For whom are cities good places to live?

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Abstract

In this paper, we use survey data to examine heterogeneity in the urban gradient of life satisfaction. Are some sociodemographic groups more satisfied in cities than others? We find that young persons with tertiary education generally report higher levels of life satisfaction in Norway's largest city, Oslo, whereas the elderly and the less educated are more satisfied elsewhere. These results may shed light on the 'urban paradox', the tendency of large cities in developed countries to have low levels of average subjective well-being and also why the received literature has produced mixed results, as the sociodemographic composition of cities varies.

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Introduction

There is an extensive research literature on the urban gradient of subjective well-being, i.e. whether life satisfaction/happiness/life evaluation is higher in cities, towns or rural areas (Wang and Wang 2016). Several scholars find that subjective well-being is lower in large cities (Berry and Okulicz-Kozaryn 2011; Lenzi and Perucca 2016; Okulicz-Kozaryn and Mazelis 2018; Sørensen 2014; Winters and Li 2017). Others find no clear differences between urban and rural areas (Best et al. 2000; Easterlin et al. 2011; Florida et al. 2013; Glaeser et al. 2016; Shucksmith et al. 2009).

The urban gradient in subjective well-being seems to depend on the income level of the country. Glaeser et al. (2016) compare the urban happiness gradient across countries and conclude that persons in large cities tend to be happier in developing countries but not in developed countries. Burger et al. (2020) find that average life evaluation tends to be higher in rural than in urban areas in advanced economies, whereas the opposite is the case for poorer countries.

The tendency of the urban gradient to decrease in city size in the developed world has been coined the ‘urban paradox’ by Morrison (2020). Morrison suggests that the paradox is due to a composition effect. Since large cities allow the well-educated to receive high wages, there is high demand for tertiary sector services, often supplied by low-paid, low-educated workers. This causes in-migration which drives up house prices and contributes to segregated cities where the well-off can afford attractive neighborhoods closer to work, whereas others are forced to commute long distances which reduces time for family and leisure. Wage inequalities, neighborhood segregation and commuting combine to create large gaps in subjective well-being. Although many people with high education level and high income are

happy with life in big cities, average subjective well-being is pushed down by the numerically dominant low-educated and less happy inhabitants.

Morrison's hypothesis implies that the relationship between city size and subjective well-being will depend on characteristics of the respondents: the urban-rural gap in subjective well-being should be increasing in education and income level. To our knowledge, only a couple of studies have attempted to include interactions between measures of urban scale and sociodemographic characteristics as determinants of subjective well-being. Okulicz-Kozaryn and Valente (2019) find that subjective well-being increases with city size for millennials whereas the opposite pattern is found for older generations. Migheli (2017) study the impact of interactions between education level and city size but does not arrive at a clear conclusion.[1]

To test Morrison's hypothesis, we include interaction terms of urban scale with education and income as explanatory variables of life satisfaction in Norway. A strength of our study is that we include simultaneously a range of interaction terms with other sociodemographic characteristics of respondents, such as age, sex, family status, immigrant status and health status. As will be clear from the literature review of our paper, there are several sociodemographic groups for which preferences for city life may deviate from the rest of the population. If interactions of urban scale and relevant respondent characteristics are excluded from the empirical analysis, the estimated relationship between the urban gradient in subjective well-being and education/income could be spurious due to omitted interaction terms. For example, well-educated people could be happy in big cities because they are on

[1] Burger et al. (2020) carry out a Blinder-Oaxaca decomposition to examine how the urban-rural gap depends on place and respondent characteristics. However, regressions results underlying the decomposition are not reported.

average younger than the low-educated and not because they are more educated. Since we include interaction terms with several sociodemographic characteristics, the risk of spurious findings is reduced in our analysis.

Norwegian survey data are used to investigate how the urban gradient in life satisfaction depends on age, sex, marital status, children, income, education level, immigrant status and self-assessed health of respondents. In the main analysis, urban scale is operationalized as a dichotomous variable equal to unity for the country's capital and largest city, Oslo, and zero for the rest of the country. Other measures of urban scale are considered in extensions.

Our results are quite supportive of Morrison's hypothesis. We find statistically significant effect of the interaction term between the indicator variable of Oslo and education level of respondents. An additional finding is that interaction terms with age are also statistically significant: young persons with tertiary education report higher levels of satisfaction in Oslo compared to the rest of the country.

The rest of the paper is organized as follows. In the next section, we present our theoretical framework and discuss reasons why sociodemographic characteristics could affect the urban gradient in subjective well-being. The third section presents the survey data sets. Results are presented in the fourth section. We verify that our main conclusions survive a number of robustness tests. In the last section, we summarize the conclusions, discuss limitations and suggest several avenues for future research.

Theory and literature

Theoretical framework

There is a large and growing research literature on subjective well-being spanning disciplines like economics, psychology, sociology, gerontology, geography, transportation research and ecological studies (Wang and Wang, 2016). Several scholars have promoted the usefulness of well-being measurements also for public policy (Diener et al. 2009, Helliwell 2021), but as the literature in the field has expanded, it has become clear that there exists a vagueness related to the terms used. Rather than getting closer to agreement on definitions, Veenhoven (2000) observes that the trend is divergence.

We make use of the fourfold classification of quality of life put forth by Veenhoven (2000), which distinguishes between life chances, outcomes, and internal and external qualities. The classification suggests that quality of life is subjective, related to an individual's perceptions of his/her life situation, and multi-dimensional (Shucksmith et al. 2009). The external qualities that affect quality of life include environmental factors, such as traits of the resident area. The point of departure of our analysis is that i) these traits vary between cities and towns/rural areas, ii) the traits' relative importance for quality of life depends on an individual's sociodemographic characteristics, and iii) quality of life can be measured by answers to questions about satisfaction with life. Hence, we hypothesize that reported life satisfaction varies between cities and towns/rural areas, and that these differences in life satisfaction depend on the respondent's age, sex, education level, etc.

City traits

Cities exhibit both negative and positive features as places of residence for households. Compared to towns and rural areas, cities have a wide selection of goods and services, low

transportation costs, a great variety of cultural amenities, and inhabitants with a diversity of backgrounds and skills (Glaeser et al. 2001; Glaeser and Gottlieb 2006). Also, cities can offer a range of educational services and promising career prospects. Although wages are higher in cities (Combes and Gobillion 2015), so are house prices and rents, which serve to depress purchasing power. Other negative traits of the urban environment include crime, inequality, ghettoes, pollution, noise and traffic congestion (Berry and Okulicz-Kozaryn 2009; Okulicz-Kozaryn 2015; Okulicz-Kozaryn and Mazelis 2018; Okulicz-Kozaryn and Valente 2018).

