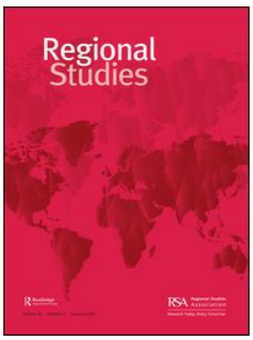

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Spatial structure and subjective well-being in North-West Europe

Marloes M. Hoogerbrugge[a], Martijn J. Burger[b] and Frank G. Van Oort[c]

ABSTRACT

This study examines the relationship between regions' spatial organization and subjective well-being in North-West Europe. Combining data on life satisfaction with data on the spatial structure of regions, we find that the degree of polycentricism is positively associated and dispersion is negatively associated with life satisfaction. At the same time, the results indicate that in more dispersed regions, people experience more positive effects of polycentric structures than in more centralized regions, while residents of more urbanized polycentric regions report lower levels of life satisfaction compared with residents of less urbanized polycentric regions. Likewise, the findings suggest that urban residents living in polycentric regions are less satisfied compared with their rural counterparts.

KEYWORDS

subjective well-being; life satisfaction; spatial structure; polycentricity; dispersion; North-West Europe

JEL I31, R10

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INTRODUCTION

Over the past decade, a burgeoning literature has examined how differences in spatial structure along monocentricity–polycentricity and centralization–dispersion dimensions drive differences in regional productivity. In this literature, it is often suggested that centralized regions with larger centres and a more balanced distribution among these centres are more productive (Meijers & Burger, 2010). Specifically, it is argued that compared with more monocentric regions, agglomeration diseconomies remain relatively limited in the more polycentric regions, whereas agglomeration externalities are to some extent shared among the cities in such an area. Empirical evidence is, however, mixed. Whereas several studies report positive effects of polycentricity on the economic performance of cities and regions (Brezzi & Veneri, 2015; Meijers & Burger, 2010; Veneri & Burgalassi, 2012; Zhang et al., 2017), others find no or negative effects (Lee & Gordon, 2007; Li & Liu, 2018).

Concurrently, the topic of regional spatial structure has also drawn considerable attention from policy-makers and planners, who differ in their visions of what a good regional structure constitutes. In the United States, the 'compact city' and 'suburbanization' movement have idealized more centralized and dispersed structures, respectively, as sprawl and compact development have both costs and benefits (Ewing & Hamidi, 2015). Compared with the United States, Europe's regional structure is more of a polycentric nature (Burger et al., 2014; Faludi, 2005), although their monocentric counterparts are sometimes seen as less wasteful or polluting (Brown et al., 2016; Mouratidis, 2018). Subsequently, compact cities policies are gaining momentum in European policies debates as more centralized cities are considered to obtain a broad range of environmental, economic and social benefits (Kahn, 2006; Organisation for Economic Co-operation and Development (OECD), 2012).

Despite the increasing interest in spatial structure, there is limited evidence how spatial structure affects broader welfare aspects. Although studies on regional spatial structure have addressed environmental sustainability (Burgalassi & Luzzati, 2015; Veneri & Burgalassi, 2012),

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income segregation (García-López & Moreno-Monroy, 2018), and amenities and metropolitan functions (Burger et al., 2014; Meijers, 2008; Meijers et al., 2016), research on how regional spatial structure affects people's experienced quality of life or subjective well-being (SWB) is absent. This lack of empirical evidence is, however, surprising given the growing literature and data availability on urban–rural differences, urbanization and SWB (e.g., Burger et al., 2020; Shucksmith et al., 2009). SWB has generally been defined as the degree to which an individual judges the overall quality of his/her own life-as-a-whole favorably (Diener et al., 1999; Veenhoven, 2000) and, hence, captures the experienced quality of life. Interest in SWB has increased in the last two decades, not only in the academic world and popular culture but also in public policy programmes (Frijters et al., 2020). The topic is gaining considerable attention in urban and regional policy (Ballas & Tranmer, 2012). Understanding how urban planning and regional spatial structure interact with inhabitants' SWB is therefore of pivotal importance, especially in the North-West European context where urban regions are generally characterized as more polycentric than elsewhere. Only a few studies have moved beyond urban–rural differences in terms of SWB. A study addressing spatial structure in this regard is the work by Lenzi and Perucca (2018, 2020) who examined the effect of urbanization on SWB within regional urban systems. They found that residents in rural communities in close proximity to urbanized regions are able to 'borrow' the positive effects of much larger localities, while being relatively insulated from their negative effects. At the same time, the greater the distance between places of different ranks, the lower the possibility to borrow size. This research builds on their findings by examining the role of spatial structure rather than regional urbanization levels.

