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Abstract: Empirical studies of Schelling models of segregation have focused on tipping point processes whereby once the minority presence in a neighborhood reaches a particular level, the white population leaves. Commonly, white flight has been identified in a number of empirical analyses including a study by Card Mas and Rothstein (2008) who found that there was strong evidence of discontinuities in white mobility flows around specific tipping points. We re-examine the nature of tipping by specifically considering the role of income in the tipping process. We show that income based sorting modifies the tendency to Schelling-like complete segregation and is consistent with observed changes in segregation patterns in Sweden.

Keywords: Schelling, ethnic preferences, income, house prices, segregation

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1. INTRODUCTION

In this paper we show how patterns of change in neighborhood ethnic composition that have been interpreted as evidence for Schelling-type processes of white flight (Card et al 2008), are in fact compatible with relatively constant levels of segregation in demographic situations where the size of the minority population is increasing. This is an important result since it contradicts the results obtained by Card (2008, using US Data), Alden et al (2015), with Swedish data), and Ong (2017) with Dutch data. Those papers argue for the presence of Schelling type processes towards complete segregation. In contrast we formulate and test a model which is consistent with constant, or even declining levels of segregation, across a range of national contexts (Malmberg, et al 2018).

Even though the numbers of immigrants have been increasing in many Western countries it does not appear that ethnic segregation on the whole is increasing. There is substantial evidence of growing diversity across European and US metropolitan areas, although some groups in the US (Hispanics in particular) have modest increases in segregation. Even so, the declines in overall segregation, or in some contexts relative stability in the levels of segregation have led some to suggest that we are witnessing the "end of the segregated century" (Glaeser and Vigdor, 2012; Clark, 2015). The stable or declining trends in segregation are generally true even though the popular perception often stresses the concentrated nature of new immigrant settlements.

A central aspect of the Schelling (1971) models and the conclusion that neighborhood transitions will lead to a segregated society is the focus on tipping behavior, the point at which a neighborhood transitions from one majority to a new majority population. Card et al (2008) demonstrated tipping like behavior in most cities though the tipping point was quite variable from 5-20 percent. They also showed that integrated neighborhoods with nontrivial minority shares could be stable.

Although they examined rents and prices they did not examine in detail the income based outcomes of tipping. In fact, in their model they assumed all whites have the same income.

Empirically, Card et al (2008) argue that high growth rates for the white population in neighborhoods with high shares of whites, and negative growth rates for whites in neighborhoods with many non-whites can be seen as evidence for a Schelling type tipping point mechanism. However, although if it is true that a specific mechanism (Schelling-type tipping) will generate a specific spatial pattern (negative growth of whites in areas with large shares of non-whites),one cannot infer a specific mechanism from the observation of a specific spatial pattern (Olsson (1969). Thus, we argue, Card and others who have estimated tipping point from data on changes in ethnic composition have not demonstrated that there is an ongoing process of ethnic sorting that will result in complete segregation, only that tipping can change the composition of areas.

We construct our argument by (a) showing that when the minority population is growing, spatial patterns that look like tipping-point white flight will also occur when there is no increase in ethnic segregation, as measured by the dissimilarity index (b) the development of an income based model of neighborhood selection, and (c) empirical evidence of income sorting in Swedish neighborhoods. In situations where rates of population growth are the same across neighborhoods, higher growth rates of natives or whites in neighborhoods with low shares of minorities are required in order to prevent segregation levels from declining. That is, the pattern similar to those found by Card and others would also occur in cases where the non-white population is growing but is distributed across neighborhoods in a way that preserves the existing patterns of over-representation and under-representation.

