official classification of cities provided by Eurostat.[4] According to this definition, EU cities are classified into six groups, from rank 0 to rank 5, as summarized in Table 1. Finally, as a third control the model accounts for the distance (measured in terms of travel time by car) to the closest city of higher (3^{rd}, 4^{th} or 5^{th}) rank.

In addition to these controls, a set of dummies at the country and year level are added to the model specification. Error terms are clustered at the NUTS3 region level.

5. Empirical results

This section presents the empirical findings from the test of the five hypotheses summarized in section 3.

[2] Data at the NUTS3 level are not available for the following countries: UK, Finland, Poland, Czeck Republic, Latvia, Lithuania and Slovakia.

[3] These data were made available thanks to the precious and kind cooperation of the Gesis Zacat Institute. We are particularly grateful to Meinhard Moschnard for his guidance and support.

[4] http://ec.europa.eu/eurostat/statistics-explained/index.php/Statistics_on_European_cities

Table 1. List of independent variables.

Name	Description	Source	Year
	Individual characteristics (survey data)		
Gender	Gender of the respondent (reference category = males)	Eurobarometer	*2004-2011*
Age	Age of the respondent (number of years). A quadratic effect is introduced to check for a non-linear relationship between age and life satisfaction	Eurobarometer	*2004-2011*
Education	Level of education of the respondent according to the ISCED classification. Low education = ISCED 1-2, medium education = ISCED 3-4, high education = ISCED 5-6, (reference category = low education)	Eurobarometer	*2004-2011*
Occupation	Occupation of the respondent: non-working, student, employed, self-employed (reference category = non-working)	Eurobarometer	*2004-2011*
Marital status	Marital status of the respondent: single, married, divorced, widow (reference category = single)	Eurobarometer	*2004-2011*
	Regional variables (NUTS2)		
Per capita GDP	Per capita GDP in NUTS2 regions	Eurostat	*2004-2011*
City ranking	Cities are grouped into five categories: rank 5 (more than 1 million inhabitants), rank 4 (500,000-1 million), rank 3 (250-500,000), rank 2 (100-250,000), rank 1 (50-100,000) and rank 0 (less than 50,000)	Eurostat	*2004-2011*
Distance from the closest 5th, 4th or 3rd rank city	Distance from the closest city of higher rank, measured in terms of travel time by car	Google maps	*2004-2011*

H1: consistently with previous literature on this topic, living in cities is associated to lower satisfaction and this relationship is reinforced as city size increases.

Table 2 reports the results from the model aimed at investigating this issue. Model (1) includes only the individual characteristics of the respondents, while model (2) and (3) respectively introduce the control for per capita GDP and the city rankings. The coefficients associated to the characteristics of the respondents have all the expected sign, as for the quadratic effect of age and the highest levels of satisfaction linked to employed people and to those with tertiary education. The same holds for the inclusion of per capita GDP, having a positive and increasing impact on wellbeing up to a certain threshold, after which its effect weakens. Finally, taking NUTS3 regions with less than 50,000 inhabitants as reference group, people living in the largest cities (rank 4 and 5) exhibit a lower and statistically significant level of life satisfaction. As discussed in section 3, this evidence is consistent with previous literature and, therefore, it confirms our hypothesis. In cities of more than 500,000 habitants, the net balance between urbanization economies and diseconomies appears to be negative, leading to lower levels, other things constant, of life satisfaction.

Table 2. Life satisfaction across regions and the direct role of urbanization.