Preferences for city life

Several scholars argue that sociodemographic groups evaluate cities' positive and negative traits differently. Especially young, well-educated people with high income appreciate what cities have to offer (Clark et al. 2002; Florida 2017; Glaeser et al. 2001; Moos 2016; Okulicz-Kozaryn and Valente 2019). The existence of a wide range of amenities is important to persons with high income and education (Adamson et al. 2004; Florida 2017; Lee 2010). Young people particularly appreciate high quality educational services, and the large number of people with higher education in cities makes it easier to partner up with well-educated individuals (Compton and Pollack 2007; Siedentop et al. 2018).

Seniors appreciate peace, slow quietness, comfortable climate and beautiful nature, which are typically found in rural locations (Chen and Rosenthal 2008; Dorfmann and Mandich 2016; Jauhiainen 2009; Walters 2002). Health status could also affect the relative importance of city versus rural amenities. For a person in poor health, the calm life of the countryside may be more attractive than living in bustling cities. On the other hand, access to high quality specialist health services usually found in cities is more important to the elderly and people in poor health.

Several studies, surveyed by Leibert (2016), argue that men are generally more attracted to rural areas than women. Rural areas are characterized by traditionally male employment sectors and leisure activities. Moreover, some women may perceive rural communities to be intrusive and controlling (Haugen and Villa 2006).

Air quality is generally better in rural areas than urban areas (Centers for Disease Control and Prevention 2017). Children (including in womb) and elderly are most vulnerable to disease and death caused by air pollution, and disability-adjusted life years (DALYS) lost from pollution-related diseases are heavily concentrated among infants and young children (Forouzanfar et al. 2016; Landrigan et al. 2018).

Safety is especially important for families with children and the elderly (Fokkema et al. 1996; Glaeser 2020). Damm and Dustmann (2014) and Chyn (2018) find that children growing up in high-crime locations are more likely to commit crimes as adults. Families with high income have the resources to sort into urban neighborhoods with low crime rates, whereas this option is not available for low-income families.

The wage structure and high housing costs of cities favor well-educated people in the working age (Morrison 2020). Autor (2019) shows that the urban wage premium for low-skilled persons has fallen in the USA due to growing demand for high-skilled workers in the service sectors. Also in Norway is the return to skills higher in cities, and especially in Oslo (Carlsen et al. 2016). Thus, compared to low skilled workers, high-skilled workers have relatively higher purchasing power in cities. Retired people don’t benefit from a high wage level, and

consequently this group may prefer to settle in areas with lower costs of living (Conway and Houtenville 2003).

The high urban housing costs per square meter favor single persons with low space requirements. Couples, and especially families with children, demand more space, which creates an incentive to move towards towns and rural areas with moderate costs of living. On the other hand, families with children will be attracted to cities because of the quality and diversity of schools and leisure time activities.

Summary. In all sociodemographic groups there are people who prefer city life and people for whom rural amenities are most important. Nevertheless, our reading of the literature is that the positive traits of the urban environment are generally of higher value to young people, women, and well-educated people with high income, whereas the positive traits of rural environments are more important to older persons, men, and people with lower income and education level. For other personal characteristics, such as marital status, having children and health status, there seem to be arguments in both directions, some favoring cities and others giving towns/rural areas the upper hand.

Operationalization of urban scale

In the main analysis, we will compare the capital and largest city of Norway, Oslo, to the rest of the country. Oslo is not comparable in size to the largest metropolises of Europe but is considerable larger than other Norwegian cities. Whereas Oslo municipality had 697 000 inhabitants in 2021, the second and third largest municipalities (Bergen and Trondheim) had, respectively, 286 000 and 208 000 inhabitants. Most municipalities in Norway are small; the

median size is approximately 5 100, one fourth of the municipalities have less than 2 200 inhabitants, and one fourth more than 13 300 persons.

Oslo has many of the positive and negative attributes that are standard for large cities. The average income that is considerably higher than the country average, and the population share with higher education is the second highest in the country (Statistics Norway 2019a; 2019b). But there are also considerably inequalities within Oslo. The city has the highest population share of immigrants and a high share of households with low income (Normann 2009; Statistics Norway 2019d). Life expectancy varies by 6-7 years between the richest and poorest city districts (Berntsen 2013).

Oslo scores high on rankings of cultural amenities (Kommunal rapport 2018) and is ranked as a desirable place to visit (Lonely planet 2017). However, the city also displays the most severe traffic jam problems in Norway (Tomtom 2018), has a relatively high level of air pollution (Norwegian Institute of Public Health 2015), and has the highest number of criminal offences per capita (Statistics Norway 2019c).

Given Oslo's particular position in the city hierarchy of Norway, and the fact that Oslo shares many traits with large cities in developed countries, we have chosen to compare Oslo with the rest of the country to examine how the urban gradient in subjective well-being varies between sociodemographic groups. In the robustness analysis, we consider alternative measures of urban scale: population size of municipality and dummy variables for population size above certain thresholds.

Data

We use two different surveys that include a question about life satisfaction, the Survey of Living Conditions (EU-SILC), conducted annually by Statistics Norway, and a survey conducted each second or third year during the last decade by the Norwegian Government Agency for Administration and Financial Management (NGAAFM). EU-SILC includes the question about life satisfaction in three of the recent surveys[2], whereas the NGAAFM survey includes this question in every survey. Both surveys include information about the respondent's age, sex, education level, income, marital status, immigrant status and whether the respondent has children. EU-SILC also includes a question about self-assessed health. The analysis is based on the sample of respondents 20 years and older that answered the question about life satisfaction.

EU-SILC survey

EU-SILC is part of a collaborative effort organized by Eurostat and aims to provide statistics on income, living conditions, welfare and social inclusion. Statistics Norway collects the data by phone using computer assisted personal interviewing (CAPI) methods. The surveys are made available for researchers, and we use data for the waves in 2013, 2017 and 2018.[3] In these years the survey includes the following question on life satisfaction:

LifeSatisfaction1: "All in all, how satisfied are you with your life nowadays?"

[2] Four surveys ask about life satisfaction, but we omit the 2020 survey due to the pandemic.

[3] EU-SILC is a panel survey where individuals are present in maximum four consecutive years. For this reason, some individuals are present in both the 2017 and 2018 surveys. To handle this issue, we cluster standard errors on individuals.

Response alternatives were given as discrete numbers from 0 to 10, where 0 is ‘very dissatisfied’ and 10 is ‘very satisfied’.

In each wave, a representative sample of approximately 12,000 of the population 16 years or older was drawn from the population registry, of which about 200 were not eligible because of death, emigration, or residency at a public institution. In each wave, between 52 and 55% of the eligible sample responded. With the exception of family status, information on the respondents’ sociodemographic characteristics is gathered from administrative registers, which reduces loss of observations. Self-reported family situation, a categorical variable describing combinations of age, single/married/cohabitation and children, is used to generate married/cohabitation status and the presence of children in the household.