Combining a newly assembled database combining SWB data from the European Social Survey (ESS) with data on regions' spatial organization in North-West Europe, the principal objective of this paper is to explore the experienced quality of life benefits of polycentricity. Our central question is whether polycentricity is important for the SWB of the population, and if a more polycentric spatial structure, compared with a more monocentric spatial structure, enhances SWB. We hypothesize a positive relationship between regional polycentricity and SWB because in polycentric regions urbanization diseconomies may remain relatively limited, whereas agglomeration benefits are to a large extent sharable among the localities in such an area. Additionally, this paper also includes other aspects of regional spatial structure such as population size and dispersion. Accordingly, the contribution of this paper to the existing literature is twofold. First, it adds to the literature on the consequences of regions' spatial structure by focusing on how polycentricity (next to population density and dispersion) is associated with the SWB of the population. Second, it adds to the existing literature on the geography of SWB by addressing the relationship between the spatial organization of regions and SWB.

The remainder of this paper is organized as follows. The next section presents a focused literature review on SWB, regional spatial structure and their interaction. The third section provides more background on the data and methodology. The fourth section presents the empirical findings. The paper concludes with a discussion of the findings in the fifth section.

LITERATURE

Defining subjective well-being

In the social sciences, SWB is often regarded as 'that what makes the good life' (Kahneman et al., 1999) or 'the experienced quality of life' (Veenhoven, 2000). The concept of SWB concerns the appreciation of one's personal condition and comprises affective experiences (i.e., moods, emotions, affectivity) and cognitive comparisons (Diener et al., 1999; Veenhoven, 2000). Hence, people's overall SWB is composed of 'how one feels most of the time' and 'how one's current life compares to the ideal life one has in mind'. As indicated by Veenhoven (2000), SWB encompasses both enduring context-free states (e.g., life satisfaction and positive affect) and enduring context-specific states (e.g., health, family, work and financial satisfaction). Although SWB constructs generally show significant intercorrelations (Krueger & Schkade, 2008), the correlations between affective SWB and cognitive SWB, and between context-free and context-specific states are only modest. In this research, we focus on the context-free and cognitive SWB, using life satisfaction as main indicator of interest.

Subjective well-being, city life and urban size

Studies on the subnational variations in SWB have particularly focused on urban–rural differences in SWB as well as the relationship between urbanization and SWB. A recent worldwide study by Burger et al. (2020) indicates that, on average, urban residents report higher levels of SWB compared with rural residents, which can be explained by 'higher living standards and better economic prospects in cities, especially for those with tertiary education' (p. 86). Despite the increasing popularity of cities as places to live, city life is generally associated with lower levels of SWB in the Western world (Burger et al., 2020; Easterlin et al., 2011) and several scholars have found a negative relationship between average SWB and urbanization in this part of the world (e.g., Berry & Okulicz-Kozaryn, 2011; Winters & Li, 2017). Urban–rural differences in SWB appear to be strongly dependent on development level since in many countries in Northern and Western Europe, Northern America, and Australia–New Zeeland, the relatively much smaller rural populations have higher average levels of SWB than urban populations. This difference can be explained by a complex interplay of people-based factors (e.g., composition of the population) and place-based factors (e.g., quality of the living environment) (Burger et al., 2020).

Indeed, the availability and variety of jobs and education in large cities or urban areas can provide well-

being advantages or benefits. All over the world, people are moving towards cities since they offer them better employment opportunities as cities are often seen as the motors of today's knowledge-economy (Storper & Scott, 2009). Cities can also offer a higher quality of life in terms of access to amenities, facilities and public services (Glaeser et al., 2001), which have been found to be positively associated with SWB in cities (Leyden et al., 2011). Hence, cities may be better (and happier) places for younger generations (Morrison & Weckroth, 2018; Okulicz-Kozaryn & Valente, 2019).

Besides the beforehand mentioned positive urbanization or agglomeration effects, large cities and urban areas can also provide negative effects or externalities. Already in 1974, Tolley examined the effect of externalities on money wages, city size and welfare economy. He highlighted that pollution and congestion lead to increasing negative externalities which tend to vary with city size. 'The presence of increasing negative externalities will make externalities greater in larger cities, giving a further reason for higher money wages there' (Tolley, 1974, p. 344). He suggested that (public) policies can internalize these externalities, for example, by tax policies or spatial reallocation. Tolley was one of the first scholars to address the question of optimal city size for a welfare economy. Several scholars acknowledge the tension between agglomerative and dispersive forces determining how cities and city-regions are formed. According to Anas et al. (1998, p. 1455), 'Both sets of forces entail strong externalities – external economies producing the agglomerative tendencies, and congestion and nuisance externalities limiting the size and density of the agglomeration that is achieved.' Where congestion and pollution are often mentioned as negative externalities of urbanization, other (big) city characteristics generally negatively affect people's SWB (amongst others, a lack of green space, high crime rates, inequality, segregation, high costs of living, lower levels of social capital, and more chance of social isolation and loneliness).[1]

