

#155

AFFILIATION SPATIALLY EXPRESSED

How Social Networks Structure Residential Mobilities in London

ANNA TUONONEN

University College London
anna.tuononen.15@ucl.ac.uk

STEPHEN LAW

University College London
stephen.law@ucl.ac.uk

ABSTRACT

This work investigates the relationships between residential location choice and social networks. Building upon the idea that social networks are key to how cities and peoples' movement are structured (Hillier 2016a), this work suggests they likely participate in urban residential choice behaviours.

It is suggested here, fundamentally, affiliations require a spatial structuring so they can be produced and reproduced. Put in other words, the choice of our residential location implies a choice of whom we want to affiliate with - that space participates in the dynamics of strengthening, maintaining or dissolving social networks - and that we consciously deploy this dynamic. This study's aim is to examine if people's residential mobilities relate to their social networks and what forms these relations might take.

To do so, this paper discusses the interdependencies between space and social networks, based on results from an MSc project released in autumn 2016. Its findings suggest that social networks are locational attractors but work in a wider reading than simply amenities regarding residential mobilities. This work proposes that the networks we have, not only direct our preference of choice in location but constitute our knowledge of suitable options within the housing market.

KEYWORDS

Social networks, residential mobility, residential location choice, housing economics, social economics

1. BACKGROUND

A number of reasons highlight why the intersection of socio-spatial networks and residential mobilities is relevant to study. Hillier identified the relationship of social and spatial networks to be a key priority in space syntax research (2016b). Considering that the research approaches within space syntax are predominantly from a static perspective, there is room to primarily explore the dynamicity of social networks against the background of space. Another aspect calling for this study is a gap between literature in socio-spatial theory and housing economics that explain decision-making concerning residential choice. To date, studies in residential choice theorise renters and buyers without social liabilities (Schirmer et al. 2014) which follows the historic economic tradition in which peoples' everyday decisions are rendered as predominantly economic considerations. While the influence of social networks is recognised in economic theory (a.o. Dutta and Jackson 2003) it has not been directly discussed in relation

to the functioning of property markets. Currently, up-to-date economic conceptions are not capable of fully describing significant phenomena in urban migration, such as the pull of skilled people into the major cities (FT Data 2016). Neither are current models able to explain why many urbanites in precarity chose to stay in places with a region's highest living costs.

Sociologists such as Akerlof (1997) and Granovetter (2005) have argued that social and economic lives are interwoven as process and its consequences. Additionally, some elements within social theory provide the grounds to believing that there could be empirical evidence to people seeking proximity to their social networks. Urry (2012) describes networking as a resource-intensive activity and thus the ability to network, 'social networking capita', is finite - one that enables or constrains an individual's mobilities based on their access to emotion as labour, time, and money among others. Hillier and Netto (2002) presented that copresence and distance are inversely related to the probabilities of meeting, which is the creating and recreating of social relations. These elements together would suggest the proximity to one's social fabric does matter, and that a spatial choice to social networks is made via residential location, implying a social choice.

2. RESEARCH METHOD

2.1 RESIDENTIAL LOCATION CHOICE DATA COLLECTION

A feasible way to capture a social choice being exercised was by observing the spatial relations to person's social networks before and after they moved. With no available datasets to compare several necessary social, spatial and economic parameters, a new dataset was collected.

To achieve this, 125 residents in case areas of London were approached via structured interviews to ask on their residential needs, current and last residential location, and important members in their social networks. Questions were asked about affiliations that are regularly part of respondents' lives and also meeting places where these relations were reinforced. Respondents were inquired about several types of affiliations, individuals and communities, and the distances respondents regularly travelled to enforce their relationships.

2.2 CASE AREAS

Interviewees to this study were to be chosen among residents that had moved to a few different comparable areas. London was picked as the case city due to its benefits of having high residential mobility (Landlord Today 2016) and diverse neighbourhoods.

