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Freedom from the tyranny of neighbourhood: Rethinkingsociospatial context effects

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Abstract

Theoretically, neighbourhood effects hold that, across scales and geographies, people's geographical surroundings may influence individual results. We contend that in order to escape the "tyranny" of the neighbourhood, researchers studying neighbourhood impacts should look at other methods of measuring people's broader socio-spatial environment, with an emphasis on the importance of the person. We investigate the geographical scopes of processes including neighbourhood effects and survey various theoretical and empirical methods concerning space and place from various fields. In the end, we propose a theory-driven data exploration approach that replaces data pragmatism with microgeographic data to operationalize sociospatial context.

Keywords
bespoke neighbourhoods, microgeographic data, neighbourhood effects, sociospatial context, spatial scale

I Introduction

Van Ham et al. (2012) found no definitive evidence tying residential setting to individual results, and there is also no clear evidence about the relevance or degree of neighbourhood impacts or the processes behind them. Some of the methodological challenges that have been brought up in the literature regarding quantitative neighbourhood impacts research include the endogeneity of neighbourhoods and bias resulting from non-random selection of residents into neighbourhoods. features, or more succinctly, a relationship between the neighbourhood effect explanatory variables and the model's error term. Both of these things make it very difficult to find the "genuine" causal links between specific locations and people's results (see Manski, 1993).

But the more fundamental question of what constitutes a neighbourhood is the subject of this study. This is a significant problem that has received shockingly little research attention so far (Galster, 2001; Lupton, 2003; Van Ham and

Manley, 2012).

See, for example, Wilson (1987) and Wacquant and Wil-son (1989) for examples of ethnographic research methodologies that were employed to investigate neighbourhood impacts. While research did begin in the area, it mostly focused on the sociospatial patterns among local communities. The quantitative research truly took off in the late 1990s, driven by the rising availability of microdata and computer capacity, although some early academics also employed secondary data and quantitative approaches to investigate neighbourhood impacts (Lewis, 1966). Researchers were able to use data from programmes like Moving to Opportunity in the 1990s to simulate how living in low-income communities affects individuals' outcomes (Katz et al., 2001; Leventhal and Brooks-Gunn, 2003). In contrast to the ethnographic concentration on specific areas and local reputations, quantitative research necessitated geocoded microdata at the individual level associated with the features of a wide variety of neighbourhoods throughout an entire city, region, or nation. Accordingly, the administrative neighbourhood borders, which are easily accessible in the data, are used as the definition of neighbourhood in the majority of quantitative research on neighbourhood impacts. Many people's sociospatial contexts are only documented in administrative neighbourhoods, which may not accurately represent a "residential neighbourhood" at all. Not surprisingly, administrative neighbourhoods are used for policy delivery and data gathering (census) purposes in accordance with the state's political and social demands, rather than in accordance with the fundamental social processes underpinning administrative
entities are deemed to outline (Jones et al., 2018; Manley et al., 2006).

Practical considerations in adopting administrative neighbourhoods have led to a lack of theoretical considerations in the majority of quantitative studies on neighbourhood impacts (Jencks and Mayer, 1990; Sampson et al., 2002). According to Raudenbush and Sampson (1999), Galster (2001), and Nicotera (2007), it is unreasonable to expect a single spatial entity to fully represent all important aspects of the sociospatial environment that might impact individual outcomes. Without a doubt, in many parts of the social sciences, researchers have attempted to make sense of complicated occurrences by making oversimplified assumptions about people and cities (Kwan, 2000). It is true that in order to make a meaningful statement, one must simplify the actual world. If we shift our focus to the theoretical realm, however, we see that many of the so-called "neighbourhood effects" really represent impacts from a variety of settings, each with its own unique temporal and geographical scope. Importantly, there are other scopes outside the residential administrative neighbourhood (Galster, 2012; Sampson et al., 2002).

Our next step is to suggest a thinking experiment: What if, instead of letting data availability dictate our data requirements, we begin with theory and define them from that vantage point? In addition, how can research take use of the growing availability of microgeographic secondary data, given that data availability is crucial to quantitative study on neighbourhood effects? This is after we have taken into account the data needs. New insights into the many geographical circumstances that impact individuals have emerged as a result of quantitative research taking into account a greater number of spatial scales, made possible by the increased availability of high-quality geographic data (Andersson and Musterd, 2010). Newer

methods of zonation, such as person-centered egohoods or tailored neighbourhoods, have recently evolved (Johnston et al., 2000;

In 2018, Petrovic et al. Up to now, tailored multiscale spatial contexts have been made possible by microgeographic data, allowing us to depart beyond fixed, single-scale administrative neighbourhood borders (Andersson and Malmberg, 2014).

This study explores the use of microgeographic data to operationalize sociospatial settings within the theoretical framework of neighbourhood impacts, within the context of our thought experiment. Starting with the most basic, we discuss three conceptual challenges related to the conventional conceptualization of place and space in many fields that examine neighbourhood impacts. Our next step is to examine the theoretical processes and geographies of neighbourhood effects (Galster, 2012). This will allow us to formulate predictions about idealised spatial units that may be used to test particular contextual effects. Thirdly, there is the matter of understanding the characteristics of spatial data and how to use them to investigate social processes; this knowledge is necessary for the operationalization of these geographical units. Drawing on these three theoretical considerations—the nature of spatial data, the geography of neighbourhood effects mechanisms, and the ideas of place and space—we examine how sociospatial settings are operationalized in quantitative empirical investigations of neighbourhood effects. From research that employ multiscale representations of the sociospatial environment (Andersson and Malmberg, 2014) to those that use fixed delimited administrative neighbourhoods, we evaluate a selection of studies that explore the geography of neighbourhood impacts (Petrovic' et al., 2018). Finally, we go over several ways that microgeographic data might enhance the study of neighbourhood impacts.