Our interest in exploring this case comes not only from a desire to reconcile tipping-point findings with findings of unchanging or declining ethnic segregation in the very same countries

and periods, for example in Aldén et al (2015) in contrast to Malmberg et al (2018), or Card et al (2008) with Rugh and Massey (2014). A strong stability and persistence of segregation patterns is also suggested in a recent study that compares ethnic segregation across five European countries: Belgium, Denmark, the Netherlands, Norway, and Sweden (Andersson et al, 2018; Rogne et al 2018). For non-European migrants, segregation profiles across small-scale neighborhoods are almost indistinguishable Rogne et al (2018, Figure 2). These findings point to the possible existence of forces that stabilize patterns of ethnic sorting and, hence it becomes critical to explore patterns of neighborhood change that are compatible with stable levels of segregation.

2. TIPPING, WHITE FLIGHT AND LEVELS OF SEGREGATION

We begin our discussion by exploring changes in the dissimilarity index when we have a growing minority population. The analysis is reported in two Tables (1a and 1b). We compute the growth rate of the white population across neighbourhoods in a city where the minority population is increasing but we maintain a constant dissimilarity index.

Table 1a shows a city divided into ten neighborhoods, each with a total population of 100 individuals. The population is made up of two groups: white and minority individuals, and the distribution of minorities is uneven with only 2% minority in the most-white neighborhood and 73% minority in the most minority dense neighborhood. With the distribution shown in the table the dissimilarity index is 0.53.

Table 1a: Ethnic composition of neighborhoods, year 0

	Total population in neighborhood	White population year 0 in neighborhood	Minority population year 0 in neighborhood	Neighborhood share of the white population	Neighborhood share of the minority population	Absolute difference
	p(i,0)	w(i,0)	m(i,0)	w(i)/W	m(i)/M	
A	100	98	2	12.5%	0.9%	0.1161
B	100	97	3	12.4%	1.4%	0.1103
C	100	96	4	12.3%	1.8%	0.1044
D	100	93	7	11.9%	3.2%	0.0868
E	100	90	10	11.5%	4.6%	0.0692
F	100	85	15	10.9%	6.9%	0.0399
G	100	78	22	10.0%	10.1%	0.0012
H	100	67	33	8.6%	15.1%	0.0657
I	100	51	49	6.5%	22.5%	0.1596
J	100	27	73	3.5%	33.5%	0.3003
Sum	1000	782	218			1.0535
					DI	0.5268

Now assume that the minority population grows by 20% over a 10-year period whereas the white population remains constant. What will then be the growth of the white population in the different neighborhoods if each neighborhood's contribution to the dissimilarity index remains the same and that the total population growth in each neighborhood is the same? The answer to this question is given in Table 1b.

Table 1b shows that there has been population growth in every neighborhood. The total white population is constant but the minority population has grown. But both the white population and the minority population has been redistributed in such a way that the absolute difference between the neighborhood share of the white population and the neighborhood share of the minority population is the same in both year 0 and year 10. This implies that the dissimilarity index is unchanged.

Table 1b: Ethnic composition of neighborhoods, year 10

	Total population in neighborhood	White population year 0 in neighborhood	Minority population year 0 in neighborhood	Neighborhood share of the white population	Neighborhood share of the minority population	Absolute difference	Share of minority in neighborhood year 0	Growth of white population relative to neighborhood population in year 0
	p(i,0)	w(i,0)	m(i,0)	w(i)/W	m(i)/M			g
A	104.36	100.97	3.39	12.9%	1.3%	0.1161	2.0%	3.0%
B	104.36	99.82	4.54	12.8%	1.7%	0.1103	3.0%	2.8%
C	104.36	98.67	5.69	12.6%	2.2%	0.1044	4.0%	2.7%
D	104.36	95.22	9.14	12.2%	3.5%	0.0868	7.0%	2.2%
E	104.36	91.77	12.59	11.7%	4.8%	0.0692	10.0%	1.8%
F	104.36	86.02	18.34	11.0%	7.0%	0.0399	15.0%	1.0%
G	104.36	77.97	26.39	10.0%	10.1%	0.0012	22.0%	0.0%
H	104.36	65.32	39.04	8.4%	14.9%	0.0657	33.0%	-1.7%
I	104.36	46.92	57.44	6.0%	22.0%	0.1596	49.0%	-4.1%
J	104.36	19.33	85.03	2.5%	32.5%	0.3003	73.0%	-7.7%
Sum	1043.60	782	261.60			1.0535		
					DI	0.5268		

