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Subjective Well-Being in a Spatial Context

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Chapter 6

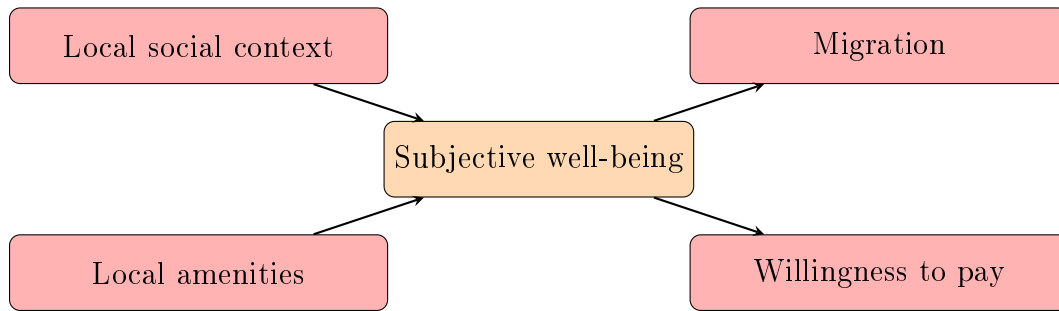
Conclusion and discussion

6.1 Introduction

Recent progress in economics has moved subjective well-being towards the centre of the discourse on economic policy and academic research (Stiglitz et al., 2008; OECD, 2011, 2016). Frey (2008) distinguish three avenues of progress: First, it has enabled a broadening conceptualization of development (Sen, 1987, 2000). Second, it has led to an increased diversity of measurements and metrics of development and progress, many of which include subjective data. Third, it has unlocked new concepts such as the valuation of processes, in addition to outcomes (Frey, 2004). Until recently, the spatial side of subjective well-being has remained under-exposed in the literature. This thesis aims to contribute to the literature on subjective well-being by placing a central focus on the spatial nature of these processes. We broadly contribute in three ways: first, we analyse which factors are associated with higher or lower subjective well-being within the region, using spatial data and spatial methods (left-hand side in figure 6.1); second, we investigate how spatial differences in subjective well-being are associated with the residential location decision (right-hand side of figure 6.1). Finally, we investigate what the spatial extent is of these processes: what is the spatial scale for which these processes are relevant and beyond which boundary these effects dissipate. The following section specifies the topics of the four empirical chapters in this thesis, and the choice of subject related to the main aims. In this thesis, each aim is addressed empirically focusing on one core aspect of the process involved.

This chapter proceeds as follows: In the following three sections, each of the research aims is addressed, drawing on the relevant empirical chapters. In the fourth section we put forward the conceptual implications from the empirical findings in this thesis, followed by implications for policies in section five. In the final section we discuss

Figure 6.1: Causes and consequences of subjective well-being



empirical considerations relating to this work, limitations, and set out a short research agenda.

6.2 Spatial determinants of subjective well-being

On the determinants of subjective well-being, this thesis addresses the role and scope of social context (chapter 2) and the availability of local amenities (chapter 3). Both ideas build on the argument by Graves (1980), and later Goetzke and Islam (2017) and Overman et al. (2010), that location specific factors may shift the quality of life experienced by the residents. Specifically, we investigate one social characteristic, relative income, and one relating to the spatial structure of the neighbourhood, access to amenities. Previous studies on relative income, comparison income, or the peer-effect (Diener et al., 1993; Clark and Oswald, 1996; Luttmer, 2005; Clark et al., 2008) have shown that an individual's absolute income may be less important than the income they receive relative to a reference group. A number of different specifications of this reference group exist, some using social comparisons (Clark and Oswald, 1996), self-reported aspirations (Ma et al., 2018), and regional (Diener et al., 1993) or national (Clark et al., 2008). We argue that observability of a person's relative income is a key factor in the functioning of this mechanism, meaning this process is predominantly spatial (local), rather than regional.

Similarly, access to amenities is widely considered to shift residential preferences (Graves and Mueser, 1993; Overman et al., 2010), to the extent that Partridge (2010, p. 518) defines amenities as "anything that shifts the household willingness to locate in a particular location", from an equilibrium determined by the labour market. These factors may include anything from climate (Graves, 1980) and natural areas (Daams et al., 2016), to bohemian milieus (Florida, 2002). One set of factors that is of particular interest is access to both public and commercial facilities in regions facing population decline (Haartsen and Venhorst, 2010). The interaction between facility closures and

population decline may lead to a reinforcing mechanism, a downward spiral, signalling the end of the village. More recently, a number of studies have shown that this does not necessarily happen (see Barakat, 2015, for an overview). One thing that may contribute to discrepancies in these outcomes is the highly local nature of population decline (Franklin and van Leeuwen, 2018). Generally, even in regions or municipalities experiencing population decline, core villages may continue to grow. If population decline across the region is not uniform, the effects associated with population decline may also be heterogeneous. We argue that using subjective well-being as a measure of experienced utility, and analyses aimed at uncovering any heterogeneity in outcomes, will provide further insight into the importance of access to facilities.

