



UvA-DARE (Digital Academic Repository)

Are males' incomes influenced by the income mix of their male neighbors? Explorations into nonlinear and threshold effects in Stockholm

Galster, G.; Andersson, R.; Musterd, S.

DOI

[10.1080/02673037.2014.931357](https://doi.org/10.1080/02673037.2014.931357)

Publication date

2015

Document Version

Final published version

Published in

Housing Studies

License

Article 25fa Dutch Copyright Act (<https://www.openaccess.nl/en/in-the-netherlands/you-share-we-take-care>)

[Link to publication](#)

Citation for published version (APA):

Galster, G., Andersson, R., & Musterd, S. (2015). Are males' incomes influenced by the income mix of their male neighbors? Explorations into nonlinear and threshold effects in Stockholm. *Housing Studies*, 30(2), 315-343. <https://doi.org/10.1080/02673037.2014.931357>

General rights

It is not permitted to download or to forward/distribute the text or part of it without the consent of the author(s) and/or copyright holder(s), other than for strictly personal, individual use, unless the work is under an open content license (like Creative Commons).

Disclaimer/Complaints regulations

If you believe that digital publication of certain material infringes any of your rights or (privacy) interests, please let the Library know, stating your reasons. In case of a legitimate complaint, the Library will make the material inaccessible and/or remove it from the website. Please Ask the Library: <https://uba.uva.nl/en/contact>, or a letter to: Library of the University of Amsterdam, Secretariat, Singel 425, 1012 WP Amsterdam, The Netherlands. You will be contacted as soon as possible.

UvA-DARE is a service provided by the library of the University of Amsterdam (<https://dare.uva.nl>)

Are Males' Incomes Influenced by the Income Mix of Their Male Neighbors? Explorations into Nonlinear and Threshold Effects in Stockholm

GEORGE GALSTER*, ROGER ANDERSSON** & SAKO MUSTERD†

*Department of Urban Studies and Planning, Wayne State University, Detroit, MI 48202, USA, **Institute for Housing and Urban Research, Uppsala University, SE-751 20 Uppsala, Sweden, †Department of Geography, Planning and International Development Studies, University of Amsterdam, 1018 TV Amsterdam, The Netherlands

(Received November 2013; accepted June 2014)

ABSTRACT *We investigate the degree to which neighborhood income composition affects the subsequent income of individual male residents, and test the degree to which these effects are characterized by nonlinear, threshold-like relationships. We specify a fixed-effects model to reduce potential bias arising from unmeasured individual characteristics affecting neighborhood selection and income. We employ annual data on 124 000 working-age males residing in Stockholm over the 1991–2006 period to estimate parameters for innovative variables measuring the sequence, duration, and intensity of neighborhood exposures. We find that two thresholds—one above 20 per cent and the other above 40 per cent—best describe the strong inverse relationship between consistent exposure to higher percentages of low-income male neighbors and subsequent earnings of individual male residents. We draw implications for potential causal mechanisms behind this relationship and formulating public policy towards places of concentrated disadvantage.*

KEY WORDS: Neighborhood effects, social mixing, nonlinear effects, threshold effects, fixed effects models, neighborhood income mix

1. Introduction

Understanding how neighborhoods change in ways that manifest themselves as nonlinear or, as a special case, threshold-like relationships has been of longstanding interest to sociologists and other social scientists. Past studies have explored three potentially nonlinear aspects of neighborhood change: demographic, physical, and economic (for a review, see Quercia & Galster, 2000). Though accepted as conventional wisdom for a long

Correspondence Address: Sako Musterd, Department of Geography, Planning and International Development Studies, University of Amsterdam, Plantage Muidergracht 14, Amsterdam 1018 TV, The Netherlands. Email: s.musterd@uva.nl

© 2014 Taylor & Francis

prior period (Wolf, 1963), a theoretical foundation for nonlinear change processes in a neighborhood's racial composition did not emerge until Schelling's (1971) 'tipping' model, which was subsequently extended by Taub *et al.* (1984). Numerous empirical studies have indeed found that threshold-like relationships characterize neighborhood racial transitions, though no universal tipping point exists (Card *et al.*, 2008; Clark, 1991; Crowder, 2000; Galster, 1990; Giles, 1975; Goering, 1978; Lee & Wood, 1991). Indeed, an even wider range of neighborhood socio-demographic dynamics may also be associated with nonlinear processes (Galster *et al.*, 2000, 2007a; Lim & Galster, 2009). As for physical changes in neighborhoods, Taub *et al.* (1984), Galster (1987), and Galster *et al.* (2008b) have contributed theoretical models that implicitly or explicitly suggest that residential property owners' investments in their dwellings (including under-maintenance or even abandonment behaviors) will respond to changes in the neighborhood context in nonlinear or threshold-like ways. Several empirical studies have provided support (Galster, 1987; Galster *et al.*, 2004, 2006; Taub *et al.*, 1984). The economic dimensions of neighborhood property value change in response to changing neighborhood conditions also appear strongly nonlinear, as evinced by the theoretical and empirical work of Meen (2004, 2006) and Galster *et al.* (2006, 2007a, 2008b).

Social scientists increasingly have been interested in not just how neighborhoods change, but also how neighborhoods *change people* (Sampson *et al.*, 2002). Here the evidence on nonlinear relationships is much less definitive, as our review below will make clear. Yet, clarifying this nonlinear issue is of equal importance to policy-makers as determining if there is any kind of substantial neighborhood effect in the first place. As demonstrated in a series of papers, Galster and Zobel (1998) and Galster (2002, 2005, 2007a,b) shows that the particular type of nonlinear relationship between the proportion of a 'disadvantaged' group in the neighborhood and the associated incidence of positive or negative externalities transpiring through intra-neighborhood social interactions holds radically different implications for the desirability and political feasibility of strategies designed to deconcentrate disadvantaged populations spatially. For example, if this relationship were linear (proportional), the spatial redistribution of the disadvantaged population would not in itself lead to any net changes in the aggregate incidence of such externalities society-wide, merely a zero-sum geographic redistribution of the same. In other words, reductions in the incidence of problematic behaviors in neighborhoods from which disadvantaged households moved would be exactly offset by increases in the incidence of such in neighborhoods into which disadvantaged households moved.

Our research reported here tries to respond to this urgent need to understand more about whether the relationship between neighborhood social mix context and resulting labor market outcomes for adult residents is nonlinear or threshold-like. Specifically, we address the research question:

Is the relationship between neighborhood male income mix and labor incomes subsequently earned by males in the neighborhood best characterized as a linear one, nonlinear one, or a threshold effect?

We will answer these questions through a panel study quantifying the degree to which the mixture of low-, middle-, and high-income males in the neighborhood affects the subsequent labor incomes of resident individual males, and investigating the degree to which these effects are nonlinear and vary by timing, duration, and intensity of exposure.

We advance the scholarly literature in three ways by estimating neighborhood effects that: (1) are unusually precise due to our large sample size; (2) are purged from bias from time-invariant unobservables due to the fixed-effect econometric techniques employed; and (3) are potentially nonlinear and characterized by thresholds.

More specifically, using annual information from 1991 to 2006 about 124 000 prime working-age males residing in the Stockholm, Sweden metropolitan area, we estimate a fixed-effects model to minimize the potential bias arising from unmeasured individual characteristics leading to neighborhood selection. Our unusually large sample size and our specification of neighborhood exposure variables allow us to obtain precise estimates of previously unobserved, nonlinear relationships. In overview, we find that two thresholds—at 20 and 40 per cent of low-income male neighbors—characterize the relationship between consistent, multi-year exposure to neighborhood male income mix and subsequent individual male earnings.

Our paper is organized as follows. We begin by briefly reviewing why neighborhood income mix may independently affect individual residents' economic outcomes and then probe how some causal mechanisms imply nonlinear or threshold-like relationships and the temporal patterns over which these relationships may transpire. We then review the scanty literature that has attempted to probe nonlinear effects of neighborhood income mix on individual incomes and find that few have overcome selection bias and none have done so while modeling the temporal dimensions of these relationships, as we do. Next, we describe our data and variables, and present our fixed-effects model. We then present our empirical results, and test for their robustness. We discuss the results and what they imply for theories of neighborhood effects on individual economic outcomes and public policies related to neighborhoods of concentrated disadvantage. We close with conclusions, caveats, and suggestions for future research.

2. Why Might Neighborhood Income Mix Affect Individuals' Labor Market Outcomes?

There have been several comprehensive reviews of the potential theoretical links between neighborhood contexts and individual outcomes of various kinds (see especially Dietz, 2002; Duncan *et al.*, 1997; Galster, 2010; Gephart, 1997; Ioannides & Loury, 2004; Jencks & Mayer, 1990; Manski, 1995; Sampson, 2001; Sampson *et al.*, 2002; Van Kempen, 1997). We discuss below only those facets of this scholarship that apply to our particular neighborhood context variable—income mix—and our particular individual outcome—income—context of each potential mechanism, paying special attention in the following section to causal processes that potentially manifest themselves in nonlinear ways.

The *socialization mechanism* suggests that residents can develop different attitudes, values, behaviors, and expectations about skill acquisition, educational credentials, labor force participation, and criminal activities as a result of interactions with neighborhood peers and role models. Both ethnographic and multivariate statistical studies have indicated the importance of socialization effects in affecting labor market outcomes, especially in the case of young males (see Anderson, 1990, 1991; Case & Katz, 1991; Diehr *et al.*, 1993; Ginther *et al.*, 2000; South & Baumer, 2000; Sullivan, 1989).¹

The *collective social control mechanism* suggests that pervasive community norms regarding education, work, and criminality can shape residents' attitudes, values, and behaviors in these realms because they do not wish to risk the potential social sanctions

(such as ostracism) associated with violation of these norms (e.g., Simmel, 1971; Weber, 1978). Collective social control may affect individuals' incomes directly by encouraging them to upgrade their skills or work second jobs. It may also operate indirectly by, for example, limiting residents' ability and willingness to look for employment opportunities outside of the neighborhood (Pinkster, 2008). Other collective social controls (perhaps arising within kin or cultural groups) may operate indirectly to 'insulate' individuals from undesirable neighborhood peer and role model effects (Pinkster, 2008; South, 2001).

The *localized social networks mechanism* suggests that residents may gain different amounts of information about skill-enhancing and employment opportunities, depending on the degree to which they rely on spatially localized, intra-neighborhood social networks and the degree to which such networks help individuals access income-enhancing resources (Granovetter, 1995). Limited social ties with employed and better-educated people who may possess such income-enhancing information is an often-observed characteristic of non-employed and lower-income people, especially when the latter reside amid concentrations of similarly disadvantaged residents (Fernandez & Harris, 1992; Pinkster, 2008; Tigges *et al.*, 1998; Wilson, 1987). Several studies from both the USA and Europe support the idea that these limited 'bridging' social networks reduce economic opportunities (see Bertrand *et al.*, 2000; Buck, 2001; Farwick, 2004; Kleit, 2001a,b, 2002, 2005; Pinkster, 2008; Wilson, 1996).

The *social disorder mechanism* potentially can generate three consequences for the economic opportunities of residents. First, widespread perceptions of social disorder may signal residents (especially males) that superior economic gains (and less chance of arrest) may be had by substituting participation in illegal activities in the neighborhood for participation in the legal labor force (Skogan, 1990). Second, residents may be able to take advantage of a different range of skill-enhancing and employment opportunities depending on the degree to which they feel secure leaving their homes and traversing their neighborhoods (Sampson *et al.*, 1997; Sampson & Raudenbush, 1999). Third, persistent exposure to disorderly, dangerous environments may create psychological damage to residents that may impair their income-earning potential (Fitzpatrick & Boldizar, 1993; Singer *et al.*, 1995).