II Modifiable geographies of neighbourhood effects *1 Concepts of space and place*

Geography, sociology, and other fields that study neighbourhood impacts have all used spatial and locational concepts.

disciplines of health, economics, and criminology in particular. Starting with the field of health studies, which integrates sociology, geography, and epidemiology (Curtis and Rees Jones, 1998; Cummins et al., 2007), we provide a short overview of space and place notions. In health geography, the difference between space and place is that the former refers to the physical location of a site and the latter to its characteristics (Tunstall et al., 2004). This leads us away from the simplistic Euclidean view of space as a distributional dimension and towards a more complex framework, where the concept of place reflects the physical and social features of specific locations. The first is that looking at location via this lens opens the door to research that "can be as rich as the study of time through social history" (Tun-stall et al., 2004: 6). Space, on the other hand, may be reduced to a simple geometric concept when location and space are so clearly differentiated. Human geographers, notably Doreen Massey, have attacked the flat surface, residual dimension conception of space (see, for example, Massey, 2005). The concept of space, as described by Massey, is a dimension of simultaneity and multiplicity as it cuts across time, linking narratives, biographies, and objects that exist simultaneously. Because of the presence of other people in space, we are prompted to consider the "social" (Massey, 2005). Analytical frameworks in geographical analysis have often made use of the place/space distinction and dynamic, unbounded space, with the former serving to centre attention on particular

locations as local contexts and the latter to dynamically and unbindingly include all of space into a single integrated spatial context.

When talking about location and space in relation to neighbourhood impacts, it's important to differentiate between composition, which is a factor at the individual level, and context, which is a measure of the social environment (Pickett and Pearl, 2001). Health geography has progressed thanks to this differentiation, which bolsters the importance of location.

as well as impacts on an individual level, with regard to health (Duncan et al., 1998; Diez Roux, 2002). Because people's traits and their physical environments are interdependent (Macintyre et al., 2002; Cummins et al., 2007), and because social space is an outcome of our interactions with one another, the'relational approach' calls into question the clear delineation between the two (Massey, 2005). According to Giddens' (1984) structuration theory cited by writers like Bernard et al. (2007) and Curtis and Rees Jones (1998), there is a two-way street: neighbourhood structures strongly impact individuals, and individuals shape neighbourhood contexts. According to Cummins et al. (2007), places are defined as "dynamic and constantly evolving entities" under the relational approach, which means that they do not have fixed qualities and may have both good and bad effects on their occupants. These effects can be felt at different geographical scales.

In the context of neighbourhood impacts and beyond, debates about space and location are intricately linked to spatial scale (Smith, 2000; Brenner, 2001). In health geography, debates around place highlight the unique qualities of locations and the connections between space and society, often on a micro level. While some research have operationalized locations at various sizes, the neighbourhood scale remains undertheorized (Tunstall et al., 2004). Many academic fields have concentrated on various geographical scales. Criminology is one of the fields that has gradually shifted its emphasis from the macro to the micro, in contrast to health geography's emphasis on smaller scales in accordance with the notion of place. Chicago sociologists in the middle of the twentieth century moved the emphasis from cities and regions to neighbourhoods and communities, largely via the development of the concept of social disorganisation (Thomas, 1966; Weisburd et al., 2008).
Park from 1967. With the advent of the 'routine activities' perspective (Cohen and Felson, 1979) and the 'crime pattern theory,' where place is explicitly considered as a 'backcloth' of human behaviour (Branting-ham and Brantingham, 1993), theoretical frameworks continued to zero in on even finer spatial scales, (Eck and Weisburd, 2015).

It is not immediately apparent which spatial context dimensions are relevant for comprehending social processes. Urban families, according to Suttles (1972), classify their neighbourhoods on a scale from one block—the smallest unit where children are allowed unsupervised play—to one sector of the city. While this broad strokes approach requires fine-tuning for particular contexts like city size and urban shape, the complexity of identifying neighbourhoods—which are more than just limited units at one geographical scale—is an ongoing challenge. Despite writers stressing social con-tions as a criteria for identifying neighbourhoods, the prevailing concept of the neighbourhood is still a "geographically bound unit" (Chaskin, 1995). Massey (1994) argues that neighbourhoods are best understood as a collection of interconnected social networks with varying degrees of physical proximity to one another. Neighbourhoods are conceptually and operationally murky due to the fact that social relationships are not spatially contained. Due to the absence of actual, stable sets of regions on a global scale, boundary fuzziness is significant both for small-scale neighbourhoods and for other purposes (Isard, 1956; Altman, 1994).

Instead of discrete units that are incompatible with one another, fuzzy neighbourhoods are spaces that overlap. The social, organisational, political, and

economic dynamics all contribute to the imbrication of neighbourhoods (Logan and Molotch, 2007). People living in these neighbourhoods don't regard their city as consisting of separate, incompatible neighbourhoods with rigid borders; rather, they see a myriad of neighbourhoods that blend into one another.

at the same time, neighbourhoods that overlap (Hunter, 1974). Given the current focus on the social aspect of neighbourhood, it seems irrelevant that community and neighbourhood are separate concepts (Hunter, 1974; Sampson, 2004). Since neighbourhoods are inherently geographical, it follows that communities, which are not necessarily physical places, also overlap spatially. The idea of overlapping fuzzy neighbourhoods, sometimes known as 'bespoke neighbourhoods' or 'egocentric neighbourhoods,' has been put into practice in the literature on neighbourhood impacts (Johnston et al., 2000). From a very tiny spatial unit up, a bespoke neighbourhood is the region around one person; hence, bespoke neighbourhoods of many individuals overlap. The geographical study of crime has a long history of employing non-overlapping units with administratively specified borders (Weisburd et al., 2008), but the matching idea of 'ego-hoods' (Hipp and Boessen, 2013) brought a significant conceptual shift in this field.