Of the respondents in the 2013, 2017 and 2018 surveys, 93.7, 85.9 and 90.4% answered the question about life satisfaction, respectively. We pool the surveys, producing altogether 18,187 person-year observations. We omit 1,023 respondents that are below the age of 20 or have missing information on income or family status, leaving 17,164 observations for the analysis.

NGAAFM survey

Since 2009, the NGAAFM has administrated five national surveys which included a question about life satisfaction. The question was:

LifeSatisfaction2: How satisfied or dissatisfied are you all in all with your life?

Respondents were asked to choose integers on a seven-point scale from 3 to -3, where -3 is 'very dissatisfied' and 3 is 'very satisfied'.

All surveys were drawn from random national registers with stratification on sex, age groups and county. The first three surveys (2009, 2012 and 2014) were postal surveys, whereas in 2017 and 2019, respondents were contacted mainly by e-mail. For the postal surveys, 30 000 questionnaires were mailed, whereas 40-45 000 respondents received e-mails in 2017 and 2019. The response rate was somewhat below 40% for the postal surveys and around 20% for the e-mail surveys. Pooling the surveys produces a total of 50,831 respondents. Dropping 1,549 persons below 20 leaves 49,302 respondents 20 years and older, of which 47,621 (96.6%) answered the question about life satisfaction.

Variable description

Summary statistics are presented in Table 1. We rescale answers to the question about life satisfaction in the NGAAFM survey to make the response scale identical to that of the EU-SILC survey, with 0 as least satisfied and 10 as most satisfied. We see that average life satisfaction is quite similar in the two surveys and higher outside Oslo in both surveys. The difference between Oslo and the rest of the country corresponds to, respectively, 14 % (EU-SILC) and 5 % (NGAAFM) of total sample standard deviation.

[Table 1 about here]

For some of the respondent characteristics, the surveys have identical definitions; for others, definitions are similar but not identical. In both surveys, marital status is taken from a question about whether the respondent is married or cohabitating. The questions about

children differ. In EU-SILC, presence of children means that the respondent lives together with a child 19 years or younger. In the NGAAFM survey, the respondent is asked to state whether he/she has a child below 18, independent of whether he/she actually lives with the child. Not surprisingly therefore, a higher share of respondents in the NGAAFM survey has children.

In EU-SILC, information about education level is taken from the national education registry. The respondent is considered to have tertiary education if he/she has completed one year of study after secondary education. In the NGAAFM survey, the variable is based on the answer to a question about the respondent's education level.

Household income is added to EU-SILC from the national income registry, whereas the respondent chooses between alternative income intervals in the NGAAFM survey. In the latter, we set household income equal to the mean of the lower and upper interval bounds except for the highest income category where there is no upper bound. In this interval, we set household income equal to the lower bound.[4]

We define the respondent to be an immigrant if he/she is born abroad. In EU-SILC, information about birth country is taken from the national population registry, whereas in the NGAAFM survey, information about birth country is given by the respondent.

[4] Income variables are price adjusted and expressed in 2019 NOK.

The EU-SILC survey contains a question about self-assessed health. We consider the respondent to be in bad health if reported health status is worse than 'good'. The NGAAFM survey does not include a question about self-assessed health.

In both surveys, the indicator variable, Oslo, is one if the respondent lives in the Oslo municipality. Commuting to Oslo takes place from surrounding municipalities, and some of Oslo's suburban areas are located in neighbor municipalities. As there is not information in the surveys about a respondent's resident neighborhood/district, we don't know if respondents in surrounding municipalities live in the suburban/commuting area of Oslo. The share of respondents living in Oslo municipality is close to the population mean in both surveys.

Results

Empirical specification

We estimate OLS regressions explaining life satisfaction as a function of a dummy variable equal to one if the respondent lives in the Oslo municipality, year fixed effects, sociodemographic characteristics of the respondent (age, male, marital status, children, tertiary education, income, immigrant status and, for EU-SILC, self-assessed health) and interaction terms between the Oslo dummy and sociodemographic variables:

$$Satisfaction_{it} = \alpha_t + \alpha_0 Oslo_{it} + \boldsymbol{Sociodemographics_{it}} \times Oslo_{it}\boldsymbol{\alpha} + \boldsymbol{Controls_{it}}\boldsymbol{\beta} + \epsilon_{it}$$

The parameter α_0 gives how satisfied person *i* in the reference category is with life in Oslo relative to the rest of the country in year *t*. The omitted categories of the sociodemographic variables define the reference category: 20 years old woman, native, without partner/husband

and children, without higher education, with average income and in good health. The parameter vector $\boldsymbol{\alpha}$ describes how life satisfaction in Oslo varies with sociodemographic characteristics. Controls include interaction terms between age (one-year intervals) and sex as well as the rest of the sociodemographic variables. α_t are year fixed effects, and ε_{it} is an error term assumed to have the standard properties.

For each survey data set, we present four regressions (Table 2). In the first regression, only the Oslo dummy and year effects are included. In the second regression, sociodemographic controls are added. In the third regression, we add all interaction terms between the Oslo dummy and the sociodemographic variables. In the last regression, statistically insignificant interaction terms are removed. For brevity, only coefficients of the Oslo dummy and the interaction terms are reported.