Main findings

A person's social position within a neighbourhood is a key determinant of subjective well-being. Contrary to popular belief, neither levels nor changes in access to facilities correspond to an individual's subjective well-being. Of the facilities studied in this thesis, only hospitality returned a positive association between accessibility and subjective well-being, although some caution is required as the significance of the association was sensitive to the specification of the accessibility measure. The effects found are significantly heterogeneous between both individuals (regarding the peer effect) and places (regarding the accessibility models): there is no one size fits all (or everywhere) model of what contributes to subjective well-being. The following sections outline the findings in more detail.

Social status and subjective well-being

An individual's income relative to that of their immediate neighbours is significantly associated with individual subjective well-being outcomes (chapter 2). Our findings are a refinement of the previous work done by Luttmer (2005) and Diener et al. (1993), who use administrative regions to show the importance of relative income as a part of utility. Similarly, McBride (2001) and Clark et al. (2002) use social constructions of the peer-effect (e.g. age or education) in the explanation of the Easterlin (1974) paradox. Similarly, McBride (2001) uses sub-national relative incomes as a reference point and finds that there are significant negative externalities to living in a higher income neighbourhood. The general idea of the peer-effect is that, for any given individual income level, if a person is surrounded by more affluent people their subjective well-being will be lower, as their evaluation of their own income will be more negative (Luttmer, 2005). Conversely, if that person lives in a neighbourhood with relatively low incomes, their

evaluation of their own station in life will be more positive.

Critically, the peer-effect is not symmetric for all individual incomes. By decomposing relative income using the Local Moran's I the results are split between both those earning lower or higher than the population average, and living in lower or higher income neighbourhoods, compared to the study region average. We control for individual income, and compare to individuals in neighbourhoods with no particular concentration of income. Individuals with above average incomes living in above average neighbourhoods report lower subjective well-being, and if they live in below average neighbourhoods they report higher subjective well-being. This is in line with the relative income literature. However, individuals with below average incomes living in neighbourhoods with lower incomes report lower subjective well-being. This shows that the relative income effect does not apply uniformly along the income distribution, suggesting the peer-effect theory is incomplete.

Quality of living environment and subjective well-being

For access to services, an aspect thought to be of some importance particularly in rural areas (Barakat, 2015), there is no association with subjective well-being (chapter 3). Theoretically, higher access to services should, *ceteris paribus*, result in higher individual utility (Cheshire and Sheppard, 2004b; Song and Sohn, 2007). Empirical findings are consistent with the idea that environmental externalities are valued by residents, with researchers finding positive associations with quality of the living environment and house prices (Daams et al., 2016), quality of school districts and house prices (Cheshire and Sheppard, 2004a), and people are willing to accept lower wages in regions with higher environmental quality (Oswald and Wu, 2011). Knowing that higher quality neighbourhoods are capitalized in rents or income, however, means that the overall effect on subjective well-being in the long run may well be neutral (Ballas and Tranmer, 2012). Short term differences are, however, critically important for the future development prospects of regions facing population decline (Haartsen and Venhorst, 2010). Very little is known about how regional development responds to decline as opposed to growth (Franklin and van Leeuwen, 2018), but service and facility accessibility are expected to play an important role (Barakat, 2015; Elshof et al., 2014). Declining quality of life as a result of lower accessibility is expected to affect migration, which in turn affects local markets and the viability of establishments, which in turn affects the quality of life.

The expected association between levels of accessibility and subjective well-being is, generally speaking, absent. We evaluate four types of services commonly reviewed in the literature (access to schools, access to general practitioners, access to retail,

and access to hospitality) and find no reliable effect on subjective well-being. This is in line with previous findings such as Ballas and Tranmer (2012), who find little to no regional variation in subjective well-being. Goetzke and Islam (2017) find that when regional differences in subjective well-being do occur, they are quickly capitalized into wages and rents. Residential preferences are heterogeneous across space (Bijker and Haartsen, 2012; Niedomysl, 2011), and findings from Chile show that the rate at which regional differences in amenities are capitalized in wages or rents varies across space (Sarrias, 2019). Chapter 3 contributes to this debate in two ways: first, modelling changes in service accessibility against subjective well-being captures site-specific shocks, while allowing the valuation of accessibility to vary across the study area captures regional differences in preferences for proximity to services (Comber et al., 2012; Sarrias, 2019). The diagnostics of the geographically weighted regressions reveal spatial heterogeneity in the association between determinants of subjective well-being and the outcome across the study region. Focusing on the accessibility measures shows that, in general, there is very little evidence of an association between changes in services and subjective well-being, and no evidence of this association varying across space. For hospitality services a positive association between accessibility and subjective well-being is uncovered, if accessibility is measured as the distance to nearest establishment. The positive association is appears only in regions experiencing population decline. This may indicate a link between hospitality services as social meeting places in declining regions.

6.3 Subjective well-being and residential locations

The duelling models of amenity migration versus labour market migration appear to be complementary, rather than exclusive. Chapter 4 is situated in the debate on the importance of amenities as drivers of migration (Graves and Mueser, 1993; Partridge, 2010), and the labour market (Storper and Scott, 2009). We take both insights, and argue that different regions may be subject to different drivers of migration. The existing empirical literature on the main drivers of migration uses a number of different regional specifications, ranging from census regions to smaller rural-urban settings. From the literature on stated preferences for residential locations we know that the factors that matter are heterogeneous between people and life-course stages (Bijker et al., 2013) and different regions (Niedomysl, 2011; Bijker, 2013). Longer-distance moves are typically associated with labour market conditions, whereas local moves involve residential quality. The discrepancy between the equilibrium (amenity focused)

model of migration, and the disequilibrium (labour market) model of migration may result from the spatial units under consideration (Openshaw, 1984): smaller regional units may favour outcomes related to amenity migration, whereas larger regional units will emphasise the labour market. We allow the degree to which each factor determines migration to vary across our study region.