The concept of spatial spillovers is particularly useful for comprehending the interrelationships across (near) communities, but bespoke neighbourhoods at various dimensions are essential. Compared to the related economic notion of spillovers, the impact of spillovers across neighbourhoods has, so far, garnered less attention (Dietz, 2002). As an exceptional byproduct of communal actions in one neighbourhood helping other regions, Sampson et al. (1999) established spatial externalities. While most people picture a self-contained, bordered region when they hear the word "neighbourhood," research into "spil-lover" neighbourhoods suggests that there is more going on in this spatial context than meets the eye. When thinking about the geographical setting of neighbourhood effects studies, Lupton (2003) uncovered three major problems: the interconnected webs of locations and the people that inhabit them then there is the matter of neighbourhood borders and how one community relates to another. All three problems may be more effectively addressed by overlapping regions at different spatial sizes than by a single constrained spatial unit.

In the end, the interplay between space and time is what really drives home the points made earlier. The two most important temporal perspectives for assessing exposure to content are location and time, both of which are multiscalar. One aspect to consider is the variety of locations that individuals encounter during their day, including their homes, schools, workplaces, and other public and private spaces (Ha¨gerstrand, 1970; Van Ham & Tammaru, 2016). Second, there is the concept of "spatial times" (Massey, 2005), which takes into account the impact of various locations on a person throughout the course of their lifetime. This includes the sequence of neighbourhoods that make up a person's neighbourhood history (Van Ham et al., 2014). The interplay and connectivity of many geographical and temporal domains gives rise to contextual effects. The underlying mechanisms may be rather varied, but we can make educated guesses about their temporal and geographical extent if we identify the process we are studying.

2 Mechanisms of contextual effectsand their spatial scope

It is believed that the neighbourhood context affects many individual life outcomes, such as health, education, and socioeconomic position; moreover, individuals react differently to changes in context (Samp-son, 2012). Since "neighbourhood effects" might refer to a wide variety of phenomena, no universal theory has been developed to explain them all (Sampson et al., 2002). The potential causes of neighbourhood impacts were classified by Galster (2012) into four

groups: social-interactive, environmental, geographical, and institutional. Some geographical processes are more important than others, depending on the result being studied. hence, some geographical settings are more crucial than others.
For instance, social norms at the neighbourhood level, social networks, social cohesiveness, and control are all examples of social-interactive processes (Galster, 2012). Because these processes rely on human connection and touch, they will most likely take place on a smaller scale. According to Van Ham and Manley (2012), the size at which peer group effects are most noticeable is on the small scale of individual blocks or even individual streets. Additionally, according to Taylor and Brower (1985), people tend to feel more socially integrated on their own "street" as opposed to farther away. The most challenging environmental factors to capture within artificially defined neighbourhood borders are exposure to air or water contaminants. Exposure to violence and physical factors, including the quality of public space and noise pollution, are additional processes, in addition to ecological (toxic) environmental circumstances (Galster, 2012). Environmental stresses are being pushed to larger and larger dimensions as the health implications of air and water pollution move from neighbourhoods to cities and even regions (Sorensen and Okata, 2011). On the other hand, polluted ground, which is a common consideration in brown field construction, may have very localised and particular effects.

The placement of the community in relation to broader political and economic systems is one example of a geographic mechanism; other examples include public services and the disproportion between communities and available jobs (Galster, 2012). Although the mismatch was first identified as a factor contributing to African-American unemployment in the US (Kain, 1968), it is just as important in Europe (Van Ham et al., 2001; Gobillon et al., 2011) to be physically close to work. Because a mechanism's operating size might change, the magnitude of the mismatch is context dependent. at different locations and at different times (Van Ham and Manley, 2012; Manley et al., 2006). Institutional mechanisms, the fourth category of mechanisms outlined by Galster (2012), include stigmatisation, local education and healthcare systems, the interface between neighbourhood residents and vital markets related to physical conditions in the neighbourhood, and other institutions to which residents have access. Some communities are more stigmatised than others because of their people' ethnicities, the kind of housing they live in, or because they are well-known and sometimes even legally designated. Instead of using administrative neighbourhood borders, tailored measurements of neighbourhood features might be more useful for mechanisms involving exposure to or access to people, resources, or hazards.
Policymakers often use neighbourhood effects studies when crafting measures to mitigate unintended consequences. A common analytical framework for empirical study is the geographical settings in which these policies are implemented. Neighbourhood effect mechanisms, on the other hand, are concerned with a wide range of spatial contexts over fuzzy space, rather than with administratively designated neighbourhoods. Space is fuzzy in both directions. The spatial opportunity structure, coined by Galster and Sharkey (2017), results from people's intersecting personal contexts and the possibility that they belong to more than one contextual scale. In addition, the neighbourhood can have varying degrees of influence on different people (Bernard et al., 2007; Small and Feldman, 2012). This is because people have different activity spaces (Kwan, 1999) or different life course relations to the neighbourhood (Ellen and Turner, 1997; Forrest and Kearns, 2001). Researchers studying neighbourhood impacts should therefore ensure that their conceptualizations of the area are consistent with the underlying processes. So, rather than "neighbourhood effects," the phrase "spatial context effects" better describes the phenomenon we are attempting to comprehend.