The Table (1b) also contains additional columns with measures that are used by Card et al (2008) to demonstrate a tipping point – these are the initial share of minorities in each neighborhood and the growth of the white population relative to the size of the total neighborhood population in year 0. As can be seen in the table, this growth rate displays the same pattern of white population growth as the examples discussed by Card et al (2008). That is, in white dominated neighborhoods there is positive growth in the white population, whereas there is white flight from neighborhoods with large minority shares. The "tipping point" in this case seems to be around 20%. Note, however, that this pattern, in the example presented here, is the result of an assumption of unchanging segregation, as it is measured by the dissimilarity index.

The reason why the growth of the white population is negative in areas with high minority shares is that the dissimilarity index cannot remain stable at a high level unless a relatively large share of the expanding minority population is accommodated in minority dense neighborhoods. If minority individuals would move in large numbers into white neighborhoods there would be a decline in the dissimilarity index. But with the assumption that there is no shift in the relative population size of different neighborhoods, the accommodation of new minority persons makes a reduction of the white population in neighborhoods necessary. That is, negative growth rates of the white population in minority dense neighborhoods can be seen as a form of displacement. Note, however, that the minority population is increasing also in the most-white neighborhoods.

What this example demonstrates is that there is a need to re-interpret the message of the Schelling model. In societies with high levels of segregation, and where the minority population is increasing, it will be possible to observe patterns of population change in neighborhoods that look like white flight. However, these patterns are not evidence of a Schelling process that will result in total segregation, since white flight patterns and indeed "tipping-points" can be observed even when there is no increase in segregation. Furthermore, since these tipping points, in the current framework, are artefacts that result from the imposed condition that the dissimilarity rate should stay the same, one should be cautious to interpret them as reflecting behavioral attitudes in the population. This is not say that tipping points identified in Card-type studies are unrelated to ethnic preferences. Also constant levels of segregation need to be explained and, given the patterns of population redistribution that are required to keep the level of segregation constant, ethnic preferences cannot be ruled out as an important factor.

Thus, the existence of ethnic preferences and possibly tipping effects is consistent with patterns of neighborhood sorting such as those illustrated in Table 1a and Table 1b. What our analysis shows

is, instead, that a pattern of an expanding white population in low minority neighborhoods and a declining white population in minority dense neighborhoods is not sufficient for concluding that a metropolitan area is in a process of population redistribution that will result in total segregation.

Given the continuing salience of the Schelling model, we can see a risk that the model is seen as an idealized representation of *real* tendencies and, if this would the case, it provides a distorted picture of what is actually happening in terms of residential sorting and ethnic segregation. Rather, what can be observed in modern multi-diverse metropolitan areas are fluctuations in levels of segregation and separation as groups make choices within the urban fabric. The re-analysis of the Card et al approach questions whether the pattern identified by Card can be seen as evidence of a cumulative Schelling process. Year 0, may very well represent an equilibrium that is shocked by the arrival on a new large minority group. This idea is also explored in Moraga et al (2017). In this sense the Card test of the tipping point may in fact be a test of the impact of immigration rather than of selection. If new migrants have lower incomes than established migrants, we would expect them to go into the most migrant dense (and less expensive) neighbourhoods. Overall, the examples point to a need for considering mechanisms beyond ethnic preferences themselves that influence residential segregation patterns even in the face of increasing minority populations. In the second part of the paper we construct a model which specifically recognizes the role of income in residential sorting.