	(1)	(2)	(3)
Age	-0.021***	-0.021***	-0.021***
	(0.002)	(0.002)	(0.002)
Age^2	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Gender: female	0.059***	0.058***	0.058***
	(0.013)	(0.013)	(0.013)
Occ.: employed	0.643***	0.638***	0.637***
	(0.022)	(0.022)	(0.022)
Occ.: self employed	0.681***	0.681***	0.679***
	(0.033)	(0.033)	(0.033)
Occ.: student	1.164***	1.161***	1.158***
	(0.041)	(0.041)	(0.041)
Educ.: secondary education	0.036	0.033	0.034
	(0.027)	(0.027)	(0.027)
Educ.: tertiary education	0.489***	0.484***	0.487***
	(0.032)	(0.031)	(0.032)
N. of children	0.046***	0.047***	0.047***
	(0.012)	(0.012)	(0.012)
Mar. status: single	-0.253***	-0.254***	-0.253***
	(0.026)	(0.026)	(0.026)
Mar. status: divorced	-0.841***	-0.843***	-0.841***
	(0.033)	(0.033)	(0.033)
Mar. status: widower	-0.540***	-0.540***	-0.539***
	(0.027)	(0.027)	(0.028)
Per capita GDP		0.127**	0.216***
		(0.064)	(0.069)
Per capita GDP^2		-0.021**	-0.028***
		(0.010)	(0.010)
Rank1			-0.026
			(0.046)
Rank2			-0.051
			(0.052)
Rank3			-0.014
			(0.059)
Rank4			-0.189***
			(0.065)
Rank5			-0.152*
			(0.083)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Constant	1.801***	1.650***	1.544***
	(0.057)	(0.102)	(0.107)
Observations	253,128	253,128	253,128

Reference categories: unemployed (occupation), primary education or lower (education), married (marital status)
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

H2: the distance from cities of higher order is negatively related to life satisfaction, i.e. the higher the distance the lower the subjective wellbeing.

To test this hypothesis the travel time distance by car to the closest cities was added to the full model specification (model 3 in Table 2). We expect individuals to benefit from the proximity of urban settings of higher rank compared with the ones they are living it. This assumption is based on the idea that cities of higher rank are likely to house functions not provided in the setting where respondents reside. Results are reported in Table 3.

The model (1) tests the relationship between life satisfaction and the proximity to cities of the highest rank (rank 5). Therefore, the regression was run on the people living in NUTS3 regions of lower order. The same procedure was applied in order to investigate the impact on wellbeing of the distance from, respectively, rank 4 (model 2) and rank 3 (model 3) cities.

It is worth mentioning that all the other controls (individual characteristics and per capita GDP) show the same associations with life satisfaction across the different models, even if they were estimated on different subsamples of the survey population (a formal description of this can be found in the Appendix A).

Results in Table 3 show that the coefficient associated to the distance from cities of higher rank is always negative and statistically significant. In other words, the higher the distance from a city larger than the one of residence of the respondent, the lower her probability to be satisfied with life. This result confirms the indirect effect of urbanization on life satisfaction: while living inside the largest cities is likely to reduce wellbeing, as negative externalities prevail on urbanization economies, the opposite happens for those residing outside the boundaries of the top-ranked urban areas. In the best case, as for rank 3 and urban areas of lower size, cities are neutral to life satisfaction, as far as they direct impact is concerned. Rather, living either close or far away from major urban settings does make a difference on wellbeing.

H3: the higher the rank of the city (and therefore the amenities provided) the broader its range.

Based on the theories of hierarchy of cities, the relationship between distance and wellbeing cannot be assumed to be the same wen considering cities of different rank. In the Christaller model, only the cities on the top of the hierarchy are supplying goods and services of the highest order (jointly with all the others). Therefore, their market range will be the broadest one and people will be willing to travel even long distances to purchase the products typical of these urban settings. Obviously the higher the distance the lower the net utility individuals will experience from the consumption of these resources. Similarly, from the perspective of the agglomeration economies literature, the cities of highest rank are providing most of the amenities (Melo et al., 2009) and, therefore, their externalities are assumed to spread over a broader spatial range than for the case of smallest urban settings. The hypothesis to be tested, then, is that the impact of proximity on life satisfaction is decreasing as distance raises in the case of lower-ranked cities, while it does not show decreasing returns for urban agglomeration in the top of the hierarchy.

To empirically verify this hypothesis we estimated three models equivalent to the ones reported in Table 3, where the minimum distance from a city of highest rank has been log-transformed. Results are reported in Table 4.

Table 3. Life satisfaction across regions and the indirect role of urbanization.