3 The nature of spatial data and social processes

Regardless of the administrative limits that data is often gathered inside, social processes do occur (Manley et al., 2006; Jones et al., 2018). There is a wide range of potential geographical scales and zonation systems; however, research areas should not be confused with statistical samples, which are selected at random from the set of all possible study areas (Longley et al., 1999). Contrarily, geographical data is often autocorrelate, which means that an observation's value is comparable to surrounding observations. An essential tenet of statistics, the independence of observations, is undermined by this "exceptional" aspect of geographical data (Anselin, 1989). But spatial autocorrelation isn't a pain; it's a tool for understanding how societies work. That "[d]ata of geographic units are tied together, like bunches of grapes, not separate, like balls in an urn" and, more importantly, that "by virtue of their very social character, persons, groups and their character-istics are interrelated and not independent" were both written by Stephan (1934) in the 1930s. (Refer to the section above on space and time being multiscalar) In spatiotemporal processes, such neighbourhood effects, "nearby" and "distant" must be identified in terms of both space and time. Although the transition to adjacent areas and timeframes does not have to be linear, what occurs in one place at one time is connected to what happens in neighbouring locations and at nearby moments (Goodchild, 2004). Clustering has historically made advantage of spatial dependency. Epidemiology and health geography have long had access to small-area data, therefore pioneering work in these fields has included mapping illness hotspots (Cuzick and Elliott, 1992). Weisburd and McEwen (2015) mapped crime in empirical study and practice of criminology. It turns out that spatial dependence isn't uniformly present everywhere when you map clusters. There is also the'special' characteristic of spatial heterogeneity.

area information systems, which necessitates taking into account regional traits rather than broad, overarching principles (Anselin, 1995; Getis, 1999). Accordingly, Brunsdon et al. (1996) and Fotheringham et al. (2003) found that geographically weighted regression (GWR) measures the spatial variation in regression parameters. Smaller spatial units have their own micro-characteristics while simultaneously being a part of bigger systems with macro-characteristics; this means that size is a determining factor in both spatial auto-correlation and spatial heterogeneity. To examine regional homogeneity and heterogeneity, spatial size serves as a useful lens. According to Openshaw and Taylor (1979) and Openshaw (1984), one significant outcome of geographic heterogeneity is the modifiable areal unit problem (MAUP). MAUP is the phenomenon wherein the selected scale of spatial units and the exact zonation of those units at a single ground scale determine the outcomes of analysis. We may conceptualise two dimensions of scale that are related to each other. A social structure's existence and the processes' operation are both affected by the phenomenon magnitude, the first of these dimensions. The second scale, the analysis scale, which is concerned with the size of the units used to experimentally measure and evaluate these occurrences, stands in contrast to this (Mon-tello, 2001). Although it may seem simplistic to propose that the scales used for analysis and phenomena should align from a research and policy standpoint, this is not always the case. Studies in the social sciences on the topic of scale have been less detailed and clear than those in the scientific sciences (Gibson et al., 2000). There is a great deal of temporal and geographical ambiguity in the phenomenon-analysis spatial representation of social processes, as described by the uncertain geo-graphic context issue (Kwan, 2012). Consequently, the processes behind neighbourhood impacts that we want to investigate and comprehend are not always congruent with the geographical data that is now accessible.

III From neighbourhood effects to sociospatial context research

Oftentimes, neighbourhoods have been handled non-spatially in the literature, or just partial theoretical concerns have been applied. Even when a neighbourhood has enough mental space, it doesn't become the fundamental subject of the study; it stays as an annoyance. Along with our criticisms of this pragmatic approach, we provide several examples that operationalize sociospatial situations and are theoretically informed. These examples have the potential to be used more broadly. A number of competing definitions of "neighbourhood" have been proposed (e.g., Nicotera, 2007; Chaix et al., 2009): "objective" and "perceived" neighbourhoods, "fixed" and "bespoke," "single-scale" and "multiscale," and "homogeneous" and "heterogeneous" neighbourhoods. When examining sociospatial context, small-sample qualitative research fundamentally vary from large-sample quantitative studies. When it comes to people's impressions of their neighbourhoods in particular, quantitative studies of huge populations fall short of what qualitative research may uncover. Limits placed on neighbourhoods by researchers from outside the area exclude locals' lived experiences, which might have an impact on people's final results. Comparative and more generalizable findings are obtained from large-sample quantitative research, which, on the other hand, need simpler assumptions about neighbourhood size and borders. It might be challenging to generalise results relating to neighbourhoods.

According to qualitative surveys, locals have different opinions about the neighbourhood. It's easier to compile multiple opinions on certain aspects of the neighbourhood, like social disorder, than on others, like social interactions (Coulton et al., 1996). Davidson et al. (2008) notes that GIS are being utilised more and more in addition to qualitative approaches such as focus groups and interviews.

in order to gauge how locals see the extent and limits of their neighbourhood (Lohmann and McMurran, 2009). Coulton et al. (2013) examined low-income neighbourhoods in ten American cities and found that, compared to conventional census tracts, neighbourhoods delineated by respondents' GIS maps are smaller. However, neighbourhoods derived from inhabitants' ordinal scale or qualitative question responses are bigger. Research using geographic information systems (GIS) has shown conflicting results when examining the extent to which and which sociodemographic factors impact residents' perceptions of their local communities (e.g., Lee and Campbell, 1997; Orford and Leigh, 2014). This reflects not just the variety of methodologies utilised but also the variety of environments in which the studies are carried out. What this teaches us about the need of paying close attention to different geographical locations and individual sociodemographics may equally be applied to large-sample quantitative research. Despite the fact that quantitative studies of neighbourhood impacts have shown individual variability resulting from ethnographic research to be very valuable (Small and Feldman, 2012), researchers still seldom mix the two methods. Given that contextual impacts depend on exposure and interaction, it is possible to apply methodologies used to demarcate perceived neighbourhoods to objectively experienced neighbourhoods as well. This might provide additional insight into individual outcomes, as pointed out by Chaix et al. (2009). Finding activity places is the goal of methods for objectively experiencing neighbourhoods; these methods use location-aware technology like GPS and mobile phone monitoring (Ahas et al., 2010; Chaix et al., 2013). Although these techniques are neither time-or space-bound (Shaw, 2010)As they painstakingly measure exposure in geography and time, they have also heightened data gathering ethical concerns. Research comparing administrative units at various geographic scales is sometimes used in empirical investigations when data on activity spaces is unavailable. These research show that spatial size is important, especially when considering the limitations caused by the absence of

