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What makes people stay in or leave shrinking cities? An empirical study from Portugal

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Abstract

The relative attractiveness of cities as places to live determines population movements in or out of them. Understanding the appealing features of a city is fundamental to local governments, particularly for cities facing population decline. Pull and push attributes of cities can include economic aspects, the availability of amenities and psychological constructs, initiating a discussion around which factors are more relevant in explaining migration. However, a pull–push approach has been underexplored in studies of shrinking cities. In the present study, we contribute to the discussion by identifying pull and push factors in Portuguese shrinking cities. Data were collected using a face-to-face questionnaire survey of 701 residents in four shrinking cities: Oporto, Barreiro, Peso da Régua and Moura. Factor analysis and automatic linear modelling were used to analyse the data. Our results support previous findings that the economic activity of a city is the most relevant feature for retaining residents. However, other characteristics specific to each city, especially those related to heritage and natural beauty, are also shown to influence a city's attractiveness as a place to live. The cause of population shrinkage is also found to influence residents' assessments of the pull and push attributes of each city. Furthermore, the results show the relevance of social ties and of place attachment to inhabitants' intention to continue living in their city of residence.

1. Introduction

The increasing degree of globalization has led to greater competition between urban areas and has intensified the less appealing characteristics of some cities compared with others (Martinez-Fernandez *et al.*, 2012). This observation has led researchers and managers to analyse the phenomenon of urban shrinkage (Hospers, 2014; Pallagst *et al*., 2009). Furthermore, the reduction in the fertility rate and the increase in the number of cities facing population decline has contributed to the rising interest in urban shrinkage (OECD, 2003; Oswalt & Rieniets, 2006). Despite the described trend, most of the research on urban shrinkage has focused on typifying the causes of and consequences emerging from shrinkage (e.g. Hospers, 2013; Martinez-Fernandez *et al.*, 2012), as well as defining policies to deal with the concomitant social problems (e.g. Cortese *et al.*, 2014; Hospers, 2013). As such, there are few studies that have specifically addressed the factors that influence whether individuals remain in or leave a shrinking city. One of the few exceptions is the investigation of Reckien & Martinez-Fernandez (2011), but that study focused solely on movements from cities to the suburbs.

The competition between nearby cities justifies the importance of understanding the pull and push factors of each urban area (Cheshire & Magrini, 2006; Royuela *et al.*, 2010). Nevertheless, the majority of studies assessing pull and push factors have been conceived in the contexts of deprived areas or urban sprawl. Both contexts are fundamentally distinct from urban shrinkage, because deprived areas are associated with a low quality of life and urban sprawl can also occur in growing cities (Pallagst *et al.*, 2009), whereas urban shrinkage can be associated with improvements in the lifestyles of those who stay (Hollander, 2011).

There is an ongoing discussion about the drivers that make individuals choose to stay in or to move out of a certain place. The discussion includes economically driven perspectives (Andersen &

van Kempen, 2003; Hoekveld, 2012) and the availability or lack of amenities (Brunner *et al.*, 2012; Royuela *et al.*, 2010). Beyond these tangible drivers, some authors have described psychological factors such as place attachment or social networks as reasons that deter inhabitants from moving out (Brown *et al.*, 2003; Coulton *et al.*, 2012).

In this study, we aim to contribute to the discussion outlined above by presenting an empirical study of pull and push factors in four shrinking cities in Portugal. On this basis, we identify and discuss the main drivers influencing whether residents stay in or leave cities within the specific context of urban shrinkage.

2. Literature review

Urban shrinkage has become a reality for a growing number of countries, regions, municipalities, and cities (Oswalt & Rieniets, 2006; Turok & Mykhnenko, 2007). In Europe, the reasons for population decline are diverse, but the most common are related to the processes of suburbanisation and deindustrialisation, to which the political transformations occurring in Eastern European countries can be added (Haase *et al.*, 2013). These processes have been aggravated by the decrease in the fertility rate, which has accentuated the ageing of the population (Hospers, 2013; Wiechmann & Pallagst, 2012). Despite the similarities in shrinkage experienced by various countries and regions, the phenomenon of shrinkage is sensitive to local contexts and to the spatial scale considered (Hoekveld, 2014).

The identification of the pull and push attributes of cities is central to gauging their attractiveness (Cheshire & Magrini, 2006; Royuela *et al.*, 2010). Within the context of shrinking cities, the only previous work on pull and push factors appears to be the study of Reckien & Martinez-Fernandez (2011), which focused on residents' movements from cities to the suburbs. The majority of studies assessing pull and push factors have been conceived for the contexts of deprived areas (Andersen, 2002; Blasius & Friedrichs, 2007) or urban sprawl (Couch & Karecha, 2006). Regardless of the context, however, the migration patterns studied tend to be related to economic aspects, and in particular to employment as an attracting factor (IOM, 2011) or to unemployment as a factor that exacerbates population decline (Andersen & van Kempen, 2003). Cities that are more economically active generate more job opportunities and are more appealing to the young adult population (Arnott & Chaves, 2012; Lutz, 2001). Such a conclusion is particularly relevant in shrinkage environments, because if the younger generations tend to leave cities sooner compared with older inhabitants (Zimmermann, 2005), then this implies a perpetuation of the cycle of decline (Hoekveld, 2012).

Despite these features of shrinkage environments, cities that are losing inhabitants may retain some appeal, as they offer an opportunity for better lifestyles (Pallagst *et al.*, 2009). This idea is supported by the reported happiness and satisfaction of those who live in shrinking cities (Delken, 2008; Hollander, 2011). Bonaiuto *et al.* (2006) argue that a combination of spatial aspects (like aesthetics, accessibility and green areas), human aspects (including social relations), and functional aspects (such as welfare, and recreational, commercial and transportation facilities) can influence migration decisions by affecting the perceived environmental quality of urban areas. Amenities such as educational institutions (Ferguson *et al.*, 2007; Brunner *et al.*, 2012), hospitals (Partridge *et al.*, 2007; Portnov & Pearlmutter, 1999) and transport accessibility (Garmendia *et al.*, 2008; Royuela *et al.*, 2010), as well as a city's location (Portnov & Pearlmutter, 1999; Portnov, 2004), have been shown to be determinants of people's decisions to stay in or leave a city. If the presence of certain types of amenities constitutes a way of bringing new inhabitants into the city, the existence of other amenities related to a lack of safety or to physical and/or social disorder constitutes a cause of individuals to move away (Blasius & Friedrichs, 2007; Elo *et al.*, 2009). Climate has also been found to influence in- or out-migration (Cheshire & Magrini, 2006).

Other studies have emphasised psychological aspects as factors discouraging inhabitants to leave a city (Grzeskowiak *et al.*, 2003; Hidalgo & Hernandez, 2001). Place attachment (Brown *et al.*, 2003; Hidalgo & Hernandez, 2001), social networks (Coulton *et al.*, 2012; Hospers, 2014) and loyalty to a place, which combines place and social ties (van der Land & Doff, 2010), have been presented as

relevant factors. Of importance is individuals' pleasure or gratification connected with their place of residence (Bonaiuto *et al.*, 2003), which renders a sense of residential satisfaction. Amérigo & Aragonés (1997) identified home ownership, time lived in the place, age, the presence of relatives, safety, friendship and relations with neighbours, family type, noise and the physical appearance of places as factors influencing the level of residential satisfaction. A sense of pride about the place of residence also reduces the incentive to move out (Twigger-Ross & Uzzell, 1996).