Unlike the prior four mechanisms that relied upon intra-neighborhood social processes, the following three mechanisms focus upon the neighborhood's relationship with decision-makers and resources in the wider metropolitan context. The *stigmatization mechanism* suggests that prospective employers in the metropolitan area may evaluate job applicants residing in certain locales based on the disrepute of the place. Case study evidence suggests that place-based stigmatization is an oft-occurring process in Western Europe (see especially Atkinson & Kintrea, 1998; Dean & Hastings, 2000; Hastings, 2004; Hastings & Dean, 2003; Martin & Watkinson, 2003; Power, 1997; Taylor, 1998; Wacquant, 1993). More limited evidence indicates it may operate in the USA as well (see Neckerman & Kirschenman, 1991). Permentier *et al.* (2007) found that Utrecht neighborhood reputations were significantly correlated with their socioeconomic characteristics. Andersson & Musterd (2010) found that neighborhood effects were more pronounced in Swedish metropolitan neighborhoods targeted by area-based regeneration policies compared to similar but non-targeted neighborhoods because, they argued, the targeted areas were highly stigmatized.

The *institutional resources mechanism* suggests that public and private institutions controlling important services and facilities geographically vary their quantity and quality

on the basis of neighborhood economic status, thereby differentially affecting residents' opportunities to acquire and use human capital accessed through these institutional resources. There is considerable US evidence of the varied quality of public institutional resources (such as schools and public transit) across neighborhoods, with a strong positive correlation between institutional capacity and service delivery effectiveness and area socioeconomic status (Card & Krueger, 1992; Condrón & Roseigno, 2003; Kozol, 1991; Lankford *et al.*, 2002). There is also some European evidence in this regard (Hastings, 2007, 2009a,b). Other US studies have shown how the internal workings of institutions serving poor communities can shape occupational expectations of their clientele (Bauder, 2001; Rasmussen, 1994). However, in our study site the correlation is likely the opposite due to conscious efforts of the Swedish welfare state to provide compensatory services (temporary employment bureaus, adult education and retraining centers, health care facilities) in more disadvantaged neighborhoods.

The *job accessibility mechanism* suggests that neighborhoods offer different degrees of access to employment information and work sites themselves, due to the combination of the degree of geographical proximity and public transportation disparities. It is important for our purposes to note that a neighborhood's access to jobs may change endogenously with changes in its income mix. For example, gentrification may lead to a substantial increase in local retail and entertainment job opportunities or, conversely, severe downward income succession may lead retailers to close if local disposable incomes fall sufficiently in the aggregate. Numerous US studies have investigated the issue of differential accessibility to work: the 'spatial mismatch' hypothesis (Ihlanfeldt, 1999). Though the Swedish public transportation is considerably more developed than in most US cities where the spatial mismatch hypothesis arose, we note that a concern over accessibility has been sufficient to generate some study in Sweden (see Zenou *et al.*, 2006).

In sum, extant theory argues that at least seven, non-mutually exclusive mechanisms may produce an individualistic labor market effect stemming from neighborhood income mix. Empirical studies have provided qualified support for all of these potential mechanisms, though it is currently impossible from the extant literature to conclude which mechanisms are the dominant contributors to the economic relationships we are investigating here.

3. Theoretical Bases for Nonlinear Neighborhood Effects

There are three, not mutually exclusive, mechanisms noted above through which a nonlinear or even threshold-like relationship between neighborhood income characteristics and individual economic outcomes may be produced: socialization, collective social control, and stigmatization. The socialization effects transpiring through peers and role models may manifest themselves as a process of 'contagion'. The basic tenet of contagion models is that if decision-makers live in a community where some of their respected or admired neighbors exhibit non-normative behaviors, they will be more likely to adopt these behaviors themselves. Crane (1991) proposes a formal contagion model to explain the incidence and spread of behaviors in neighborhoods with economic consequences, such as dropping out of school. The key implication of this contagion model is that there may be a threshold incidence of problematic behaviors in neighborhoods that might be associated with changes in its socioeconomic composition. Crane states that if

the incidence of problems stays below a critical point, the frequency or prevalence of the problem tends to gravitate toward some relatively low-level equilibrium. But if the incidence surpasses a critical point, the process will spread explosively. In other words, an epidemic may occur, raising the incidence to an equilibrium at a much higher level. (1991, p. 1227)

This formulation is based on the relationship of the rate of ‘infection’ (i.e., adoption of non-normative behaviors) to the rate of ‘cure’ (i.e., return to normative behaviors); when the latter exceeds the former, a disproportionate increase in the population-wide rate of non-normative behaviors ensues, eventually tapering off once nearly everyone behaves in this fashion.

The collective social control mechanism also implicitly suggests a threshold given its emphasis on the role that local social groups may exert on shaping an individual’s attitudes, values, and behaviors. Such an effect can occur strongly only to the degree that: (1) the individual comes in social contact with the group and (2) the group can exert more powerful threats or inducement to conform to its positions than competing groups with which the individual comes in contact. These two preconditions imply the existence of a threshold. Given the importance of interpersonal contact in enforcing conformity, if the individuals constituting the group in question were scattered innocuously over urban space, they would be less likely to be able either to convey their normative positions effectively to others with whom they might come in contact or to exert much pressure to conform to these positions. It is only when a group reaches some threshold of density or power over a predefined area that it is likely to become effective in shaping the attitudes, values, and behaviors of other residents. Past this threshold, as more members are recruited, the group’s power to sanction non-conformists probably grows nonlinearly. This is especially likely when the position of the group becomes so dominant as to become normative in the area.²

Finally, we argue that the neighborhood effect of stigmatization operates through a threshold. Opinions held by the larger community about the residents of a particular neighborhood are unlikely to be altered in a linear fashion by marginal changes in the population of the particular neighborhood group that is the prime basis of the stigmatization. A neighborhood that is not stigmatized is not likely to become so if only a few of the ‘disreputable’ group become occupants because the larger society will probably remain unaware of this change. It is only when a threshold of this ‘disreputable’ group has been exceeded that public opinion is likely to turn against this place and all its inhabitants, with concomitant restrictions on their human-capital-building resources and job opportunities.

To conclude, three of the aforementioned seven neighborhood effect mechanisms should manifest themselves as nonlinear or threshold-like relationships between the measured neighborhood economic mix and individual labor force outcomes. The first empirical implication for this paper is that we will experiment with several variable specifications of nonlinear and threshold-like functional forms. The second implication is that we will draw inferences about which causal mechanisms are consistent with the observed empirical relationships. Of course, like virtually all multivariate statistical studies in this field, we cannot measure directly these underlying causal mechanisms that are assumed to be operating behind the veneer of neighborhood income mix, so our inferences will be drawn with caution.

4. Empirical Evidence on Nonlinear Neighborhood Effects on Economic Outcomes

There have been many multivariate studies using non-experimentally produced data that have tried to quantify the linear relationship between a neighborhood's socioeconomic composition and individual economic outcomes. Most have observed nontrivial partial correlations between various measures of the economic composition of neighborhood residents and several measures of adult labor market performance (Andersson *et al.*, 2007; Briggs *et al.*, 2011; Buck, 2001; Musterd & Andersson, 2005, 2006; O'Regan & Quigley, 1996; Urban, 2009), though some have not found statistically or substantively significant relationships that could not be explained by selection (Drever, 2004; McCulloch, 2001; Musterd *et al.*, 2003). The more recent and statistically sophisticated studies employ longitudinal datasets so that they may apply instrumental variable, differencing, fixed effect, or comparisons of siblings techniques to correct for the well-known geographic selection problem,³ yet come to no consensus. Several studies using US data (Bayer *et al.*, 2008; Cutler *et al.*, 2008; Dawkins *et al.*, 2005; Galster *et al.*, 2007b; Vartanian & Buck, 2005; Weinberg *et al.*, 2004), several using Swedish data (Galster *et al.*, 2008a, 2010; Hedman & Galster, 2013; Musterd *et al.*, 2012), one Scottish study (Van Ham & Manley, 2009), and one French study (Sari, 2012) find nontrivial neighborhood effects on various labor market outcomes. On the other hand, three UK-based analyses (Bolster *et al.*, 2007; Propper *et al.*, 2007; Van Ham & Manley, 2010) and one from the USA (Plotnick & Hoffman, 1999) find minor, if any, neighborhood effects, and instead suggest that selection dominates. Evidence from natural experiments has been mixed. Rosenbaum (1991, 1995), Rubinowitz & Rosenbaum (2000), Edin *et al.* (2003), Åslund & Fredricksson (2009), Piil Damm (2009, 2014), and DeLuca *et al.* (2010) find evidence of neighborhood effects on labor market outcomes, but Oreopoulos (2003) does not. Finally, the evidence from the experimental MTO demonstration suggested no substantial effects from different neighborhood poverty rates on labor market outcomes (e.g., Goering & Feins, 2003; Katz *et al.*, 2001, 2007; Ludwig *et al.*, 2000, 2001a,b, 2008; Orr *et al.*, 2003; Sanbonmatsu *et al.*, 2011).

Of more importance for the present work, relatively few studies have tested for nonlinearities in the relationship between a neighborhood's household composition and adult labor market outcomes when analyzing non-experimentally produced data. Vartanian (1999a,b) and Weinberg *et al.* (2004) both examine the consequences of experiencing high neighborhood poverty rates in the USA as a child. Both studies find that the independent impacts of childhood neighborhood poverty rates in encouraging negative outcomes like school leaving and longer adult poverty spells appear to be negligible unless the neighborhood exceeds about 20 per cent poverty, whereupon the externality effects grow rapidly until the neighborhood reaches approximately 40 per cent poverty. Subsequent increases in the poverty population appear to have little marginal external effect. Analogously, the independent impacts of childhood neighborhood poverty rates in discouraging adult employment appear to be negligible unless the neighborhood exceeds about 15 per cent poverty, whereupon the effects grow rapidly until the neighborhood reaches roughly 30 per cent poverty. Again, subsequent increases in poverty appear to have little marginal effect.

As far as nonlinear relationships between individual outcomes and neighborhood percentages of *affluent* residents in the USA are concerned, the work of Crane (1991), Duncan *et al.* (1997), and Chase-Lansdale *et al.* (1997) is relevant, though it applies to youth instead of adults. Unfortunately, though they all suggest the existence of a threshold

of affluence, they differ on where this occurs. Crane's (1991) analysis finds strong evidence of epidemic-like effects on both secondary school leaving and teenage childbearing associated with the share of affluent (professional-managerial occupation) neighbors dropping below 5 per cent. For the same outcome, Duncan *et al.* (1997) find that the effect of percentage of affluent neighbors becomes dramatically stronger when the percentage exceeds the national mean for the neighborhood. Chase-Lansdale *et al.* (1997) find that the percentage of affluent neighbors is positively associated with higher intellectual functioning scores for black children and female children only when the percentage exceeds the 25th percentile and is less than the 75th percentile; for other children, the effect is linear.

Turley (2003) analyzes behavioral and psychological test scores for youth as measured in a special supplement of the US Panel Study of Income Dynamics. She relates these scores to the median family income of the census tract, so one cannot be certain whether the observed relationship is being generated by the relative share of affluent or poor residents. She tests for nonlinearities by employing a quadratic version of median neighborhood income and finds that the squared term is statistically significant and negative for the self-esteem outcome, implying that improving the economic environment of youth has a much greater impact for those initially in disadvantaged circumstances.