The spatial extent of urbanization and subjective well-being

Despite the increasing attention for explaining spatial variations in SWB, empirical research on the geography of SWB neglects the spatial structure of regions. The regional spatial structure can be captured by the distribution of the population within a region, where common indicators such as urban size, density and self-report cityness of place of residence do not reveal much about how a region is organized. As mentioned above, rural residents in Northern and Western European countries report higher levels of SWB than their urban counterparts. This can be driven by the spatial expansion of urban areas which resulted in more and more rural residents finding themselves living and working near metropolitan centres. As suggested by Lenzi and Perucca (2018, 2020), well-being advantages and disadvantages of cities are not bounded within a city's administrative or functional borders but can spread across the regional urban system and filter down the urban hierarchy. 'In fact, residents in rural communities located in urbanized regions can benefit from the positive externalities generated by larger cities in the region, and enjoy their advantages without suffering from their greater costs' (Lenzi & Perucca, 2018, p. S118).

These findings can be linked to the concept of borrowed size as introduced by Alonso (1973), suggesting that smaller places can borrow some of the urbanization advantages of the neighbouring major cities without incurring in the related disadvantages (Burger et al., 2015; Camagni et al., 2016; Meijers & Burger, 2017; Meijers et al., 2016). According to Camagni et al. (2016), small cities, which are generally less endowed with high-rank functions, can borrow these functions through the easy accessibility of stronger cities in the same regional context. In their turn, larger cities can benefit from advantages deriving from agglomeration economies which they 'borrow' from the entire urban system (critical mass effects). Meijers et al. (2016) found that particularly small cities gain by increasing size suggesting that economies of scale might be positive to a certain level of urbanization and can become negative after reaching this level. Arguably, places affect not only the SWB of residents within their administrative borders, but also the SWB of inhabitants in surrounding places, and accordingly, the spatial structure of regions is important for a more accurate understanding of spatial interdependencies and spillovers in the geography of SWB. In a recent study, Lenzi and Perucca (2020) examined how the proximity to large cities, and therefore the accessibility to their agglomeration advantages, is associated with the life satisfaction of residents of smaller places. They found that residents of smaller places that are located in close proximity of a larger city have a higher probability to be satisfied with life.

Spatial structure: degree of polycentricity and dispersion

Following Meijers and Burger (2010) two dimensions of spatial structure can be defined: the polycentricity–monocentricity and the centralization–dispersion dimension. The polycentricity–monocentricity dimension provides information on the hierarchy between multiple cities in a region (Meijers, 2005; Parr, 2004) and examines how the regional population is spread over different urban centres. The more balanced is the size distribution of cities, the more polycentric is the regional urban system (Burger & Meijers, 2012). Polycentric urban regions can be defined as collections of historically distinct and both administratively and politically independent cities located in close proximity to each other and well connected through infrastructure (Meijers, 2005). Whereas the monocentric–polycentric dimension focuses on the question how the urban population is spread over urban centres, the centralization–dispersion dimension addresses the extent to which the regional population is located in urban centres vis-à-vis rural areas (Anas et al., 1998). A dispersed spatial structure refers to the situation in which a large part of the population is not living in city

centres, but is spread out across the region in a non-concentrated pattern. As Meijers and Burger (2010) argued, dispersion is not necessarily similar to urban sprawl, as this is often equated with low-density residential development, whereas dispersion concerns the issue of whether or not the development is taking place in centres, leaving aside the question of density. The distinction between the two dimensions of regional spatial structure is shown in Figure 1.

Polycentricity and subjective well-being

An important question is whether polycentric metropolitan areas perform better from a socio-economic point of view than their monocentric counterparts. One of the possible advantages of a polycentric structure is that it comes with a lack of agglomeration disadvantages or diseconomies (Goffette-Nagot & Schmitt, 1999; Parr, 2002) such as crime, high housing prices, traffic congestion and pollution. These agglomeration disadvantages are believed to remain confined to individual cities and are less likely to spill over to the wider region. Concurrently, it is argued that within polycentric regions agglomeration advantages are shared within a regionalized spatial organization (Parr, 2002) since urban networks may substitute for agglomeration (Johansson & Quigley, 2004) as agglomeration benefits extend beyond administrative borders. Building on the idea that agglomeration advantages have regionalized, while agglomeration disadvantages remain more local, we hypothesize here that there is a positive association between polycentricity and metropolitan performance. A polycentric spatial structure may provide a better balance between agglomeration benefits and costs. As suggested by Capello and Camagni (2000), smaller cities may be better able to keep the socio-economic and environmental costs under control which is in favour of polycentric urban regions consisting of a network of multiple small and medium-sized cities (rather than one monocentric large city). On the other hand, polycentric regions lack the 'critical mass of large cities with agglomeration economies' (Lambooy, 1998, p. 459), which is a unique selling point of monocentric regions. In other words, polycentric structures diminish some agglomeration benefits which is, for example, indicated by studies on polycentricity and urban functions. Polycentric regions do not host more cultural, leisure and sports amenities (Meijers, 2008), and the more specialized retail functions that require a large urban support base are less found in more polycentric regions (Burger et al., 2014). As discussed by Lenzi and Perucca (2020), agglomeration shadow effects (such as duplication of lower rank functions, missed agglomeration benefits or competition effects) can prevail over borrowed size effects depending on the spatial hierarchical ordering of cities.