In chapter 5 we extend the argument made by Goetzke and Islam (2017), associating migration to inter-regional differences in subjective well-being, to house prices in a local context. Higher local subjective well-being implies a location-specific shift in favourable residential characteristics, which should lead to local differences in the price paid for housing. In a standard hedonic framework, property characteristics and neighbourhood characteristics are included in the estimation (Sheppard, 1999). One issue with the estimation of hedonic models is that imperfect observability of the characteristics may lead to demand that can not be explained (Bajari and Benkard, 2005). Perfect observability is a difficult requirement to satisfy, as there may be substantial heterogeneity in housing preferences across the life course, and in different periods. We propose the use of subjective well-being as a flexible proxy for unobserved characteristics. By modelling both the direct and indirect effects of subjective well-being on the hedonic price we are able to separate property specific and neighbourhood specific shifts in the experienced utility.

Main findings

The main takeaway is that local quality of life is plausibly associated with individuals' residential choices, both in terms of migration and transaction prices paid. For property prices, both individual differences in subjective well-being as well as happier neighbourhoods translate into higher property prices, reflecting a willingness to pay on a very local level for unobserved quality of the neighbourhood. In terms of migration, we show that the association between the quality of the residential environment and migration varies across space: Some regions will be more attractive because of the quality of life on offer, whereas others are more attractive because of labour market growth. The following sections examine the results in more detail.

Migration for residential quality or jobs

A recent academic argument on the main causes of migration pitched regional quality of life against factors relating to the labour market (Partridge, 2010). In chapter 4, we show that the discussion is less about which factor is more important, and more about which factor matters more *where*. Conventionally, migration is a labour mar-

ket equilibrium restoring process, which takes the expected returns to labour in the home region, and compares it to the expected returns to labour elsewhere (Storper and Scott, 2009). Over the twentieth century, the degree to which this model explained interregional migration decreased (in developed nations) as residents placed increasing emphasis on the quality of their living environment (Clark et al., 2002). In chapter 4 we note that studies into either cause tend to focus on different subsets of regions: labour market migration tends to be studied from the perspective of urban regions (i.e. competitive cities, functional labour markets) or large scale metropolitan statistical units (c.f. Crozet, 2004), whereas studies explaining regional development through quality of life tend to focus on rural regions (c.f. Stockdale, 2006) or amenity-rich neighbourhoods. The choice of region, or regional specification, is critical when studying these patterns, as migration motives and destination-selection are heterogeneous across space. People sort into regions that best fit their preferences (Tiebout, 1956), leading to two problems with regional migration models. First, comparing a subset of regions may skew the results towards either labour market or residential quality as the predominant explanation. Second, aggregating spatial data to larger regions (for example as a consequence of data availability) and estimating global regression models can affect the results found (as a consequence of the modifiable area unit problem Openshaw, 1984). For this chapter we use a domain-specific measure of quality of life, similar to Comber et al. (2012), who use a domain specific measure (satisfaction with proximity to services) to find effects of service accessibility. We use self-reported residential quality as the right hand side variable, rather than overall subjective well-being. Overall subjective well-being includes an individual's position in the labour market, evidenced by the associations with income and unemployment, meaning it would not be possible to separate the effect of the labour market and that of residential quality.

In chapter 4 we take a country-wide approach and allow the influence of amenities and labour market growth on in-migration to vary across the study region. We find that for some regions, e.g. the metropolitan Randstad region, in-migration is associated with both labour market growth and residential quality. Away from the Randstad, we find that in the region around the Veluwe National Park in-migration is positively associated with residential quality, and not with labour market growth. A number of model specifications were run to provide some context to these results. First, we include urbanity in the model showing that neither labour market nor amenity migration capture the attraction urban regions have in the process of migration (over and above the presence of universities, which were also controlled for). Second, a control for the metropolitan Randstad region was included to assess whether the inclusion of larger urban conglomerates improved model estimation, which was not the case. The results

indicate that the pull-factors for migration are not the same across space. Depending on where we look, the determinants of migration may be very different: For some regions, migration is a function of the quality of the living environment, while for others labour market considerations are the dominant factor. These results may explain why the literature is divided on disequilibrium and equilibrium migration, and has obvious policy implications for regions aiming to attract new residents.

Willingness to pay for happy living

In chapter 5 we show, using a hedonic price model, that happy regions translate into higher property prices. Both individual subjective well-being and neighbourhood subjective well-being are positively associated with the property's transaction price. The conventional way of modelling residential property prices is by using hedonic price models (Rosen, 1974). The hedonic model allows the researcher to pick apart the price paid for a house into the price paid for each characteristic of a house. This means a pecuniary value can be attributed to floorspace, plot size, quality of maintenance and so on. Decomposition of residential property prices is, however, problematic, especially with respect to unobserved or unobservable variables (Sheppard, 1999). Unobservable characteristics are those that can not be measured (reliably) at all, such as curb appeal or neighbourhood quality. Unobserved variables are those that could, technically, be measured, but are generally not recorded. Interior floor plans (e.g. a modern kitchen island) can affect the price paid, and could technically be recorded into property data, but are usually not available. One reason for their unavailability is the cost of collecting such specific data. A more fundamental problem with the availability of these types of data is that they may be subject to trends and fashion, meaning *ex ante* it is not possible to anticipate all relevant characteristics.