The European-based evidence related to potential nonlinear neighborhood effects is even more contradictory. Most relevant evidence focuses on individual economic outcomes as they relate to percentages of disadvantaged neighbors. Here the findings regarding nonlinearities are inconsistent in the extreme (cf. Buck, 2001; Gordon & Monastiriotis, 2006; Hedman & Galster, 2013; Musterd *et al.*, 2003; Musterd & Andersson, 2005; Oberwittler, 2007; Ostendorf *et al.*, 2001; Van der Klaauw & Van Ours, 2003). The two studies using European data to investigate potential nonlinear effects of shares of affluent neighbors on educational attainments both find increasing marginal positive effects (cf. Gordon & Monastiriotis, 2006; Kauppinen, 2004). Buck (2007) observes a variety of nonlinearities and thresholds associated with relationships between various measures of individual social capital and an index of deprivation in UK neighborhoods. Unfortunately, only one of these European-based studies of nonlinear effects used techniques for avoiding selection bias (Hedman & Galster, 2013). Their instrumental variables spline model revealed a substantial negative impact on individual earnings only when the neighborhood share of low-income residents exceeded 20 per cent, and was even more substantial when it exceeded 50 per cent.

To sum up, the literature on the potential nonlinear relationships between neighborhood socioeconomic context and individual labor market outcomes is thin, inconsistent, and likely plagued by geographic selection bias. It is in this realm where we hope this paper can contribute.

5. Data and Empirical Model

5.1. The Swedish Data Files

The variables we employ are constructed from data contained in the Statistics Sweden *Louise* files, which are produced annually. These files contain a large amount of information on all individuals age 15 and above and represent compilations of data assembled from a range of statistical registers (income, education, labor market, and

Table 1. Descriptive statistics for Stockholm males being analyzed.

	Mean	SD
Number of children under age 7	1.066	2.283
Marital status: coupled or married (1 = yes)	0.497	0.500
Pre-retirement status (1 = yes)	0.054	0.226
Parental leave during year (1 = yes)	0.206	0.404
Sick leave during year (1 = yes)	0.097	0.296
Student during year (1 = yes)	0.037	0.189
12 years of education (LT 12 is omitted category)	0.164	0.37
13–14 years of education	0.178	0.382
15 + years of education	0.239	0.427
Changed from couple to single prior year (1 = yes)	0.020	0.139
Changed from single to couple prior year (1 = yes)	0.030	0.171
Mean local labor market earnings for people aged 20–64 (in 100 SWE kronor)	1961.11	313.12
Percentage of low-income neighbors current year	31.221	9.463
Percentage of high-income neighbors current year	37.813	13.846
Dependent Variable		
ln (income from work, in 100 SWE kronor)	6.831	2.628
<i>N</i>	124 269	

population). We merged selected information about individuals from annual *Louise* files to create a longitudinal database 1991–2006 for all adults residing in 1991 in Sweden's largest metropolitan area, Stockholm.⁴ Since we focus on labor income, we confine our analysis to prime working-age males (ages 20–49 in 1991). Since we also wish to maintain a reasonably consistent notion of urban neighborhood, we further confine our analysis to those males who were residents of the Stockholm metropolitan area in each year from 1991 to 2006.⁵ This restriction meant that we analyze 70 per cent of the Stockholm male population ages 20–49 in 1991 and more than half of the resident male population in this range for any given year in our panel. Characteristics of our sample are provided in the descriptive statistics of [Table 1](#).

5.2. Our Model of the Determinants of Individual Labor Incomes

Our outcome of interest is the individual's annual income from work (measured in Swedish *kronor*, SEK; \$1 = 7.40 SEK).⁶ Since this indicator encapsulates the net impact of educational credentials, labor force participation, employment regularity, and hourly compensation, we believe it to be the most comprehensive single measure of an individual's economic performance. We model in conventional, log-linear form⁷ the annual income from work during year t (with the current year $t = 0$) for individual i residing in neighborhood j as:

$$\ln(I_{ij}) = \alpha + \beta[P_{it}] + \gamma[P_i] + \delta[UP_i] + \theta[N_{ij}] + \mu[L_t] + \varepsilon_{it}, \quad (1)$$

where:

- I_{it} = annual income from work observed for individual i in year t ;
 $[P_{it}]$ = observed characteristics in year t for individual i that can vary over time (e.g., marital or fertility status, educational attainment);
 $[P_i]$ = observed characteristics for individual i that do not vary over time (e.g., gender and country of birth);
 $[UP_i]$ = unobserved characteristics for individual i that do not vary over time after start of analysis period that may affect income (e.g., childhood experiences, certain beliefs and work habits);
 $[N_{jt}]$ = observed economic characteristics of neighborhood(s) j where individual resides during year t and three years prior (e.g., shares of low-income neighbors);
 $[L_t]$ = observed characteristics of the regional labor market during year t that potentially affect earnings of all working-age adults;
 ϵ_{it} = a random error term with statistical properties discussed below;
 i = individual;
 j = neighborhood;
 t = year.

As amplified below, we will alter the specification of the $[N_t]$ variables, experimenting with different nonlinear functional forms.

In this study we operationalize ‘neighborhood’ as a ‘SAMS’ area, as defined by Statistics Sweden. The SAMS classification scheme is designed to identify relatively homogeneous areas by taking into account housing type, tenure, and construction period. Buck (2001), Bolster *et al.* (2007), and Andersson & Musterd (2010) consistently found stronger neighborhood effects at smaller spatial scales and the 184 Stockholm SAMS areas (on average 20 hectares and 4259 population) fit these requirements.

We focus on the income mix of neighborhood as the $[N_t]$ variable of importance for three reasons. First, this is the aspect of neighborhood that has been the dominant focus of the international scholarly literature beginning with the ‘concentrated poverty’ thesis of Wilson (1987). Second, this dimension has been the focal point of several ‘social mix’ public policy initiatives in both the USA and Western Europe (see Galster, 2013; Murie & Musterd, 2004; Musterd & Andersson, 2005). Third, an earlier study using similar Swedish data found that initial neighborhood income mix was more strongly correlated with subsequent levels of individual incomes than neighborhood mix defined by education, ethnicity, family status, or housing tenure (Andersson *et al.*, 2007). As our measure of neighborhood income mix, we specify the proportion of working age (20–64 years) males in the lowest 30 per cent of the *nationwide* male income distribution and that proportion in the highest 30 per cent of the distribution; the middle 40 per cent becomes the excluded reference category. For brevity, we will refer to these groups as ‘lower-income’, ‘middle-income’, and ‘higher-income’ neighbors. In the database we have constructed, we computed these neighborhood conditions annually from 1991 to 2006 based on the *entire* adult male population in Stockholm, even though our modeling utilizes only some of these observations, as explained above. We use the male income distribution for operationalizing neighborhood income mix since we think it better serves as a proxy for social networks, role models, and peer effects that may influence individual male’s earnings.⁸ As for the control variables in our models, we operationalize the observed characteristics of individual males $[P_i]$ and $[P]$ with a set of variables describing their

demographic and household characteristics, educational attainments, immigrant status, and features of their employment status during the period that will affect their income but are likely not related to neighborhood context (such as parental leave, illness, or attending school). We also include for $[L_t]$ calendar year, its squared value, and the mean labor income for prime-age workers during year to control for the time-varying local labor market conditions experienced during the period of analysis.⁹ See Table 1 for a complete listing of these variables and their descriptive statistics.

We cannot, of course, directly measure $[UP]$. Indeed, the aforementioned geographic selection bias occurs when this unobserved heterogeneity is not statistically controlled and proves correlated with the $[N]$ variables, producing thereby a violation of the standard independence assumptions for ϵ_{it} . However, the panel nature of our data provides a well-known vehicle for overcoming part of this problem with a proxy for time-invariant unobservables: fixed-effect model. The fixed effects model assumes that each individual has a particular intercept differing from the mean by some constant value, i.e., α_i , which we would argue serves as a proxy for the $[UP]$ terms. Thus, (1) can be rewritten as a fixed effects model:

$$\ln(I_{ijk}) = \alpha_i + \beta[P_{it}] + \gamma[P_i] + \theta[N_{it}] + \mu[L_t] + \epsilon_{it}. \quad (2)$$

We recognize that θ still may be biased if *time-varying* unobserved characteristics $[UP_{it}]$ are strongly correlated with both $[N_{it}]$ and $\ln(I_{ijk})$ in (2).

We do not explicitly model selection into employment but treat this as an implicit intervening variable in our model of neighborhood effects, in the same way as we treat hours worked and the wage per hour. We regard these as behind-the-scenes aspects of labor force activity that may be affected by neighborhood and ultimately will end up as an income effect. In this paper we do not look into this ‘black box’ of all potential intervening variables.

5.3. Empirical Strategy for Estimating the Nonlinearity of Neighborhood Effects

We use two specifications of the $[N]$ variable to test for nonlinearities. The first is a simple quadratic specification, wherein the cumulative percentage of low-income neighbors summed over the current and prior three years¹⁰ and this value squared—and the corresponding pair of variables for the percentage of high-income neighbors—is employed. Unfortunately, quadratics are imprecise for pinpointing thresholds, so we also employ an original specification involving a set of 15 dummy variables entered into model (2). The set describes the timing of the individual’s exposure potentially exceeding a particular minimum percentage (expressed as a dichotomous condition) of *low-income* males (controlling for the percentage of high-income males) in the neighborhood over each of the prior three years (and persisting currently). Each set denoting the sequence consists of 15 mutually exclusive and exhaustive dummy variables denoting alternative sequences of whether the particular minimum percentage of the low-income group was absent or present during a given year for the individual. For a four-year period (including the year contemporaneous to when earnings are measured), there are 16 possible combinations of patterns; the excluded reference category is the case where at no time during the past three years (or currently) the individual has been exposed to a neighborhood condition exceeding the given minimum percentage being modeled at this

point. The other extreme case is when the given minimum percentage was exceeded all three prior years and still persists at the end of year t . As further explanation, one dummy denotes that the individual was exposed to more than x per cent of low-income neighbors only once four years ago, another denotes exposure only once three years ago, etc.; another dummy denotes exposure twice both three and four years ago, another twice two and four year ago, another twice one and four years ago, etc.

By systematically varying in iterative fashion the exposure percentage x defining the set of dummies and re-estimating the model afresh, we obtain an estimate of where threshold effects occur, if anywhere, for a given temporal pattern of exposure. That is, we estimate a set of five regressions like (2); for each the threshold for defining the 15 aforementioned timing of exposure dummies is alternatively set at: 10, 20, 30, 40, and 50 per cent.

In a parallel modeling procedure we estimate four regressions with an analogous set of 15 dummies for the sequence of potentially exceeding a threshold x per cent of *high-income* male neighbors, controlling for the percentage of low-income male neighbors. For percentages of high-income neighbors, we experiment with the alternative minimum percentages of x : 20, 30, 40, and 50 per cent.¹¹

The unique advantage of this specification is that we can not only observe whether thresholds occur (by comparing the coefficients of the dummy denoting a particular temporal pattern of exposure across alternative minimum percentage exposures) but whether the duration of exposure matters in shaping thresholds (by comparing the coefficients of the dummies denoting short-term exposure and more sustained exposure for a given minimum percentage exposure).

Since this specification is unusual, some further explication of how results should be interpreted is in order. Although the two alternative sets of 15 dummy variables uniquely specify each possible sequence of exceeding thresholds involving percentages of low- and high-income neighbors, their coefficients are interpreted as the difference associated with the given sequence of exceeding the particular group threshold being employed at the time and *never* having exceeded that threshold over the prior three years or currently. Because the percentage of high-income neighbors is controlled in the model using the 15 low-income neighbor permutations and vice versa, the implicit variation between sometimes exceeding the threshold percentage and never exceeding it results from differences in the percentage of *middle-income* neighbors.

Given the foregoing foundation we can now specify formally our research null hypotheses in the context of results from estimating Equation (2):

H_{01} : None of the coefficients of the income mix dummy variables are significantly different from zero. If we fail to reject H_{01} , the implication would be that sample individual male's incomes are unaffected by the income mix of males in their neighborhoods.