Empirical research on the direct link between polycentricity and SWB is scarce, but there seem to be some silver linings of living in polycentric regions as this has been associated with lower pollution levels in Italy (Veneri & Burgalassi, 2012), lower poverty rates in the United States (Arribas-Bel & Sanz-Gracia, 2014) and lower income segregation in Brazil (García-López & Moreno-Monroy, 2018), which on their turn are positively associated with SWB. Results on polycentricity and commuting are not conclusive as the existence of subcentres in a polycentric region can increase the probability of finding a job close to one's home, affecting in turn decreasing commuting distance and travel time. On the other hand, inhabitants of polycentric regions are more likely to have longer commutes as functions are spread across different cities in the region, which in turn would negatively affect SWB as commuting can negatively affect SWB (Lancée et al., 2017; Stutzer & Frey, 2008).

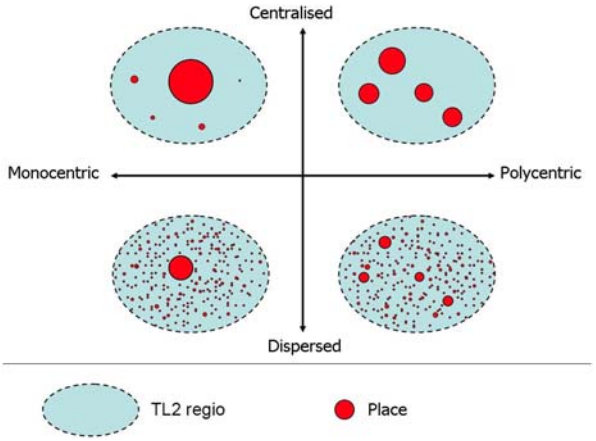

Figure 1. Dimensions of regional spatial structure.
Sources: Ouwehand et al. (2020) (adapted from Meijers & Burger, 2010).

Dispersion and subjective well-being

Several studies have discussed the relation between the centralization–dispersion dimension and SWB, although they primarily focus on urban structure rather than regional spatial structure. Brown et al. (2016) studied the relationship between aspects of urban structure, namely land-use fragmentation, population density and centralization, and life satisfaction in 33 cities distributed across five OECD countries. Their study suggests that city centralization decreases life satisfaction on average for individuals residing both within *and* outside the core and that local land-use fragmentation is associated strongly and negatively with life satisfaction. Mouratidis (2018) found a significant positive association of compact versus sprawled morphological structures of neighbourhoods on life satisfaction and consequently argued that compact cities have the potential to promote SWB (when common urban problems are addressed). Due to demographic and lifestyle changes, Ewing and Hamidi (2015) also expect a higher demand for compact and centralized cities as there is a growing preference for compact walkable cities (e.g., streets that accommodate pedestrians and cyclists) and proximity to shopping and facilities. Also, the OECD (2012) study on compact cities argues that local services and jobs nearby contribute to a better quality of life.

Highly dispersed regions may lack 'economies of scale' (Burger et al., 2014; Hall, 2009), resulting in lower availability of public services (e.g., nearby schools, community care centres, public transport) and amenities (e.g., entertainment, stores), herewith also increasing transport costs, especially when the city is far away. This is likely to be negatively associated with SWB. Other studies argue that land-use fragmentation decreases the potential for social interactions, providing a plausible route for negative effects on SWB. Farber and Li (2013) investigated the impact of spatial structure on the opportunities for people to participate in face-to-face activities and indicated that social interaction potential is hampered by decentralization, fragmentation and longer commutes in the largest metropolitan regions in the United States. Long commutes negatively affect informal social interaction, and even depress the civic involvement of non-commuters who live in areas where commuting levels are higher (Putnam, 2000). However, other scholars found that people living in sprawled cities often have longer commutes in terms of distance, but they are commuting at higher speeds so their commutes do not necessary take longer in terms of time (Ewing et al., 2003).

All in all, the overall balance of well-being advantages and disadvantages of polycentricity and dispersion is yet unclear. Polycentric urban regions might be beneficial for individual SWB as they contain a more balanced spatial structure whereby people can profit from the regionalized agglomeration benefits while they encounter the local agglomeration diseconomies less. There are various channels (e.g., commuting, social cohesion, access to services and jobs) that may have a positive and negative influence on individual SWB. In this paper we do not examine these various channels but focus on the overall effect of a region's spatial structure on individual SWB.