3. INCOME SORTING AND ETHNIC MIXING: A SIMPLIFIED MODEL

The analysis presented above suggest that large migration inflows into a metropolitan region can trigger a process of population redistribution that preserves patterns of over-representation and under-representation even though the population balance between migrants and non-migrants have shifted. The analysis has also demonstrated that this re-distribution can follow a rather complicated

pattern. A relevant question is, therefore, how this re-distribution comes about and what factors that will govern the process? And, more specifically, if it is possible that the redistribution is linked to a combination of ethnic preferences that influence house prices and income based spatial sorting (Clark and Ledwith, 2007).

There is a well-established literature which documents the relationship between minority density and house prices. These studies, primarily from the United States, find that minority density tends to have a negative effect on house prices (see e.g. Bailey 1966, Berry 1976, Chambers 1992, Harris 1999). Similar results have also been presented for Oslo (Nordvik and Osland 2017).

It has also been suggested that economic status influences residential sorting (Tiebout 1956). Households that can pay for amenities such as school quality, green space, and protective services will likely sort together with residents who also value such amenities. Households willing to pay for such amenities are likely to have higher incomes and the preference for these amenities further structures the sorting process. In effect, the Tiebout model predicts income segregation because households with similar preferences and ability-to-pay tend to form homogeneous communities. A basis for the role of income is reflected also in the research which documents how ethnic preferences and income sorting can interact.

Below we present a model that combines Tiebout's income based sorting with the empirically based notion of a relationship between minority density and house prices in order to show that stable patterns of ethnic over-representation and under-representation can be the result of an equilibrium process. Thus, we will argue that the Schelling case for segregation is overstated if one allows house prices to respond to lower demand for housing in migrant dense neighborhoods, and acknowledge that there are income differences among whites.

The same basic argument advanced by Schelling for ethnic segregation is also central in the creation of income segregation. If, following Schelling households have preferences regarding the income level (and or the class status) of their neighbors, in particular if higher income neighbors are preferred to lower income neighbors, or that individuals want to be in neighborhoods where they have incomes similar to those of their neighbors, then finding households with similar incomes will be more likely than finding households with incomes that are different (Clark, 2002).

3.1 Assumptions and conceptual structure of the model

a) Both low income and high income individuals prefer living in majority dense neighbourhoods. *Living in a minority dense neighbourhoods has a negative effect on welfare*

b) House prices are higher in majority dense neighbourhoods.

c) To live in majority dense neighbourhoods, individuals have to spend more on housing and less on other consumption goods.

d) Reducing consumption by a fixed amount will have less impact on the welfare of high income individuals than on the welfare of low income individuals (*concave utility*).

Thus, in order to protect their consumption level and welfare, low income individuals will stay in minority dense neighbourhoods.

3.2 Model formulation

Consider the following simple model of a metropolitan housing market. Individuals spend their income on a dwelling, D, and consumption goods x. The price of a dwelling in neighborhood j is r_j and the price (vector) of consumption goods is p. All individuals have one dwelling but they can choose in which neighborhood to live. The income of an individual is Y, and assuming no saving the budget constraint becomes

(1) $Y_i = r_j D_j + px_i \Leftrightarrow Y_i = r_j + px_i,$

since all individuals have one dwelling, that is D=1.

This implies that the amount an individual can spend on consumption goods depend on income, in which neighborhood the dwelling is located, and on the price of dwellings in that neighborhood.

(2) $px_i = Y_i - r_j$

Now assume that the utility of an individual is determined by the quantity of consumption goods and by the ethnic composition of the neighborhood where the dwelling is located.

(3) $U_i = U(x_i, j)$

Let *j* be an index based on the ethnic composition of the neighborhood such that

(4) $U(x_i, j+1) > U(x_i, j)$

That is, neighborhoods with a more desirable ethnic composition have a higher index than neighborhoods with a less desirable ethnic composition.

Now assume that the housing market is equilibrium in the sense that no individual can increase their utility by moving to a different neighborhood. Then the price r_j needs to be increasing in *j*, simply because if $r_j > r_{j'}$ when $j < j'$then location j'would dominate *j*, and this cannot be an equilibrium.