H_{02} : All the coefficients of the income mix dummy variables are significantly different from zero and, for any given temporal pattern of exposure, vary in magnitude proportionately to differences in the particular income mix dummy variable. If we fail to reject H_{02} , the implication would be that sample individual male's incomes are affected by the income mix of males in their neighborhoods as characterized by a linear relationship.

- H_{03} : All the coefficients of the income mix dummy variables are significantly different from zero and, for any given temporal pattern of exposure, do not vary in magnitude proportionately to differences in the particular income mix dummy variable. If we fail to reject H_{03} the implication would be that sample individual male's incomes are affected by the income mix of males in their neighborhoods as characterized by a continuous, nonlinear relationship with no minimum threshold.
- H_{04} : The coefficients of the income mix dummy variables become significantly different from zero for any given temporal pattern of exposure only after they exceed a critical exposure percentage in the particular income mix dummy variable. If we fail to reject H_{04} , the implication would be that sample individual male's incomes are affected by the income mix of males in their neighborhoods as characterized by a minimum threshold relationship, regardless of duration of exposure.
- H_{05} : The coefficients of the income mix dummy variables become significantly different from zero only after they exceed a critical exposure percentage but only for that subset of income mix dummy variables denoting longer durations of sustained exposure exceeding the critical value. If we fail to reject H_{05} , the implication would be that sample individual male's incomes are affected by the income mix of males in their neighborhoods as characterized by a minimum threshold relationship, but only after sustained exposure to such a context.

6. Findings

6.1. Preliminary Test of Geographic Selection Bias

We began by estimating a benchmark against which we could compare coefficient estimates for neighborhood mix variables based on our fixed-effect model noted above. This 'myopic' model estimates (1) with OLS but no fixed effects, based on a 2000 cross-section of our dataset, with conventional linear variables for the percentages of low- and high-income neighbors.¹² We then estimated a comparable model but using the entire panel with fixed effects. The key comparison involved the magnitudes of the (statistically significant) negative coefficients for the percentage of low-income neighbors: the myopic model estimate was 64 per cent higher. This result matches that of a similar test conducted by Weinberg *et al.* (2004), giving us confidence that our fixed-effect approach is effectively removing the bias associated with geographic selection based on time-invariant unobserved characteristics of individuals analyzed.

6.2. Overview of Results

We estimated parameters of our various fixed-effects models (2) with alternative specifications of neighborhood income mix variables [N] described above, using the generalized least squares algorithm in STATA IC-11. We estimated and report robust standard errors to account for geographic clustering. Our models explained a respectable third of the variance in individual male labor incomes over the 15-year period, with the vast majority of estimated coefficients proving highly statistically significant (see Tables 2–4).

Table 2. Regression results for control variables.

Fixed effects (within regression)	Personal ID	No. of obs =	1615497	
Group variable		No. of groups =	124269	
R^2		Obs per group:	13	
Within	= 0.0889			
Between	= 0.4603			
Overall	= 0.3093			
	$F(31,124268) =$	1111.46		
$\text{corr}(u_i, X)$	= 0.3763	Prob > $F =$	0.0000	
Dependent variable: ln (Income from work, in 100 SWE kronor)	Coefficient	Robust std. error	t	$p > t$
No. of children under age 7	- 0.0076752	0.000965	- 7.95	0.000
Marital status: coupled/married	0.0584399	0.008596	6.8	0.000
Pre-retirement status	- 2.758715	0.030525	- 90.37	0.000
Parental leave during year	0.2799324	0.005156	54.3	0.000
Sick leave during year	0.0844245	0.008057	10.48	0.000
Student during year	- 1.550888	0.014886	- 104.19	0.000
12 years of education	0.1524062	0.034231	4.45	0.000
13-14 years of education	0.0910555	0.033487	2.72	0.007
15 + years of education	0.5637155	0.035592	15.84	0.000
Changed from couple to single prior year	0.0536602	0.010764	4.99	0.000
Changed from single to couple prior year	- 0.0317507	0.00781	- 4.07	0.000
Mean local labor market earnings for people aged 20-64 (in 100 SWE kronor)	0.0004115	7.78E-06	52.86	0.000
Constant	5.834716	0.023029	253.36	0.000
	sigma_u	1.782937		
	sigma_e	1.486876		
	rho	0.589807		

Table 3. Estimated parameters of neighborhood income variables, quadratic model.

Neighborhood income mix	Coefficient	Std. error
Percentage of low-income	- 0.0025	0.0004**
Percentage of low-income squared	- 0.0056	0.0013**
Percentage of high-income	- 0.0025	0.0003**
Percentage of high-income squared	0.0059	0.0010**

** $p < 0.01$.

Note: Robust standard errors reported. Coefficients of squared term are multiplied by 1000. Models include controls shown in Table 2 and fixed effects.

Table 4. Estimated parameters for selected exposures to low-income neighbors (robust standard errors shown in parentheses).

Exposure to low-income neighbors during year is GE:	Years this exposure was experienced		
	Current, Current-1	Current, Current-1, Current-2	Current, Current-1, Current-2, Current-3
10 per cent	0.002 (0.195)	- 0.029 (0.168)	0.124 (0.149)
20 per cent	- 0.018 (0.018)	- 0.015 (0.014)	- 0.051 (0.013)***
30 per cent	- 0.038 (0.011)***	- 0.054 (0.012)***	- 0.06 (0.011)***
40 per cent	- 0.059 (0.018)***	- 0.082 (0.018)***	- 0.069 (0.019)***
50 per cent	- 0.351 (0.055)***	- 0.416 (0.059)***	- 0.322 (0.050)***

*** $p < 0.001$.

Note: All models include controls shown in Table 2 and fixed effects. GE, greater than or equal to.

Results for the control variables are presented in Table 2.¹³ The control variables of time-varying individual characteristics perform as expected. Incomes are greater for those who: have better educational credentials, are not currently enrolled in school, recently changed their civil union status, or take advantage of the generous Swedish benefits for sick leave or parental leave. Those who are phasing into retirement or who have an increase in the number of children under age seven see lower incomes. Years in which local labor markets have greater average incomes subsequently convey analogous gains to individuals, presumably through expanding local labor demands. All the subsequent results regarding neighborhood income mix variables should be interpreted in the context of models containing these control variables (as well as person-specific fixed effects), though for brevity these are not reported.

Of more relevance to our enquiry are the results for the neighborhood income mix variables. In overview, they provide strong evidence of statistically significant, economically substantial nonlinear and threshold effects, although results are notably different for variations in shares of low- and high-income neighbors in the mix.

As a preliminary way of exploring nonlinear possibilities, we begin with the quadratic models. We show in Table 3 coefficients of the neighborhood income mix variables

specified as cumulative percentages of exposures to low- and high-income male neighbors over the current and prior three years. It is clear that the marginal negative associations with either low-income or high-income percentages (compared to middle-income neighbors) are not constant, given the high statistical significance of the squared terms. These nonlinear relationships are mirror images of each other, with the percentage of low-income neighbors exhibiting increasingly negative marginal effects but the percentage of high-income neighbors exhibiting diminishing marginal effects. Given these provocative findings, we are encouraged to investigate threshold possibilities with our aforementioned specification; the remainder of the results section is devoted to these findings.

6.3. Results for Percentages of Low-Income Neighbors

Estimated parameters for selected dummy variables denoting different sequences of exposures to a variety of minimum percentages of low-income neighbors are shown in Table 4 and Figure 1.¹⁴ Examination of these results leads to a sound rejection of null hypotheses H_{01} , H_{02} , and H_{03} , and failure to reject H_{04} and H_{05} . For Stockholm males the percentage of low-income neighbors must exceed some threshold between 20 and 30 per cent before any statistically significant negative relationship emerges, so long as the exposure duration has been three years or less (i.e., starting two years ago and persisting through the current year). In 2000, 12 per cent of our sample lived in such concentrations for three years or less. If the exposure duration has been four years, however, the threshold is lower: in the 10–20 per cent range. Moreover, there is a second threshold for all exposure durations tested that occurs past 40 per cent low-income neighbors, which in

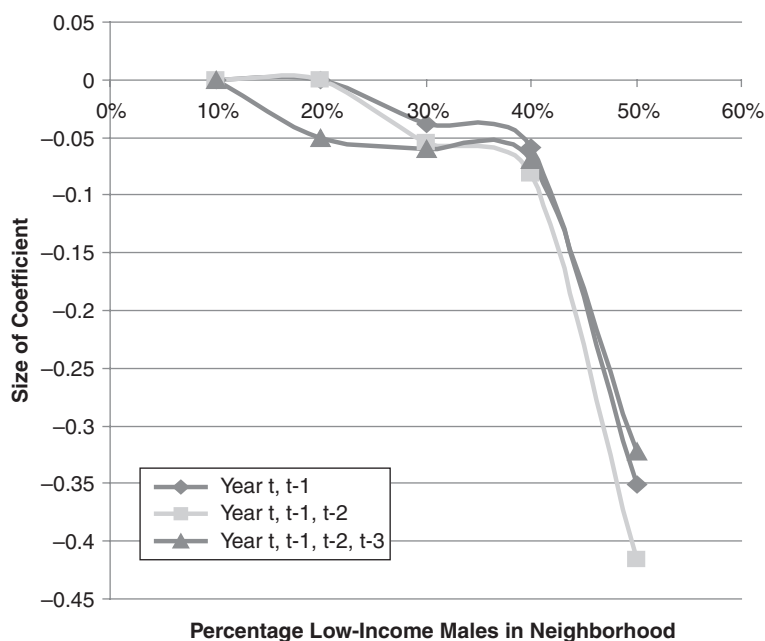


Figure 1. Estimated coefficients for exceeding of alternative thresholds of low-income neighbors, for three durations of exposure. Note: Figure based on data in Table 4.

2000 was the case for 11 per cent of our sample.¹⁵ Exposures above this intensity are associated with dramatically lower incomes for resident males, regardless of whether the exposure began last year or three years previously. Again, all these findings should be interpreted as the association of being exposed to a greater percentage of low-income neighbors compared to an equivalently smaller percentage of middle-income neighbors.

These threshold findings are economically as well as statistically significant, and as such are consistent with results from the fixed-effect models of Vartanian (1999a,b) and Weinberg *et al.* (2004) and the instrumental variable model of Hedman & Galster (2013). If the exposure to low income neighbors during the past two or three years (and persisting currently) was between 20 and 40 per cent, our estimates indicate that individual incomes would be predicted to be 5–8 per cent lower (with slightly larger figures for longer exposures), compared to similar males in their same labor market area who were never exposed to such a high percentage of low-income neighbors over the period (and instead had more middle-income neighbors). Exposure of 50 per cent for two years or more (4 per cent of our sample in 2000), however, was associated with more substantial income penalties: 28–34 per cent compared to similar males who were never exposed to such a high percentage of low-income neighbors over the same period (and instead had more middle-income neighbors).¹⁶ There is no clear relationship between duration of exposure and size of this penalty, however.

6.4. Results for Percentages of High-Income Neighbors

Estimated parameters for selected dummy variables denoting different sequences of exposures to a variety of minimum percentages of high-income neighbors are shown in Table 5. Examination of these results leads to a failure to reject null hypotheses H_{01} , and a rejection of all the others. Indeed, the results for shares of high-income neighbors bear no resemblance to those for low-income neighbors. There are few statistically significant

Table 5. Estimated parameters for selected exposures to high-income neighbors (robust standard errors shown in parentheses).

Exposure to high-income neighbors during year is GE:	Years this exposure was experienced		
	Current, Current-1	Current, Current-1, Current-2	Current, Current-1, Current-2, Current-3
20 per cent	- 0.070 (0.028)*	- 0.093 (0.029)***	- 0.001 (0.026)
30 per cent	- 0.016 (0.012)	- 0.018 (0.013)	- 0.049 (0.013)***
40 per cent	0.01 (0.009)	0.014 (0.010)	- 0.001 (0.011)
50 per cent	- 0.013 (0.010)	- 0.021 (0.011)	- 0.018 (0.012)
60 per cent	0.005 (0.016)	0.022 (0.018)	0.016 (0.018)

* $p < 0.05$; *** $p < 0.001$.