We argue that subjective well-being may serve as a useful proxy for these types of characteristics. Previous research has shown that improving the quality of a house can lead to higher subjective well-being (Cattaneo et al., 2009), while (Goetzke and Islam, 2017) use the idea that site-specific characteristics can affect regional subjective well-being. In our study we estimate a hedonic price model using subjective well-being as a proxy for unobserved utility derived from the house and the neighbourhood, while accounting for a large set of property and neighbourhood characteristics. As subjective well-being might be endogenous to the price paid, we use novel spatial econometric techniques (Kelejian and Prucha, 2010) to enable an instrumental variables estimate of individual subjective well-being, instrumented through self-assessed health. The results show that individual subjective well-being is positively associated with the transaction

price paid, with a one *per cent* increase in subjective well-being corresponding to a 0.18 *per cent* increase in the property transaction price. When the spatial lag of subjective well-being is included in the model, the association for the individual subjective well-being decreases to 0.09 *per cent*, while a one *per cent* increase in neighbourhood well-being relates to a 0.10 *per cent* higher house price. The results in chapter 5 confirm that higher subjective well-being is capitalized into property prices, and that this effect is relevant for both the individual property as well as the neighbourhood. Buyers have a higher willingness to pay to move to happier places, and sellers require more compensation to leave these happy places: happy communities have a monetary value.

6.4 The spatial extent of processes related to subjective well-being

Finally, this thesis aims to provide some insight into the spatial nature of the processes considered in each of the chapters. Very few analyses have incorporated local data as part of happiness research, and as a consequence, little is known about the appropriate scale of analysis (Ballas, 2013). One notable exception is the "Mappiness" project, which collected data on individuals' happiness using a smartphone based app (MacKerron and Mourato, 2013). The general gap in the literature is understandable as the availability of large scale data on subjective well-being has lagged behind the increased interest (Frey, 2008). More generally, survey data tend to be aggregated to regions to preserve the anonymity of respondents, preventing local analysis. However, given the hyper-local nature of the experienced neighbourhood (Gans, 2017; Campbell et al., 2009), the spatial scale that is relevant for residential location decisions and residential quality of life may be very small. Where possible across the empirical chapters in this thesis, explicit attention is given to the spatial scale of the processes under consideration.

Main findings

Different processes relating to subjective well-being take place over different spatial scales. As a consequence, the appropriate spatial scale in the analyses is dependent on which processes are studied. Although there is no one size fits all guidance (e.g. smaller is better), prior knowledge of the extent of the spatial processes under consideration prove to be a good starting point for determination of the appropriate scales. For the association between socio-economic status and subjective well-being, contingent on

the experienced neighbourhood, we find indications that the peer-effect is indeed most relevant for smaller spatial scales. This can also be argued to result from a requirement of observability: those living further away will not be part of an individual's observed relative social status. For amenity migration and the subjective well-being related to proximity to amenities, the models are better for larger spatial scales, although still sub-national. For migration models this makes sense: functional labour markets are extensive (Hoogstra et al., 2017), meaning individuals will have a relatively large search-radius when considering higher quality amenities as well. The following section deals with the results in more detail.

Empirical relevance of spatial scale

In this section we discuss some considerations regarding the spatial scales that matter for subjective well-being. The final aim of this thesis was to provide insight into the spatial scales that were relevant for the processes involving subjective well-being. The results in the empirical chapter show that it depends on the question asked. One common thread throughout the four empirical chapters is that the processes modelled contain substantially more heterogeneity than conventionally modelled. Chapter 2 models the effect of neighbourhood comparison income on subjective well-being. This question hinges on the observability of neighbourhood incomes. In the existing literature, the reference group chosen is generally constrained by data availability, e.g. countries, or large scale sub-national regions, metropolitan statistical units. The results in chapter 2 show that these regional definitions are not fine-grained enough to capture the true heterogeneity of the process studied. Even in our study using individual locations, the numbers of available cases restrict estimation lower than 100 nearest neighbours, meaning the number given is an upper estimate. Chapter 3 models the association between accessibility of services. The effect of proximity to services on satisfaction with service provision is known to be heterogeneous along the distance to the nearest service (Song and Sohn, 2007) and across space (Comber et al., 2012). In chapter 3 we find that accessibility is not associated with overall subjective well-being. The results do indicate that the association between the control variables and subjective well-being is heterogeneous across space. This was previously shown by Sarrias (2019) for regionally aggregated data. The results in chapter 3 show that for these models, contrary to chapter 2, smaller did not equal better, meaning the optimum is between hyper-local and global (computation limitations meant a precise estimate is not available). Finally, regarding the question addressed in chapter 4, whether in-migration is associated with the labour market or with residential quality, the best fit model was at 53 nearest

municipalities, with closer neighbours weighing more heavily in the models. The model performance for global coefficients, even with an inverse distance weighting scheme, was substantially worse than all of the smaller region models. Finally, in chapter 5 the neighbourhood bandwidth was defined as 1 kilometre, with different bandwidths (up to 5 kilometres) returning similar estimates (due to the particular regression estimation used a direct comparison of bandwidth size was not possible).