Baseline results

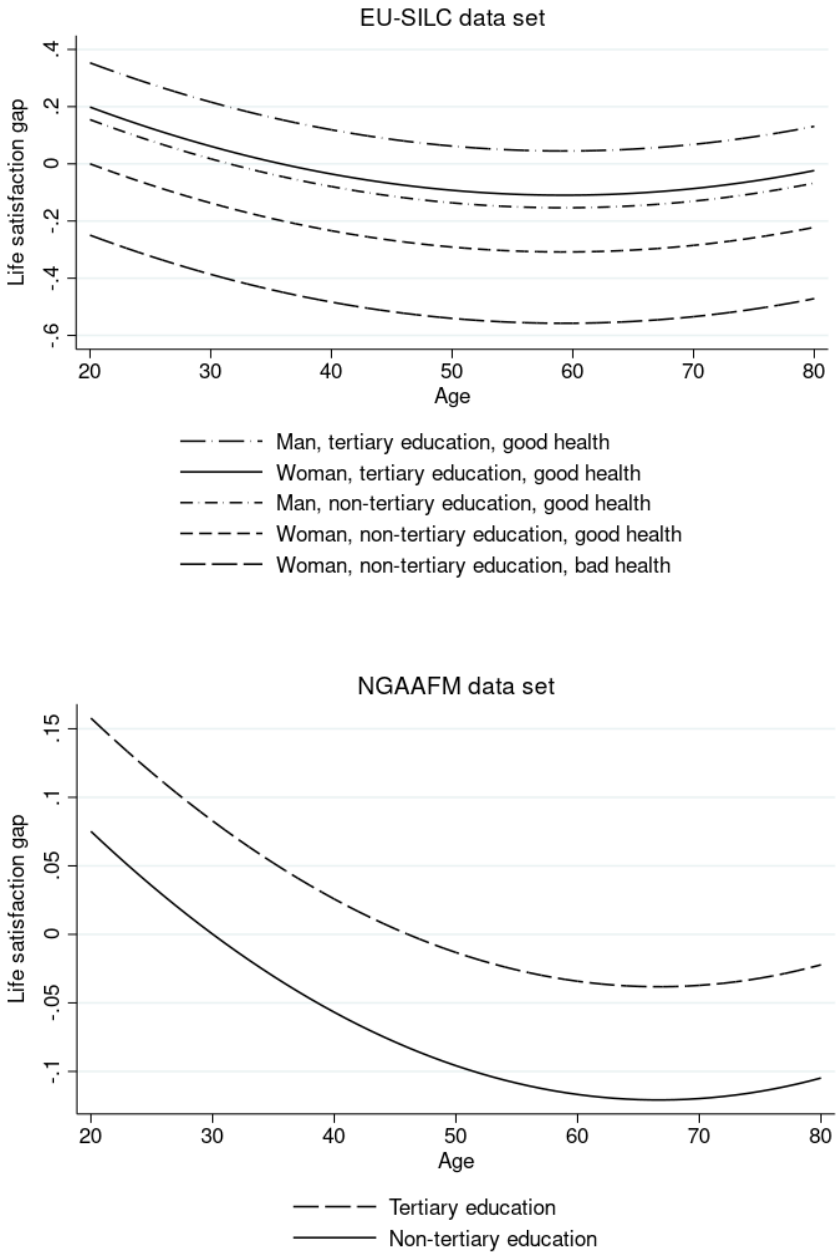
With only year effects, the coefficient of the Oslo dummy takes on negative sign in both surveys (columns one and five). For the EC-SILC survey, the coefficient is statistically significant and roughly equal to the difference in average life satisfaction between Oslo and the rest of the country. For the NGAAFM survey, the coefficient is insignificant and close to zero. Inclusion of controls reduces the Oslo effect by one third in EU-SILC data set (column two), but the coefficient is still significant. In the NGAAFM data set (column six), the coefficient remains close to zero and changes sign.

[Table 2 about here]

Interaction terms with age, gender, education and self-assessed health are statistically significant in the EU-SILC data set (column four), whereas interaction terms with age and education are significant in the NGAAFM survey (column eight). For both surveys, we find that satisfaction with life in Oslo relative to the rest of the country is decreasing in age (until the fifties or sixties) and higher for persons with tertiary education. For the EU-SILC survey, we also find that males are relatively more satisfied with life in Oslo, whereas people with bad health, other things equal, have lower life satisfaction in Oslo.

Figure 1 shows the relation between the difference in life satisfaction between Oslo and the rest of the country as a function of age for alternative sociodemographic categories, using the estimates of columns four and eight. The first panel depicts this relation for the EU-SILC. Women without tertiary education are always more satisfied with life when they don't live in Oslo, independent of age and self-assessed health. Women with tertiary education and in good health are more satisfied in Oslo until the late thirties and thereafter more satisfied outside Oslo. Men prefer Oslo longer than women. A man in good health without tertiary education will have higher life satisfaction in Oslo until about 30 years of age, whereas a man in good health with tertiary education always prefers Oslo.

[Figure 1, both panels, about here]



[Title: Estimated differences in life satisfaction between Oslo and elsewhere for various sociodemographic groups using (a) the Survey of Living Conditions (EU-SILC) dataset, and (b) the Norwegian Government Agency for Administration and Financial Management (NGAAFM) dataset]

The second panel of figure 1 depicts the relation for the NGAAFM survey. A person with tertiary education (both genders) is relatively more satisfied in Oslo until the forties, whereas

a person without tertiary education is more satisfied in Oslo approximately until the age of thirty.

Robustness analysis

To assess the robustness of our main conclusions, several robustness tests are carried out. We a) estimate an ordered probit model, b) consider alternative measures of urban scale, c) use weighing of respondents to account for non-response, d) use an alternative satisfaction variable, e) include a control for variation in response scale usage, and f) consider subsamples by respondent age.

Order probit. Since the dependent variable is discrete, it can be argued that an ordered probit model is appropriate. Table 3 presents ordered probit estimates for the specifications of columns four and eight of Table 2.

[Table 3 about here]

Comparison with Table 2 shows that all coefficients of the interaction terms have the same signs as in the OLS regressions. They also remain statistically significant with the exception of the coefficients of the interaction terms with age squared and bad health which become borderline insignificant in the EU-SILC data set.

Robustness tests b)-e) are carried out only on the NGAAFM data set since these tests require information about the resident municipality of all respondents. For the EU-SILC data set, we only know the resident municipality of respondents from Oslo, the reason being that, for

reasons of anonymity, resident county but not resident municipality is listed, and the Oslo county overlaps completely with the municipality of Oslo.

Urban scale. We consider three alternative operationalizations of urban scale. In the first column of Table 4, the Oslo dummy has been replaced with a dummy for municipality size above 200,000. This dummy is one for Oslo and Bergen municipality. In the third column, the dummy is one for municipalities with size bigger than 100,000. Six municipalities are covered by this dummy. In the fifth column, we use municipal population (scaled by 100,000) as measure of urban scale.

[Table 4 about here]

The interaction term with age has a negative and statistically significant coefficient in all three regressions whereas the effect of interaction with education level is positive and significant in two of the regressions.

In columns two, four and six, the three regressions are estimated without Oslo. We see that now none of the interaction terms are statistically significant, the only exception being the interaction with age in column four, which is significant at the 10 % level. Hence, the main conclusions seem to be driven by Oslo. Without Oslo, there are hardly any effects of interactions between with urban scale and sociodemographics. Hence, we do not find city effects on the relation between life satisfaction and sociodemographics for smaller cities than Oslo, suggesting that the baseline empirical specification, with the Oslo dummy as proxy for urban scale, is appropriate.

Weighting of observations. The survey samples are stratified to be representative of the Norwegian population. However, the response percentage will necessarily vary. We have repeated the regressions reported in Table 2 for the NGAAFM data set using, for each year, municipality population scaled by the number of respondents as weights. Then the total weight of respondents in a municipality will equal the municipality's overall population share. The results (not reported) are very similar to the results presented in Table 2, indicating that weighting does not affect any of the conclusions.