Note: All models include controls shown in Table 2 and fixed effects.

coefficients for the dummy variables denoting the various potential sequences of above-threshold exposures to high-income neighbors, and they follow no consistent patterns related to intensity or duration of exposure. Without exception, these few statistically significant findings indicate that exposures to a larger percentage of high-income neighbors is associated with slightly smaller incomes than exposure to an equivalently larger percentage of middle-income neighbors, but these results are too fragmentary to carry much weight.

To probe this result further, we tested whether there might be a lower threshold associated with percentage of high-income residents. That is, instead of specifying the dummy variables for pattern of exposure as equal to or greater than a particular percentage, we re-specified them as exposure being *less than* this percentage. This experiment provided no new insights. Consistent exposures from two to four years in duration to neighborhoods having either less than 20 per cent or less than 30 per cent high-income neighbors yielded no statistically significant relationships with individual income. The overriding portrait of thus remains that there appear to be no consistent, strong effects on individual Stockholm males' incomes associated with alternative mixes of middle- and high-income neighbors, even at the extremes. This is different from the findings of the US-based studies of Crane (1991), Duncan *et al.* (1997), and Chase-Lansdale *et al.* (1997), though their measures of neighborhood context and individual outcomes are considerably different.

There are several possible explanations for this surprising result. First, it may be that high-income males may not have sufficiently close social distances to middle- and low-income neighbors to become effective peers, role models, collective norm enforcers, and transmitters of employment information resources through local networks. Second, our aggregation of individuals may obscure beneficial externalities that high-income neighbors may generate for other high-income residents, as we have found in companion work (Galster *et al.*, 2013). Third, our fixed-effect model may understate neighborhood effect sizes compared to an instrumental variable specification (cf. Hedman & Galster, 2013). In sum, for the latter two reasons we would urge caution in drawing firm conclusions regarding the impact of high-income neighbors.

7. Discussion

7.1. Issues of Bias and Nonlinear Relationships

We have argued that it is most appropriate theoretically and empirically to model neighborhood effects with an econometric model that both controls for geographic selection bias based on time-invariant unobservables and allows for a nonlinear neighborhood effect. Our results strongly support both claims. Comparison of our fixed-effect estimate to a cross-sectional benchmark estimate suggested that geographic selection bias boosted the magnitude of the apparent neighborhood effect by 64 per cent. Even if less biased, the linear fixed-effect model nevertheless produced a highly misleading 'average effect'. That is, with the linear fixed effect model we found that increasing the low-income share by 10 percentage points (and implicitly decreasing the middle-income share correspondingly) was associated with a decrease in Stockholm males' incomes of 23 per cent, on average.¹⁷ By contrast, the results for our threshold model reported in Table 4 showed that such a hypothetical increase would be associated

with: (1) no income difference if the neighborhood's low-income percentage stayed below 20; (2) a 5–8 per cent lower income if the neighborhood's low-income percentage stayed between 20 and 40; and (3) a 28–34 per cent lower income if the neighborhood's low-income percentage was above 40. Three-quarters of our sample reside in the middle range above; for them the linear estimate of the apparent negative impact of low-income neighbors would represent a gross exaggeration.

Of course, fixed-effects models are not a foolproof means of completely overcoming geographic selection bias, attempting as they do to control only for time-invariant individual unobserved characteristics. Unobserved time-varying characteristics may be lurking behind the scenes here, though we would argue that we have controlled for the major variables likely to produce a correlation between individual income and income mix of the neighborhood inhabited. Nevertheless, as an exploratory analysis we estimated a random-effects model of (2), which arguably would be more capable of controlling for time-varying unobservables (but less capable of controlling for time-invariant ones). The magnitude of the relationships portrayed in [Figure 1](#) appears even stronger with the random-effects model estimates.

7.2. *Issues of Duration and Consistency of Exposure*

Our findings support the notion that neighborhood effects are stronger the longer the exposure to above-threshold intensities, as has been found elsewhere (Musterd *et al.*, 2012). Moreover, while prior work has used 'average' exposures registered over a period (e.g., Clampt-Lundquist & Massey, 2008; Crowder & South, 2011; Holloway & Mulherin, 2004; Kauppinen, 2007; Sampson *et al.*, 2008; Wheaton & Clarke, 2003; Wodtke *et al.*, 2011), we measure whether such exposures occurred *consistently* over the period, finding that such indeed matters for the size of the apparent effect. We recognize that our investigation has been limited to four-year maximum durations of exposure; this was a strategic choice on our part to preserve temporal degrees of freedom in our panel. Certainly, further investigations probing consequences of even longer-term exposures to disadvantaged Stockholm contexts would be appropriate.

7.3. *Potential Mechanisms of Neighborhood Effects*

Earlier we offered several potential explanations drawn from the literature about how the income mix of neighborhoods might affect the subsequent labor earnings of individuals. Our results provide support for several of these mechanisms, but not for others. Our finding of strong nonlinear relationships supports the existence of mechanisms for which theory would predict such a relationship—socialization, collective social control, and stigmatization—as discussed above. Peer effects emanating from lower-income residents that discourage work may become irresistible when the neighborhood exceeds its critical value of these residents. At this critical juncture, norms supportive of work and/or collective social controls may start breaking down in a variety of ways that limit economic opportunities for residents. Stigmatization of neighborhoods because of their high share of low-income residents may also be operating in neighborhoods with roughly half their population in the low-income category. However, we think place-based stigmatization is an unlikely reason compared to socialization and collective social control for the observed reduction of the lower threshold point associated with a longer, more intense exposure to

low-income neighbors. Thus, our evidence is consistent with socialization and collective social control mechanisms that qualitatively change both one standard deviation below the mean percentage of low-income neighbors and again—perhaps more significantly—one standard deviation above the mean. In the latter case the effect may be amplified by an added stigmatization effect that reduces the changes for any employment and thereby imposes severe income penalties. We emphasize that these conclusions about underlying causal mechanisms should be treated as highly tentative pending many more qualitative investigations into a variety of Swedish neighborhood contexts. Moreover, other causal mechanisms (such as networks and institutional resources) may be operative, though we can offer no explanation as to how these mechanisms generate nonlinear effects.

7.4. Implications for Public Policy towards Disadvantaged Neighborhoods

A wide range of programmatic approaches have been employed to combat socio-spatial segregation and prevent the formation of clusters of ‘deprived’ or ‘disadvantaged’ households. These fall under the rubric of ‘social mix’ in Western Europe and ‘mixed income communities’ or ‘poverty deconcentration’ in the US. Programmatic examples include: urban regeneration measures that replace concentrations of social housing with more diverse housing stocks (UK, Netherlands, USA); social housing management and tenant allocation reform (France, Ireland, Netherlands); tenant-based housing allowances (France, USA); and land-use planning rules requiring mixed developments (UK, some US locales) (see Andersson *et al.*, 2010; Berube, 2005; Briggs, 2005; Galster, 2013; Murie & Musterd, 2004; Musterd & Andersson, 2005; Norris, 2006).

These initiatives have been debated on conceptual and empirical grounds by a wide range of European and American scholars (see Atkinson & Kintrea, 2000, 2001; Cheshire, 2007; Joseph *et al.*, 2006; Kearns, 2002; Meen *et al.*, 2005; Musterd *et al.*, 2003; Ostendorf *et al.*, 2001). Our work will not resolve this debate, but it contributes to it in two key ways, assuming we can generalize. First, it implies that the income mix of a neighborhood matters—and in extreme concentrations of low-income groups, it matters a great deal—in shaping the earning prospects of its adult residents. This is in stark contrast to much of the recent neighborhood effects research in the USA cited above, which has often found little labor market impact on adults and instead emphasized effects on children. Thus, policy-makers would do well to pay attention to concentrations of disadvantage as a potential social concern regarding economic opportunity for adults, not merely children. Second, it suggests that increasing spatial concentrations of low-income residents result in (either through intra- and/or extra-neighborhood mechanisms), past some threshold percentage, *increasing* marginal negative externalities for their neighbors that manifest themselves as reduced earnings. This threshold finding is consistent with virtually all (the limited) US-based evidence but only some of the European-based evidence, as explained above. If proven general for other outcomes and national contexts, this means that efforts to deconcentrate low-income populations by creating more mixed-income neighborhoods will yield net positive gains for society, following the models of Galster and Zobel (1998) and Galster (2002, 2005, 2007a,b). This importantly means that policies aimed at avoiding concentrations of disadvantage can be justified on the basis of social efficiency (i.e., utilitarian principles) as well as on humanitarian grounds (Galster, 2013).

8. Conclusion and Caveats

Nonlinear relationships have been of longstanding interest in the theoretical and empirical investigation of the urban neighborhood. They have been a more peripheral concern, however, within the burgeoning literature on how neighborhood context may affect individuals. We have advanced this latter aspect of the literature by investigating whether the relationship between neighborhood income mix and labor incomes subsequently earned by male adults is characterized as nonlinear or threshold effect, and the degree to which this relationship varies with the timing, duration, and intensity of exposure. We employed a fixed-effects model and estimated its parameters using annual data on 124 000 working-age males in Stockholm over the 1991–2006 period. We found that thresholds—characterizing two critical masses of low-income neighbors—best describe the relationship between neighborhood income mix and subsequent individual earnings. The threshold at which small apparent negative income impacts from low-income (compared to middle-income) neighbors manifest themselves appears inversely related to the duration of consistent exposure. No thresholds are apparent regarding the share of high-income neighbors.

Though firm conclusions are impossible, we think that socialization and collective social control, perhaps abetted by place-based stigmatization in extremely disadvantaged contexts, are most strongly supported by the nonlinear findings. Regardless of which mechanisms are producing the statistical results, our findings support the notion forwarded by Wilson (1987) decades ago that there is a compelling public policy interest in focusing on areas of concentrated low-income residence. Further, it implies that future scholarship attempting to quantify neighborhood effects should investigate potential nonlinear aspects of the relationship; average effects can badly distort the situation at the extremes.

In closing, we acknowledge several limitations of our research as a potential guide for future research. First, we have defined income groups in an expansive way; perhaps more extreme nonlinear neighborhood effects might be observed if the share of neighbors in the more extremely low-income groups were considered, instead of the lowest 30 per cent. Second, our analysis excludes recent immigrants to Sweden, who may be affected by different aspects of neighborhood social mix (Andersson *et al.*, 2014). Third, we could not control for the potential biases from time-varying unobservables, so replications employing instrumental variables are recommended (cf. Hedman & Galster, 2013).

Acknowledgements

The authors wish to thank participants in the Glasgow University Urban Studies Seminar and the Inequality and Social Policy Seminar at Harvard University for their constructive feedback on an earlier version of this work, and the University of Amsterdam and Uppsala University – Institute for Housing and Urban Research (IBF) for their institutional financial support. A special debt of gratitude is owed to Prof. Paul Jargowsky, whose exceptionally careful and insightful critique of a preliminary draft of this paper proved immensely helpful. The research assistance of Dan Beard is gratefully acknowledged.

Notes

¹ Also see the reviews in Leventhal & Brooks-Gunn (2000) and Friedrichs *et al.* (2003).

² More modern sociological treatises closely related to collective socialization also suggest thresholds (Granovetter, 1978; Granovetter & Soong, 1983). An illustration is Wilson's (1987) contention that as a critical mass of middle-class families leave the inner city, low-income blacks left behind become

isolated from the positive role models that the erstwhile dominant middle class offered. Economists also have developed several mathematical treatises involving collective socialization effects in which thresholds often emerge as solutions to complex decision problems under certain assumptions (Akerlof, 1980; Brock & Durlauf, 2001; Galster, 1987, chap. 3).