6.5 Conceptual implications and discussion

In this section we draw on the results in the previous section and put forward some theoretical implications. We start from the point of view of the role of place in processes involving subjective well-being, followed by a short section on the findings relating to the measurement of subjective well-being and its processes. We conclude with a short research agenda.

6.5.1 Do places matter?

The literature on regional subjective well-being predominantly features results that suggest that subjective well-being differences between places are negligible or non-existent (Goetzke and Islam, 2017; Ballas and Tranmer, 2012): The characteristics of the individual are what determine the overall quality of a person's life. One tempting implication of this may be that places are largely irrelevant in this process. Our results show that places are important for both the determination of individual subjective well-being, as well as the outcome of individual behaviour. Subjective well-being is an outcome measure, asking individuals to evaluate all aspects of their lives simultaneously (Veneri and Murtin, 2019). In the Graves (1980) model of migration, part of the functional mechanism of migration in equilibrium is the heterogeneity in what characteristics of place are desirable to different people. This heterogeneity guides the spatial sorting of people, allowing people to find an optimal residential location based on their preferences (Bijker and Haartsen, 2012) and budget constraint (Sheppard, 1999). Until now, very little quantitative research has been undertaken to account for this heterogeneity. The main exception to this is the study by Sarrias (2019) in Chile, which allows for heterogeneity in determinants by region.

We extend the idea of regional variations in determinants of subjective well-being to include local heterogeneity. From a qualitative perspective, Bijker et al. (2013) show that different people sort into different areas as a consequence of migration motives that can be highly idiosyncratic. This characteristic means investigation using more

generalizable quantitative methods is difficult. Proximity to family and proximity to friends, for instance, are not motives that are easy to generalize, and are unlikely to lead to the determination of a single solution to a utility-equilibrium. This conclusion is entirely in line with the Graves (1980) model of migration, and the amenity-led literature on economic growth (Partridge, 2010; Clark et al., 2002). The idiosyncratic reasons for moving to a certain location are generally summarized into two categories: the labour market and not the labour market (Partridge, 2010). This thesis tests simultaneously the degree to which each group of factors contributes to migration and find that this differs from place to place. Where we measure, and how we construct our spatial units, can influence if the category "not the labour market" matters in terms of migration. Moreover, we show that there may be substantial spatial heterogeneity regarding which factors actually constitute the category "not-the-labour-market": Both for people and for places, what contributes to a higher quality of life is very heterogeneous.

6.5.2 Interacting people and places

We can extend the spatial heterogeneity in the determinants of subjective well-being one step further. We show that individual characteristics, interacting with the characteristics of the place of residence, affect the individual's subjective well-being. The argument here is that a more flexible interactive agent perspective is warranted when studying the causes of subjective well-being (c.f. Anselin, 2010), rather than viewing the outcome of subjective well-being as a factor of individual characteristics, spatial characteristics, and stochastic disturbances. We explicitly model the effect of a person's absolute socio-economic position, and interact this with their position in the neighbourhood, and find that whether or not this affects a person's subjective well-being is contingent on the individual's characteristics. Overall, we show that the theoretical peer-effect model of subjective well-being is incomplete. In the following section we show where the discrepancies are and propose a solution to the problem based on externalities contingent on individual characteristics.

In the expected peer effect, the outcome of subjective well-being is negatively related with neighbourhood incomes: richer neighbours lead to lower relative positions. Contrary to this prediction, we find a lower subjective well-being for lower income individuals in less affluent neighbourhoods, and no negative effects of living in more affluent neighbourhoods. We find that, for lower income individuals, rather than an increasingly negative peer effect as incomes in the reference group rise, we find a negative effect in low-income neighbourhoods, and no effect beyond.

One promising solution may be that the local externalities overshadow the compar-

ison effect for lower income individuals. Previous work has shown there is a willingness to pay for access to higher quality neighbourhoods (Cheshire and Sheppard, 2004b), which would result in higher income individuals concentrating around these higher quality neighbourhoods, and vice versa. Lower income individuals will, as a consequence, cluster in lower quality neighbourhoods. The associated dis-utility may explain the discrepancy between the observed and expected effects for low income residents, as high income individuals appear not to be affected by this. There is some evidence in the literature to support this line of reasoning. Suminski et al. (2012) show that public spending on parks is higher in high income neighbourhoods, and Cattaneo et al. (2009) show that increasing residential quality through public spending has a positive effect on residents' subjective well-being. Rostila et al. (2012) find that spending on social goods mediates the negative effects of inequality on health (see Wilkinson and Pickett, 2009, for an overview), arguing that social goods mainly benefit low income individuals.