On the basis of the literature described above, we developed a list of possible pull and push variables relevant to shrinking cities (described in detail in Section 4). The variables were rated by residents of four Portuguese cities in which population decline between 1991 and 2011 was observed. The following section describes these case study cities.

3. The case study cities

Portugal has 158 cities, of which 31 showed population loss between 1991 and 2011 (Guimarães *et al.*, 2014). Such a phenomenon is a result of a multiplicity of causes that differ from city to city. In addition to the ageing population and low fertility rates, the phenomena of suburbanisation, economic transformation, environmental features and the satellite effect have been proposed to explain urban decline in Portugal (Guimarães *et al.*, 2014). Of the 31 shrinking cities listed in Guimarães *et al.* (2014), four case studies were selected for the present study: Oporto, Barreiro, Moura and Peso da Régua (Figure 1). Each city represents one type of shrinkage driver to ensure that each case study is as distinct as possible.

The city of Oporto is the second most populous city in Portugal and is located in the north of the country. Oporto is well known for its wine and for its historical centre, which is classified as World Heritage by UNESCO. The shrinkage process of Oporto has been explained as relating mainly to suburbanization.

Barreiro, located on the southern bank of the Tejo River, shows the second-largest population loss in relative terms of the nation's shrinking cities between 1991 and 2011. Until 1950, the city's industry was outstanding, with the operation of railways and the chemical industry. The main cause for population displacement has been linked to the abrupt closure of its industries.

Moura is located in the interior of the country, in the Alentejo region, which is affected by desertification, heat waves and extensive drought periods that might become more severe because of anticipated global climate change. Therefore, Moura has been included in a shrinkage typology related to climatic drivers. In addition to these climatic features, Moura's large distance from major cities implies a lack of supporting public services.

Peso da Régua, located in the Douro region in the north of the country, has been identified as a satellite city of a nearby growing urban centre, Vila Real. Peso da Régua is an international capital of wine-making, with agriculture and tourism being the main economic activities. The city is located at 125 m altitude and is surrounded by rugged terrain, and is also part of a UNESCO world heritage site.

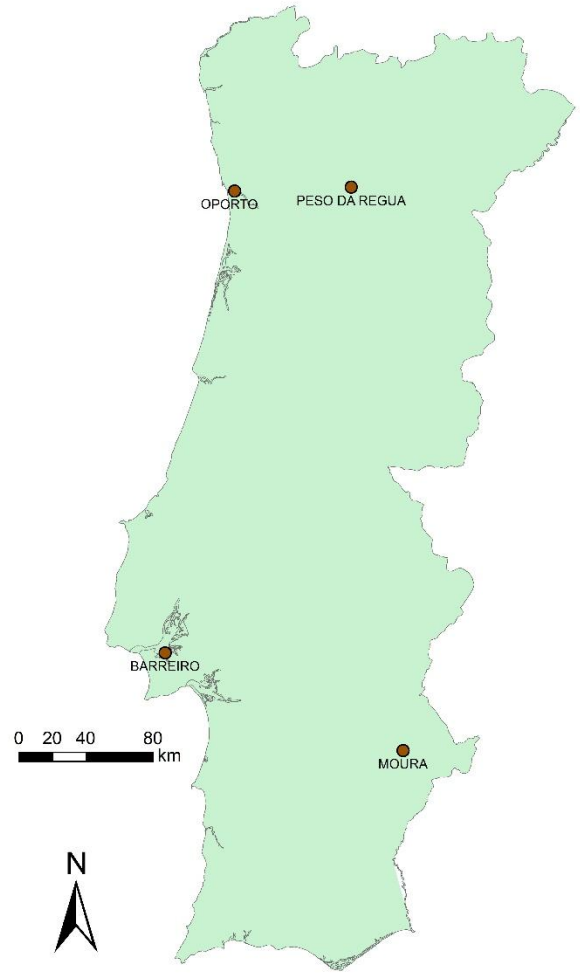

Figure 1: Map of Portugal showing the locations of the four case study cities.

4. Methods

4.1. Data collection

The main goal of this study was to understand what makes residents of shrinking cities stay (the pull factors) and also the features that could eventually lead them to abandon their city (the push factors). To achieve this, a questionnaire was designed and administered by survey in each of the case study cities. In total, 701 questionnaires were gathered by face-to-face survey in July 2014: 180 in Oporto, 179 in Barreiro, and 171 in both Peso da Régua and Moura. The number of questionnaires was calculated using a random stratified sampling method based on the 2011 population figures for each city (data from the 2011 National Census). The sample size was sufficient to ensure a maximum margin of error of 7.45% for a 95% confidence interval on the population proportion. Each city subsample was stratified according to the typology of households in the city. A pilot survey was conducted prior to the main survey to test the accuracy of the questionnaire.

The questionnaires included 24 pull and 24 push variables (Table 1) that respondents rated with respect to the degree of influence that each variable had on their willingness to live in the city and on their possible departure from it. The rating was conducted using a 5-point Likert scale: 5 – crucial, 4 – very important, 3 – moderately important, 2 – weakly important, and 1 – irrelevant. In addition to this information, the questionnaire included items regarding demographic and socioeconomic characteristics (i.e. age, household income, household size, education level, era of construction of the house, home ownership and the number of years of residence in the city), as well as respondents' levels of satisfaction with their city of residence, how they perceived the evolution of its population and whether they intended to leave the city within one year.

To the authors' knowledge, there has been no instrument specifically constructed to assess which factors make a city attractive/unattractive in shrinkage environments, apart from the work of Reckien & Martinez-Fernandez (2011), which assessed only urban sprawl. Therefore, the list of pull and push variables (Table 1) was defined based on the literature assessing the attractive/unattractive attributes of places and the specific characteristics of the case studies.

Table 1: Pull and push variables contained in the questionnaire. Respondents were asked to rate the level of importance of each factor using a 5-point Likert scale.

Pull variable/coding		Push variable/coding	
Work in the city in which you live	LIVE_WORK	Lack of road access	ROADS
Live close to friends and family	LIVE_F_F	Lack of commercial areas	SHOPPING
Existence of a sense of community	COMMUNITY	Lack of good schools	SCHOOLS
Existence of mutual aid between neighbours	MUTUAL_AID	Lack of accesses adapted to special needs	SPECIAL_NEEDS
A good place to raise children	CHILDREN_GROWTH	Lack of leisure areas	LEISURE
A good place to meet people	MEET_PEOPLE	Lack of services for elderly residents	ELDERLY
Being involved in local organizations	ONG_PARTICIPATION	Lack of public services	PUBLIC_SERVICES
The existence of elderly centres	ELDERLY_CENTRE	Lack of green areas	GREEN_AREAS
Being close to work	CLOSE_WORK	Being distant from work	WORK_FAR
Being close to shopping areas	CLOSE_SHOPPING	Finding higher salary elsewhere	MONEY
Being close to leisure areas	CLOSE_LEISURE	Lack of employment opportunities	NO_JOB
Being close to good schools	CLOSE_SCHOOLS	Expensive housing	HOUSING
Being close to green areas	CLOSE_GREEN	Risk of floods, heat waves	RISK
The safety of the city	SECURITY	Vandalized quarters	QUARTERS
The tranquillity of the city	TRANQUILITY	Abandoned buildings	ABANDON
The affordability of the houses	AFFORDABLE_HOUSE	Lack of safety in the city	UNSAFE
The existence of walking trails	WALKING_TRAILS	Lack of environmental quality	NO_ENV_QUALITY
The existence of open-air sport areas	SPORT_OPEN_AIR	City with many old people	OLD_PEOPLE
The existence of a lively night life	NIGHT_LIFE	Sense of population decline	SHRINKING
The existence of good environmental quality	ENV_QUALITY	Undesirable neighbours	BAD_NEIGHBORS
The existence of good weather	CLIMATE	Insufficient housing dimensions	SMALL_HOUSE
Good public transport coverage	PUB_TRANS	Existence of homeless people	NON_RESIDENTS
The city's beauty	BEAUTY	Lack of planned city development	NO_PLAN
The city's heritage	HERITAGE	Constricted distribution and size of buildings	OPRESS