Place satisfaction. Some recent studies have estimated the effect of urban scale on place satisfaction (European Commission 2013, 2016; Weziak-Bialowolska 2016). It can be argued that place satisfaction better captures the effects of where you live on subjective well-being since respondents may choose to disregard personal circumstances unrelated to place of residence when assessing place satisfaction. To consider how age and education level affect place satisfaction in Oslo relative to the rest of the country, we use the NGAAFM survey, which includes a question about place satisfaction, as well as a survey data set collected by TNS Gallup during the nighties and first half of the two-thousands, which has two questions about place satisfaction. The TNS Gallup data set is described in the Online Appendix. The NGAAFM survey asked the following question:

PlaceSatisfaction1: All in all, how satisfied or dissatisfied are you with your municipality as a place to live?

The TNS Gallup survey asked the same question as well as another question about place satisfaction:

PlaceSatisfaction2: All in all, to what extent are you comfortable with living in your resident municipality?

Answers to the questions are scaled to make the response scale identical to that of life satisfaction. The first, second and fourth columns of Table 5 present OLS regressions explaining the place satisfaction variables as a function of the Oslo dummy, interactions of the Oslo dummy with age and tertiary education, year effects, and all socioeconomic controls.[5] The results parallel those of life satisfaction. For both place satisfaction variables, we find that satisfaction with Oslo relative to the rest of the country is decreasing in age. For PlaceSatisfaction1 in the NGAAFM data set and PlaceSatisfaction2, satisfaction with Oslo relative to other municipalities is increasing in education level, whereas for PlaceSatisfaction1 in the TNS Gallup data set, the interaction term with education level is positive, but small and insignificant.

[Table 5 about here]

Response scale usage. Analyses of subjective well-being are based on the assumption that respondents use the same response scale. If respondents in different geographical areas use the response scale differently, comparisons of subjective well-beings may be biased.[6] If, for instance, for a given level of subjective well-being, respondents in Oslo report a lower score than respondents in other municipalities, subjective well-being in the capital will be underestimated compared to the rest of the country.

[5] The interaction term with age squared is not statistically significant and therefore omitted.

[6] Psychological traits vary geographically and are correlated with reported subjective well-being (Diener et al. 1999; Rentflow et al. 2008).

The standard methods used to control for variation in response scale usage are repeated observations on individuals and vignette evaluations (King et al. 2004). Neither method is applicable here as our survey data sets consist of cross-sectional samples, and vignette questions are not included in either of the surveys. Therefore, we use an alternative method to calculate a proxy for individual response scale usage proposed by Carlsen and Johansen (2004). The proxy can be computed only for the TNS Gallup data set.[7] We calculate the proxy by subtracting the respondent's evaluation of the quality of the local climate from an objective measure of the climate in the municipality computed from meteorological data; details are given in the Online Appendix.

In columns three and five of Table 5, our proxy for response scale usage has been added to the specifications in columns two and four. For both place satisfaction variables, the coefficient of the proxy is positive as expected and highly significant.[8] However, the coefficients of the interaction terms are hardly affected, implying that the effects of sociodemographics on satisfaction with Oslo relative to the rest of the country cannot be explained by geographical variation in response scale usage.

[Table 6 about here]

[7] The TNS Gallup survey includes the question we use to calculate the response scale proxy whereas the EU-SILC and NGAAFM surveys do not. We therefore extend the analysis of place satisfaction to control for individual variations in response scale usage.

[8] People with a positive evaluation of the local climate, for given meteorological conditions, also express a positive evaluation of other local attributes, including scoring high on place satisfaction.

Subsamples by age. Burger et al (2020) allow explanatory variables of the urban-rural differential in subjective well-being to be moderated by age, arguing that factors forming preferences for city living of youth and young adults are not necessarily the same as those of elderly cohorts. We compared the estimated effect of education level on life satisfaction in Oslo for various subsamples of age and did not find systematic variation across subsamples. In Table 6, the specifications of columns four and eight of Table 2 are estimated for, respectively, respondents above 45 years of age and respondents aged 45 and lower. The results are mixed: for the EU-SILC data set, the coefficient of education level is somewhat higher for elderly cohorts, whereas the effect of education is stronger for young people in the NGAAFM data set. We have considered alternative cut-off points for age: the coefficient of education level is quite stable across age groups for EU-SILC, whereas the results for the NGAAFM data set depend on the selected cut-off point.

Discussion and conclusions

Our point of departure is the hypothesis, advanced by Morrison (2020), that the urban paradox – low average subjective well-being in many large cities – is due to heterogeneity: although well-educated inhabitants with high income generally enjoy life in big cities, their impact on average subjective well-being is dominated by numerically superior lower educated inhabitants that often have low income and low subjective well-being. Morrison's hypothesis can explain why the literature on subjective well-being -and urban scale has produced conflicting results (Wang and Wang 2016). If sociodemographic groups evaluate life in cities differently, the overall evaluation will depend on the composition of the city population. Results may also differ if the data sets used by researchers exhibit distinct sociodemographic compositions.

Our results are quite supportive of Morrison's hypothesis. People with tertiary education tend to have higher life satisfaction in Oslo, whereas people without tertiary education have higher life satisfaction in other municipalities. We also find that young people have generally higher life satisfaction in Oslo, whereas the elderly tend to have higher life satisfaction in the rest of the country. Thus, the young and well-educated are happier with life in Oslo than other socioeconomic groups. This conclusion holds for both surveys we employ and is robust with respect to estimation method, measure of subjective well-being (with one exception for tertiary education), weighting of observations and correction for response scale usage. Although income level does not have a separate impact on the difference in life satisfaction between Oslo and the rest of the country, well-educated Oslo inhabitants with high life satisfaction will generally be well-off as education and income levels are positively correlated.

In some analyses, we find that men are relatively more satisfied in Oslo than women (this result is contrary to the general belief held in the literature) and that people with bad health are relatively more satisfied in other parts of the country, but these results are not robust. We do not find any evidence of sociodemographic differences in preferences for city living when Oslo is excluded from the sample.

The main innovation of our paper relative to the received literature is that we use multivariable regression analysis to allow the effect of urban scale on subjective well-being to vary simultaneously with many personal characteristics of respondents. That is, we examine how one personal attribute, for instance education level, affects the urban gradient in subjective well-being for a given age, sex, family situation, income level, etc. This reduces the risk of finding spurious effects of sociodemographic variables on city preferences. For

example, we can establish that the well-educated prefer city life not because they tend to be younger than the less educated.

A limitation of our study is that we estimate associations rather than causal effects. If the population moves towards areas where life satisfaction is high, these areas will be more populated, creating a direction of causality from life satisfaction to population size. In the presence of such reverse causality, there is no straightforward interpretation of the estimated interaction effects between urban scale and sociodemographics on subjective well-being.