	(1)	(2)	(3)
Age	-0.021***	-0.022***	-0.023***
	(0.002)	(0.002)	(0.002)
Age^2	0.000***	0.000***	0.000***
	(0.000)	(0.000)	(0.000)
Gender: female	0.058***	0.054***	0.051***
	(0.014)	(0.014)	(0.015)
Occ.: employed	0.644***	0.643***	0.639***
	(0.022)	(0.023)	(0.024)
Occ.: self employed	0.665***	0.652***	0.636***
	(0.034)	(0.036)	(0.039)
Occ.: student	1.158***	1.168***	1.138***
	(0.042)	(0.043)	(0.049)
Educ.: secondary education	0.044	0.012	0.013
	(0.028)	(0.027)	(0.029)
Educ.: tertiary education	0.483***	0.449***	0.436***
	(0.034)	(0.031)	(0.032)
N. of children	0.049***	0.048***	0.056***
	(0.012)	(0.013)	(0.014)
Mar. status: single	-0.256***	-0.270***	-0.276***
	(0.025)	(0.024)	(0.025)
Mar. status: divorced	-0.857***	-0.879***	-0.884***
	(0.034)	(0.032)	(0.034)
Mar. status: widower	-0.548***	-0.557***	-0.566***
	(0.028)	(0.027)	(0.029)
Per capita GDP	0.131	0.188*	0.192*
	(0.080)	(0.102)	(0.102)
Per capita GDP^2	-0.017	-0.023	-0.023
	(0.012)	(0.015)	(0.016)
Rank1	-0.019	-0.016	-0.027
	(0.045)	(0.046)	(0.044)
Rank2	-0.031	-0.032	-0.022
	(0.053)	(0.055)	(0.053)
Rank3	-0.003	-0.001	
	(0.060)	(0.061)	
Rank4	-0.151**		
	(0.068)		
Min. travel time to Rank5	-0.015***		
	(0.005)		
Min. travel time to Rank4		-0.024***	
		(0.008)	
Min. travel time to Rank3			-0.053***
			(0.010)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Constant	1.676***	1.640***	1.692***
	(0.126)	(0.152)	(0.152)
Observations	234,633	204,904	176,124

Reference categories: unemployed (occupation), primary education or lower (education), married (marital status)
Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Model (1) checks for the occurrence of decreasing returns in the impact of the minimum distance from a rank 5 city on wellbeing. The coefficient is not statistically significant, consistently with our ex-ante assumption: even at long distances urbanization economies generated by the largest cities are likely to have an impact on the life satisfaction of the resident population.

Table 4. Life satisfaction and the range of cities.

	(1)	(2)	(3)
Individual characteristics	Yes	Yes	Yes
Per capita GDP	0.142*	0.194*	0.189*
	(0.081)	(0.104)	(0.102)
Per capita GDP^2	-0.018°	-0.024°	-0.022
	(0.012)	(0.016)	(0.016)
Rank1	-0.016	-0.012	-0.027
	(0.044)	(0.047)	(0.044)
Rank2	-0.038	-0.031	-0.032
	(0.052)	(0.055)	(0.054)
Rank3	0.000	-0.001	
	(0.058)	(0.062)	
Rank4	-0.159**		
	(0.068)		
Log of min. travel time to Rank5	-0.001		
	(0.041)		
Log of min. travel time to Rank4		-0.067°	
		(0.044)	
Log of min. travel time to Rank3			-0.130***
			(0.041)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Constant	1.625***	1.900***	2.205***
	(0.251)	(0.277)	(0.246)
Observations	234,633	205,187	176,124

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10, ° p<0.15

When considering the distance from cities included in the rank 4 category (model 1) the coefficient becomes slightly significant and with a negative sign, pointing out the occurrence of decreasing returns: a marginal increase in the distance from a rank 4 city is likely to reduce wellbeing less and less as we move further away. The same result, with a much stronger level of significance, characterizes rank 3 cities, which is fully consistent with the hypothesis that the range of urban areas of lower size is shorter than in the case of the top-ranked towns. In other words, in the case of rank 3 cities, the relationship between proximity and life satisfaction is particularly intense at short distances from the urban setting, while it reduces as the distance increases.