4.2. Data analysis

An important outcome of the questionnaire survey was the rating of importance made by each of the respondents of the 24 pull and 24 push variables that were reduced to a small number of factors using factor analysis. Prior to the factor analysis being conducted, the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity were computed to check the appropriateness of implementing factor analysis on the collected data. A comparison of threshold and measured values of these statistics showed that factor analysis was an adequate method (Table 2) to use for the data both for the full sample and for each city's subsample of respondents.

Table 2: Results of the Kaiser-Meyer-Olkin (KMO) measure and Bartlett's Test.

		KMO measure of sampling adequacy	Bartlett's Test of Sphericity		
			Chi-Square	df	Sig.
Pull variables	Full sample	0.886	7456.1	276	0.000
	Oporto	0.763	1929.8		
	Barreiro	0.877	2172.7		
	Peso da Régua	0.807	2186.4		
	Moura	0.853	1822.7		
Push variables	Full sample	0.941	13474.0		
	Oporto	0.922	4613.8		
	Barreiro	0.806	2030.9		
	Peso da Régua	0.933	4357.5		

	Moura	0.858	1788.8		

Note: Values of the KMO measure of >0.8 are usually considered as good, and support the use of factor analysis. Low values of Bartlett's test (<0.05) indicate that the correlation between the variables is significant and appropriate for factor analysis.

Factor analysis was implemented with the principal components method and a varimax rotation using SPSS software. The number of factors was selected according to the standard criterion of retaining only those factors that have associated eigenvalues of >1.

As all factors were standardized to have a mean of zero and a variance of one, we also calculated (non-standardized) factors as weighted averages of the original (non-standardized) observed variables, using the corresponding factor loadings as weightings. This information allowed us to determine the level of importance of each factor in the decision to reside in or leave a shrinking city.

Factor analysis was undertaken for the full sample and for each of the four case study cities, for both the pull and push factors. The individual cities were analysed to identify any particular factors within each city that might have been missed when conducting the analysis using the full sample.

Regarding the factors discovered for the full sample, we wanted to understand which measured variables had an influence on their level of importance. Therefore, we estimated linear models using the new Automatic Linear Modelling (LINEAR) procedure in SPSS 21.0. In addition to a summary of the demographic and socioeconomic profiles of the respondents as well as their assessment of their city of residence, Table 3 provides the list of all the explanatory variables that were considered. The final set of explanatory variables appearing in the linear model for each factor was based on the optimality of the small-sample-corrected Akaike information criterion over all possible subsets and also required that all the included variables were significant at the 5% significance level. Before the regression models were estimated, missing values were replaced in some of the continuous, ordinal and nominal variables by their sample means, medians and modes, respectively. Values of continuous variables that lay beyond a cut-off value of three standard deviations from the mean were identified as outliers and replaced by the cut-off value. Finally, to arrive at more parsimonious models, categories of both ordinal and nominal variables were merged. Similar categories were identified based upon the relationship between the explanatory variable and the dependent variable. Categories that were not significantly different at 10% significant level were merged. Whenever all the categories of a given variable ended up being merged into a single category, that variable was excluded from the model because it had no value as a predictor.

Table 3 Model variables, respondent demographic and socioeconomic statistics, and respondents' assessment of their city of residence.

Variables and statistics					
City (Nominal variable: 1 – Moura, 2 – Barreiro, 3 – Peso da Régua, 4 – Oporto)					
	Overall	**Oporto**	**Barreiro**	**Peso da Régua**	**Moura**
Sample (N)	701	189	179	171	171
Age (Continuous variable)					
Mean	54	57	54	53	52
Maximum	96		87		
Minimum	18				
Gender (Nominal variable: 1 – Feminine, 0 – Masculine)					
Frequency of women (%)	61.2	70.6	51.4	62.6	60.2
Education Level (Ordinal variable) (1 – illiterate, 2 – primary school (incomplete or complete), 3 – secondary school (2 years), 4 – secondary school (5 years), 5 – secondary school (8 years), 6 – higher education)					
Mean	3. 34	3.37	3.55	3.37	3.07
Maximum	6				
Minimum	1				
Monthly household income (Ordinal variable: 1 – <500, 2 – 500 to 1000, 3 – 1000 to 1500, 4 – 1500 to 2000, 5 – 2000)					
Mean	1.93	1.78	2.25	1.80	
Maximum	5			4	
Minimum	1				
Household (Ordinal variable: 1 – one person to 5 – >4)					
Mean	2.26	2.13	2.08	2.49	2.33

Maximum	5				
Minimum	1				
Era of construction (Ordinal variable; 1 – after the 1970s, 2 – before the 1970s)					
Frequency of houses after the 1970's (%)	52.4	57.8	45.8	63.7	58.5
Ownership (Nominal variable; 0 – owner, 1 – renting)					
Frequency of owners (%)	59.1	29.4	69.8	60.8	77.2
Years of Residence (Ordinal variable; 1 – <10 years, 2 – 10 to 20 years, 3 – >20 years)					
Mean	2.44	2.42	2.61	2.28	2.43
Maximum	3				
Minimum	1				
Perception regarding population evolution (Ordinal variable: 1 – diminishing, 2 – stable, 3 – growing)					
Mean	1.41	1.38	1.58	1.44	1.22
Maximum	3				
Minimum	1				
Satisfaction about the city (Ordinal variable 1 – unsatisfied to 5 – very satisfied)					
Mean	4.05	4.34	3.54	4.24	4.10
Maximum	5				
Minimum	1	2	1	3	1
Intention of leaving the city within one year (Nominal variable; 1 – yes, 0 – no)					
Respondents wanting to leave (%)	6.1%	2.8%	6.1%	5.8%	9.9%

5. Results and interpretation

5.1. What makes residents of shrinking cities stay? The pull factors

Table 4 gives the results of the factor analysis regarding the possible pull factors for the full sample. The table is organized with respect to the variance explained by each factor.

Table 4: Factor analysis of the 24 pull variables (full sample).