- ³ The empirical challenges associated with obtaining accurate estimates of the independent causal effect of neighborhoods on individual residents has been the subject of numerous scholarly reviews (see Dietz, 2002; Ellen & Turner, 2003; Friedrichs *et al.*, 2003; Galster, 2005, 2008; Gephart, 1997; Leventhal & Brooks-Gunn, 2000; Sampson *et al.*, 2002). Arguably the central methodological challenge that researchers confront in obtaining an unbiased estimate of the magnitude of neighborhood effects is geographic selection bias (Ginther *et al.*, 2000). The issue is that certain types of individuals who have certain (unmeasured) characteristics will move from/to certain types of neighborhoods and these same unobservables may also affect the outcome in question. Any observed relationship between neighborhood conditions and outcomes for such individuals or their children may therefore be biased because of this systematic spatial selection process, *even if all the observable characteristics are controlled* (Duncan *et al.*, 1997; Manski, 1993, 1995, 2000).
- ⁴ We define the metropolitan area as the municipalities of Stockholm, Solna, and Sundbyberg.
- ⁵ This restriction also means that we do not analyze international immigrants who entered Stockholm after 1991. In a companion paper (Andersson *et al.*, 2014), we investigate neighborhood effects for this subpopulation and find that, while strong, they also have distinctive features related to the ethnic and employment composition of neighbors.
- ⁶ Formally, income from work is computed here as the sum of: cash salary payments, income from active businesses, and the value of tax-based benefits that employees accrue as terms of their employment (sick or parental leave, work-related injury or illness compensation, daily payments for temporary military service, or giving assistance to a handicapped relative).
- ⁷ The log-linear transformation not only is appropriate given the positive skew of the income distribution, but also has sound grounding in economic theory, implicitly suggesting that income is a multiplicative (not additive) function of personal, neighborhood, and labor market characteristics.
- ⁸ As a practical matter, the national distributions of males and females are remarkably similar in Sweden.
- ⁹ Multicollinearity resulted in only the squared term being retained in the models.
- ¹⁰ We recognize that this span is arbitrary and represents a compromise: longer periods place higher requirements on how many years we must compute $[N]$ and thus the number of permutations of patterns possible; shorter periods reduce the length of duration for which we can test.
- ¹¹ The ranges of minimum percentages for both groups were selected to insure adequate sample sizes for each alternative.
- ¹² We include in this myopic benchmark model controls for the individual's year of birth and ethnic background (i.e., being Swedish or foreign born) because we do not use fixed effects.
- ¹³ The results for control variables did not vary appreciably with the alternative specifications of $[N]$; thus, for brevity we report only the results for the model using exposure to 50 per cent of more low-income neighbors as the $[N\%X]$ variables.
- ¹⁴ Here we discuss the subsets of income mix dummies showing variations in sustained exposures; other permutations of sequences of exposures also evince similar general patterns and their results are available upon request.
- ¹⁵ We experimented to ascertain more precisely where the threshold was, and determined it was approximately 40 per cent.
- ¹⁶ In a semi-log model it is proper to use the expression $\text{EXP}(b) - 1$ to calculate the percentage difference in income associated with a dummy variable changing from zero to one, where b is the coefficient and EXP is the exponentiation function.
- ¹⁷ Results available upon request to the first author.

References

- Akerlof, G. (1980) A theory of social custom, of which unemployment may be one consequence, *Quarterly Journal of Economics*, 94, pp. 749–775.

- Anderson, E. (1990) *Streetwise: Race, Class and Change in an Urban Community* (Chicago, IL: University of Chicago Press).
- Anderson, E. (1991) Neighborhood effects on teenage pregnancy, in: C. Jencks & P. Peterson (Eds) *The Urban Underclass*, pp. 375–398 (Brookings Institution Press: Washington, DC).
- Andersson, R., BråmÅ, Å. & Holmqvist, E. (2010) Counteracting segregation: Swedish policies and experiences, *Housing Studies*, 25(2), pp. 237–256.
- Andersson, R. & Musterd, S. (2010) What scale matters? Exploring the relationships between individuals' social position, neighbourhood context and the scale of neighbourhood, *Geografiska Annaler B, Human Geography*, 92(1), pp. 1–21.
- Andersson, R., Musterd, S. & Galster, G. (2014) Neighbourhood ethnic composition and employment effects on immigrant incomes, *Journal of Ethnic and Migration Studies*, 40(5), pp. 710–736.
- Andersson, R., Musterd, S., Galster, G. & Kauppinen, T. (2007) What mix matters? Exploring the relationships between individuals' incomes and different measures of their neighborhood context, *Housing Studies*, 22(5), pp. 637–660.
- Åslund, O. & Fredricksson, P. (2009) Peer effects in welfare dependence: Quasi-experimental evidence, *Journal of Human Resources*, 44(3), pp. 798–825.
- Atkinson, R. & Kintrea, K. (1998) *Reconnecting Excluded Communities: Neighbourhood Impacts of Owner Occupation* (Edinburgh: Scottish Homes).
- Atkinson, R. & Kintrea, K. (2000) Owner-occupation, social mix and neighborhood impacts, *Policy and Politics*, 28, pp. 93–108.
- Atkinson, R. & Kintrea, K. (2001) Area effects: What do they mean for British housing and regeneration policy? *European Journal of Housing Policy*, 2(2), pp. 147–166.
- Bauder, H. (2001) 'You're good with your hands, why don't you become an auto mechanic': Neighborhood context, institutions and career development, *International Journal of Urban and Regional Research*, 25(3), pp. 593–608.
- Bayer, P., Ross, S. & Topa, G. (2008) Place of work and place of residence: Informal hiring networks and labor market outcomes, *Journal of Political Economy*, 116, pp. 1150–1196.
- Bertrand, M., Luttmer, E. & Mullainathan, S. (2000) Network effects and welfare cultures, *Quarterly Journal of Economics*, 115(3), pp. 1019–1055.
- Berube, A. (2005) *Mixed Communities in England: A U.S. Perspective on Evidence and Policy Proposals* (York, UK: Joseph Roundtree Foundation).
- Bolster, A., Burgess, S., Johnston, R., Jones, K., Propper, C. & Sarker, R. (2007) Neighborhoods, households and income dynamics: A semi-parametric investigation of neighborhood effects, *Journal of Economic Geography*, 7, pp. 1–38.
- Briggs, X. (Ed.) (2005) *The Geography of Opportunity* (Washington, DC: Brookings Institution Press).
- Briggs, X., Cove, E., Duarte, C. & Turner, M. A. (2011) How does leaving high-poverty neighborhoods affect the employment prospects of low-income mothers and youth? in: H. Newburger, E. Birch & S. Wachter (Eds) *Neighborhood and Life Chances: How Place Matters in Modern America*, pp. 179–203 (Philadelphia: University of Pennsylvania Press).
- Brock, W. & Durlauf, S. (2001) Interactions-based models, in: J. Heckman & E. Learner (Eds) *Handbook of Econometrics*, pp. 3297–3380 (North-Holland: Amsterdam).
- Buck, N. (2001) Identifying neighborhood effects on social exclusion, *Urban Studies*, 38, pp. 2251–2275.
- Buck, N. (2007) Spatial mobility, social mobility, and the neighbourhood: Evidence from the British Household Panel Survey, Paper presented at the workshop: Neighbourhood Effects Studies on the Basis of European Micro-data, Humboldt University, Berlin, March.
- Card, D. & Krueger, A. (1992) Does school quality matter? *Journal of Political Economy*, 100, pp. 1–40.
- Card, D., Mas, A. & Rothstein, J. (2008) Tipping and the dynamics of segregation, *Quarterly Journal of Economics*, 123, pp. 177–218.
- Case, A. & Katz, L. (1991) *The Company You Keep: The Effects of Family and Neighborhood on Disadvantaged Youth*, *NBER Working Paper 3705* (Cambridge, MA: National Bureau of Economic Research).
- Chase-Lansdale, P., Gordon, R., Brooks-Gunn, J. & Klebanov, P. (1997) Neighborhood and family influences on the intellectual and behavioral competence of preschool and early school-age children, in: J. Brooks-Gunn, G. J. Duncan & J. Aber (Eds) *Neighborhood Poverty: Vol. 1. Context and Consequences for Children*, pp. 79–118 (New York: Russell Sage Foundation).
- Cheshire, P. (2007) *Are Mixed-Income Communities the Answer to Segregation and Poverty?* (York: Joseph Rowntree Foundation).

- Clampet-Lundquist, S. & Massey, D. (2008) Neighborhood effects on economic self-sufficiency: A reconsideration of the Moving to Opportunity experiment, *American Journal of Sociology*, 114(1), pp. 107–143.
- Clark, W. A. V. (1991) Residential preferences and neighborhood racial segregation: A test of the Schelling segregation model, *Demography*, 28(1), pp. 1–19.
- Condron, D. & Roscigno, V. (2003) Disparities within: Unequal spending and achievement in an urban school district, *Sociology of Education*, 76(1), pp. 18–36.
- Crane, J. (1991) The epidemic theory of ghettos and neighborhood effects on dropping out and teenage childbearing, *American Journal of Sociology*, 96(5), pp. 1226–1259.
- Crowder, K. (2000) The racial context of white mobility: An individual-level assessment of the white flight hypothesis, *Social Science Research*, 29, pp. 223–257.
- Crowder, K. & South, S. (2011) Spatial and temporal dimensions of neighborhood effects on high school graduation, *Social Science Research*, 40, pp. 87–106.
- Cutler, D., Glaeser, E. & Vigdor, J. (2008) When are ghettos bad? Lessons from immigrant segregation in the United States, *Journal of Urban Economics*, 63, pp. 759–774.
- Dawkins, C., Shen, Q. & Sanchez, T. (2005) Race, space and unemployment duration, *Journal of Urban Economics*, 58(1), pp. 91–113.
- Dean, J. & Hastings, A. (2000) *Challenging Images: Housing Estates, Stigma and Regeneration* (Bristol: The Policy Press and Joseph Rowntree Foundation).
- DeLuca, S., Duncan, G., Mendenhall, R. & Keels, M. (2010) Gautreaux mothers and their children: An update, *Housing Policy Debate*, 20(1), pp. 7–25.
- Dietz, R. (2002) The estimation of neighborhood effects in the social sciences, *Social Science Research*, 31, pp. 539–575.
- Diehr, P., Koepsel, T., Cheadle, A., Psaty, B., Wagner, E. & Curry, S. (1993) Do communities differ in health behaviors? *Journal of Clinical Epidemiology*, 46, pp. 1141–1149.
- Drever, A. (2004) Separate spaces, separate outcomes? Neighborhood impacts on minorities in Germany, *Urban Studies*, 41(8), pp. 1423–1439.
- Duncan, G., Connell, J. & Klebanov, P. (1997) Conceptual and methodological issues in estimating causal effects of neighborhoods and family conditions on individual development, in: J. Brooks-Gunn, G. J. Duncan & J. L. Aber (Eds) *Neighborhood Poverty: Vol. 1. Context and Consequences for Children*, pp. 219–250 (New York: Russell Sage Foundation).
- Edin, P., Fredrickson, P. & Aslund, O. (2003) Ethnic enclaves and the economic success of immigrants: Evidence from a natural experiment, *Quarterly Journal of Economics*, 113, pp. 329–357.
- Ellen, I. & Turner, M. (2003) Do neighborhoods matter and why? in: J. Goering & J. Feins (Eds) *Choosing a Better Life? Evaluating the Moving to Opportunity Experiment*, pp. 313–338 (Washington, DC: Urban Institute Press).
- Farwick, A. (2004) Spatial isolation, social networks, and the economic integration of migrants in poverty areas, Paper presented at the Inside Poverty Areas conference, University of Koln, Koln, November.
- Fernandez, R. & Harris, D. (1992) Social isolation and the underclass, in: A. Harrell & G. Peterson (Eds) *Drugs, Crime and Social Isolation* (Washington, DC: Urban Institute Press).
- Fitzpatrick, K. & Boldizar, J. (1993) The prevalence and consequences of exposure to violence among African-American youth, *Journal of the American Academy of Child and Adolescent Psychiatry*, 32(2), pp. 424–430.
- Friedrichs, J., Galster, G. & Musterd, S. (2003) Neighborhood effects on social opportunities: The European and American research and policy context, *Housing Studies*, 18(6), pp. 797–806.
- Galster, G. (1987) *Homeowners and Neighborhood Reinvestment* (Durham, NC: Duke University Press).
- Galster, G. (1990) White flight from integrated neighborhoods, *Urban Studies*, 27(3), pp. 385–399.
- Galster, G. (2002) An economic efficiency analysis of deconcentrating poverty populations, *Journal of Housing Economics*, 11, pp. 303–329.
- Galster, G. (2005) *Neighbourhood Mix, Social Opportunities, and the Policy Challenges of an Increasingly Diverse Amsterdam* Available at <http://www.fmg.uva.nl/amidst/object.cfm/objectid=7C149E7C-EC9F-4C2E-91DB7485C0839425> (accessed 16 January 2009) (Amsterdam: University of Amsterdam, Department of Geography, Planning, and International Development Studies).
- Galster, G. (2007a) Neighbourhood social mix as a goal of housing policy: A theoretical analysis, *European Journal of Housing Policy*, 7(1), pp. 19–43.
- Galster, G. (2007b) Should policymakers strive for neighborhood social mix? An analysis of the Western European evidence base, *Housing Studies*, 22(4), pp. 523–546.