Another possible limitation is that the country we study, Norway, has no cities that are big at the world scale; Oslo is a medium-sized city, and the other Norwegian cities should probably be classified as small. However, as we have argued, relative to the rest of the country, Oslo exhibits several positive and negative traits that characterize big cities. Moreover, for the group of second biggest cities in Norway, we do not find that age, education level or other sociodemographic characteristics affect preferences for city living.

Our results show that in a rich country with a generous welfare state, like Norway, socioeconomic inequalities in subjective well-being are bigger in the capital/biggest city than in smaller cities, towns and the countryside. Our finding raises the question of whether this empirical pattern, possibly in a stronger version, can be found also in countries with lower overall income level and less generous welfare state. Thus, a natural extension of our study would be to examine how sociodemographics affect the urban gradient in subjective well-being in different types of countries. Studies tend to find that the urban paradox does not hold in developing countries, that is, subjective well-being is generally higher in large cities than elsewhere (Glaeser et al. 2016; Wang and Wang 2016). An interesting question is whether

this result is caused by particular sociodemographic groups, or whether virtually everybody is happier in large cities than elsewhere.

Our literature review presents several potential explanations why young and well-educated people have high subjective well-being in cities. To throw light on the reasons for preference differences in city living, we plan to examine how sociodemographics affect the urban gradient in domain satisfactions, that is, satisfaction with various areas of life, as well as how important distinct domain satisfactions are for overall subjective well-being. There seems to be a general lack of studies of sociodemographic differences both in inhabitants' perceptions of city traits and the traits' relative importance for subjective well-being. For instance, how do differences in perceptions of safety between big and small cities vary across age? Are perceptions of safety more important to the subjective well-being of the elderly than for young people?

Another avenue for future research concerns whether value differences between cities and other areas are more important for some sociodemographic groups. Morrison and Weckroth (2018) argue that self-enhancement values, such as power and achievement, held by many city inhabitants, contribute negatively to average subjective well-being in large cities. Outside large cities, people are more likely to hold self-transcendence values, like benevolence, which tend to be positively associated with subjective well-being. A possible explanation for our results is that the negative association between self-enhancement values and subjective well-being is weaker for the young and well-educated, for instance because elderly people and the less educated feel that they are not appreciated in an environment where achievements and positions in the social hierarchy are considered important.

Another possible extension of our study concerns variation within cities. Large cities are usually heterogenous; Helliwell et al. (2019) find that variation in life satisfaction within Canadian cities is considerably larger than the variation generally observed between cities. Preferences for living in core city may be affected by other sociodemographic characteristics than preferences for living in suburban areas. Sociodemographic variations in life satisfaction in cities can be due to segregation; young and educated people can be happy in large cities because they live in other neighborhoods than elderly people with lower education levels. Alternatively, the young and well-educated could be happier than other sociodemographic groups living in the same neighborhood. Several studies explore how subjective well-being is affected by neighborhood and local area characteristics, such as socioeconomic disadvantage and greenspace (Ala-Mantila et al. 2018; Ambrey and Fleming 2014; Bertram and Rehdanz 2015; Cao 2016). Morrison (2011) and Shields et al. (2009) also include perceptions of neighborhood characteristics as determinants of subjective well-being, but we are not aware of studies that examine how the effects of neighborhood characteristics on subjective well-being vary between sociodemographic groups.

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Declaration of interest statement

The authors declare that there is no conflict of interest.

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Data availability statement

The survey data are available under license from TNS Gallup, Statistics Norway and the Norwegian Government Agency for Administration and Financial Management. Contact the authors for access to Stata codes on model specifications.

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Table 1. Summary statistics

	LifeSatisfaction1 EU-SILC			LifeSatisfaction2 NGAAFM		
	Full sample	Oslo	Non-Oslo	Full sample	Oslo	Non-Oslo
Life satisfaction	7.98 (1.67)	7.78 (1.73)	8.01 (1.66)	8.19 (1.88)	8.11 (1.88)	8.21 (1.88)
	[0,10]	[0,10]	[0,10]	[0,10]	[0,10]	[0,10]
Age	49.9 (17.7)	45.13 (17.59)	50.64 (16.99)	51.3 (17.8)	47.1 (17.9)	51.9 (17.8)
	[20,97]	[20,97]	[20,97]	[20,101]	[20,98]	[20,101]
Male	0.52	0.48	0.52	0.49	0.46	0.49
Married	0.67	0.58	0.68	0.72	0.65	0.73
Children	0.31	0.26	0.32	0.39	0.38	0.39
Tertiary education	0.41	0.59	0.38	0.45	0.65	0.42
Income (10^5 2019 NOK)	5.97 (5.60)	6.35 (6.61)	5.91 (5.42)	6.62 (3.20)	6.97 (3.29)	6.56 (3.18)
	[0,184.65]	[0,141.94]	[0,184.65]	[1.5,12.03]	[1.5,12.03]	[1.5,12.03]
Immigrant	0.10	0.19	0.09	0.12	0.21	0.11
Bad health	0.23	0.20	0.23			
Oslo	0.13	1	0	0.13	1	0
N	17,164	2,301	14,863	47,621	6,242	41,379
Years	2013, 2017, 2018			2009, 2012, 2014, 2017, 2019		

The table displays means, standard deviations (in parentheses) and minimum and maximum (in brackets).
LifeSatisfaction1: All in all, how satisfied are you with your life nowadays?
LifeSatisfaction2: How satisfied or dissatisfied are you all in all with your life?

Table 2. Life satisfaction in Oslo for sociodemographic groups

Dependent variable:	LifeSatisfaction1				LifeSatisfaction2			
Data source:	EU-SILC				NGAAFM			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Oslo	-0.2301***	-0.1460***	-0.1287	-0.0930	-0.0189	0.0251	0.3290***	0.2074***
	(0.0426)	(0.0390)	(0.1218)	(0.1117)	(0.0256)	(0.0309)	(0.0933)	(0.0782)
Oslo x (age - 20)			-0.0167*	-0.0157**			-0.0197***	-0.0189***
			(0.0089)	(0.0077)			(0.0057)	(0.0053)
Oslo x (age - 20)^2			0.0002	0.0002*			0.0002**	0.00021**
			(0.0001)	(0.0001)			(0.0001)	(0.00008)
Oslo x male			0.1534*	0.1546**			-0.0055	
			(0.0778)	(0.0765)			(0.0510)	
Oslo x married			0.0601				-0.0684	
			(0.0912)				(0.0623)	
Oslo x children			-0.0021				-0.0041	
			(0.0963)				(0.0627)	
Oslo x tertiary education			0.2020**	0.1985**			0.1053*	0.1246**
			(0.0803)	(0.0799)			(0.0579)	(0.0552)
Oslo x (income - mean(income))			-0.0021				0.0077	
			(0.0076)				(0.0099)	
Oslo x immigrant			0.0503				-0.1074	
			(0.1109)				(0.0791)	
Oslo x bad health			-0.2458**	-0.2494**				
			(0.1149)	(0.1149)				
Year fixed effects	X	X	X	X	X	X	X	X
Age x Sex fixed effects		X	X	X		X	X	X
Sociodemographic controls		X	X	X		X	X	X
Observations	17,164				47,621			