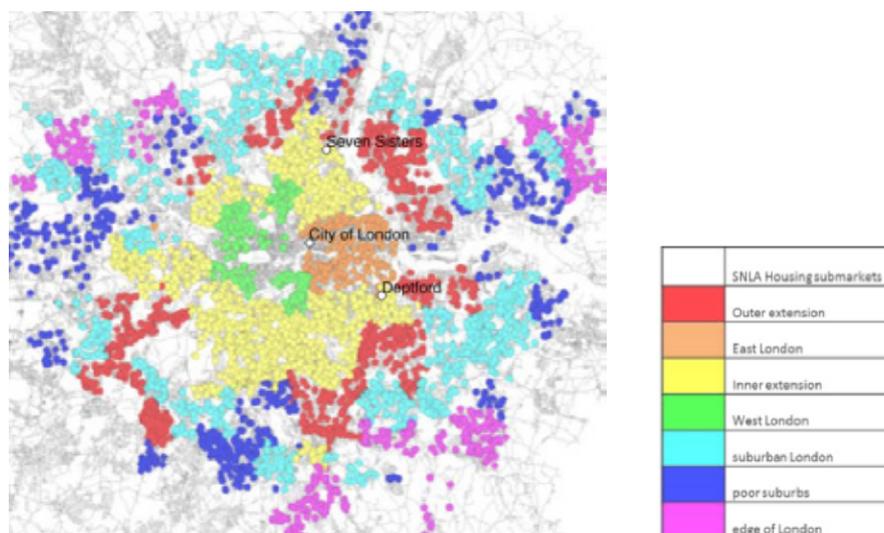


Figure 1 - Areas Seven Sisters and Deptford overlaid on a submarket division proposed by Law et al. 2015.

The control factors by which areas were chosen were the diversity of population measured by social networks (Hristova et al. 2016), belonging to the same submarket when accounting for features of the street grid (Fig.1), similar accessibility values (NAIN, NACH), and demographics by age, ethnicity and occupation to portray a range of narratives that join in location choice. Applying these criteria of similarity, Seven Sisters in Haringey and Deptford in Lewisham were chosen as the case areas to this study.

2.3 SPATIAL ANALYSIS

Space syntax theory and analysis, GIS and statistical analysis were used to derive tendencies from the structural interviews.

GIS: All map representations were created with the help of open-source GIS (geographical information systems) software QGIS. Specific techniques used are geocoding and heatmaps.

Transport analysis: To calculate the distances and travel times between each respondent and their closest contacts, a transport network analysis using the Google Maps API (Application Programming Interface) was conducted. Google Maps API is essentially an app that allows users to calculate spatial distance indices using the Google Map engine and its database.

The database includes:

- the pedestrian network data to calculate walking distances between the origin and destination
- detailed public transport network and time-table data to calculate travel times between origin and destination.

A python-based function was developed to calculate spatial measures in a respondent's egocentric graph (marked in orange, Fig 2.).

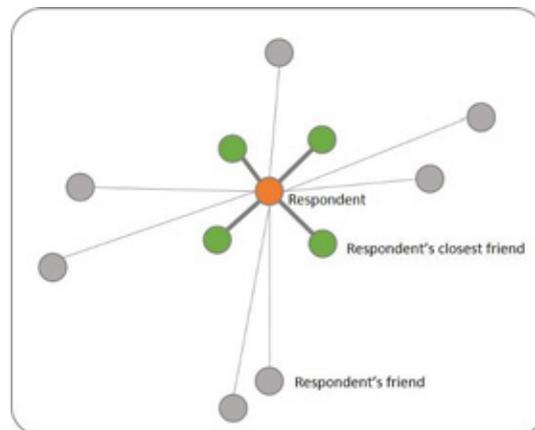


Figure 2 - An ego-centric network graph illustrating the respondent (orange) and the respondent closest affiliations (green). The length of the edge corresponds with the social distance between the respondent and their contacts.

These measures are the metric distance, travel time and angular distance between the interviewee and their closest contacts.

Dist (ij) = network walking distance between i and j
 where i is the interviewed correspondent
 j is each of its closest social contacts

Time (ij) = public transport travel time between i and j
 where i is the interviewed correspondent
 j is each of its closest social contacts

Ang (ij) = network angular distance between i and j
 where i is the interviewed correspondent
 j is each of its closest social contacts

Heatmap of Seven Sisters' and Deptford's NAIN and NACH values for radii 800, 2000 and N.

		SEVEN SISTERS		DEPTFORD		
		Radii	NAIN	NACH	NAIN	NACH
Min.	800		1,748	1,338	1,387	1,353
	2000		1,433	1,423	1,144	1,376
	N		1,380	1,528	1,224	1,502
Max.						

Table 1 - Space syntax: Two commonly used space syntax measures were calculated for central street segments of each case area

One of the measures is the segment angular integration (1) (Hillier and Hanson 1984; Hillier et al. 2012), which measures the reciprocal average shortest path between every origins (i) to every destination (j) - or more simply its to movement potential to reach all nodes in the system (Hillier and Iida 2005). The segment angular intergration is also known as closeness centrality in the network science literature.

$$CC_i(r) = \frac{N(r)-1}{\sum d_{ij}(r)}$$

BC_i is the Betweenness centrality at i

N_{st} is the overlap between s and t on segment i

(2)

$$BC_i = \sum_{s \neq t} \theta_i^{st}$$

3. RESULTS

3.1 INTRAURBAN MIGRATION - A GEOGRAPHICALLY CONFINED PHENOMENON

Unravelling the direction of the analysis, this section shows a visual overview (Fig.3) of where respondents had previously moved to either case area.