DATA AND METHODOLOGY

Data

This paper uses a database combining SWB data of the European Social Survey (ESS) with data on the spatial organization of regions based on subnational data from Eurostat. Regions are defined at the OECD territorial levels 2 (TL2), which corresponds to the territorial level immediately below the central level. We focused specifically on North-West Europe, since the relationship between location and SWB is thought to be different in Southern and Eastern Europe as urban residents in Northern and Western European countries report on average lower levels of life satisfaction compared with their rural counterparts (Burger et al., 2020). Despite recent research on this topic, there is still a lot unknown on how (and why) the urban–rural SWB differential varies among countries. Hence, to facilitate interpretation of our results, we decided to focus our research on one specific part of Europe that has been extensively examined in the study of spatial structure. Our database consists of 68 regions in eight North-West European countries: Austria, Belgium, Denmark, Finland, France, Germany, the Netherlands and Sweden. Subsequently, we grouped the individual countries in four groups: (1) Scandinavian (Denmark, Sweden and Finland), (2) France, (3) Germany and Austria, and (4) Belgium and the Netherlands.[2]

In order to construct the spatial structure variables, we collected population data (average of 2010–12) from Eurostat's local administrative units (LAU), which comprise all the municipalities and communes of the European Union.[3] All cities with a minimum threshold of 50,000 inhabitants were selected. This is the lowest territorial level for which SWB data are available for multiple European countries.

We merged this database on the spatial organization of regions with SWB data of the ESS, which is a cross-national survey that has been conducted across Europe. Every two years, face-to-face interviews are conducted with cross-sectional samples. The ESS database consists of cumulative data on SWB and socio-demographic variables for the first eight rounds of the ESS from 2002 to 2016. The data are available at the NUTS-2 level, which we manually aggregated it to the TL2 level by using the territorial grids of OECD member countries (OECD, 2016).

Variables

Dependent variable: life satisfaction

SWB is often measured by asking people to judge the overall quality of his/her own life as a whole (Veenhoven, 2000). After all, individuals are in the best position to gauge their own life, and therefore survey data about life satisfaction are generally regarded as valid and reliable (Blanchflower & Oswald, 2004; Kahneman & Krueger, 2006), even when only a single question is asked to determine how happy a person is (Cheung & Lucas, 2014). In this study, we measure SWB using a life evaluation question, which has been very common in the happiness economics literature. The life satisfaction variable is based on the ESS survey question: How satisfied are you with life as a whole? This question is answered on a scale of 0–10, where 0 means extremely dissatisfied and 10 means extremely satisfied.

Independent variables: polycentricity and dispersion

This study focuses on two characteristics of regions' spatial organization: the degree of polycentricity and the degree of dispersion. The polycentricity–monocentricity dimension captures the hierarchical distribution of the urban population across a region's city cores. The degree of morphological polycentricity is calculated using the Herfindahl–Hirschman index (HHI). Earlier studies on polycentricity have used this index, which turns out to be an appropriate measure to calculate polycentricity (Meijers et al., 2018; Sun et al., 2019). This index measures the population share of a city in the total population of all cities in the region. The sum of the squared shares of the cities is inversed, where a larger positive value represents a higher

degree of polycentricity and a smaller value a higher degree of monocentricity.

The dispersion–centralization dimension measures the share of the population not located within the city cores of a region. Previous studies on centralization or compactness also considered the relative proportion of the population living in the core (Brown et al., 2016). If a large part of the population resides within cities, this region can be considered as centralized. The dispersion–centralization dimension is calculated by dividing the total number of people not living in a city by the total regional population, and is subsequently log transformed. A larger negative value represents a more centralized region, whereas a smaller negative coefficient represents a more dispersed region.

In addition, we take in two other variables related to location: urban residence and urban size. Urban residence is measured as the self-reported location of individuals, where respondents had to indicate whether they live in a big city, suburb or outskirts of a big city, small city or town, country village or farm or home in countryside. The binary variable urban residence equals 1 if the respondents indicated to live in a big city, suburbs or outskirts of a big city and small city or town. Hence, this variable is based on people's personal judgment about their place of residence rather than official classifications of their actual location. The urban size variable is measured at the regional level as the log of the urban population of the TL2 regions. As Lenzi and Perucca (2018) indicated in their study on European regions characterized by different urbanization levels, life satisfaction is lower in more urbanized (i.e., first-rank) regions and higher in mid-urbanized (i.e., second-rank) regions. Taking these findings one step further, we investigate how the independent regional spatial structure variables interact with the level of urbanization.

Control variables

We control for several variables that may confound the relationship between spatial structure and individual SWB. We include the individual demographic and socio-economic control variables that are commonly used in SWB research (e.g., Diener, 2000), namely gender, age, age squared, having a partner, having children, employment, percentage higher educated, perceived household income,[4] health problems and social contacts.[5] Note that some of the individual level variables are endogenous, in that they also explain the relationship between spatial structure and SWB. Hence, estimations including these economic controls should be perceived as more conservative estimates. Table 1 shows the descriptive statistics of the variables included in our study.