using data from tiny areas to depict local contexts. In their research on income inequality in Halifax, Nova Scotia (Canada), Prouse et al. (2014), for instance, challenged the use of census tracts as a main proxy for neighbourhoods due to their coarse size. Dissemination zones, as defined within census tracts, that follow distinguishing characteristics like roads or rivers and contain 400 to 700 people are more useful in smaller cities, according to the authors. This last thought acknowledges the importance of both geographical size and urban design, drawing attention to the differences between larger and smaller cities. But we must not lose sight of the bigger picture in favour of micro-geographies.

There has been a recent uptick in the use of "bespoke neighbourhoods" to aggregate the smallest accessible units to larger sizes, allowing neighbourhood effects research to go beyond the administrative unit (Bolster et al., 2007; Stein, 2014; Veldhuizen et al., 2015). People who live on the outside of an administrative neighbourhood may identify with or be impacted by the neighbouring community. This is something that bespoke neighbourhoods aim to address. To better comprehend the broader housing environment, it may be worthwhile to investigate the geographical size of custom neighbourhoods. For example, Petrovic et al. (2018) built custom communities at 101 different spatial scales, from very small (100 by 100 metre grids) to extremely big (units of land area). They demonstrated how varied urban forms within a city and between cities impact multiscale understandings of spatial context. Up until now, the vast majority of studies on neighbourhood effects have focused on effects within a single neighbourhood, or the immediate area where a person resides. However, there has been a dearth of research on neighbourhoods in their broader spatial context, the impact of "neighbourhoods," or the formation of an interconnected network of neighbourhoods.

outside of the immediate vicinity (Sampson, 2001). It is essential to take urban form into account when assessing this broader context and spatial autocorrelation (Petrovic' et al., 2018). We need to comprehend contextual effects within a multiscalar space-time framework since, as previously said, space and time are both multiscalar. As an example, Van Ham et al. (2014) investigated the impacts of neighbourhoods across generations in Sweden by tracking people's histories of their neighbourhoods from the time they left their parents' house. Their findings indicate that residing in a low-income neighbourhood as a child increases the probability of continuing to live in such an area as an adult. And research by Hedman et al. (2015) shown that a person's income was still influenced by their early neighbourhood even after they left home for the first time, even after 17 years. The impacts of social exposures have lengthy temporal delays, and Wodtke et al. (2011) shown that being exposed to low-income areas for an extended period of time significantly impacts academic performance.

It is possible to conclude that the MAUP and geography are unrelated to individual outcomes due to a lack of suitable data. As an example, in Sweden, Bra¨nnstro¨m (2005) failed to discover any correlation between individual income and receipt of social assistance and either census districts or parishes. According to Andersson and Musterd (2010), events taking place at lower spatial scales may be obscured by these two geographical units due to their heterogeneity. With the availability of microgeographic data in the form of small grid cells, it is becoming easier to examine these smaller scales. Starting with grid cells and aggregating them to larger scales of bespoke neighbourhoods allowed for further differentiation of spatial scales (O¨ sth et al., 2014; Petrovic' et al., 2018). Researchers are able to depart beyond administratively defined neighbourhoods and instead work within personalised, multi-scale geographical settings made feasible by micro-geographic data. This change indicates a shift from the field of sociospatial contextual effects research as opposed to that of neighbourhood

effects research.

IV The role of microgeographic data in future contextual effects research

Microgeographic data include spatial data witha fine spatial resolution, such as point data or areal data for regularly shaped (grids) or irregu-larly shaped polygons, e.g. census tracts. These data can come from various sources, including (government) registers or large-scale surveys. According to the fractal principle, 'all geographic phenomena reveal more detail with finer spatial resolution, at predictable rates' (Goodchild, 2004: 711). As such, the 'special' features of spatial data – spatial autocorrelation and spatial heterogeneity (Anselin, 1995, see Section 2.3.) – should be recognised, not as problems but as opportunities (Fotheringhamet al., 2000). In this respect, microgeographic data offer numerous opportunities to advance research into contextual effects.

1 Spatial and relational thinking

Spatial units are often treated like any other variable when using analytical tools and methodologies for neighbourhood impacts study. Using conventional statistical methods while disregarding spatial dependence is one approach; recognising the existence of spatial dependence and attempting to eliminate it in order to justify the use of aspatial methods is another; and finally, explicitly considering spatial autocorrelation and providing a theoretical explanation is a third fundamental way to handle spatial data. Even spatial statistics often views this spatial dependency as an annoyance that needs fixing, rather as a valuable source of information; nonetheless, the second method is helpful for neighbourhood impacts study. With more and more microgeographic data being available, social scientists are considering how they use geographical analysis into their studies, and how they portray sociospatial context.

Although the spatial component is as important for social as it is for natural processes, the social sciences have been slower to use GIS compared to the scientific sciences. Although early social science did make use of maps, numerous fields have now strayed from this foundation and established other methods (Steinberg and Steinberg, 2005). Mapping is especially pertinent to current data science developments due to the fact that visualisation aids in elucidating complicated spatio-temporal patterns. There has been insufficient integration of GIS with investigations of neighbourhood impacts. The exception to this rule is Knaap's (2017) study, which used a spatial opportunity structure map to connect opportunity geography with neighbourhood impact mechanisms. Using a number of layers to capture distinct but interconnected aspects, GIS represents geography. Similarly, contextual variables like ethnic and economic positions arrange the geographical opportunity structure (Galster and Sharkey, 2017). Through the interplay of various contextual qualities and the features in surrounding locations, spatial context may be operationalized using methods like geographically weighted regression (GWR). This tool provides particular results for multiple locations instead of a single universal output, making it a handy exploring tool.