- Galster, G. (2008) Quantifying the effect of neighbourhood on individuals: Challenges, alternative approaches and promising directions, *Journal of Applied Social Science Studies [Schmollers Jahrbuch/Zeitschrift für Wirtschafts-und Sozialwissenschaften]*, 128(1), pp. 7–48.
- Galster, G. (2010) The mechanism(s) of neighborhood effects: Theory, evidence, and policy implications, Paper presented at ESRC conference on Neighbourhood Effects, St. Andrews University, Scotland, March.
- Galster, G. (2013) Neighborhood social mix: Theory, evidence, and implications for policy and planning, in: N. Carmon & S. Fainstein (Eds) *Planning as if People Mattered: Looking Back to the Future*, pp. 307–336 (Philadelphia: University of Pennsylvania Press).
- Galster, G. & Zobel, A. (1998) Will dispersed housing programs reduce social costs in the U.S.? *Housing Studies*, 13(5), pp. 605–622.
- Galster, G., Andersson, R. & Musterd, S. (2010) Who is affected by neighbourhood income mix? Gender, age, family, employment and income differences, *Urban Studies*, 47(14), pp. 2915–2944.
- Galster, G., Andersson, R. & Musterd, S. (2013) *Neighborhood Social Mix and Adults' Income Trajectories: Longitudinal Evidence from Stockholm*, Unpublished paper (Uppsala: IBF, Institute for Housing and Urban Studies, Uppsala University).
- Galster, G., Andersson, R., Musterd, S. & Kauppinen, T. (2008a) Does neighborhood income mix affect earnings of adults? New evidence from Sweden, *Journal of Urban Economics*, 63, pp. 858–870.
- Galster, G., Cutsinger, J. & Lim, U. (2007a) Are neighborhoods self-stabilizing? Exploring endogenous dynamics, *Urban Studies*, 44(1), pp. 1–19.
- Galster, G., Cutsinger, J. & Malega, R. (2008b) The costs of concentrated poverty: Neighborhood property markets and the dynamics of decline, in: N. Retsinas & E. Belsky (Eds) *Revisiting Rental Housing: Policies, Programs, and Priorities*, pp. 93–113 (Brookings Institution Press: Washington, DC).
- Galster, G., Marcotte, D., Mandell, M., Wolman, H. & Augustine, N. (2007b) The influence of neighborhood poverty during childhood on fertility, education and earnings outcomes, *Housing Studies*, 22(5), pp. 723–752.
- Galster, G., Quercia, R. & Cortes, A. (2000) Identifying neighborhood thresholds: An empirical exploration, *Housing Policy Debate*, 11(3), pp. 701–732.
- Galster, G., Tatian, P. & Accordino, J. (2006) Targeting investments for neighborhood revitalization, *Journal of the American Planning Association*, 72(4), pp. 457–474.
- Galster, G., Temkin, K., Walker, C. & Sawyer, N. (2004) Measuring the impacts of community development initiatives, *Evaluation Review*, 28(6), pp. 1–38.
- Gephart, M. (1997) Neighborhoods and communities as contexts for development, in: J. Brooks-Gunn, G. J. Duncan & J. L. Aber (Eds) *Neighborhood Poverty: Vol. I. Context and Consequences for Children*, pp. 1–43 (New York: Russell Sage Foundation).
- Giles, M. (1975) White flight and percent black: The tipping point re-examined, *Social Science Quarterly*, 56(1), pp. 85–92.
- Ginther, D., Haveman, R. & Wolfe, B. (2000) Neighborhood attributes as determinants of children's outcomes, *Journal of Human Resources*, 35, pp. 603–642.
- Goering, J. (1978) Neighborhood tipping and racial transition: A review of social science evidence, *Journal of the American Institute of Planners*, 44, pp. 68–78.
- Goering, J. & Feins, J. (Eds) (2003) *Choosing a Better Life? Evaluating the Moving to Opportunity Experiment* (Washington, DC: Urban Institute Press).
- Gordon, I. & Monastiriotis, V. (2006) Urban size, spatial segregation and inequality in educational outcomes, *Urban Studies*, 43(1), pp. 213–236.
- Granovetter, M. (1978) Threshold models of collective behavior, *American Journal of Sociology*, 83, pp. 1420–1443.
- Granovetter, M. (1995) *Getting a Job* (Chicago, IL: University of Chicago Press).
- Granovetter, M. & Soong, R. (1983) Threshold models of diffusion and collective behavior, *Journal of Mathematical Sociology*, 9, pp. 165–179.
- Hastings, A. (2004) Stigma and social housing estates, *Journal of Housing and the Built Environment*, 19(3), pp. 233–254.
- Hastings, A. (2007) Territorial justice and environmental services: UK, *Environment and Planning C*, 25, pp. 896–917.
- Hastings, A. (2009a) Neighbourhood environmental services and neighbourhood 'effects': Exploring the role of urban services in intensifying neighbourhood problems, *Housing Studies*, 24(4), pp. 503–524.

- Hastings, A. (2009b) Poor neighbourhoods and poor services: Evidence on the 'rationing' of environmental service provision to deprived neighbourhoods, *Urban Studies*, 46(13), pp. 2907–2928.
- Hastings, A. & Dean, J. (2003) Challenging images: Tackling stigma through estate regeneration, *Policy and Politics*, 31(2), pp. 171–184.
- Hedman, L. & Galster, G. (2013) Neighborhood income sorting and the effects of neighborhood income mix on income: A holistic empirical exploration, *Urban Studies*, 50(1), pp. 107–127.
- Holloway, S. & Mulherin, S. (2004) The effect of adolescent neighborhood poverty on adult employment, *Journal of Urban Affairs*, 26(4), pp. 427–454.
- Ihlanfeldt, K. (1999) The geography of economic and social opportunity within metropolitan areas, in: A. Altshuler, W. Morrill, H. Wolman & F. Mitchell (Eds) *Governance and Opportunity in Metropolitan America*, pp. 213–252 (Washington, DC: National Academy of Sciences).
- Ioannides, Y. & Loury, L. (2004) Job information networks, neighborhood effects, and inequality, *Journal of Economic Literature*, 42, pp. 1056–1093.
- Jencks, C. & Mayer, S. (1990) The social consequences of growing up in a poor neighborhood, in: L. Lynn & M. McGeary (Eds) *Inner-city Poverty in the United States*, pp. 111–186 (Washington, DC: National Academy Press).
- Joseph, M. (2006) Is mixed-income development an antidote to urban poverty? *Housing Policy Debate*, 17(2), pp. 209–234.
- Joseph, M., Chaskin, R. & Webber, H. (2006) The theoretical basis for addressing poverty through mixed-income development, *Urban Affairs Review*, 42(3), pp. 369–409.
- Katz, L., Kling, J. & Liebman, J. (2001) A Moving to Opportunity in Boston: Early results of a randomized mobility experiment, *Quarterly Journal of Economics*, 116, pp. 607–654.
- Kauppinen, T. (2004) Neighbourhood effects in a European city: The educational careers of young people in Helsinki, Paper presented at European Network for Housing Research meetings, Cambridge, July.
- Kauppinen, T. (2007) Neighbourhood effects in a European City: Secondary education of young people in Helsinki, *Social Science Research*, 36, pp. 421–444.
- Kearns, A. (2002) Response: From residential disadvantage to opportunity? Reflections on British and European policy and research, *Housing Studies*, 17(1), pp. 145–150.
- Kleit, R. (2001a) The role of neighborhood social networks in scattered-site public housing residents' search for jobs, *Housing Policy Debate*, 12(3), pp. 541–573.
- Kleit, R. (2001b) Neighborhood relations in scattered-site and clustered public housing, *Journal of Urban Affairs*, 23, pp. 409–430.
- Kleit, R. (2002) Job search networks and strategies in scattered-site public housing, *Housing Studies*, 17(1), pp. 83–100.
- Kleit, R. (2005) HOPE VI new communities: Neighborhood relationships in mixed-income housing, *Environment and Planning A*, 37(8), pp. 1413–1441.
- Kling, J., Liebman, J. & Katz, L. (2007) Experimental analysis of neighborhood effects, *Econometrica*, 75(1), pp. 83–119.
- Kozol, J. (1991) *Savage Inequalities* (New York: Harper).
- Lankford, H., Loeb, S. & Wyckoff, J. (2002) Teacher sorting and the plight of urban schools: A descriptive analysis, *Educational Evaluation and Policy Analysis*, 24(1), pp. 37–62.
- Lee, B. & Wood, P. (1991) Is neighborhood racial succession place-specific? *Demography*, 28(1), pp. 21–40.
- Leventhal, T. & Brooks-Gunn, J. (2000) The neighborhoods they live in, *Psychological Bulletin*, 126(2), pp. 309–337.
- Lim, U. & Galster, G. (2009) The dynamics of neighborhood property crime rates, *Annals of Regional Science*, 43(4), pp. 925–945.
- Ludwig, J., Duncan, G. & Hirschfield, P. (2001a) Urban poverty and juvenile crime: Evidence from a randomized housing-mobility experiment, *Quarterly Journal of Economics*, 116(2), pp. 655–679.
- Ludwig, J., Duncan, G. & Pinkston, J. (2000) *Neighborhood Effects on Economic Self-Sufficiency: Evidence from a Randomized Housing-Mobility Experiment*, JCPR Working Paper 159. Available at <http://www.jcpr.org/wp/Wpprofile.cfm?ID=165> (accessed 17 January 2009).
- Ludwig, J., Ladd, H. & Duncan, G. (2001b) The effects of urban poverty on educational outcomes: Evidence from a randomized experiment, in: W. Gale & J. R. Pack (Eds) *Brookings-Wharton Papers on Urban Affairs*, pp. 147–201 (Brookings Institution Press: Washington, DC).