A second possible explanation is that low income individuals do not assess their relative position in life based on relative income. Rojas (2008) argue that evaluating what a good life is from the basis of solely financial indicators is too narrow. The degree to which changes in the financial situation translate into higher subjective well-being is not the same at the lower and higher ends of the income scale. The same argument is made by Kingdon and Knight (2006), arguing for a more inclusive, and perhaps capability-based, approach to assessing quality of life in poverty. Both outcomes suggest that the individual's financial situation may be valued differently by low income individuals. This has important implications, in particular in terms of behavioural economics and nudging of welfare recipients, as financial utility based arguments may be less effective. Finally, Tay and Diener (2011) show that an individual's failure to fulfil universal needs (e.g. Maslow's hierarchy of needs) is negatively associated with subjective well-being. Taking the hierarchical approach, if an individual is struggling to fulfil basic needs, social comparisons and respect, which are higher up in the hierarchy of needs, may not factor into a person's life evaluation: the more pressing matters take precedence. The implication from the empirical work in this thesis is that neither the local externalities, peer-group comparisons, nor the individual characteristics on their own are sufficient to explain neighbourhood effects on subjective well-being.

We show that happier individuals as well as happier neighbourhoods are associated with higher transaction prices. Combining this finding with the findings in chapter 2, it appears that inequality is detrimental to individual property prices. Concentrations of low incomes have a negative effect on average neighbourhood subjective well-being, meaning lower prices for residential property. The same is true for concentrations of higher incomes, compared to more mixed neighbourhoods. One caveat is that the

observations in our data are cross-sectional and can therefore not capture changes over time. An important future development of this research would be to assess the reciprocal associations between moving to neighbourhoods of different socio-economic status, and the associated transaction prices paid and received.

Returning to the question posed in this section; do places matter? The evidence we present suggests that it is the interaction between the individual and the local environment that matters for individual subjective well-being. The outcome measure of subjective well-being appears to conform to a regional equilibrium, but this even outcome hides substantial heterogeneity. These present clear avenues for future research, with a focus on the individual-environment interaction, as well as a spatial decomposition of the process under consideration.

6.6 Policy implications

In this thesis, we have studied both the factors determining regional differences in subjective well-being and quality of life, and behavioural responses associated with those differences. Local and national policy-makers currently pay considerable attention to the measurement of regional development through subjective well-being and policies aimed at improving those statistics. These topics are especially relevant for those working in regions facing population decline (Haartsen and Venhorst, 2010) or other economic decline (Franklin and van Leeuwen, 2018). Chapter 5 suggests that there are good reasons for doing so. Higher individual and regional subjective well-being corresponds to higher willingness to pay for living in a certain neighbourhood, while chapter 2 emphasises the impact that inequality may have on subjective well-being. Aside from the immediate impact of preferable living circumstances, improving subjective well-being may return a monetary value as well, through property taxation and sorting of higher income households. The results in this thesis provide further insight into how subjective well-being may function in a policy context.

From a theoretical perspective, regional subjective well-being equilibrates to a state where only individual and household characteristics determine subjective well-being (Tiebout, 1956; Ballas, 2013). In chapter 5 we demonstrate that this process functions similarly in the North of the Netherlands, with regions with higher subjective well-being commanding higher residential property prices. Investing in site-specific characteristics that improve subjective well-being are, therefore, likely to trigger a migration response, capitalizing the added benefit into the hedonic price of properties (Cheshire and Shepard, 2004a), resulting in a return to equilibrium. Regional subjective well-being may

have gone up in the process, but only as a function of the higher income new residents. Similarly chapter 2 demonstrates that the relative income effect, identified by Easterlin (1974), Dolan et al. (2008), and Luttmer (2005) is present in the North of the Netherlands as well. Concentrations of higher income households produce a negative externality for high income residents. Similarly, concentrations of lower income households produce a negative externality for low income residents. These findings suggest that reducing interregional income inequality, e.g. mixing high and low income housing, will result in a positive effect on the level of subjective well-being. Limiting the migratory response and capitalization of increased subjective well-being will need to be a key component of the mixing policy.

In terms of the migratory response, improvements to residential quality, such as the availability of shops and schools, are commonly proposed as an instrument for attracting new households to regions facing population decline (Haartsen and Venhorst, 2010). The theoretical foundation for this is the idea that overall utility improves with greater accessibility, leading to in-migration. In this thesis we fail to identify an association between service accessibility and overall utility, proxied through subjective well-being (chapter 3). We also compare the degree to which in-migration is associated with residential quality. Using strict controls on false discovery rates, residential quality is only related to in-migration around the Veluwe National Park. Changes in residential quality were not significantly associated with concurrent changes in in-migration. Based on the results in this thesis, the expected returns to policies aimed at attracting new residents are limited if not absent.

6.7 Empirical considerations and further research

6.7.1 Benefits of the large individual dataset

In this section we reflect on methodological and data aspects related to this thesis. Chapters 2, 3, and 5 are based on the Lifelines population survey. For the study of subjective well-being, and isolating the effects we are interested in, the dataset provides tremendous depth. While the focus in this thesis is on spatial processes, the results consistently reveal the importance of individual characteristics and determinants of subjective well-being. Health, social contacts, family and household situation are well-established and important predictors of subjective well-being (Dolan et al., 2008; Ballas, 2013). One issue faced by studies of regional or spatial subjective well-being is the possibility that regional differences are, in fact, a reflection of compositional differences. Failing to correct for individual characteristics that determine subjective well-being may

lead to attributing regional variations in subjective well-being to the region, whereas they may in fact be the result of clustering of, for example, younger or wealthier people (Graves, 1980). Similarly, the results in this thesis emphasise the importance of knowing the relevant spatial scale. These types of analyses require large numbers of cases with detailed geographical information, which are not usually available. Combining this data with local methods of analysis means we can take a uniquely fine-grained look at the processes involving subjective well-being. As with most aspects of the literature on subjective well-being, this side of the Lifelines project is under continuous development, with links to the Statistics Netherlands registry data implemented this year, and a new wave of subjective well-being data currently being collected. Property transaction data is similarly hard to obtain for research purposes. The data in chapter 5 are the result of a unique combination between individual property transaction data and data on the subjective well-being of the property's occupants. The processes modelled using this level of detailed information would not have been accessible for study without these datasets.