Now assume that the utility function is additive and strictly concave with respect to the consumption good:

(5) $U(x, j) = U(x) + V(j)$

(6) and $\frac{\partial U(x)}{\partial x} > \frac{\partial U(x+a)}{\partial x}$, $when\ a > 0$

Then we can show, by contradiction, that the "quality" of ethnic composition chosen by individuals is increasing with income:

Suppose there exists two households with incomes Y_{low} and Y_{high}, such that Y_{low} chooses j_{high} and Y_{high} chooses j_{low}. Solving for consumption in terms of location choice, this would mean that:

(7) $$U(Y_{low} - r_{high}) + V(j_{high}) \Rightarrow U(Y_{low} - r_{low}) + V(j_{low})$$

(8) $$U(Y_{high} - r_{low}) + V(j_{low}) \Rightarrow U(Y_{high} - r_{high}) + V(j_{high})$$

The upper equation says that the low income type prefers the high neighborhood over the low neighborhood, and the lower equation says that the rich household prefers the low neighborhood over the high neighborhood. By moving over everything but $V(j_{low})$ in the lower equation to right hand side and substituting for but $V(j_{low})$ in the upper equation, this can be re-arranged to:

(9) $$U(Y_{high} - r_{low}) - U(Y_{high} - r_{high}) \Rightarrow U(Y_{low} - r_{low}) - U(Y_{low} - r_{high})$$

This says that the rich household gains more from saving $r_{high} - r_{low}$ than the poor household, which is inconsistent with strictly concave utility.

To conclude, this argument suggests that in a population with income differences it is possible to have an equilibrium distribution of individuals across neighborhoods with varying ethnic *compositions as long as low-income individuals reside in neighborhoods with a less desirable ethnic composition.*

It should be noted that this analysis is incomplete in the sense that it does not provide a full description of what would characterize a housing market equilibrium which is influenced by ethnic preferences. Rather it captures some necessary conditions that needs to be fulfilled by an equilibrium. The model suggests that low income individuals will be concentrated in minority dense neighborhoods and that high income individuals will be concentrated in majority dense neighborhoods. Thus, we expect an income gradient across neighborhoods with increasing minority density. Is this prediction consistent with the segregation patterns found in a country with

a relatively large foreign-born population? This is a question that we will address in the empirical part of the paper using Swedish data.

4. TESTING THE MODEL - EVIDENCE OF INCOME SORTING IN SWEDISH NEIGHBORHOODS

In order to assess empirically if ethnic preferences can lead to income based sorting we will take advantage of the Geographic Context data made available to Stockholm University by Statistics Sweden. Geographic Context is based on Swedish individual level register data and contains information about all individuals in Sweden between 1990 and 2012 including data on income, family, education, and country of birth. The data includes geocodes for the residential location of the individuals in the data set and, thus, allows a detailed analysis of residential patterns.

The Swedish case is interesting given that Sweden in recent decades has experienced a very large increase in its foreign born population. In 1980, there were 626,953 foreign born individuals in Sweden. In 2017 this figure had increased to 1,877,050 individuals out of a total population of 10,120,242. There has also been a shift in the composition of the foreign born population: From being close to 90% of European, mainly Nordic, origin in 1980, to a situation where a majority, 54.4%, is of non-European origin in 2017 (Statistics Sweden 2018).