- Ludwig, J., Liebman, J., Kling, J., Duncan, G., Katz, L., Kessler, R. & Sanbonmatsu, L. (2008) What can we learn about neighborhood effects from the Moving to Opportunity experiment? *American Journal of Sociology*, 114(1), pp. 144–188.
- Manski, C. (1993) Identification of endogenous social effects: The reflection problem, *Review of Economic Studies*, 60, pp. 531–542.
- Manski, C. (1995) *Identification Problems in the Social Sciences* (Cambridge, MA: Harvard University Press).
- Manski, C. (2000) Economic analysis of social interactions, *Journal of Economic Perspectives*, 14, pp. 115–136.
- Martin, G. & Watkinson, J. (2003) *Rebalancing Communities: Introducing Mixed Incomes into Existing Rented Housing Estates* (York: Joseph Rowntree Foundation).
- McCulloch, A. (2001) Ward-level deprivation and individual social and economic outcomes in the British household panel survey, *Environment and Planning A*, 33, pp. 667–684.
- Meen, G. (2004) *Non-Linear Behaviour in Local Housing Markets and the Implications for Sustainable Mixed-Income Communities in England*, Unpublished paper (Reading: University of Reading).
- Meen, G. (2006) *Modelling Local Deprivation and Segregation in England*, Unpublished paper (Reading: University of Reading).
- Meen, G., Gibb, K., Goody, J., McGrath, T. & Mackinnon, J. (2005) *Economic Segregation in England* (York: Joseph Rowntree Foundation).
- Murie, A. & Musterd, S. (2004) Social exclusion and opportunity structures in European cities and neighbourhoods, *Urban Studies*, 41(8), pp. 1425–1443.
- Musterd, S. & Andersson, R. (2005) Housing mix, social mix and social opportunities, *Urban Affairs Review*, 40(6), pp. 761–790.
- Musterd, S. & Andersson, R. (2006) Employment, social mobility and neighborhood effects, *International Journal of Urban and Regional Research*, 30(1), pp. 120–140.
- Musterd, S., Galster, G. & Andersson, R. (2012) Temporal dimensions and the measurement of neighbourhood effects, *Environment and Planning A*, 44(3), pp. 605–627.
- Musterd, S., Ostendorf, W. & de Vos, S. (2003) Neighborhood effects and social mobility, *Housing Studies*, 18(6), pp. 877–892.
- Neckerman, K. & Kirschenman, J. (1991) Hiring strategies, racial bias, and inner-city workers, *Social Problems*, 38(4), pp. 433–447.
- Norris, M. (2006) Developing, designing and managing mixed tenure housing estates, *European Planning Studies*, 14(2), pp. 199–218.
- Oberwittler, D. (2007) The effects of neighbourhood poverty on adolescent problem behaviours: A multi-level analysis differentiated by gender and ethnicity, *Housing Studies*, 22(6), pp. 781–804.
- O'Regan, K. & Quigley, J. (1996) Spatial effects upon employment outcomes, *New England Economic Review: Special Issue: Earnings Equality*, pp. 41–64.
- Oreopoulos, P. (2003) The long-run consequences of living in a poor neighborhood, *Quarterly Journal of Economics*, 118(4), pp. 1533–1575.
- Orr, L., Feins, J., Jacob, R. & Beecroft, E. (2003) *Moving to Opportunity: Interim Impacts Evaluation, Final Report* (Washington, DC: U.S. Department of Housing and Urban Development).
- Ostendorf, W., Musterd, S. & de Vos, S. (2001) Social mix and the neighborhood effect: Policy ambition and empirical support, *Housing Studies*, 16(3), pp. 371–380.
- Permentier, M., Bolt, G. & van Ham, M. (2007) Comparing residents' and non-residents' assessments of neighbourhood reputations, Paper presented at the American Association of Geographers meetings, San Francisco, CA, April.
- Piil Damm, A. (2009) Ethnic enclaves and immigrant labor market outcomes: Quasi-experimental evidence, *Journal of Labor Economics*, 27(2), pp. 281–314.
- Piil Damm, A. (2014) Neighborhood quality and labor market outcomes: Evidence from a quasi-random neighborhood assignment of immigrants, *Journal of Urban Economics*, 79(1), pp. 139–166.
- Pinkster, F. (2008) *Living in concentrated poverty*, Unpublished PhD dissertation, Department of Geography, Planning, and International Development Studies, University of Amsterdam.
- Plotnick, R. & Hoffman, S. (1999) The effect of neighborhood characteristics on young adult outcomes: Alternative estimates, *Social Science Quarterly*, 80(1), pp. 1–18.
- Power, A. (1997) *Estates on the Edge: The Social Consequences of Mass Housing in Northern Europe* (London: Macmillan).
- Propper, C., Burgess, S., Bolster, A., Leckie, G., Jones, K. & Johnston, R. (2007) The impact of neighbourhood on the income and mental health of British Social renters, *Urban Studies*, 44(2), pp. 393–415.

- Quercia, R. & Galster, G. (2000) Threshold effects and neighborhood change, *Journal of Planning Education and Research*, 20(2), pp. 146–162.
- Rasmussen, D. (1994) Spatial economic development, education and the new poverty, *International Regional Science Review*, 14, pp. 107–117.
- Rosenbaum, J. (1991) Black pioneers: Do moves to the suburbs increase economic opportunity for mothers and children? *Housing Policy Debate*, 2, pp. 1179–1213.
- Rosenbaum, J. (1995) Changing the geography of opportunity by expanding residential choice: Lessons from the Gautreaux program, *Housing Policy Debate*, 6(1), pp. 231–269.
- Rubinowitz, L. & Rosenbaum, J. (2000) *Crossing the Class and Color Lines: From Public Housing to White Suburbia* (Chicago, IL: University of Chicago Press).
- Sampson, R. (2001) How do communities undergird or undermine human development? Relevant contexts and social mechanisms, in: A. Booth & A. Crouter (Eds) *Does It Take a Village? Community Effects on Children, Adolescents and Families*, pp. 3–30 (London/Mahwah, NJ: Lawrence Erlbaum).
- Sampson, R., Morenoff, J. & Gannon-Rowley, T. (2002) Assessing ‘neighborhood effects’: Social processes and new directions in research, *Annual Review of Sociology*, 28, pp. 443–478.
- Sampson, R. & Raudenbush, S. (1999) Systematic social observations of public spaces: A new look at disorder in urban neighborhoods, *American Journal of Sociology*, 105, pp. 603–651.
- Sampson, R., Raudenbush, S. & Earls, F. (1997) Neighborhoods and violent crime: A multilevel study of collective efficacy, *Science*, 277, pp. 918–924.
- Sampson, R., Sharkey, P. & Raudenbush, S. (2008) Durable effects of concentrated disadvantage on verbal ability among African-American Children, *Proceedings of the National Academy of Sciences of the United States of America*, 105, pp. 931–969.
- Sanbonmatsu, L., Ludwig, J., Katz, L., Gennetian, L., Duncan, G., Kessler, R., Adam, E., McDade, T. & Lindau, S. (2011) *Impacts of the Moving to Opportunity for Fair Housing Demonstration Program after 10 to 15 Years* (Washington, DC: U.S. Department of Housing and Urban Development, Office of Policy Development and Research).
- Sari, F. (2012) Analysis of neighbourhood effects and work behaviour: Evidence from Paris, *Housing Studies*, 27(1), pp. 45–76.
- Schelling, T. (1971) Dynamic models of segregation, *Journal of Mathematical Sociology*, 1, pp. 143–186.
- Simmel, G. (1971) *Georg Simmel on Individuality and Social Forms* (Chicago, IL: University of Chicago Press).
- Singer, M., Anglin, T., Song, L. & Lunghofer, L. (1995) Adolescents’ exposure to violence and associated symptoms of psychological trauma, *Journal of the American Medical Association*, 273(6), pp. 477–482.
- Skogan, W. (1990) *Disorder and Decline: Crime and the Spiral of Decay in American Neighborhoods* (Berkeley/Los Angeles: University of California Press).
- South, S. (2001) Issues in the analysis of neighborhoods, families, and children, in: A. Booth & A. Crouter (Eds) *Does It Take a Village? Community Effects on Children, Adolescents and Families*, pp. 87–94 (London/Mahwah, NJ: Lawrence Erlbaum).
- South, S. & Baumer, E. (2000) Deciphering community and race effects on adolescent pre-marital childbearing, *Social Forces*, 78, pp. 1379–1407.
- Sullivan, M. (1989) *Getting Paid: Youth Crime and Work in the Inner City* (Ithaca, NY: Cornell University Press).
- Taub, R., Taylor, D. G. & Dunham, J. (1984) *Paths of Neighborhood Change* (Chicago, IL: University of Chicago Press).
- Taylor, M. (1998) Combating the social exclusion of housing estates, *Housing Studies*, 13(6), pp. 819–832.
- Tigges, L. M., Browne, I. & Green, G. P. (1998) Social isolation of the urban poor, *Sociological Quarterly*, 39(1), pp. 53–77.
- Turley, R. (2003) When do neighborhoods matter? The role of race and neighborhood peers, *Social Science Research*, 32, pp. 61–79.
- Urban, S. (2009) Is the neighbourhood effect an economic or an immigrant issue? *Urban Studies*, 46(3), pp. 583–603.
- Van der Klaauw, B. & Van Ours, J. (2003) From welfare to work: Does the neighborhood matter? *Journal of Public Economics*, 87, pp. 957–985.
- Van Ham, M. & Manley, D. (2009) *The Effect of Neighbourhood Housing Tenure Mix on Labor Market Outcomes: A Longitudinal Perspective*, Discussion paper IZA DP no. 4094 (March) (Bonn: Institute for the Study of Labor).
- Van Ham, M. & Manley, D. (2010) The effect of neighbourhood housing tenure mix on labor market outcomes: A longitudinal investigation of neighbourhood effects, *Journal of Economic Geography*, 10(2), pp. 257–282.

- Van Kempen, E. (1997) Poverty pockets and life chances, *American Behavioral Scientist*, 41(3), pp. 430–449.
- Vartanian, T. (1999a) Adolescent neighborhood effects on labor market and economic outcomes, *Social Service Review*, 73(2), pp. 142–167.
- Vartanian, T. (1999b) Childhood conditions and adult welfare use, *Journal of Marriage and the Family*, 61, pp. 225–237.
- Vartanian, T. & Buck, P. (2005) Childhood and adolescent neighborhood effects on adult income: Using siblings to examine differences in ordinary least squares and fixed-effect models, *Social Service Review*, 79, pp. 60–94.
- Wacquant, L. (1993) Urban outcasts: Stigma and division in the black American ghetto and the French periphery, *International Journal of Urban and Regional Research*, 17(3), pp. 366–383.
- Weber, M. (1978) *Economy and Society*, 2 Vols. (Berkeley: University of California Press).
- Weinberg, B., Reagan, P. & Yankow, J. (2004) Do neighborhoods affect work behavior? Evidence from the NLSY79, *Journal of Labor Economics*, 22(4), pp. 891–924.
- Wheaton, B. & Clarke, P. (2003) Space meets time: Integrating temporal and contextual influences on mental health in early adulthood, *American Sociological Review*, 68(5), pp. 680–706.
- Wilson, W. J. (1987) *The Truly Disadvantaged* (Chicago IL: University of Chicago Press).
- Wilson, W. J. (1996) *When Work Disappears* (New York: Knopf).
- Wodtke, G., Harding, D. & Elwert, F. (2011) Neighborhood effects in temporal perspective: The impact of long-term exposure to concentrated disadvantage on high school graduation, *American Sociological Review*, 76(5), pp. 713–736.
- Wolf, E. (1963) The tipping-point in racially changing neighborhoods, *Journal of the American Institute of Planners*, 29(3), pp. 217–222.
- Zenou, Y., Åslund, O. & Östh, J. (2006) *How Important Is Access to Jobs? Old Question – Improved Answer*, IFAU Working paper (Uppsala: Uppsala University).