6.7.2 Limitations and future research

One of the main limitations of this study is the cross-sectional nature of the dataset. Going forward, and with the new wave of subjective well-being data becoming available towards the end of 2020, changes in subjective well-being may be related to changes in the geographical situation of individuals and households. While the literature and results in this thesis suggest that subjective well-being equilibrates over time (Goetzke and Islam, 2017; Ballas and Tranmer, 2012), there is little information on the procedural utility involved in this process. One question that could be addressed is, if site specific characteristics change exogenously, e.g. the recent earthquakes in Groningen (Bakema et al., 2018), how does this affect the overall subjective well-being, and to what extent does this differ between those who move and those who do not? Similarly, if an individual's relative income changes, either through a change in personal income or a change in neighbourhood composition, to what extent does the peer effect of income hold? Research into inter-regional and inter-personal inequality suggests that the effects of inequality may be far-reaching (Wilkinson and Pickett, 2009). This thesis shows that the peer effect appears to be less relevant for individuals with lower incomes. One explanation may be that differences not pertaining to income may be more important in lower income neighbourhoods. Decomposing the SWB effects across quantiles means getting a better idea of what matters to whom. A longitudinal set of subjective well-being measures would also allow us to gauge the question of increasing

happiness with time in residence. In chapter 5 we show that transaction prices and subjective well-being are positively associated, and we find tentative evidence that longer time in residence is associated with subjective well-being. This latter finding is not new (Ballas and Tranmer, 2012), but it is theoretically problematic. If time in residence is positively associated with residential utility, the price that owners would require to offset this added utility will be higher than the willingness to pay of individuals who do not experience this utility. By leveraging the fine level of detail in the Lifelines dataset combined with longitudinal subjective well-being data we will be able to gain substantial additional insights. We should be able to separate to what extent higher subjective well-being leads to increased time in residence, as in, happy people are less likely to move. In addition, we will be able to get an estimate of the reverse of that process, that longer time in residence leads to higher subjective well-being. This is the emergent-property argument proposed in chapter 5, where the utility derived from a residential location is contingent on the familiarity of the residents with their surroundings and neighbours. This type of analysis will be able to give insight into the value of familiarity, and a better idea of the utility costs of moving.

A second issue relating to the data is the measurement of subjective well-being. The recent surge in subjective well-being studies and interdisciplinary nature of the new results mean that there is a continuous stream of new insights into how to measure and understand subjective well-being (Frey, 2008). A very basic question to measure subjective well-being is "*All things considered, how happy were you over the past X weeks?*" (see for instance Ballas and Tranmer, 2012). More recently, researchers have argued for compound measures of subjective well-being, as these are better capable of picking up nuances in life evaluation, or unhappiness (Kahneman and Krueger, 2006). Frey (2008) distinguishes three components to happiness, overall life evaluation, and positive and negative affect. In the Lifelines dataset, a compound measure of subjective well-being is collected in the RAND-36 survey scales (Hays and Morales, 2001). The initial purpose of these survey items was to provide better evaluations of medical outcomes, as objective measures were found to be lacking in personal evaluative context, hence the original name of Medical Outcome Survey - Short Form (MOS-SF) (Ware and Gandek, 1998). The Lifelines data on subjective well-being contains the four week evaluation of life question (over the past four weeks, how often were you happy), combined with a number of mental health and happiness related questions. As such, it broadly fits the requirements of Kahneman and Krueger (2006) compound and evaluative measure of overall quality of life. Different adaptations from the SF-36 to an economic conceptualization of utility exist, but require additional data (Brazier et al., 2002). In this thesis, we use the items relating to the happiness of the individual as a proxy of utility as this

most closely fits the measures used in the literature (Frey, 2004). Both the individual survey item relating to four week happiness, and the compound measure were used with no qualitative differences between the outcomes. The measurement of quality of life is, however, continually evolving (Frey, 2008), with more purpose-built measures of subjective well-being always just around the corner. The RAND-36 scales have, to a large degree, been replaced with these more recent measures (Kahneman and Krueger, 2006).