Space, according to relational theory, can only be described in terms of relations. It encompasses not just people's subjective relationships with one another and their own unique spatial impressions of their neighbourhoods, but also more "objective" interactions, such as the practical distances to places of employment, medical facilities, and educational institutions. The importance of locations' relative positions is highlighted by relational views on place (Cummins et al., 2007). The ability to measure distances and relative positions is fundamental to spatial knowledge (Montello, 1998). In addition, circumstances in one community do not exist in a vacuum; they are

influenced by those in other communities.

because of this, spatial autocorrelation is the key idea of the study. Lastly, individual results may be influenced by links between geographically dispersed locales, such as people's movement trajectories or regional labour markets. Microgeographic data allows for more precise measurements of distances and spatial interactions.

Not only may the home locations of individuals be recorded using population registers or census data, but modern technologies like mobile sensing can also be used to track people's movements, providing even more precise location measurements. This innovation raises privacy issues, albeit it is novel (Campbell et al., 2008). Limited release, pre-computed indicators and synthetic data, remote access, and question-and-answer are four approaches for privacy-conscientious usage of mobile phone data for research that were suggested by De Montjoye et al. (2018). Although some of the models are applicable to health data and other forms of sensitive data, none of them simplify the challenges associated with using sensitive data in research (De Montjoye et al., 2018). More and more sensitive data is being linked from many sources, including administrative records, survey data, and aerial images, which raises privacy concerns.

2 Fuzzy and bounded space

"Geographic objects with indeterminate boundaries" is the definition given to neighbourhoods by Burrough and Frank (1996). For the same neighbourhood effect mechanism in one context, or for the same mechanism in another, the importance of imposed borders varies. Areas bordering asylum facilities and officially established neighbourhoods with large minority populations may both be stigmatised, however the size of these places may not match up with administrative divisions. People may depend on recognised authorities, yet many limited and fuzzy areas dictate the narratives of particular homes. Designated neighbourhoods, like school districts, may also consider (functional) distances to transit locations and other facilities when choosing possible communities. The relevant settings become even more nebulous when one moves into the area, as proximity rather than administrative boundaries determines one's exposure to others. Better understanding of confined areas, such as ethnic composition heterogeneity or housing types within administrative units, and fuzzy spaces of potential or actual exposure to context may be achieved with the use of microgeographic data.

Instead of using fixed geographical units, a "moving window" with exposure surfaces specified at various spatial scales better represents an individual's exposure to environment. If, for instance, a person's home is in a very tiny region surrounded by a much bigger, very different area, merging the two locations into one huge unit would hide this. According to Jones et al. (2018), this is not the case with the moving window. Moving windows that expose surfaces may also help us go beyond discrete-space models. The widely-used fixed effects model renders geography irrelevant when considering neighbourhood effects, which are inherently spatial processes (Bell et al., 2018). Furthermore, the subject of neighbourhood effects becomes meaningless when a person is used as the only control unit in a fixed effects model, which rejects group level effects and claims that outcomes are independent across regions. There are two main approaches to include geographical dependence: spatial econometric models that capture spillovers and hierarchical space structures in multilevel models. In both perspectives, the interplay and cohabitation of different geographical dimensions is acknowledged, which is crucial to understanding the dynamics of social processes. Furthermore, continuous-space modelling may also be used to very tiny regions that are very near to precise geographic coordinates. By keeping space under consideration throughout, we can see how results are distributed geographically and how big spatial variances, as opposed to using a more conventional and limited approach to evaluating neighbourhood characteristics, which might mask or

understate the impact of context as a multi-dimensional spatial and temporal category (Cummins et al., 2007).

For example, in the case of education results, the duration of exposure to one's home area and school is crucial; for health and labour market outcomes, one's housing and employment are also important. Accordingly, microgeographic data may likewise enhance the space-time relationship. For studies examining exposures on daily space-time routes, for instance, we may use micro-locations; for studies examining long-term exposures to, instance, poverty, we can use bigger scales. Even while administrative units provide a clear outline of a neighborhood's borders, no one knows exactly where somebody lives inside that region. While the borders of an individual's several neighbourhoods are less clear, microgeographic data may more precisely pinpoint their location. Consequently, the crucial concern in measuring various spatial scales is the establishment of appropriate thresholds.

3 Thresholds in fuzzy space

A fuzzy space still has thresholds. Difference and identity are impossible in an environment devoid of boundaries (Abrahamsson, 2018). Fuzzy space and the unique nature of each neighbourhood make it difficult to utilise microgeographic data to set thresholds in custom neighbourhoods. Distance or population statistics are often used to create bespoke communities. From each person's precise location, custom neighbourhoods based on population data may be built. Due to the fact that micro-scale grid cells are produced based on distance, modest increases in distance may be applied more precisely than small increases in population. Regardless of the geometry of the spatial units may be used, however they provide more difficulties when it comes to defining population and distance. Selecting certain methods for defining individual neighbourhoods is both a practical and theoretical concern. One argument in favour of population count thresholds is the fact that the placement of certain institutions or services is dependent on the populations they serve. In other places, the distribution of these persons is significant because of the role that distance plays in determining exposure and accessibility. For instance, while the density of a community might impact social processes, direct residential environments and exposure to first neighbours are often linked with short distances regardless of the number of neighbours. Additionally, population quantity is insufficient to describe large-scale settings since the same number of individuals might be scattered across vastly diverse locations. Local land use patterns (such as homes, playgrounds, transit infrastructure, etc.) might be just as helpful as distance when it comes to establishing boundaries in fuzzy space.