H4: the distance from cities of the same rank does not affect life satisfaction, based on the assumption that towns of the same size are providing similar varieties of amenities.

What we did not test yet is one of the underlying hypotheses on which the Christaller model is based, i.e. that cities of the same rank are providing the same typologies of goods and services. This assumption is clearly unrealistic, and more recent models built on the same theoretical framework of the one adopted by Christaller allowed overcoming this restrictive condition. Nevertheless, in the analysis of life satisfaction we can expect cities of the same size to provide similar services, at least to customers. In fact, if from the production side each city may be characterized by its own peculiar specialization and structure, leading to a variety of urban models and settings, from the consumption side cities are more homogeneous, housing the same typologies of public services and amenities of different order like hospitals, universities, transportation networks etc. If life satisfaction, as a proxy for individuals' utility, is expected to primary depend on consumption, we can consider cities of the same rank as comparable in the functions they host, at least to a certain extent.

Based on this reasoning, then, we will expect the distance from cities of the same size to have no effect on the life satisfaction of the population: in this case distance would capture the proximity to markets and functions very similar to the ones already present in the town of residence. This hypothesis is tested in the models whose results are reported in Table 5. The specification of the models is the same used in the regression reported in Table 3, but this time the sample is made up by the respondents living respectively in rank 5 (model (1)), rank 4 (model (2)) and rank 3 (model (3)) cities.

Table 5. Life satisfaction and the distance from cities of the same rank.

	(1)	(2)	(3)
Individual characteristics	Yes	Yes	Yes
Min. travel time to Rank5	0.043		
	(0.084)		
Min. travel time to Rank4		-0.036	
		(0.047)	
Min. travel time to Rank3			-0.084°
			(0.058)
Country dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Constant	0.814*	2.025***	1.797***
	(0.474)	(0.608)	(0.513)
Observations	18,495	29,729	28,780

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10, ° p<0.15

As expected, none of the coefficients associated to the minimum travel time is statistically significant, with the partial exception of the one of rank 3 cities, whose significance is however lower than the 85 per cent level. Therefore, the relationship between proximity and life satisfaction holds only for cities of lower rank and their accessibility to urban settlements of higher size, since in that case physical distance mirrors the possibility to access services and goods that are not available in their pace of residence.

H5: cultural proximity reinforces the effects of physical accessibility on life satisfaction.

The last hypothesis investigated by the present paper involves the role of other kinds of proximity in the mediation of the widespread effects over space of urbanization economies. Spatial proximity is not the only element through which individuals can benefit of the positive externalities of cities (Caragliu and Nijkamp, 2013). For instance, recalling the three kinds of urban spillovers discussed in section 2 (Puga, 2010), cultural proximity certainly favours face-to-face interactions and knowledge diffusion. Institutional proximity, on the other hand, makes easier the consumption of the public services provided in large cities. With reference to life satisfaction, then, we expect the relationship between physical proximity to cities of higher rank and wellbeing to be stronger if it is matched by other kinds of proximity.

Empirically, we assume that two cities have a high degree of cultural and institutional proximity if they are both located in the same country. Then, we expect physical distance from cities of higher rank to have a stronger impact on life satisfaction when the two settlements (the one of residence of the respondent and the one of higher rank) are in the same country. This hypothesis is tested by splitting each of the models estimated in Table 3 into two sub-models: the first one includes those respondents for whom the closest city of higher rank pertains to the same nation. Results are reported in Table 6.

Table 6. Cultural proximity and the indirect role of urbanization on life satisfaction.