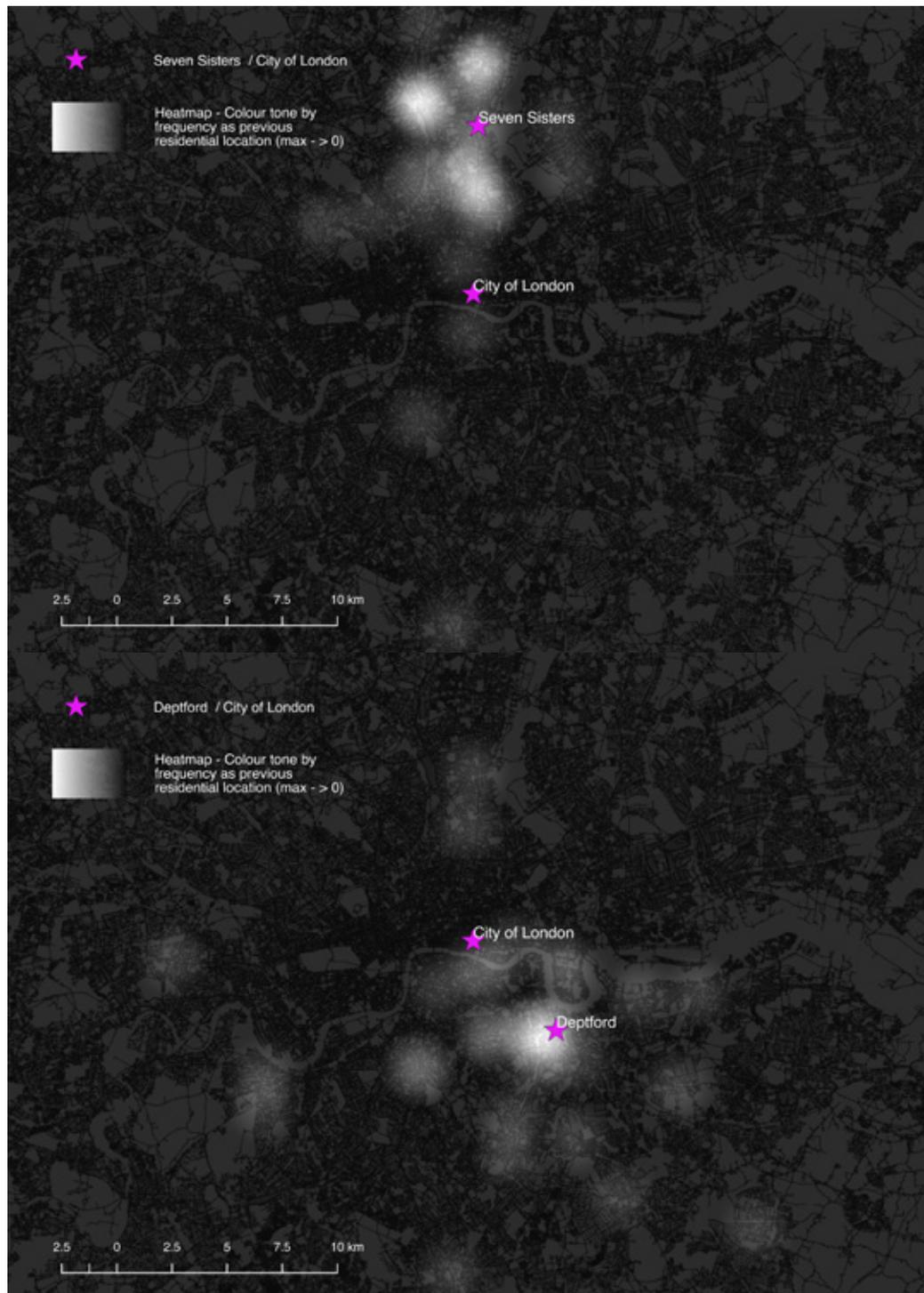


Figure 3 - Point density clusters of respondents' previous residential locations by case area.

The overview suggests that the River Thames notably is a divisive element for people re-settling from either side of the city. A previous research to residential choice (Zondag and Pieters 2005) yielded that its participants' new residential location was strongly related to the site of their last residence. The visual study of Fig.3 confirms this partially, but also that there is variation in the relationship. A significant share of participants had moved locally (Fig.3) which is shown as bright, dense clusters around both case areas. Moreover, the number of those moving declines when exceeding locality to greater distances. These aspects suggest that distance and spatial configuration would influence the mental maps of the city and the choice of residential location.