Ordinal variables (rated from 1 to 5)	Factors				
	1	**2**	**3**	**4**	**5**
1) SECURITY	0.77	0.19	0.10	0.08	0.07
2) AFFORDABLE_HOUSE	0.76	0.06	0.12	0.10	0.10
3) TRANQUILITY	0.72	0.09	0.14	0.01	0.06
4) PUB_TRANS	0.69	0.08	0.06	0.14	0.05
5) CHILDREN_GROWTH	0.58	0.05	0.48	0.23	0.11
6) CLOSE_SCHOOLS	0.55	0.18	0.22	0.31	0.29
7) BEAUTY	0.53	0.50	0.32	-0.18	-0.00
8) LIVE_F_F	0.51	-0.11	0.35	0.20	0.17
9) HERITAGE	0.51	0.48	0.28	-0.20	0.01
1) SPORT_OPEN_AIR	0.01	0.80	-0.02	0.22	0.04
2) WALKING_TRAILS	0.19	0.67	0.08	0.21	-0.01
3) NIGHT_LIFE	0.02	0.64	0.13	-0.02	0.14
4) ENV_QUALITY	0.47	0.56	0.26	0.02	-0.05
5) CLIMATE	0.48	0.52	0.28	-0.08	-0.06
1) MUTUAL_AID	0.33	0.01	0.76	-0.03	-0.05
2) COMMUNITY	0.29	0.11	0.74	0.20	-0.03
3) ONG_PARTICIPATION	-0.06	0.40	0.61	-0.10	0.27
4) ELDERLY_CENTER	0.37	0.21	0.60	0.08	0.06
5) MEET_PEOPLE	-0.05	0.41	0.57	-0.10	0.34
1) CLOSE_SHOPPING	0.07	-0.11	-0.01	0.81	0.11
2) CLOSE_LEISURE	0.02	0.18	0.05	0.78	0.09
3) CLOSE_GREEN	0.37	0.16	0.08	0.58	0.01
1) CLOSE_WORK	0.10	0.07	0.04	0.19	0.85
2) LIVE_WORK	0.22	0.04	0.11	0.04	0.83
VARIANCE EXPLAINED	**32%**	**10%**	**8%**	**7%**	**5%**

Note: The original variables are ordinal (Likert scale, ranging from 1 – irrelevant to 5 – crucial). Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. The rotation converged in 7 iterations. Total variance explained = 62%.

Factor 1 is composed of variables regarding the *living conditions* within the city (e.g. security, affordability of the houses and tranquillity). Factor 2 comprises variables regarding *recreational & environmental amenities* (e.g. the existence of open-air areas for sports activities, footpaths and

lively nightlife). Factor 3 is related to *social ties* (e.g. the existence of mutual aid and trust between neighbours, community spirit and involvement in local organizations). Factor 4 is related to *accessibility* to services such as shopping, leisure and nature. Finally, factor 5 includes two variables related mostly to the proximity between home and the workplace, designated as *live & work.*

5.2. What might make residents leave shrinking cities? The push factors

Regarding the characteristics that might lead respondents to leave their city of residence (push variables), the factor analysis reveals four factors (Table 5). Factor 1 is related mainly to the *lack of services* within the city (e.g. shopping areas, public services and roads). Factor 2 focuses on the *shrinking atmosphere* of the city (e.g. the sense of population decline and the high proportion of elderly people). Factor 3 is also related to the atmosphere of the city but linked more to the *surroundings & visual attributes* (e.g. the existence of degraded and abandoned buildings, poor environmental quality, small houses and a perception that the city is unsafe). Finally, three variables loaded on factor 4 and are related to *working conditions*, such as the lack of job opportunities, better income elsewhere and a large distance between the workplace and home.

Table 5: Factor analysis of the 24 push variables (full sample).

Ordinal variables (rated from 1 to 5)	Factors			
	1	2	3	4
1) SHOPPING	0.77	0.24	0.06	0.24
2) PUBLIC_SERVICES	0.75	0.23	0.30	0.18
3) ROADS	0.73	0.29	0.13	0.26
4) SCHOOLS	0.73	0.19	0.34	0.30
5) GREEN_AREAS	0.71	0.28	0.26	0.20
6) ELDERLY	0.71	0.12	0.44	0.15
7) LEISURE	0.61	0.32	0.28	0.09
8) SPECIAL_NEEDS	0.56	0.26	0.53	0.10
1) SHRINKING	0.22	0.81	0.12	0.18
2) OLD_PEOPLE	0.11	0.76	0.00	0.18
3) NON_RESIDENTS	0.22	0.75	0.33	0.07
4) NO_PLAN	0.17	0.74	0.43	0.10
5) BAD_NEIGHBORS	0.34	0.66	0.20	0.11
6) SMALL_HOUSE	0.33	0.65	0.15	0.17
7) OPRESS	0.14	0.64	0.56	0.14
8) RISK	0.36	0.52	0.24	0.09
1) QUARTERS	0.28	0.22	0.80	0.14
2) ABANDON	0.30	0.25	0.79	0.16
3) NO_ENV_QUALITY	0.43	0.40	0.61	0.21
4) UNSAFE	0.44	0.24	0.58	0.31
5) HOUSING	0.37	0.24	0.46	0.45
1) NO_JOB	0.23	0.19	0.23	0.86
2) MONEY	0.24	0.16	0.24	0.85
3) WORK_FAR	0.21	0.16	0.02	0.80
VARIANCE EXPLAINED	**51%**	**8%**	**6%**	**5%**

Note: The original variables are ordinal (Likert scale, ranging from 1 – irrelevant to 5 – crucial). Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization. The rotation converged in 6 iterations. Total variance explained = 70%.

5.3. What influences the scores of the pull and push factors?

Figures 2 and 3 schematically display the results of regressions of each pull and push factor, respectively. The figures show the final set of explanatory variables influencing the score of each factor, as well as the valence of each relationship (positive or negative). These relationships represent partial regression coefficients and measure the impact of each variable while keeping all the other variables constant. With regard to the *living conditions* pull factor, the score was influenced by the city of residence, the number of years of residence, gender, the era of house construction and tenancy. Residents of Barreiro and Peso da Régua tended to score this factor lower compared with residents of Moura and Oporto. Men also tended to score it lower than did women, whereas those renting houses and living in newer houses provided higher scores. The *recreational & environmental amenities* scores tended to be lower for those with the lowest monthly income, as well as for older

residents and the less well educated. Residents of Peso da Régua tended to give higher scores, as did households of up to three persons. In the case of the *accessibility pull factor*, Moura and Oporto stand out but in this case with lower factor scores than the remaining cities. Furthermore, residents with lower education levels gave lower scores. The *live & work* factor score was influenced by the city of residence and by the age and education level of the respondents. Residents of Moura and Oporto, compared with residents in the other two cities, gave higher factor scores, as did younger respondents and those with higher levels of education.