	(1a)	(1b)	(2a)	(2b)	(3a)	(3b)
	CP =high	*CP =low*	*CP =high*	*CP =low*	*CP =high*	*CP =low*
Individual characteristics	Yes	Yes	Yes	Yes	Yes	Yes
Rank1	-0.067	-0.000	-0.009	-0.014	-0.066	0.067
	(0.071)	(0.058)	(0.055)	(0.087)	(0.049)	(0.075)
Rank2	-0.082	-0.000	-0.010	-0.046	-0.059	0.056
	(0.083)	(0.068)	(0.069)	(0.102)	(0.065)	(0.092)
Rank3	-0.016	-0.010	0.044	-0.058		
	(0.086)	(0.082)	(0.065)	(0.115)		
Rank4	-0.092	-0.103				
	(0.097)	(0.110)				
Min. travel time to Rank5	-0.015***	-0.019*				
	(0.005)	(0.012)				
Min. travel time to Rank4			-0.037**	-0.019***		
			(0.019)	(0.007)		
Min. travel time to Rank3					-0.057***	-0.014
					(0.010)	(0.025)
Country dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.642***	1.853***	1.980***	1.202***	1.805***	1.265***
	(0.152)	(0.211)	(0.202)	(0.261)	(0.173)	(0.342)
Observations	101,071	133,562	113,290	91,611	109,014	67,110

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.10, ° p<0.15

Models (1a) and (1b) concern the effect of the distance from the closest rank 5 city for the resident population in urban settings of lower order. Their population is split between those individuals for whom the closest rank 5 city is located in the same country (model (1a)) and those for whom the nearest town of highest rank is situated in another country (model (1b)). The *ex-ante* expectation is

that what we defined as a proxy for cultural and institutional proximity should reinforce the impact of physical accessibility on wellbeing. Even if the estimated coefficient associated to the travel time distance in model (1b) has a broader confidence interval than the one in model (1a) the two do not significantly differ. The same holds for rank 4 cities, as it can be noted contrasting models (2a) and (2b). The finding for rank 3 areas, on the other hand, show that physical accessibility to the closest city is likely to generate a payoff in terms of life satisfaction only when it is associated to cultural proximity. This result reflects in part the decreasing return of the proximity to rank 3 cities pointed out in Table 4, since the average travel time in model (2b) is higher than in model (2a). However, it may also mirror the fact that the benefits associated to the access to amenities of higher order provided by rank 5 and rank 4 cities counterbalance the transaction costs related to the different cultural and institutional settings, while this is not true in the case of rank 3 regions.

6. Conclusions and further research

This paper is a first attempt to investigate the relationship between the physical proximity to high-rank cities on life satisfaction. The main finding shows that proximity, and therefore the accessibility to the goods and services supplied in large urban settlements, matter in the understanding of the wellbeing of residents in areas characterized by a lower degree of urbanization. This result is important because it recognizes that large cities are not just a source of dissatisfaction. Rather, they produce positive spillovers spreading outside their boundaries and reaching the population living within a broad range. This evidence holds to a different extent for cities at different levels of the urban hierarchy. For instance, the range of rank 3 cities is apparently shorter than the one of urban settlements of higher order.

Further research has to be focused on a more detailed analysis of this mechanisms and to a full understanding about the relationship between physical accessibility and proximity of other kinds, only briefly discussed in the present work.

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Appendix A.

Table A1 reports the result of a t-test comparing the estimated coefficients of the three models whose estimates are shown in Table 3. For none of them the result is statistically significant, implying that the association between the independent variables and life satisfaction is the same across the three sub-samples on which models were estimated. Figure A1 reports the plot of the coefficient for a visual comparison of our estimates.

Table A1. Comparisons between the coefficients estimated under different specifications of the model (reported in Table 2).

	Chi^2	P-value
Age	2.69	0.261
Age^2	2.91	0.233
Gender: female	0.74	0.690
Occ.: employed	0.160	0.922
Occ.: self employed	3.75	0.153
Occ.: student	3.60	0.165
Educ.: secondary education	3.22	0.199
Educ.: tertiary education	2.67	0.263
Mar. status: single	1.19	0.551
Mar. status: divorced	1.21	0.545
Mar. status: widower	1.05	0.593
Per capita GDP	0.95	0.623
Per capita GDP^2	0.36	0.835
Rank1	0.85	0.655
Rank2	0.47	0.792

Figure A1. Plot of the coefficients estimated under different specifications of the model (reported in Table 3).