3.2 LAYING FUNDAMENTS TO RESIDENTIAL MOBILITY: MOTIVATIONS AND IMPROVEMENTS OF HOUSING CIRCUMSTANCES

It is more commonly formulated in studies on residential mobilities, that the decision to relocate stems from a housing arrangement not meeting the occupant's expectations (Clark and Onaka 1985). Considering the historical tradition in which housing needs have been quantified in terms of economic or physical utility, this study brings to light the social choices that have not been considered in detail.

Taking Clark and Onaka's argument as a starting point, respondents of this study were asked to name one or multiple reasons that triggered the choice of their current frames of housing - Table 2 gathers their responses. It indicates, that the access to one's work or study location (31), social opportunities (22) and price (20) are most prominent coherent factors in the location choice for the interviewees of this study. The term 'social opportunities' is used to combine a few named motives describing the same aspect but in more practical terms. These comprise the presence of outdoor places to meet people (new and known), experiencing a sense of community and that people of similar demographics are residing in the same area.

	MOTIVATIONS from 162 total mentions	FREQ.	NAIN
LOW OR NO EFFECT	Shift from renting to buying first property	8	27%
	Contract ended	6	
	Improvement in home's condition	2	
	Price	20	
	Free from commute costs	1	
	Social housing	4	
	Finding a workhome	2	
	IMPLICIT OR LIKELY EFFECT	Access to work or study location	
Bustle		2	
Generally new opportunities		2	
Leisure / things to do		2	
Finding somewhere more suitable for family living		3	
Safer		1	
Amenities, services or consumption opportunities		5	
Work opportunities		2	
EXPLICIT EFFECT	Access to family members(s)	3	42%
	Access to friend(s)	10	
	Social opportunities from this area	22	
	Tension with cohabitants/ neighbours	10	
	Moving in with partner	4	
	Moving in with family member(s)	2	
	Moving in with friend(s)	7	
	Extra room (for child)	10	

Table 2 - The opportunities and improvements claimed by the new dwelling and location, by frequency of mention.

Then, results were categorised by the degree to which each influences peoples' social behaviour and social networks:

- no effect (economic or physical improvements)
- an implicit or likely effect to social networks
- aware motive to directly affect one's social networks.

Doing so helps to distinguish that only 27% of motives had to do with solely physical or economic improvements of housing, as opposed to mainstream conceptions in residential choice literature. Again, 72% of named improvements had consequences on social networks either explicitly or implicitly. An example of an implicit effect of is moving to a safer environment, in which a person may be inclined to spend time outdoors and be exposed to more social contact.

Together, the motives listed (Table 2) uncover a multi-faceted sociality in the improved living circumstances chosen by the participants. The many ways social networks are considered - as current or potential, close or distant – reveal how social networks work in more intricate ways than any of the quantitative methodologies that follow would suggest.

3.3 SOCIAL NETWORKS - A FACTOR WORTH NOTING IN HOUSING ECONOMICS

This section aims to provide a sense of scale and the importance of social networks as a factor in the decision of distance to their contacts – and thus location. To do so, this section deploys quantitative means to explore the urban migration of the study’s interviewees in relation to their social contacts. Continuing from there, this work goes on to examine how social networks perform as a spatial attractor in relation to the workplace, often named an eminent factor for residential location (Schirmer et al. 2014).

We begin by observing how the distance to respondents’ personal networks changed when respondents relocated. This paper finds a trend (Fig. 4) among respondents staying within same distance (29 % saying within +/- 1.25 km distance) or shifting closer (65% moving more than 1.25 km closer) to their affiliations in the urban sphere. One in three (35%) moved more than 1.25 km away from their affiliations. A look at the symmetry of the results show a spatial attraction of social networks: there is a significantly greater deviation among respondents moving closer to their contacts (94.24) than among those moving away (3.27). This difference is constituted of people moving closer to their affiliations over a large scale of possible distances.