Using spatial profiles—which include a variety of unique neighbourhoods ranging from micro to macro dimensions—it is possible to account for several spatial scales in a fuzzy environment. Using the egocentric paradigm (Lee et al., 2008) as a starting point, Spielman and Logan (2013) generated building profiles that illustrate the scale-dependent changes in environmental social compositions. In order to examine the diversity of distance profiles across scales, Petrovic et al. (2018) constructed distance profiles of exposure to sociospatial content at 101 different spatial scales. According to Dean et al. (2018) and Petrovic et al. (2018), there were areas where the content changed gradually, while other areas showed'social cliffs,' which are sudden shifts in distance profiles. Neighbourhood effects research would benefit from illuminating these noticeable sociospatial shifts because, while often addressed in empirical research, microlocations and local variations in exposure provide the theoretical basis of these effects.

via a surrogate of geographical units that are too coarsely defined. Researchers have paid greater attention to the fuzzy nature of space, its boundaries, and changes within it while researching natural phenomena than social phenomena (Burrough and Frank, 1996; Fisher, 2000). Similar challenges, especially spatial size, were addressed by Fisher et al.

(2004) when determining the extent of a mountain from many perspectives. Urban "social cliffs" and "social cleavages" might be located using the same techniques that were used to determine morphometric classes (ridges, peaks, slopes, channels, and mountains) on mountains. Using these techniques, the idea of distance profiles that reflect sociospatial context may be expanded upon. Regardless of the parameters used to define bespoke neighbourhoods (e.g., distance, population counts, travel time), lower scales allow for more 'bespoke' communities, whereas larger scales allow for more'shared' and over-lapping neighbourhoods. Consequently, the multiscale customised neighbourhood approach highlights both large-scale common contexts and local uniqueness and severe contextual situations. Theoretical frameworks for neighbourhood impacts mechanisms seek this, and this is also the way sociospatial context will be operationalized more often in the future, thanks to the proliferation of data from the microgeography.

V Structuring the uncertainty of sociospatial context

Issues of spatial size and bounds in fuzzy space pervaded both the theoretical and empirical literature reviews on the topic of space and place, as well as the processes of spatial contextual effects. The operationalization of sociospatial context is fraught with ambiguity due to this and the vast potential of micro-geographic data. Research based on actual data that deals with the problem of geographic scope on occasion point out that the magnitude of contextual effects is not governed by any theoretical framework (e.g., Plum and Knies, 2015). Here we provide the connection between spatial scales and contextual processes some form. However, the operationalization of sociospatial context may be organised to reveal which mechanisms are likely to work at which scales and on what parameters this likelihood relies, despite the fact that uncertainty in this area is inevitable.

In Figure 1, we can see a matrix representing various geographical scales and contextual processes. A scale's density indicates how probable it is that it is relevant to a certain process. For instance, school districts stretch to wider sizes than peer group impacts, which typically function at smaller geographical regions. Processes like stigmatisation are examples of systems that may function at many scales concurrently. While variables affecting the job market tend to have an impact on broader geographic scales, the precise scope of each labour markets differs throughout areas. In Figure 1, the horizontal lines show several methods. If we use only one spatial scale, we can miss certain important scales while catching others that are less important.

One way to illustrate how people's sociodemographic traits and their urban environment influence the choice of size is with the following example: Although one kid lives on a street with low-income neighbours, he or she attends a middle-class school and lives in a middle-class neighbourhood. Even if they both reside in the same metropolitan region and attend the same school, one youngster lives on a street with more wealthier neighbours. Since both kids are urban dwellers, their spatial contexts involve interactions between elements at the individual, family, neighbourhood, city, and regional levels, among others. These contexts are shared at some dimensions and different at others.

Recognising the critical lower-level variables is the key to bringing together neighbourhood impacts research with views on human development that are more focused on individuals and families.

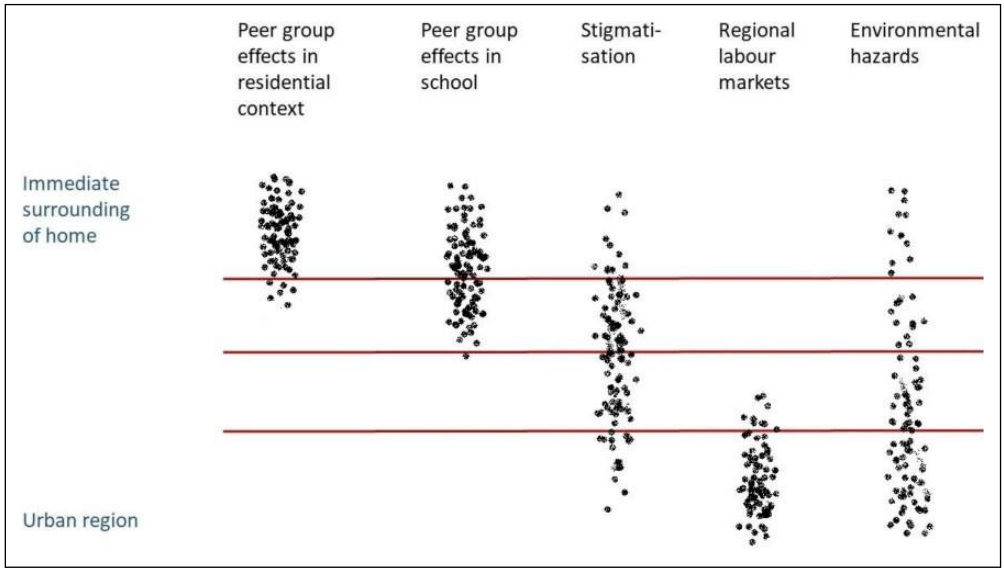

Figure 1. Spatial scales of contextual mechanisms.

context – the family, and its mediating position between an individual and the neighbourhood (Lee, 2001; Hedman et al., 2019), as well as the interaction of other factors, such as genes, with the environment (see e.g. Boardman et al., 2013). Although technology has become increasingly important in the social domain, many forms of social life remain spatially organised. Many types of behaviours are spatially concentrated, so that even individuals who use the internet the most concentrate in certain neighbourhoods (Sampson, 2012).