Estimation strategy

To understand the relationship between a regions' spatial structure and the SWB of individuals in a region, we estimate the following model:

$$\mathrm{SWB}_{ir} = S_r + \text{ß}\mathrm{IND}_{ir} + \mathrm{YEAR}_t + \mathrm{COUNTRY}_r + \varepsilon_{it}$$

Table 1. Descriptive statistics of main variables included in the study.

	Mean	SD	Minimum	Maximum
Life satisfaction	7.50	1.96	0	10
Polycentricity (HHI)	0.78	0.20	0	0.99
Dispersion (ln)	−0.65	0.40	−1.52	−0.03
Urban population (ln)	13.91	1.04	10.86	16.24
Individual control variables				
Urban residence	0.63	0.48	0	1
Age	48.40	18.24	14	105
Male	0.48	0.50	0	1
Having a partner	0.61	0.49	0	1
Having children	0.33	0.47	0	1
Percentage higher educated	0.29	0.45	0	1
Employment				
Employed	0.52	0.50	0	1
Not in labour force	0.43	0.50	0	1
Unemployed	0.05	0.21	0	1
Household income feeling				
Very difficult on present income	0.03	0.17	0	1
Difficult on present income	0.10	0.31	0	1
Coping on present income	0.46	0.50	0	1
Living comfortably on present income	0.41	0.49	0	1
Hampered by health problems?				
Yes a lot	0.06	0.24	0	1
Yes to some extent	0.21	0.41	0	1
No	0.73	0.44	0	1
Social meetings				
Once a month or less	0.14	0.34	0	1
Several times a month	0.20	0.40	0	1
Once a week	0.18	0.38	0	1
Several times a week	0.33	0.47	0	1
Every day	0.15	0.36	0	1

Note: Observations = 107,815; regions = 68.

where SWB_{ir} denotes the life satisfaction of individual i in region r; S_r denotes a vector of spatial structure variables characterizing region r (polycentricity and dispersion); IND_{ir} is a vector of the control variables that relate to the individual demographic and socio-economic characteristics of individual i in region r; $COUNTRY_r$ is a vector of country groups; and $YEAR_t$ are the year dummies. A set of year dummies controls for changes over time which can be of importance as the economic crisis of 2008 falls within the survey period.

In line with previous studies (Neira et al., 2018; Pittau et al., 2010), we use multilevel modelling to account for the hierarchical nature of the data, respondents within regions and countries, and to account for contextual characteristics of TL2 regions. The standard model assumes that the individual-level predictor variables are uncorrelated with the regional-level error terms. However, both theoretically and empirically, such an assumption is difficult to meet. Not correcting for this would lead to inconsistent parameter estimates. As shown by Snijders and Berkhof (2007), the correlation between the lower level predictor variables and higher level error terms can be easily removed by including region-level means of the lower level predictor variables in the regression model, a procedure known as the Mundlak (1978) correction. Hence, our multilevel estimations are augmented with this correction. All models are estimated using the xthybrid package in Stata (Schunck & Perales, 2017) and using cluster-robust standard errors (clustered at the TL2 level).

EMPIRICAL RESULTS

Baseline estimates

Table 2 reports the results of the multilevel estimations of regional spatial structure on SWB. In line with earlier work in the SWB literature (e.g., Diener, 2000), we find that intimate relationships, social capital, income and work are important for life satisfaction. In Model 2 we added urban residence as separate individual level variable and we find a negative association between self-reported urban residence and life satisfaction. On average, urban residents report a lower overall life satisfaction of 0.11 points (on a scale from 0 to 10). This is in line with previous studies on urban–rural differences and SWB in the Western world (Burger et al., 2020; Easterlin et al., 2011). When we add the regional spatial structure variables to our estimations (Models III), we observe a positive and weakly significant association between polycentricity and life satisfaction and a negative and weakly significant association between dispersion and life satisfaction. This signifies that – on average – it seems to matter for individual life satisfaction whether one lives in a polycentric or monocentric region or in a more centralized or dispersed region. The SWB difference between the most and least dispersed regions in North-West Europe is about 0.12 points, holding everything else constant, which is limited compared with more important individual level factors.

Table 2. Multilevel analysis results for the effect of regions' spatial structure on life satisfaction.