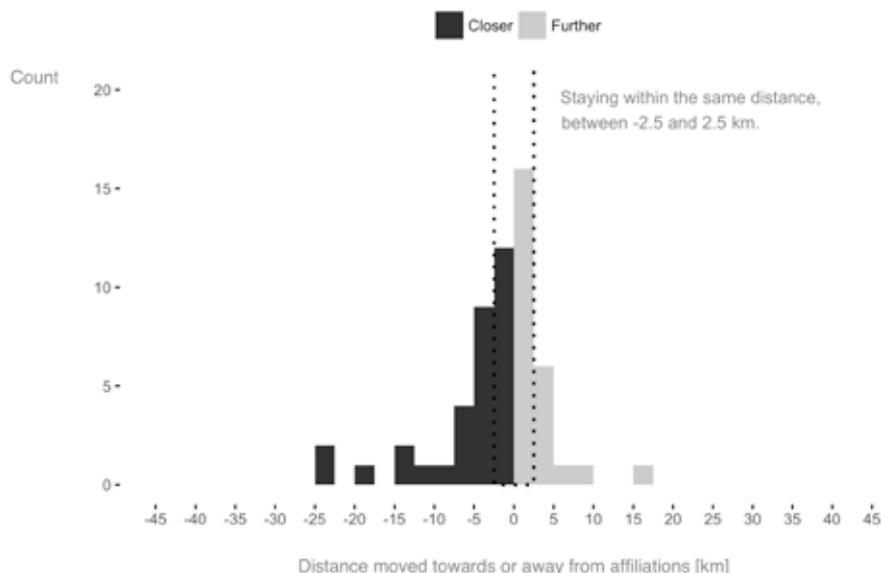


Figure 4 - Relocation depicted as the change of distance to participants’ social network members. The numbers are averaged distances to the respondents’ contacts (individuals, groups and communities), which means all affiliations mentioned are accorded the same weight. Thus, for example, information, where the respondent had moved closer to one particular contact and further away from other contacts, is averaged out. Respondents’ affiliations were asked in the present situation, which entails that they likely did not often meet when living very far away.

To ascertain that the results narrate a spatial preference towards social affiliations, a comparison between work and social networks was made. Among a subset of working participants, via linear regression, changed distances to social contacts as well as work were analysed. Following this, choice behaviors were observed by socioeconomics defined by professional groups and the level of education they require.

Professional group	Regression equation Y = Spat.pref. *X + Constant	Unstandardised coeff. Beta values	Interpretation	RSME	R ²
Group 1-4 Mainly university education	Constant	3.79	balanced between affiliations and work	6.14	0.99
	Spatial preference	1.03			
Group 5-6 Mainly vocational education	Constant	0.55	balanced between affiliations and work	3.08	0.99
	Spatial preference	0.99			
Group 7-9 Mainly no education needed	Constant	-3.42	notably toward work at the expense of affiliations	4.16	0.73
	Spatial preference	0.55			

Table 3 - The linear regression model coefficients on the spatial preference among working participants. The occupational categories in use are applied from Census definitions (2011).

The coefficients indicate (Table 3) that affiliations were as influential as work regarding the change of distance for all respondents except for those working in professions not requiring formal education. The gap among working participants in groups 1-6 and 7-9 demonstrates both that there is a tendency to exercise the choice to be closer to affiliations, but also that there are circumstances to allocate notably more proximity towards work than to social affiliations. With reference to Urry's proposition (2012), the gap likely corresponds to how the maintenance of networks is dependent of societal privileges, to which socio-economic opportunities, Urry argued, are key.

3.4 AREAL SELECTION: ACCUMULATING SPATIAL MEMORY, AND THE FOLLOWING PHENOMENON

Asking respondents what their relationship to their current living area was before they moved revealed that a majority of 59% had contacts that resided in the area already (Table 4).

No known people living	Family member(s)	Partner/ spouse	Friend(s)	Several affiliations	Employer	Has always lived here
15 out of 44 34 %	3 out of 44 7 %	2 out of 44 5 %	5 out of 44 11 %	16 out of 44 36 %	1 of 44 2 %	2 of 44 5 %
59 %						

Table 4 - Responses to question: Did you know someone in this area before moving here?

In their direct meaning, the results imply that among participants there was a tendency to move where their close relations already lived. Indirectly, there are a few ways in which affiliations likely have a role in the location choices here. Firstly, by providing trusted information and by thus directing preference as Granovetter (2005) argues: '[...]social networks affect the flow and the quality of information. Much information is subtle, nuanced and difficult to verify, so actors do not believe impersonal sources and instead rely on people they know.' (ibid., p. 33). Secondly, affiliations may work as destinations to participants' everyday mobilities. Through this, one can experience their area and areas in-between first-hand without obligations. Griffiths (2016) suggests attractors and everyday trajectories equate to areas and accumulate the experience of the lived city: 'Mundane mobility practices also have effects on identity, belonging and understanding of place (as often understood to be the case of exotic journeys to far-away destinations)'. (ibid., p. 242). One respondent of the study mentioned specifically knowing their new neighbourhood, Deptford, as a previous switch point on their commute.