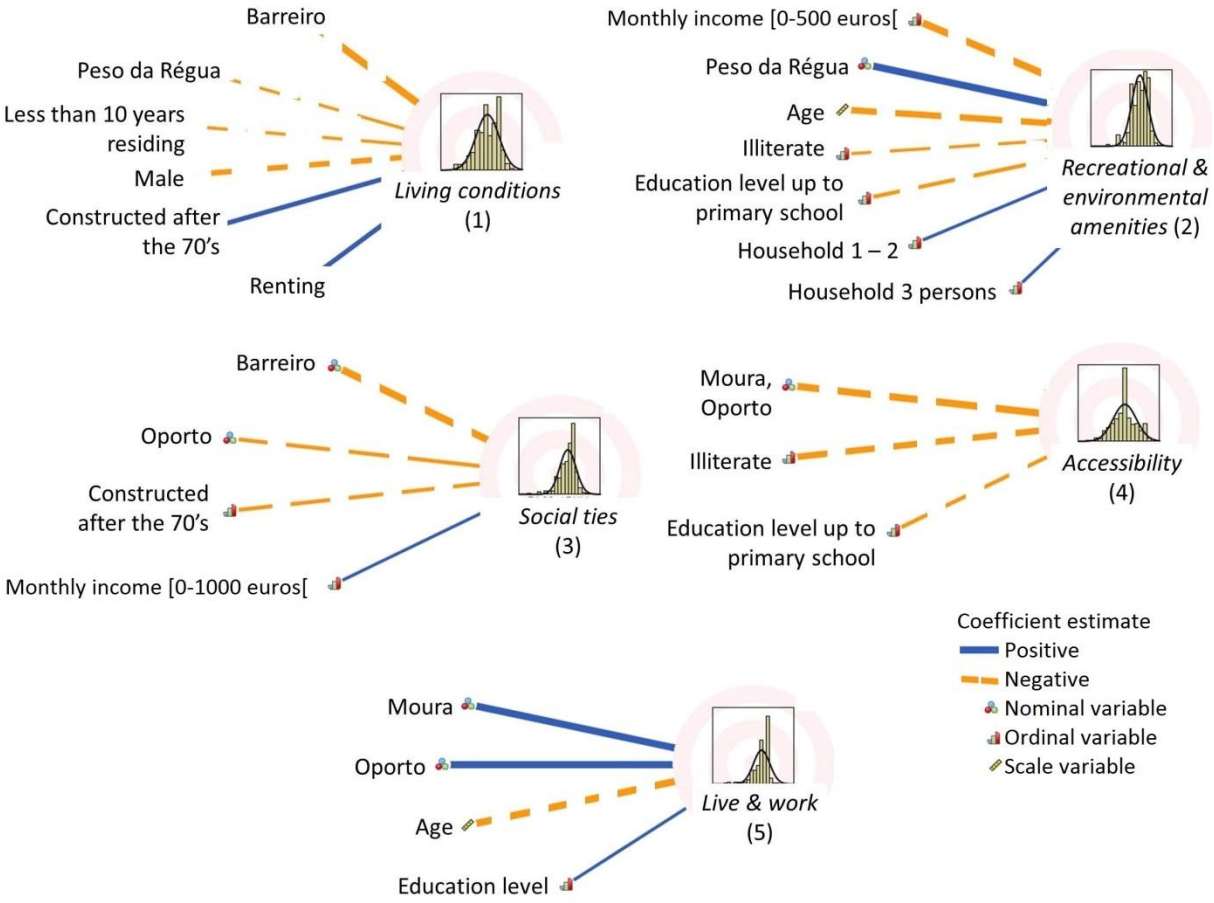

Figure 2: Variables influencing the scores of the pull factors. The results were obtained by Automatic Linear Modelling in SPSS. The thickness of each line is proportional to the strength of the relationship between the variable and the factor. The histogram in each case shows the distribution of the scores of each factor.

Regarding the push factors, and in the case of the *lack of services*, residents of Barreiro and especially Moura tended to score higher than did residents of the other cities. The less satisfied respondents tended to give lower scores for this factor. For the *shrinking atmosphere* push factor, Moura residents tended to score higher, as did male respondents and those with low satisfaction levels. Households with monthly incomes of <500 and 500–1000 euros, households with 1 to 4 persons, and residents who were not planning to leave the city tended to give lower scores for this push factor. Furthermore, residents who were less satisfied with their city of residence provided higher scores. With regard to the *surrounding & visual attributes* push factor, Moura and Peso da Régua provided lower scores, as did residents living in newer houses. Smaller households (1–2 persons) gave higher scores for this factor compared with larger households. For *working conditions*, Moura residents stand out from the remaining respondents because of their higher factor scores. This factor for potentially deciding to leave the city was less important for older residents and for those with very low incomes, as well as for residents with higher levels of satisfaction with their city.

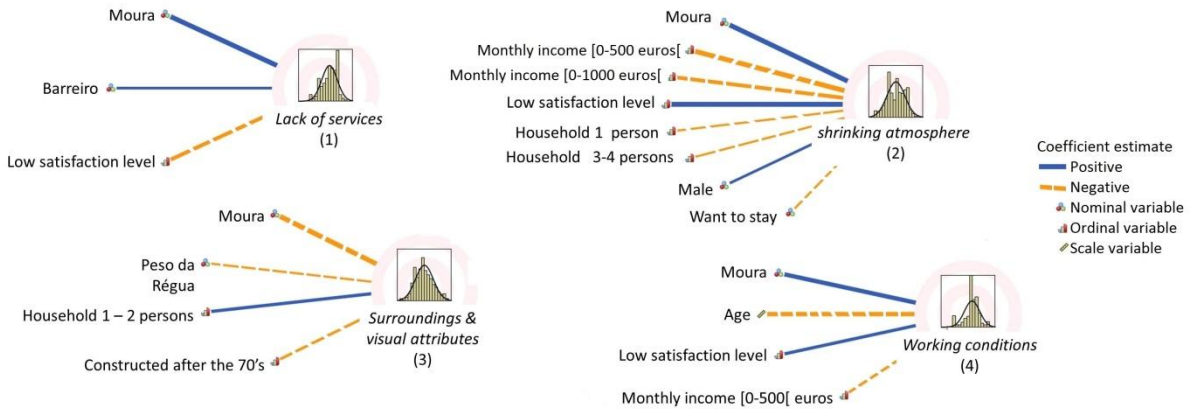

Figure 3: Variables influencing the scores of the push factors. The results were obtained by Automatic Linear Modelling in SPSS. The thickness of each line is proportional to the strength of the relationship between the variable and the factor. The histogram in each case shows the distribution of the scores of each factor.

5.4. Looking more deeply into each city

Given that the study was undertaken in four different cities, factor analysis was performed for each city subsample. The main goal of the analyses was to identify whether any factors emerged that were specific to each city. To make such a comparison, Tables 6 and 7 list the variables as presented in Tables 4 and 5. Regarding the presentation of the results of the pull factors (Table 6) and push factors (Table 7), the loading values presented are the highest registered for each variable.

In the case of Oporto, the results for the pull variables show the existence of six factors. Most factors have a similar composition to those based on the full sample. However, a new pull factor emerged for Oporto (factor 6 in Table 6), comprising variables related to the city's *beauty & heritage*.

The subsample for Barreiro city also included six pull factors. Again, most factors are composed of the same variables as for the full sample. However, an additional factor (factor 6 in Table 6) is specific to Barreiro, and consists of two variables related to the *sense of community*.