R-squared	0.0032	0.1773	0.1788	0.1788	0.0299	0.0766	0.0773	0.0771
Adjusted R-squared	0.0030	0.1695	0.1705	0.1707	0.0266	0.0731	0.0736	0.0736

LifeSatisfaction1: All in all, how satisfied are you with your life nowadays?
LifeSatisfaction2: How satisfied or dissatisfied are you all in all with your life?
Sociodemographic controls include income and indicators for married, children, tertiary education and immigrant (and bad health in columns (2)-(4)).
Robust standard errors are in parentheses. In columns (1)-(4), these are clustered on respondents.
*** p<0.01, ** p<0.05, * p<0.1

Table 3. Robustness analysis: ordered probit

Dependent variable:	LifeSatisfaction1	LifeSatisfaction2
Data source:	EU-SILC	NGAAFM
	(1)	(2)
Oslo	-0.0959	0.0752*
	(0.0756)	(0.0439)
Oslo x (age - 20)	-0.0095*	-0.0084***
	(0.0052)	(0.0031)
Oslo x (age - 20)^2	0.00013	0.00009*
	(0.00009)	(0.00005)
Oslo x male	0.1211**	
	(0.0510)	
Oslo x tertiary education	0.1505***	0.0826**
	(0.0525)	(0.0317)
Oslo x bad health	-0.1057	
	(0.0656)	
Year fixed effects	X	X
Age x Sex fixed effects	X	X
Sociodemographic controls	X	X
Observations	17 164	47 621
Pseudo R-squared	0.0514	0.0296

LifeSatisfaction1: All in all, how satisfied are you with your life nowadays?
LifeSatisfaction2: How satisfied or dissatisfied are you all in all with your life?
Sociodemographic controls include income and indicators for married, children, tertiary education and immigrant (and bad health in column (1)).
Robust standard errors are in parentheses. In column (1), these are clustered on respondents.
*** p<0.01, ** p<0.05, * p<0.

Table 4. Robustness analysis: alternative urban scale variables

Population variable:	Population > 200,000	Population > 200,000	Population > 100,000	Population > 100,000	Population	Population
Sample:	Full	Oslo excluded	Full	Oslo excluded	Full	Oslo excluded
	(1)	(2)	(3)	(4)	(5)	(6)
Pop. Var.	-0,0956	0.0968	0.2092***	0.1700**	0.0375***	0.0469
	(0.0756)	(0.1177)	(0.0612)	(0.0772)	(0.0128)	(0.0406)
Pop. Var. x (age - 20)	-0.0097*	-0.0012	-0.0139***	-0.0084*	-0.0031***	-0.0020
	(0.0052)	(0.0078)	(0.0040)	(0.0051)	(0.0009)	(0.0027)
Pop. Var. x (age - 20)^2	0.00013	-0.00004	0.00013**	0.00005	0.00003**	0.0000006
	(0.00009)	(0.0001)	(0.00006)	(0.00008)	(0.00001)	(0.00004)
Pop. Var. x tertiary education	0.1522***	-0.1160	0.0381	-0.0248	0.0174**	-0.0151
	(0.0525)	(0.0759)	(0.0398)	(0.0504)	(0.0088)	(0.0260)
Year fixed effects	X	X	X	X	X	X
Age x Sex fixed effects	X	X	X	X	X	X
Sociodemographic controls	X	X	X	X	X	X
Observations	47,621	41,379	47,621	41,379	47,621	41,379
R-squared	0.0769	0.0759	0.0771	0.0762	0.0771	0.0760
Adjusted R-squared	0.0734	0.0719	0.0737	0.0722	0.0736	0.0720

Data: NGAAFM. Dependent variable: LifeSatisfaction2.
LifeSatisfaction2: How satisfied or dissatisfied are you all in all with your life?
In columns (1)-(4), the population variables are indicators of municipal population above 200,000 and 100,000 persons, respectively.
In columns (5)-(6), the population variable is municipal population in survey year, divided by 10^5, respectively.
Sociodemographic controls include income and indicators for married, children, tertiary education and immigrant.
Robust standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 5. Robustness analysis: place satisfaction and response scale

Dependent variable:	PlaceSatisfaction1			PlaceSatisfaction2	
Data source:	NGAAFM	TNS Gallup		TNS Gallup	
	(1)	(2)	(3)	(4)	(5)
Response scale usage control			0.2340***		0.2248***
			(0.0026)		(0.0028)
Oslo	0.0036	0.0265***	0.3145***	-0.0121	0.0342
	(0.0420)	(0.0626)	(0.0605)	(0.0666)	(0.0654)
Oslo x (age - 20)	-0.0044***	-0.0132***	-0.0133***	-0.0063***	-0.0063***
	(0.0009)	(0.0018)	(0.0017)	(0.0018)	(0.0017)
Oslo x tertiary education	0.1199***	0.0578	0.0068	0.2858***	0.2363***
	(0.0344)	(0.0537)	(0.0517)	(0.0566)	(0.0553)
Year fixed effects	X	X	X	X	X
Age x Sex fixed effects	X	X	X	X	X
Sociodemographic controls	X	X	X	X	X
N	45,052	130,596	130,596	130,368	130,368
R-squared	0.0339	0.0335	0.1012	0.0482	0.1049
Adjusted R-squared	0.0301	0.0316	0.0994	0.0464	0.1032

PlaceSatisfaction1: All in all, how satisfied or dissatisfied are you with your municipality as a place to live?
PlaceSatisfaction2: All in all, to what extent are you comfortable with living in your resident municipality?
Sociodemographic controls include income and indicators for married, children, tertiary education and immigrant.
Robust standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 6. Robustness analysis: life satisfaction for subsamples of age

Dependent variable:	LifeSatisfaction1		LifeSatisfaction2	
Data source:	EU-SILC		NGAAFM	
Age:	<=45	>45	<=45	>45
	(1)	(2)	(4)	(5)
Oslo	-0.0509	0.4440	0.1284	0.3135
	(0.1497)	(0.8487)	(0.1151)	(0.5095)
Oslo x (age - 20)	-0.0142	-0.0409	0.0026	-0.0180
	(0.0281)	(0.0397)	(0.0210)	(0.0230)
Oslo x (age - 20)^2	0.0002	0.0005	-0.0009	0.0002
	(0.0011)	(0.0004)	(0.0008)	(0.0003)
Oslo x tertiary education	0.1956*	0.2528**	0.1631*	0.0432
	(0.1094)	(0.1213)	(0.0913)	(0.0711)
Year fixed effects	X	X	X	X
Age x Sex fixed effects	X	X	X	X
Sociodemographic controls	X	X	X	X
N	7,206	9,958	18,863	28,758
R-squared	0.1704	0.1813	0.0773	0.0603
Adjusted R-squared	0.1760	0.1760	0.0738	0.0561