3.5 PERCEIVING THE NEARNESS TO ONE'S SOCIAL FABRIC

This part explores how residents in Seven Sisters and Deptford interacted with the distance incorporated to their social networks when they moved. Two parameters are used to describe perceived distance; this section will examine which of them may better explain the logic by which people move close to each other. To elaborate on the parameters used, spatial distance is considered influencing the likelihood of one's spontaneous and planned meetings (a.o. Hillier and Netto, 2002), whereas the second parameter, travel time, is considered as depicting the mobility costs to meet one's social contacts.

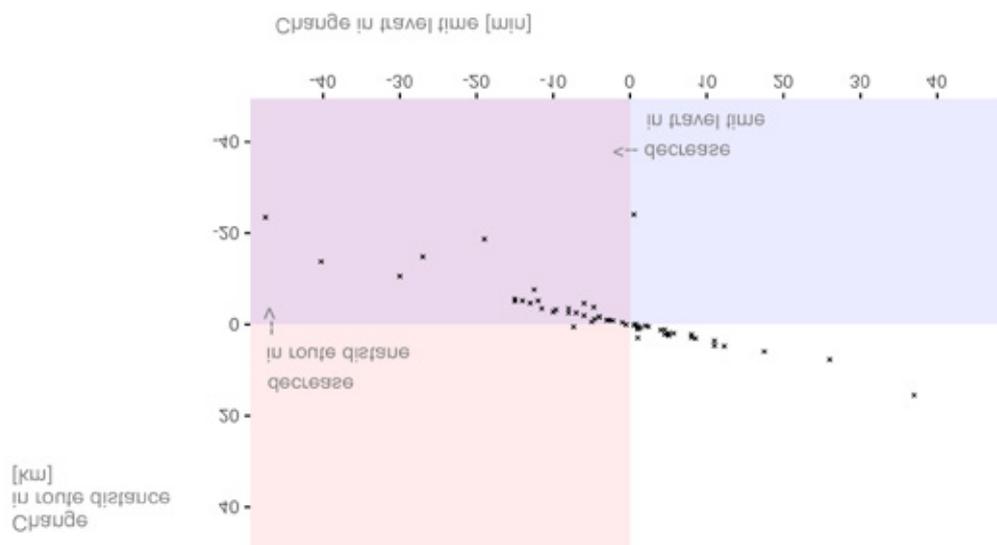


Figure 5 - The changes in route distance and travel time to respondents' social networks.

The above-lying regression analysis (Fig.5) illustrates different behaviour among those relocating further to those moving closer to their affiliations. With increases in both distance and travel time, the results comply to a linear trend; again those who relocated with decreased distance and travel time behaved with lesser uniformity. These participants appeared to an extent 'drawn towards' saving in route distance over travel time. It suggests, that nearness and presence of social networks – if carrying priority – are rather perceived in terms of spatial distance than associated costs to meet.

Results in which there is spatial nearing while travel time is not declining accordingly may also indicate a change of travel mode, where walking locally becomes the fastest means to meet. Considering that most of peoples' trips are short and the likelihood of meetings increases with proximity, the benefit of spatial nearness enables an organic encountering along everyday travel – an aspect that may be a decisive consideration in choosing a distance to one's closest contacts.

3.6 GRASPING THE SPATIALISED MARKET: AFFORDANCES OF THE STREET GRID VERSUS THE SCALES OF RESIDENTIAL MOBILITIES

Section 3.1 (Fig.3) displayed the rapid decline of the number of people moving to either case area the further away they moved from. By examining the same effect numerically (Fig.6), this study observes divergent residential patterns to each case area. Compared to Seven Sisters, Deptford attracted an unexpected number of people further away, as far as approximately 7.5 -10km and from its immediate vicinity. In Seven Sisters the same tendency is inverted, where a majority of participants relocated from within 2.5-7.5 km.