In the cases of Peso da Régua and Moura, five pull factors were identified for each subsample. In Peso da Régua, factor 1 is a mixture of *living conditions & environmental amenities*. Factor 2 is composed of variables representing *social ties*, such as the sense of community, being close to friends and family, and the city being a good place in which to raise children. Factors 3 and 5 have similar compositions to those for the full sample, and can therefore can be respectively entitled *accessibility* and *live & work.* Factor 4 is a mixture of activities related to *recreation & social networks.*

For Moura, no factor completely follows the composition obtained for the full sample, but there are similarities. Factor 1 is a mixture and covers *living conditions, environmental amenities & mutual aid.* Factor 2 concerns mostly *social ties.* Factor 3 mixes features regarding the city *landscape* (i.e. city beauty and heritage)*, recreation activities* (i.e. vibrant nightlife), *and environmental amenities* (i.e. environmental quality and proximity to green areas). Factor 4 combines proximity to services and work, which justifies its designation as *accessibility and live & work*. The fifth factor is related to environmental amenities and is encapsulated as *contact with nature*.

Table 6 Pull factors for each city subsample.

Ordinal variables	Cities, factor loadings and factors							
	Oporto		Barreiro		Peso da Régua		Moura	
SECURITY	0.68		0.77		0.60	**1**	0.59	
AFFORDABLE_HOUSE	0.81		0.70	**1**	0.42	**2**	0.80	**1**
TRANQUILITY	0.60	**1**	0.76		0.53	**3**	0.74	
PUB_TRANS	0.72		0.59		0.50	**1**	0.54	
CHILDREN_GROWTH	0.65		0.59	**3**	0.57	**2**	0.57	**2**
LIVE_F_F	0.53		0.40	**4**	0.48		0.69	**1**

CLOSE_SCHOOLS	0.67	5	0.47	1	0.58		0.42	
BEAUTY	0.88	6	0.71		0.77	1	0.70	3
HERITAGE	8.82		0.74	2	8.84		0.66	
SPORT_OPEN_AIR	0.84		0.62		0.43	4	0.59	5
WALKING_TRAILS	0.80		0.66	1	0.47	1	0.87	
NIGHT_LIFE	0.67	2	0.59		0.75	4	0.68	3
ENV_QUALITY	0.68		0.54	2	0.82	1	0.62	
CLIMATE	0.55		0.70		0.79		0.52	1
MUTUAL_AID	0.85		0.87	6	0.87	2	0.62	
COMUNITY	0.82		0.44		0.82		0.64	
ONG_PARTICIPATION	0.42	3	0.76		0.68	4	0.77	2
ELDERLY_CENTER	0.65		0.61	3	0.58	1	0.58	
MEET_PEOPLE	0.47		0.76		0.61	4	0.82	
CLOSE_SHOPPING	0.70		0.81	4	0.81		0.81	4
CLOSE_LEISURE	0.79	4	0.77		0.75	3	0.76	
CLOSE_GREEN	0.72		0.51	1	0.62		0.48	3
CLOSE_WORK	0.58	5	0.87	5	0.90	5	0.76	4
LIVE_WORK	0.75		0.87		0.89		0.51	
VARIANCE EXPLAINED	64%		67%		63%		61%	

Note: The variables listed in the first column of the table are differentiated by shading and lines representing the factor composition for the full sample from factor 1 (top) to factor 5 (bottom).

Table 7 provides information on the results of the factor analysis of each city subsample with regard to the push factors. For Oporto, most push factors have a different composition from those of the full sample. The exception is factor 2, which includes variables associated with the *shrinking atmosphere* of the city. Factor 1 comprises variables regarding the lack of services and variables describing the surroundings and visual attributes of the city; hence this factor can be entitled *lack of services & the city surroundings*. Factor 3 includes, in addition to working conditions, the affordability of houses; hence in this case the factor can be designated as *economic conditions*. Finally, factor 4 is a combination of variables regarding the lack of services and the inadequacy of the size of houses; hence this factor is designated as *house size & lack of services*.

For Barreiro, most factors have the same composition as those for Oporto but with the exceptions of factor 1 entitled *lack of services* and factor 3 entitled *surrounding & visual attributes* (excluding housing affordability), which follow the full sample. Factors 2 and 4 are similar to factors 2 and 3 of Oporto, designated as *shrinking atmosphere* and *economic conditions*, respectively. Factor 5 includes one variable regarding the *risk* of floods, heat waves or frost, which is a factor specific to Barreiro.

For Peso da Régua, push factor 1 comprises variables regarding *lack of services & the city surroundings*. Factors 2 and 3 are related to the atmosphere of the city, with the former factor being associated mainly with *neighbourhood features* whereas the latter is encapsulated by the *effects of shrinkage*. Factor 4 concerns *working conditions*.

In the case of Moura, factor 1 concerns mainly the city's *shrinking atmosphere*. Factor 2 includes variables representing *lack of services* & *economic conditions*. Factor 3 includes two variables related to the physical effects of shrinkage and a variable associated with working conditions, and can be termed *shrinking neighbourhood*. Factor 4 is composed of two variables describing *shrinkage awareness*. Finally, Moura includes a fifth factor, encapsulating a *lack of recreational services*.

Table 7: Push factors for each city subsample.

Ordinal variables	Cities, factor loadings and factors							
	Oporto		Barreiro		Peso da Régua		Moura	
ELDERLY	0.77		0.80		0.85		0.62	
PUBLIC_SERVICES	0.70		0.73		0.83		0.73	2
SCHOOLS	0.68	1	0.62		0.83		0.54	
ROADS	0.60		0.62	1	0.75	1	0.68	
SPECIAL_NEEDS	0.79		0.70		0.66		0.40	
LEISURE	0.63		0.64		0.66		0.72	5
GREEN_AREAS	0.65	4	0.57		0.69		0.44	

SHOPPING	0.69		0.52		0.75		0.75	
SMALL_HOUSE	0.73		0.64	**3**	0.83	**2**	0.80	**1**
SHRINKING	0.77		0.79		0.72		0.50	**4**
OLD_PEOPLE	0.77		0.75		0.83	**3**	0.74	
NO_PLAN	0.74	**2**	0.72	**2**	0.61		0.82	
OPRESS	0.67		0.75		0.70		0.78	
NON_RESIDENTS	0.68		0.79		0.70		0.76	**1**
BAD_NEIGHBORS	0.56		0.45		0.84	**2**	0.59	
RISK	0.58		0.82	**5**	0.64		0.65	
QUARTERS	0.74		0.81		0.54	**3**	0.66	**3**
ABANDON	0.77	**1**	0.80	**3**	0.54		0.79	
NO_ENV_QUALITY	0.69		0.50		0.56		0.72	**1**
UNSAFE	0.67		0.69		0.62	**1**	0.64	
HOUSING	0.68		0.43		0.43		0.54	
MONEY	0.89	**3**	0.78	**4**	0.89		0.68	**2**
NO_JOB	0.87		0.88		0.88	**4**	0.74	
WORK_FAR	0.81		0.73		0.90		0.53	**3**
VARIANCE EXPLAINED	77%		66%		76%		61%	

Note: The variables listed in the first column of the table are differentiated by shading and lines representing the factor composition for the full sample from factor 1 (top) to factor 4 (bottom).

5.5. Which factors are more important?

With respect to the importance of the pull factors presented, Figure 4 shows the score of each factor calculated as the weighted average score of the constituent variables for both the full sample and the city subsamples. The *live & work* factor was the most important factor for the full sample, with a score of 3.5 out of 5. Three factors had scores of >2.5: *accessibility*, *living conditions* and *social ties. Recreational & environmental amenities* were found to have the lowest importance.