From a modelling perspective, two chapters use geographically weighted regressions to analyse spatial heterogeneity. Since the conception of these types of models (Brunsdon et al., 1998), a large number of developments have taken place in both the modelling and computational efficiency, as well as the interpretation of the results. There are two main critiques to the use of geographically weighted regressions. First, the use of local regressions is associated with issues of multi-collinearity (Brunsdon et al., 2012): as the spatially filtered regression points become fewer in local regressions, the probability of finding locally multi-collinear variables increases. To deal with this complication, local measures of multi-collinearity have been implemented in the regression estimation methods (Lu et al., 2014; Wheeler, 2007) and simulation studies have shown that this issue is much less severe than previously thought (Fotheringham and Oshan, 2016). The second problem with geographically weighted regression is the interpretation of the heterogeneity of the coefficients. In chapters 3 and 4 we use a theoretical framework that implies spatial sorting of individuals and preferences to contextualize the variation, similar to the interpretation offered in Sarrias (2019). It is argued, however, that the differences found are an unobserved variables problem. Spatially heterogeneous models "show evidence of heterogeneity but do not explain it" (Anselin, 2010, p. 17). In addition, Billé et al. (2017) show that geographically weighted regressions assume that the heterogeneity is smooth across space, while discrete breaks (spatial regimes) may also be plausible. Computationally their proposed two-step solution is still prohibitive (around 400 cases, maximum). Sarrias (2019) compares both a continuous and discrete model for spatial heterogeneity and finds the discrete model for spatial heterogeneity to be slightly preferable, both in terms of plausibility of the coefficients as well as interpretability. This method uses *a priori* specified distributions of the parameters, that are then fit over the different regions (Sarrias, 2020). The interpretation of the classes and the variation between the coefficients are, however, still left to the researcher. All these methods only partially solve the problem of interpreting the heterogeneity, although the literature in this direction is developing (Sarrias, 2020; Dekker et al., 2019; Miltenburg, 2017). Combining our insights with the recent developments relating to modelling heterogeneity, and insights gained from agent-based interactive

models (Anselin, 2010), future research questions related to well-being should aim to elicit not just which process are at play, but also for whom.

The results in this thesis show that the relevant spatial scale is, unsurprisingly, dependent on the topic studied. Addressing these issues is not easy, as the choice of scale is limited by the availability of data, computational requirements, or model specification. Over the past decades, tremendous progress has been made regarding all three aspects. In terms of computational requirements, the availability of ever higher performance computers means more complicated models can now be solved. Given the current boom in large datasets there is also an increasing push for more efficient estimation techniques (Arbia et al., 2019). However, as computational power increases, so do computational requirements. The models estimated in chapters 3 and 4 use geographically weighted regressions from the *GWmodel* (Lu et al., 2014) package. This package offers the kind suggestion: "Take a cup of tea and have a break, it will take a few minutes" if the number of cases exceeds 1500. Although appropriate at the time, 1500 cases is generally disposed of quickly on modern hardware. Currently the estimation of much larger datasets is possible using the *gwr.scalable* method in the same package and using the substantial increase in RAM modern systems have. However, new developments related to geographically weighted regressions mean that it is now possible to estimate the size of each parameter bandwidth separately (Lu et al., 2017), which unfortunately comes with exponentially higher computation cost. The benefits of these types of analyses is that, rather than take spatial heterogeneity at a system (all regression variables) level, it allows the spatial bandwidths to be estimated for each variable separately. This means the full spectrum of local, regional, and national processes can be combined in a single model, provided the data is available. The results in this thesis suggest that testing for spatial heterogeneity should be standard practice when working with spatial data.

Looking at the availability of spatial data, most sources still rely on regional aggregation before data dissemination. Subjective metrics are particularly difficult to get as locational data (Nakaya et al., 2007), as they are generally collected using surveys and these require relative anonymity before the data can be shared (Longley et al., 2018). There are two major developments that open up subjective well-being data to spatial scientists: first, user shared data, and second, small-area estimated data. The first category of development uses the openly accessible data shared online by individuals, such as tweets or publicly scrapeable data. Although these future avenues of data appear promising, they come with notable limitations. A commonality in user shared data are the ethical considerations that need to be taken into account (Williams et al., 2017). The data generally is not shared with academic papers in mind, meaning individuals

may express opinions online that they would not if they were aware they would be scrutinized, and the consent of publicly shared data is not the same as consenting to be included in a study. More fundamentally, the generalizability of user shared data is limited to a population of people who are likely to engage in publicly sharing data. Location data is generally unreliable, and, with Twitter as an example, the researcher has no control over the selections made before the data is shared by the service API. Legally, academic research is not necessarily covered by the terms of service, particularly so in the case of scraped data.

A second avenue for furthering spatial studies into subjective well-being is the use of small-area estimation, or spatial micro-simulation. The basic idea is to combine a representative survey dataset containing data on the topics in question, and known neighbourhood census data that contains at least one characteristic against which the survey data can be matched. The analytical dataset is built by a joint optimisation routine, sampling from the survey data until each neighbourhood fits the relative census characteristic (Morrissey et al., 2008). One critical point of this type of research is that the outcome dataset is generally difficult to validate, although conceptually that is merely a generalization of a survey-representativeness argument. The method has been successfully implemented to estimate Irish GP usage (Morrissey et al., 2008), retail centre attractiveness (Nakaya et al., 2007), obesogenic environments (Edwards and Clarke, 2009), and obesity in the Netherlands (van de Kasstelee et al., 2017).

6.8 Concluding remarks

The results in this thesis highlight three components as part of a regional development research agenda. First, the results in this thesis emphasize the usefulness of subjective well-being as a measure of quality of life. In general, the associations with subjective well-being in the empirical chapters are plausible in terms of size, sign, and significance. Second, analyses that explicitly model spatial relations provide better fits to the data than more general models, confirming that local processes, e.g. residential decision-making, require local analyses. Finally, the results show that the interaction between the individual and their environment can mediate which processes relate to subjective well-being. There is room for yet more, and more types of, heterogeneity.

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