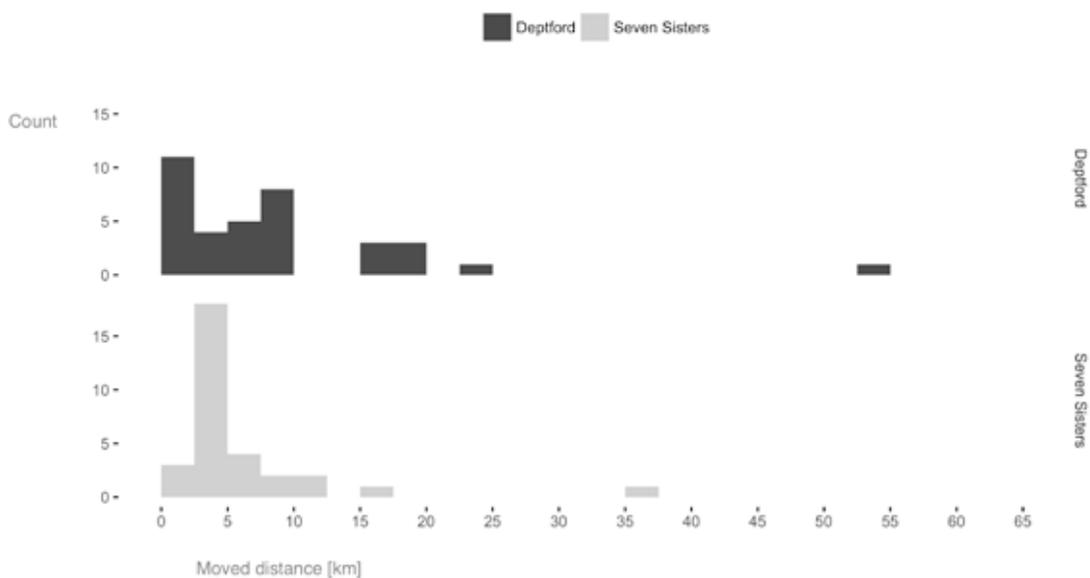


Figure 6 - Change of residential location measured as route distance. Here notable is the difference between the distributions of distances from which residents have located to either case area.

We reflect these results together with the case centers' NAIN and NACH measures (Section 2.3 Table 1) that indicate how likely each of the centres is known in its surrounding area. This comparison highlights a discrepancy, in which in all radii Seven Sisters possesses higher centrality values than Deptford, yet Deptford attracts participants from a greater geographic area. What the pull to Deptford within a larger urban area could potentially mean, is that Deptford is included in the mental map to a more widely spread population despite what the spatial affordances suggest (Table 1) – and since it was chosen possibly implies a better relative option among the areas in people's mental maps. What motivates and characterises someone moving long distances?

Moving distances of the study participants were compared with how far they regularly travelled to maintain their social lives (Fig.7). The scales of moved distances were shown to link to the geographical spread of one's contacts - again indicative of one's capacity to network (Urry

2012). The resulted moving distances may be a multiplied result of networks' influence: contacts informing and directing preference, following contacts where they live to be close to them, and mental maps accumulated through travel practices.

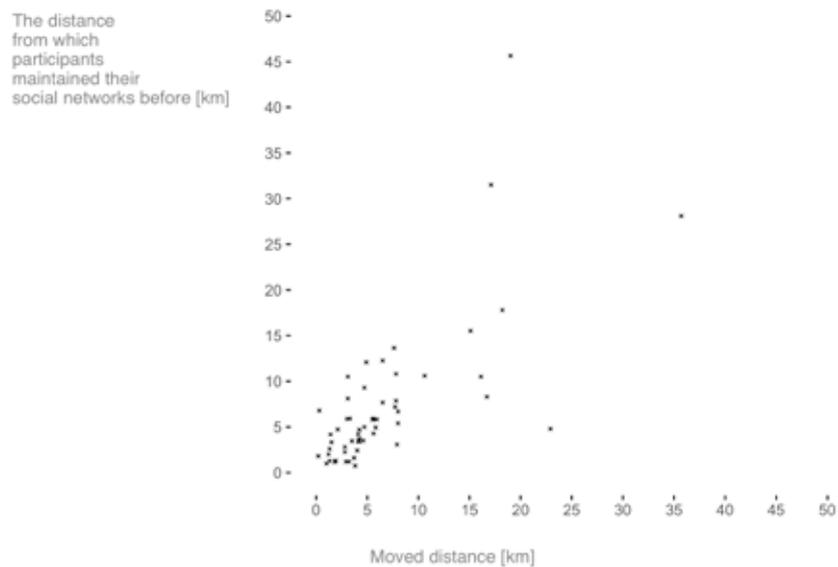


Figure 7 - Respondents' networking mobilities and residential mobilities.

In any of the cases, spatially spread networks seem to allow accumulating knowledge of a larger pool of suitable areas than those whose networks are local – thus allowing a greater freedom to relocate within the housing property market as Fig. 7 suggests. Again those with local social networks showed something to be described as residential 'immobility'. This translated into their new residential choice likely having remained local.

4. DISCUSSION

This paper provided an account of multiple approaches to investigating the link between residential location choice and social networks. Combining the several qualitative and quantitative observations seem to arrive at the same effect – that social networks are incorporated in the notion of space, and that they entail the choice of distance to them.