The aforementioned order of importance for the full sample was not found for Oporto, where the specific factor of *beauty & heritage* was scored as very important (3.6), followed by the remaining factors all with a score of around 3 (moderately important). For Barreiro, the *live & work*, *accessibility* and *living conditions* factors were scored as moderately important, whereas the remaining three factors were considered as being of lower importance. For Peso da Régua, the *live & work* factor was ranked as very important (a score of around 4) whereas the factors *living conditions & environmental amenities, accessibility* and *social ties* were considered moderately important. The *recreation and social network* factor was ranked as weakly important (around 2). For Moura, all factors were considered moderately important.

The weighted score values of the push factors were generally lower than those of the pull factors (Figures 4 and 5). The highest value obtained was for the *working conditions* factor in the case of the full sample and for Peso da Régua. In Oporto, Barreiro and Moura, the variables that characterized this factor were included in factors with a different designation – *economic conditions* and *lack of services & economic conditions* – but with the same level of importance as the *working conditions* push factor. The least important push factor in both Oporto and Barreiro was the *shrinking atmosphere* and in Peso da Régua was the *effects of shrinkage*, whereas in Moura the factors *lack of recreational services* and *shrinkage awareness* were ranked lowest.

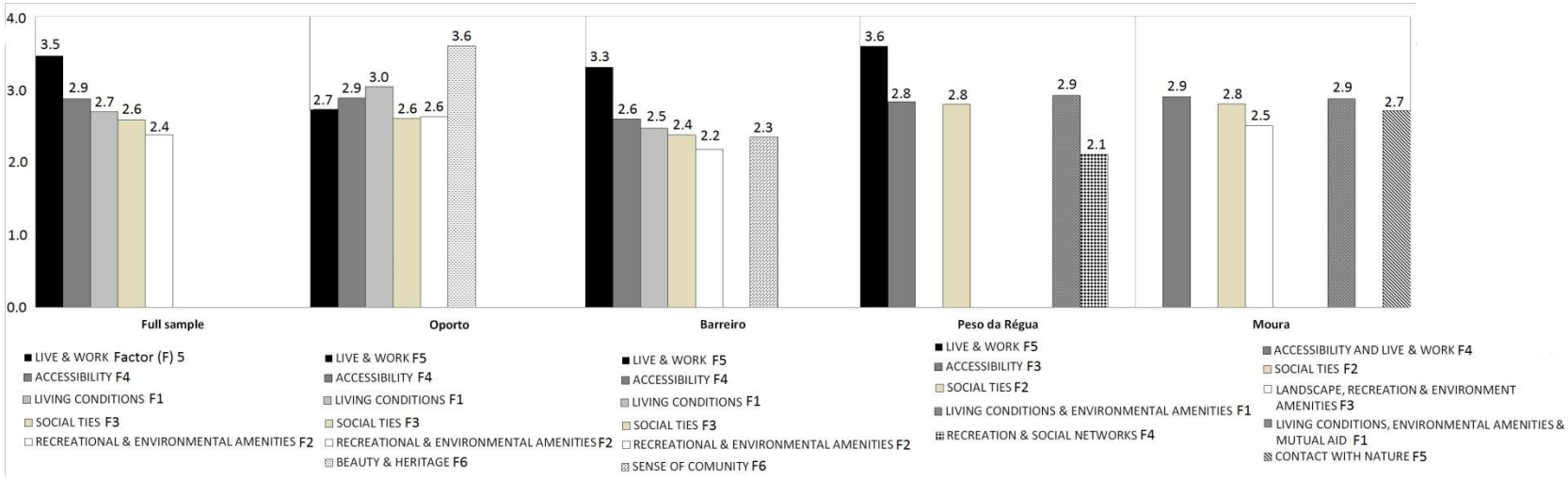

Figure 4: Weighted average scores of the pull factors for the full sample and for the specific cases of Oporto, Barreiro, Peso da Régua and Moura. The number presented after each factor name corresponds to the factor number in Tables 4 and 6.

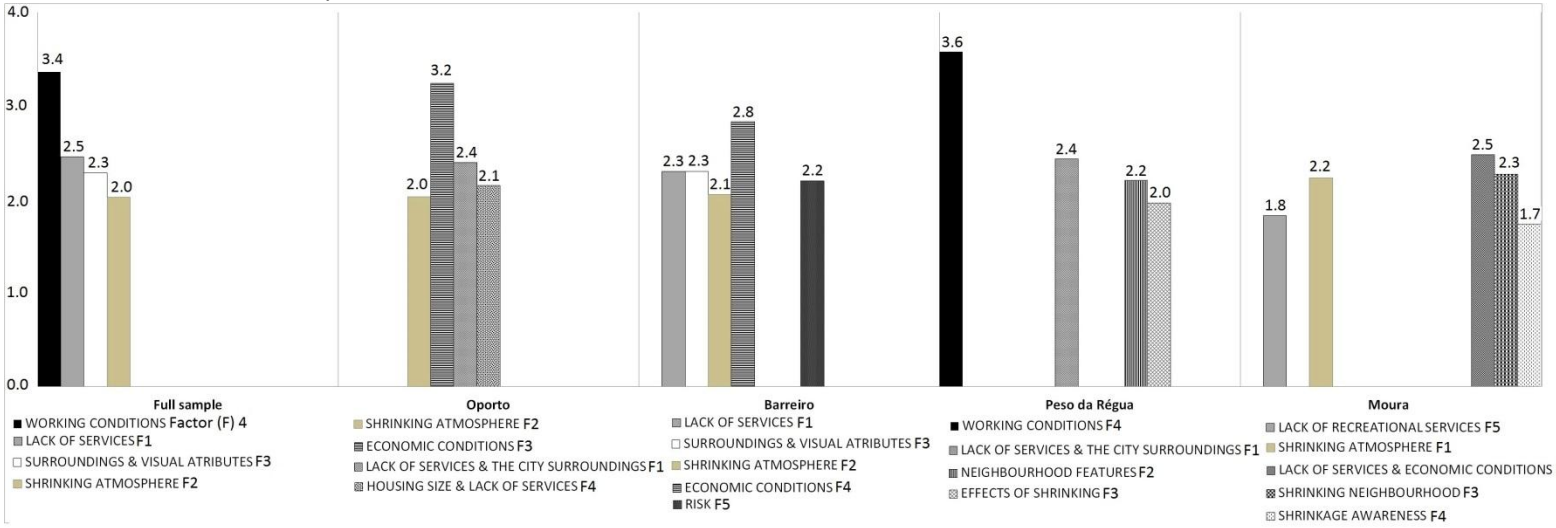

Figure 5: Weighted average scores of the push factors for the full sample and for the specific cases of Oporto, Barreiro, Peso da Régua and Moura. The number presented after each factor name corresponds to the factor number in Tables 5 and 7.