	Model I	Model II	Model III
Regional level			
Polycentricity (HH)			0.13*
			(0.07)
Dispersion (ln)			−0.12*
			(0.07)
Urban population (ln)			−0.02
			(0.02)
Individual level			
Urban residence		−0.11***	−0.11***
		(0.03)	(0.03)
Male	−0.09***	−0.09***	−0.09***
	(0.03)	(0.03)	(0.03)
Age	−0.05***	−0.05***	−0.05***
	(0.00)	(0.00)	(0.00)
Age^2	0.00***	0.00***	0.00***
	(0.00)	(0.00)	(0.00)
Having a partner	0.51***	0.51***	0.51***
	(0.05)	(0.05)	(0.05)
Having children	0.09***	0.09***	0.09***
	(0.03)	(0.03)	(0.03)
% Higher educated	0.06**	0.07***	0.07***
	(0.03)	(0.03)	(0.03)
Employment (reference: Employed)			
Unemployed	−0.61***	−0.61***	−0.61***
	(0.07)	(0.07)	(0.07)
Not in labour force	0.10***	0.11***	0.10***
	(0.04)	(0.04)	(0.04)
Household income (reference: Very difficult on present income)			
Difficult on present income	0.88***	0.88***	0.88***
	(0.07)	(0.07)	(0.07)
Coping on present income	1.78***	1.78***	1.78***
	(0.09)	(0.09)	(0.09)
Living comfortably on present income	2.33***	2.34***	2.34***
	(0.10)	(0.10)	(0.10)
Hampered by health problems (reference: Yes a lot)			
Yes, to some extent	0.70***	0.71***	0.71***
	(0.03)	(0.03)	(0.03)
No	1.13***	1.13***	1.13***
	(0.04)	(0.04)	(0.04)
Social meetings (Reference: Once a month or less)			
Several times a month	0.46***	0.45***	0.45***
	(0.09)	(0.09)	(0.09)

(*Continued*)

Table 2. Continued.

	Model I	Model II	Model III
Once a week	0.50***	0.50***	0.50***
	(0.09)	(0.09)	(0.09)
Several times a week	0.68***	0.68***	0.68***
	(0.09)	(0.09)	(0.09)
Every day	0.82***	0.82***	0.82***
	(0.09)	(0.09)	(0.09)
Year and country group dummies	Yes	Yes	Yes
Mundlak correction	Yes	Yes	Yes
Observations	107,815	107,815	107,815
Regions	68	68	68

Note: Cluster-robust standard errors are shown in parentheses; ***$p < 0.01$; **$p < 0.05$; and *$p < 0.1$.

Interaction with urban size and urban residence

The next step in analysing the impact of the degree of dispersion and polycentricity on SWB is to see how these dimensions interact and how they are contingent on the size of the region. Table 3 reports the interaction terms between different dimensions of spatial structure and life satisfaction. For the interaction between polycentricity and dispersion (Model I), we find a positive and significant association with life satisfaction. This coefficient indicates that in a more dispersed region one experiences more positive effects of polycentric structures than in a more centralized region. A possible explanation might be the proximity of city centres; even when many people live dispersed in the region, they still can profit of the agglomeration advantages provided by the multiple cities of a polycentric region. As pointed out by Leyden et al. (2011), access to amenities, facilities and public services are positively associated with SWB.

For the interaction between polycentricity and urban size (Table 3, Model II), we find a weakly significant negative effect. This suggests that the residents of polycentric regions that are more urbanized report lower levels of life satisfaction compared with the residents of polycentric regions that are less urbanized. This is consistent with the research of Lenzi and Perucca (2018) who found that life satisfaction is lower in more urbanized regions and higher in mid-urbanized regions. A possible explanation might be that the inhabitants of highly urbanized polycentric regions encounter more SWB disadvantages of urbanization compared with inhabitants of less urbanized polycentric regions. The interaction term between dispersion and urban size on life satisfaction is insignificant (Table 3, Model III).

Subsequently, we examined the interaction effects with the self-considered place of residence as reported by the respondents of the ESS. The interaction between polycentricity and urban residence is negative and significant (Table 3, Model IV), suggesting that urban residents living in a more polycentric region are less satisfied than the rural residents living in a more polycentric region. These urban residents might encounter more urbanization disadvantages due to the polycentric structure of the region, while at the same time the rural residents might profit more from the polycentric structure with multiple cities. Similarly, the negative and significant interaction term can also be interpreted as agglomeration benefits being larger in more monocentric regions (see also Meijers & Burger, 2010), confirming the theoretical assumption that polycentricity diminishes some agglomeration benefits. At the same time, this would mean that polycentricity does not seem to diminish some of the agglomeration diseconomies associated with city life and decrease SWB. A further examination of this claim is, however, beyond the scope of this research and needs to be addressed in future research. The interaction terms between dispersion and urban residence (Table 3, Model V) and urban size and urban residence (Table 3, Model VI) are insignificant.

DISCUSSION AND CONCLUSIONS

In this study, we examined the association between spatial structure of North-West European regions and the SWB of their inhabitants using life satisfaction as a proxy. Within the regions' spatial structure, we make a distinction between the degree of polycentricity and the degree of dispersion. A polycentric region consists of multiple cities with a rather balanced population distribution and in a dispersed region the population is spread across the region in a non-concentrated pattern. For this study, we combined SWB data from the ESS with Eurostat population data, which we used to construct the spatial structure variables. By using multilevel analysis, we found that polycentricity is positively associated with life satisfaction while dispersion is negatively associated with life satisfaction. These results suggest that that Europe's focus on polycentrism is likely to enhance SWB, but more research is needed to verify this claim.