In the analysis, participants were shown to arrange their spatial circumstance to maintain or strengthen existing relations, but also to dissolving them. Interestingly, for a section of the interviewees, their locational decision was motivated by the potentiality of new encounters. Another key take-away to this work is that the link between social networks and housing choice works in subtler ways and with an expanded notion than indicated in previous interpretations. The analyses accumulated insights to how residential choice is influenced by the interdependence between spatial and social networks. This study highlights some of the findings from both sides.

Findings on the role of space:

- The spatial configuration of London was shown to structure the mental perception of the city, and thus to influence residential mobilities of people of this study.
- Among the subjects of the study choosing proximity to social networks, somewhat more significance was placed on gained spatial proximity than in saving on mobility costs (measured as travel time). This would suggest that proximity is more strongly perceived in spatial terms.

Findings on the role of social networks:

- Social networks are interwoven into residential decision-making, both directly and indirectly:
 - a. Directly: as providers of material everyday support, and an interface to enforce distinct identities.
 - b. Indirectly: by providing information advantage, directing preference and providing a well-trusted source of information unlike for example universal media (Granovetter 2005). Also, enforcing relationships entails the expectation of presence that induces mobilities; through these people become acquainted with areas.
- Social networks appear to play a key role in explaining the variation in the scale of residential mobilities, highlighting how variable the knowledge of the housing market among this study's participants was. This is suggested to be the result of networks influencing people's varying capability to interact with space - and overcoming it.

REFERENCES

- Akerlof, G., 1997. Social distance and social decisions. *Econometrica*, 65(5), pp.1005–1027.
- Dutta, B. and Jackson, M., 2003. On the formation of networks and groups. *Studies in Economic Design, (Networks and Groups)*, pp.1–21.
- FT Data, 2016. Are Londoners leaving London? Available at: <http://blogs.ft.com/ftdata/2016/06/09/are-londoners-leaving-london-internal-migration-uk/> [Accessed August 20, 2016].
- Granovetter, M., 2005. The impact of social structure on economic outcomes. *The Journal of Economic Perspectives*, 19(1), pp.33–50.
- Granovetter, M., 1985. Economic action and the problem of embeddedness. *American Journal of Sociology*, 91(3), pp.481–510.
- Griffiths, S., and Lünen, A. von., 2016. *Spatial cultures: towards a new social morphology of cities past and present*. New York, US: Routledge.
- Hillier, B., 2016a. The fourth sustainability, creativity: statistical associations and credible mechanisms. In J. Portugali and E. Stolk, eds. *Complexity, Cognition, Urban Planning and Design: Post-Proceedings of the 2nd Delft International Conference*. Cham: Springer International Publishing, pp. 75–92.
- Hillier, B., 2016b. What are cities for? And how does it relate to their spatial form? *The Journal of Space Syntax*. Available at: <http://joss.bartlett.ucl.ac.uk/journal/index.php/joss/article/view/282> [Accessed February 5, 2017].
- Hillier, B. and Hanson, J., 1984. *The social logic of space*. Cambridge: Cambridge University Press.
- Hillier, B. and Iida, S., 2005. Network effects and psychological effects: A theory of urban movement. In A. Van Ness, *Proceedings of the Fifth International Space Syntax Symposium*. Delft: University of Technology, pp.553-564.
- Hillier, B. and Netto, V., 2002. *Society seen through the prism of space: outline of a theory of society and space*. Urban Design International.
- Hillier, B. Yang, T. and Turner, A., 2012. Normalising least angle choice in Depthmap and how it opens up new perspectives on the global and local analysis of city space. *Journal of Space Syntax* (3)2, pp.155-193.
- Hristova, D., Williams, M. and Panzarasa, P., 2016. Measuring urban social diversity using interconnected geo-social networks. *Proceedings of the 25th International Conference on World Wide Web*, pp.21–30.
- Landlord Today, 2016. Average tenancy is now 18 months. Available at: <https://www.landlordtoday.co.uk/breaking-news/2016/5/average-tenancy-is-now-18-months> [Accessed June 14, 2016].
- Law, S., Karimi, K. and Penn, A., 2015. An empirical study on applying community detection methods in defining spatial housing submarkets in London. *Proceedings from 10th Space Syntax Symposium*. UCL: London
- Schirmer, P. Van Eggermond, M. and Axhausen, K., 2014. The role of location in residential location choice models: a review of literature, pp.3–21.
- Urry, J., 2012. Social networks, mobile lives and social inequalities. *Journal of Transport Geography*, 21, pp.24–30.
- Zondag, B. and Pieters, M., 2005. Influence of accessibility on residential location choice. *Transportation Research Record: Journal of the Transportation Research Board*, pp.63–70.