LifeSatisfaction1: All in all, how satisfied are you with your life nowadays?
LifeSatisfaction2: How satisfied or dissatisfied are you all in all with your life?
Sociodemographic controls include income and indicators for married, children, tertiary education and immigrant.
Robust standard errors are in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Appendix

A1. TNS Gallup survey

TNS Gallup conducted postal surveys annually from 1994 to 2000 and again in 2003 and 2005. Each year, thirty to forty thousand persons received the survey, and about 50% returned the questionnaire. We pool the surveys, producing altogether 158,230 respondents. We omit respondents below 20 years of age and respondents who did not answer the question about the local climate, leaving 130,596 respondents who reported PlaceSatisfaction1, and 130,368 who reported PlaceSatisfaction2.

A2. Measure of response scale usage

An objective measure of the local climate was created by the government commission that designed the present system for financing of Norwegian specialist health care (NOU 2008:2). Based on studies of geographic variation in consumption of specialist health services, the commission computed an index that runs from 0 to 1 where 0 denotes the 'worst' climate and 1 the 'best' climate.[9] The index assigns a unique value to each Norwegian municipality based on historical meteorological data (temperature by season, precipitation, and latitude).

[9] The climate index used by the Norwegian government assigns 1 to bad climate and 0 to good climate. We have inverted the scale.

The following question about the respondent's resident municipality was included in the TNS Gallup questionnaire:

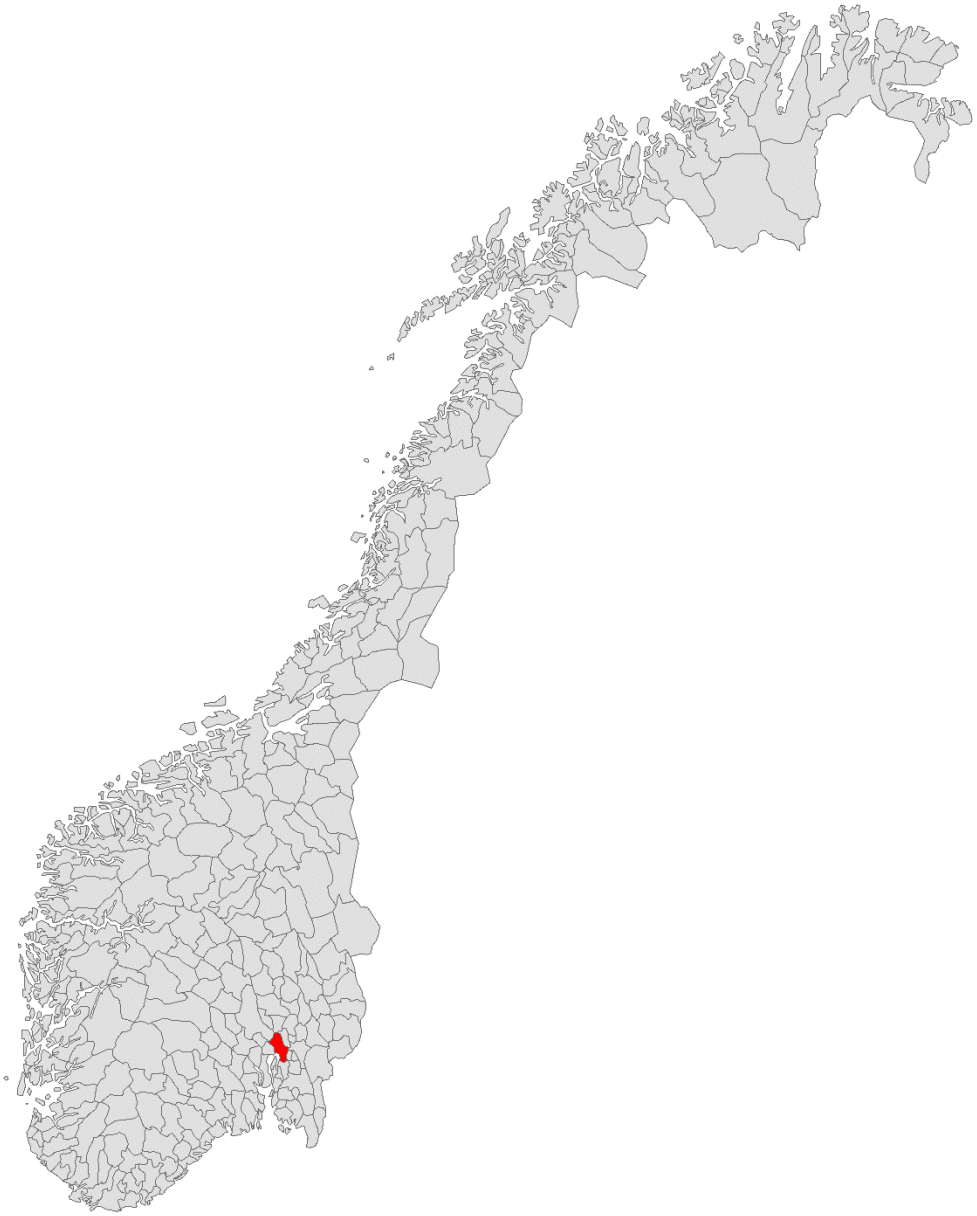
How satisfied/dissatisfied are you with the weather and climatic conditions?

Respondents were asked to indicate a discrete number from 1 to 6 where 6 corresponds to ‘very satisfied’ and 1 to ‘very dissatisfied’. We rescaled answers so that the variable runs from 0 to 10.

An OLS regression was fitted explaining subjective evaluation of the climate as a function of the climate indicator used by the Norwegian government. The coefficient is highly significant ($t \approx 153$) and large; going from the ‘worst’ to the ‘best’ climate increases respondents’ average evaluation by 7.79, that is, spans almost 80% of the response interval. The residual from this regression is our proxy for response scale usage.

Map of Norwegian municipalities

Figure A1. Municipality map showing location of Oslo



Source: ©Kartverket, 2020. www.kartverket.no
The map shows Norwegian municipalities with Oslo illustrated in red.

Appendix references

NOU 2008:2. Norges offentlige utredninger. Fordeling av inntekter mellom regionale helseforetak.