6. Discussion

Drivers for staying in a place or moving to another have been distinguished as economic (Andersen & van Kempen, 2003), amenities related (Partridge *et al.*, 2007) and psychological (Coulton *et al.*, 2012). The factors obtained in the present study fit the previously described typology of drivers (Tables 4 and 5). The pull and push factors designated *accessibility*, *living conditions*, *recreational & environmental amenities* and *lack of services* are constituted mostly by variables associated with amenities (Ferguson *et al.*, 2007; Garmendia *et al.*, 2008). The *social ties* pull factor is related mostly to psychological aspects (Brown *et al.*, 2003; Coulton *et al.*, 2012). Finally, economic drivers (Andersen & van Kempen, 2003) associated mainly with employment are included in the pull factor *live & work* and in the push factor *working conditions*. However, in the case of the push variables, the analysis uncovered two factors composed mainly of specific features of cities that are losing population. The factors of *surrounding & visual attributes* and the *shrinking atmosphere* embrace variables concerning the existence of abandoned buildings, vandalized quarters and unsafety for the former factor, and a predominance of aged residents and homeless people for the latter. Despite the clear evidence of shrinkage characteristics, as revealed through *surroundings & visual attributes* and a *shrinking atmosphere*, the low importance of these factors to the decision to potentially move out of the city (Figure 5) suggests that although residents of the studied cities acknowledge the shrinkage process, these are not the most relevant factors influencing residents' decisions to leave. Moreover, an atmosphere of shrinkage does not seem to prejudice residential satisfaction as suggested by Delken (2008) and Hollander (2011).

In this empirical study, the relevance of economic aspects in residents' decision to stay in or leave a city was evident. The variables associated with working conditions are grouped in discrete pull and push factors (Tables 4 and 5). Hence, the availability of and proximity to work is a factor that explained residents' willingness to stay and also their potential departure when a job or better working conditions could be found elsewhere. This can be considered an initial insight regarding the importance of economic drivers. Furthermore, these economic drivers (Tables 6 and 7) were also obtained for each subsample (i.e. Oporto, Barreiro, Peso da Régua and Moura). Finally, when measuring the level of importance of each factor, it is clear that *live & work* is the most important pull factor and that *working conditions* is the main factor pushing residents to leave (Figures 4 and 5). Hence, the present study supports the economic perspective of migratory movement (Andersen & van Kempen, 2003; Arnott & Chaves, 2012).

Despite the predominance of economic drivers, the results also show the relevance of cities' specific characteristics with respect to pull and push factors. The most striking case is that of Oporto, where the *beauty & heritage* factor was identified (Table 6) and was considered by residents as the most important pull factor (Figure 4). This is an example of the importance of particular psychological factors, especially those related to place attachment, in explaining the willingness of residents to stay (Brown *et al.*, 2003). However, it should be noted that of the four case study cities, Oporto is the oldest city with a very distinct identity, and the *beauty & heritage* factor emphasizes residents' pride in their city (Twigger-Ross & Uzzell, 1996). Furthermore, the results obtained regarding the push factors clearly show that in a situation of a lack of employment or of better opportunities elsewhere, residents of Oporto would move out (Figure 5). Despite this, the fact that Oporto residents show a high level of attachment to place should not be disregarded, especially when trying to deal with the process of urban shrinkage. Place attachment might be the driver to get residents involved in defining strategies to make shrinkage an opportunity rather than a threat (Hospers, 2013). Place attachment has also been identified as an aspect that delays the decision to move out (Grzeskowiak *et al.*, 2003; Hidalgo & Hernandez, 2001).

The opposite situation was found in Barreiro, where although a case-specific pull factor was identified (the *sense of community*), this factor was rated as having little importance in influencing residents' decision to stay (Table 6 and Figure 4). In addition, economic reasons are predominant in both pull and push factors (Figures 4 and 5) and, with regard to the regression models of the factor scores, Barreiro also stands out by the low score given to the *social ties* pull factor (Figure 2). Hence,

in Barreiro, place attachment is particularly low and moving out might be a faster process than in the case of Oporto.

Of the four case study cities, Peso da Régua showed the lowest relative population decline between 1991 and 2011. The city's lower score (compared with other cities) registered in the s*urrounding and visual attributes* push factor (Figure 3) might be related to the lack of visual impacts of the shrinkage experienced and also to the city's widely renowned natural landscape. Furthermore, the score of the pull factor *recreational & environmental amenities* was higher in Peso da Régua than in other cities (Figure 2), which denotes an appreciation of the city's natural features.

Moura is also an example of the importance of non-economic drivers in influencing residents' decisions. Figures 2 and 3 show that residents of Moura can be distinguished from the residents of the other cities with respect to the scores attributed to several pull and push factors. Furthermore, the economic variables were found grouped with other variables in the city's particular pull factor, designated *accessibility and live & work* (Table 6), as well as in one push factor designated *lack of services & economic conditions* (Table 7). From the average score obtained in the Moura subsample, this push factor was the only one considered important in a decision to move out (Figure 5).

In the particular context of shrinking cities, our results show the relevance of the reasons behind the population decline. Oporto is an example of population loss by suburbanization (Guimarães *et al.*, 2014), and the most important push factor identified for this city (Figure 5) includes variables relating to housing conditions (i.e. factor 3 in Table 7, designated *economic conditions*). In deindustrialization processes, as experienced in Barreiro, one negative impact reported is a decrease in the strength of social ties (Hosper, 2013). Our results show that this city suffers from such a phenomenon, as the *social ties* pull factor score was lower in Barreiro compared with other cities (Figure 2). Furthermore, the average scores presented in Figure 4 show that the *social ties* and *sense of community* pull factors registered the lower values amongst all the specific pull factors for Barreiro. Moura is an inland city and has an ageing population, and our results demonstrate how such conditions affect the particular push factors identified in this city (Table 7). The variables referring to economic and amenities are mixed within the same factor (i.e. *lack of services & economic conditions*) and this factor is the most important push factor (Figure 5). Peso da Régua is surrounded by a landscape that is internationally recognised for its natural beauty. This feature is reflected in the results, as Peso da Régua was the city with the highest score for the pull factor *recreation & environmental amenities (*Figure 2). Furthermore, one of the most valued factors identified for Peso da Régua (Figure 4) was that of *living conditions & environmental amenities*. Bonaiuto *et al.* (2006) argued that spatial aspects such as aesthetics, accessibility and green areas influence migration decisions by affecting the perceived environmental quality of the places. This would appear to apply in the particular cases of Moura and Peso da Régua, as well as in Oporto.

The socioeconomic characteristics of respondents were also shown to influence the scores obtained for the pull and push factors identified through the estimated models (Figures 2 and 3). Economic drivers are more important for the younger generations and also for those with higher education levels, whereas psychological drivers such as the *social ties* factor are more valued by respondents with low incomes (<1000 euros/month). Moreover, the push factor *shrinking atmosphere* is significantly less valued by lower-income residents. Furthermore, residents living in newer houses value different factors from those living in older houses: whereas the former positively value the pull factor *living conditions*, the latter value the pull factor *social ties* as well as the push factor *surrounding & visual attributes* (Figures 2 and 3).

7. Conclusion

When dealing with shrinking cities, one relevant question to be addressed by policy makers is what makes residents decide to remain in a city and what could make them leave. This knowledge could be crucial for urban development, because it could lead to more suitable strategies being found to maintain and even increase the populations of shrinking cities. Our empirical study supports previous

findings that underline the need to assure job opportunities and good working conditions. However, the specificities uncovered also highlight that strategies focused solely on assuring economic conditions might not be sufficient to maintain or increase a city population, and therefore other factors need to be considered. Both social ties and place attachment were also found to be important drivers of residents' decisions regarding migration; hence, a sense of community as well as a city's identity and distinctive features need to be considered to increase its resilience.

Acknowledgments

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