General hypotheses about specific mechanisms and their spatial scope are as important as the knowledge of the spatial and temporal setting. Theory can inspire qualitative studies in various settings, based on which hypotheses for quantitative studies can be formulated. Ethnographic studies, therefore, have an intermediate role between theory and quantitative studies – to help generate clearer and more specific hypotheses, but also to provide qualitative data which can be linked with administrative records. The way to implement the theory of contextual mechanisms in quantitative studies would then be firstly, to formulate general hypothesis, for distinguishing between different mechanisms, e.g. peer group effects operate at a smaller spatial scale than stigmatisation (see Figure 1); secondly, to analyse the spatial and temporal setting, e.g. stigmatisation takes larger spatial scope in a big city and increases over time as the concentration of poverty increases; thirdly, to formulate specific and nuanced hypotheses regarding affected people, e.g. people from the neighbourhood with different vocations or of different age are affected in different ways.

VI Conclusions

With the proliferation of high-quality, easily-accessible spatial data, this study expands upon previous theoretical and empirical work on neighbourhood effects in an effort to increase spatial awareness and bring together expertise from other fields. We found that there is a growing fascination in geographical size and customised neighbourhoods, but that there are also disagreements between the theoretical and empirical perspectives on contextual impacts.

In light of this, we suggested applications for microgeographic data that may potentially further the study of contextual impacts. To start with, we should take a spatial view from methods that make use of it, like GIS, since data should serve as a reminder that contextual effects study is all about the area around us. Second, fuzzy space theory may be used to microgeographic data. Additionally, while using distinct ideas of space (fuzzy and bounded) as necessary, it is important to remember clearly recognisable landmarks and bounds. Third, microgeographic data, such as spatial profiles, are needed for more exploration of fuzzy space, especially its thresholds. Spatial profiles reveal that MAUP is more than just an issue; it can be used as a tool to examine contexts at various sizes within space.

For quantitative research to be conducted, there must be a coordinated supply of high-quality data, mathematically-expressed hypotheses, analytical methods and tools, and technology to support the study (Haining, 2003). An important first step, and preferably the primary factor in selecting suitable geographical data, is formulating hypotheses. Social mechanisms, for instance, vary from institutional mechanisms in terms of geographical size and zonation schemes; hence, these ideas should be guided by theoretical approaches to the processes of neighbourhood impacts. Using the findings of qualitative research on the study area and spatial patterns of area features (such as housing types or poverty concentrations in various regions of cities) might help clarify the hypothesis. Importantly, micro-geographic data enable the implementation of a broader range of scaling and zonation schemes, making theoretical approaches to neighbourhood effects practicable and reintroducing spatial thinking to the field of neighbourhood effects research.

In fields like health geography and criminology, the idea of place was first introduced, and there is a clear relationship between theorising place and space and the availability of geographical data. received greater focus than other areas of study in the field of neighbourhood impacts (for a related remark, see Haining, 2003). Additionally, there are similarities between theoretical methods used to study social theory or the technical aspects of spatial data (e.g., spatial spillovers, the relational approach) and the nature of spatial data (e.g., spatial autocorrelation). Research on neighbourhood impacts is more grounded, and our understanding of phenomenon size is enhanced, by combining theoretical and geographical analytic methodologies. Collectively, this may subsequently guide the size of analysis. By focusing on both small-scale micro-locations and larger-scale urban, institutional, and economic structures, microgeographic data may help bridge the gap between the phenomena and the scale of research.

Geographical objects with blurry borders in both physical and human geography have a similar pattern. Neighbourhood effects research might benefit from the expertise of geographers, who are known for their keen eye for spatial relationships (Massey, 1995), by developing zonation systems that are more precise in capturing contextual effects and less subject to arbitrary boundaries. Additionally, physical

geography techniques that are utilised to operationalize scale-dependent geo-graphic phenomena may be used to dynamise space and bring it into relevance within the broader social science field (Fisher et al., 2004). Researchers studying neighbourhood impacts may use microgeographic data to account for variability, location, distance, and exposure as well as spatial dependency and heterogeneity among neighbourhoods. We shift from autonomous limited spatial units to continuous space with microgeographic data; here, neighbourhoods are less clear-cut than previously thought; thus, instead of studying 'neighbourhood' impacts, we should look at spatial contextual effects.

A hallmark of neighbourhood effects research for quite some time has been the use of conventional administrative units. This seems sense, given that many datasets have strict geographical requirements. But social scientists are able to better grasp sociospatial environment and draw stronger conclusions regarding contextual impacts because to the increasingly available microgeographic data. Other methods of operationalizing neighbourhoods should not be limited to the range of geographical situations that may be studied using microgeographic data. On the contrary, they ought to establish themselves as a standard in spatial contextual research. Whereas the literature on neighbourhood effects calls for a closer look at what constitutes a neighbourhood, we take it a step further and say that researchers can't advance the field of neighbourhood effects unless they abandon the narrow focus on neighbourhoods in favour of studying how people's larger sociospatial contexts influence their experiences.

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