Subsequently, we found three significant interaction terms when examining the main variables of interest of this study. First, for the interaction between polycentricity and dispersion we found a positive and significant association with life satisfaction. This finding indicates that in a more dispersed region one experiences more positive effects of polycentric structures than in a more centralized region. Second, the interaction between polycentricity and urban size turned out to be negatively associated with SWB, suggesting that residents of polycentric regions which are more urbanized report lower levels of life satisfaction compared with the residents of polycentric regions which are less urbanized. Finally, for the interaction between polycentricity and urban residence we found a significant negative association, suggesting that urban residents living in a polycentric region are less satisfied than their rural counterparts. This finding suggests that a polycentric regional structure enables rural residents to borrow size and access the agglomeration advantages that are not

Table 3. Interaction effects between different dimensions of spatial structure and life satisfaction – multilevel analysis.

	Interaction polycentricity and dispersion Model I	Interaction polycentricity and urban population Model II	Interaction dispersion and urban population Model III	Interaction polycentricity and urban residence Model IV	Interaction dispersion and urban residence Model V	Interaction urban population and urban residence Model VI
Polycentricity (HHI) ×	0.23**					
Dispersion	(0.10)					
Polycentricity (HHI) ×		−0.08*				
Urban population (ln)		(0.05)				
Dispersion (ln) × Urban			0.04			
population (ln)			(0.04)			
Polycentricity (HHI) ×				−0.30**		
Urban residence				(0.13)		
Dispersion (ln) × Urban					−0.10	
residence					(0.08)	
Urban population (ln) ×						0.03
Urban residence						(0.02)
Polycentricity (HHI)	0.29***	1.16*	0.12*	0.34***	0.14*	0.13*
	(0.09)	(0.60)	(0.07)	(0.11)	(0.07)	(0.07)
Dispersion (ln)	−0.27***	−0.11*	−0.76	−0.11	−0.05	−0.12*
	(0.09)	(0.07)	(0.56)	(0.07)	(0.08)	(0.07)
Urban population (ln)	−0.02	0.05	0.00	−0.02	−0.02	−0.03
	(0.02)	(0.04)	(0.03)	(0.02)	(0.02)	(0.03)
Urban residence	−0.11***	−0.11***	−0.11***	0.13	−0.17**	−0.46*
	(0.03)	(0.03)	(0.03)	(0.09)	(0.08)	(0.24)
Individual controls	Yes	Yes	Yes	Yes	Yes	Yes
Year and country group dummies	Yes	Yes	Yes	Yes	Yes	Yes
Mundlak correction	Yes	Yes	Yes	Yes	Yes	Yes
Observations	107,815	107,815	107,815	107,815	107,815	107,815
Regions	68	68	68	68	68	68

Note: Cluster-robust standard errors are shown in parentheses; ***$p < 0.01$; **$p < 0.05$; and *$p < 0.1$.

available in their place of residence but matters for their life satisfaction. However, this is rather speculative and future research on polycentricity and SWB is needed to verify this claim.

The effects we found are relatively small and sometimes weak in terms of statistical significance. Nevertheless, this paper provides some preliminary insights in the relationship of region's spatial structure and individual SWB, which are worthwhile to verify in future studies. This study focused only on North-West European regions, which limits the generalizability of the results. The polycentric structure of this specific part of Europe differs from the rest of Europe and regions in other parts of the world. For future research, it would be interesting to broaden the scope and perform a worldwide study by using multiple datasets on spatial structure and SWB. Finally, there is a need to gain more insights which underlying mechanisms influence people's SWB and how these indicators might outperform each other. As this paper is explorative in character, further examination of such underlying mechanisms needs to be addressed in future research.

One of the limitations of this research is that we did not control for reverse causality as it might be possible that SWB affects regions' spatial structures. It can be argued that lower levels of SWB, driven by urbanization disadvantages, may disperse people out of the main cities into the region. In this case it is not spatial structure that directs SWB, but SWB that directs spatial structure. For future research it would be valuable to take causalities into account by using panel data analysis or by conducting natural experiments. Moreover, it would be interesting to look at Functional Urban Areas (as defined by ESPON), rather than the territorial and administrative units of formal regional institutions we used in this study. Using SWB data from the ESS prevents us to take the exact geographical scale into account that matters more for people's life; the scale individuals live, work, access amenities and develop social relations. It would be interesting to gain more insights in people's activity patterns, for example by using time use surveys providing insights how people actually make use of the region and how they derive well-being from it (Morris, 2019).

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

NOTES

1. For a comprehensive discussion of well-being (dis)advantages of both urban and rural areas, see Hoogerbrugge and Burger (2020).
2. The main reason for using country groups rather than individual country dummies is the low number of regions in some smaller countries. By defining county groups based on a geographical logic and even distribution among the groups, we try to overcome this problem.
3. For Germany and France, we use the LAU-1 level (if available); for the other countries, the LAU-2 level is used in order to gain units of more or less comparable size.
4. Based on the ESS survey question: How do you feel about household's income nowadays?
5. Based on the ESS survey question: How often do you socially meet with friends, relatives or colleagues?

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