Using the Swedish micro data, we first analyze the ethnic composition of egocentric neighborhoods that encompasses the 200 nearest neighbors. The focus will be on the share of migrants (foreign born) in these bespoke neighborhoods. To identify the 200 nearest neighbors of the individuals in our dataset we will use the EquiPop software. The approach used in Equipop is to expand buffers around all residential locations until the buffer contains at least 200 individuals. When this target has been reached the demographic composition of the buffer population is

computed, in this case the proportion of foreign born, for details see (Malmberg, Nielsen et al. 2016). As a result of the expanding foreign-born population, an increasing number of neighborhood have reached high levels of migrant density. However, there has been no clear upward trend in the dissimilarity index since the foreign born population has increased both in migrant dense and non-migrant dense neighborhoods

If there is income based sorting across neighborhoods with varying concentration of foreign born this should be reflected in income differences between more and less migrant dense neighborhoods. To measure income, we have used individual disposable income. Disposable income is the sum of all taxable and tax free income minus taxes and negative transfers and is computed on the household level. To obtain the individual disposable income, household disposable income is multiplied by the individuals consumption weight (=1 for adults) and divided by the household's total consumption weight (Statistics Sweden 2011). Before being used to compute average income in different neighborhoods, income has been transformed into percentile values for the entire Swedish adult population. In order to simplify the statistical analysis, the population has been aggregated into percentile bins based on the concentration of migrants in their individualized neighborhoods. That is, the individuals in each percentile in the distribution of individualized neighborhoods are represented by one value, their mean percentile of disposable income (for binning see chapter 3 in Han *et al.* 2011).

The population has been divided into three groups: Foreign born, Swedish born with Swedish born parents (Swedish background), and Swedish born with at least one foreign born parent (non-Swedish background). This division has been made in order to make it possible to analyze if income sorting across neighborhoods with different migrant density works in different ways depending on ethnic background.

Neighborhoods have been divided into four groups. First, into neighborhoods that are located in a densely populated region or not. The cut-off point for being in a dense region was taken to be that there should be at least 204,800 inhabitants within a radius of 30 km from the center of the individualized neighborhood (Statistics Sweden building on a definition proposed by the Swedish Association of Local Authorities and Regions (2013) uses 200,000 inhabitants as a cut-off value for what is defined as a metropolitan municipality). The cut-off point used here is based on the data provided in (Malmberg, Nielsen et al. 2016).

Second, into neighborhoods that are located inside or outside dense settlements, as defined by Statistics Sweden. In Sweden, dense settlements are generously defined as agglomeration with at least 200 inhabitants. In an agglomeration, houses are not allowed to be more than 200 meters apart. Neighborhoods, thus can be located in (1) dense settlements that are in a metropolitan area, (2) dense settlements in non-metropolitan areas, (3) outside dense settlements but in a metropolitan area, or (4) outside dense settlements and in a non-metropolitan area. This division of neighborhoods makes it possible to analyze if income sorting works differently in different geographical contexts. The theoretical motivation for this classification is that low income individuals might be able to access neighborhoods with low proportions of migrants if such neighborhoods are located in areas at large distances from the center of large agglomerations. Three different ethnic background classifications and four geographically different neighborhood types makes it possible to analyze 12 different types of income sorting (Table 2). As we can see from the table, the foreign born population are concentrated in dense settlements, either non-metropolitan areas or the large cities- more than 60 percent are in the large cities. In contrast, only 45 percent of Swedish born with a non- Swedish background and 37 percent of the Swedish native born population are in the large cities.

Table 2: Swedish adult population 16 years and older in 2012, by ethnic background and geographical location.

Geographical location	Foreign born	Swedish born, non-Swedish background	Swedish born, Swedish background	Total
Outside dense settlements, non-metropolitan areas	63,449	148,702	759,248	971,399
Outside dense settlements, metropolitan areas	19,922	32,355	154,048	206,325
In dense settlements, non-metropolitan areas	456,789	614,172	2,306,140	3,377,101
In dense settlements, metropolitan areas	815,403	651,107	1,899,215	3,365,725
Total	1,355,563	1,446,336	5,118,651	7,920,550

Source: Geographic Context data

We have chosen to do the analysis graphically by computing the mean percentile income across neighborhoods with different migrant density for foreign born, Swedish born with Swedish background, and Swedish born with non-Swedish background separately for the different geographical context. To assess the variation in income across neighborhoods with different concentrations of foreign born we have used the aggregation of individuals in different percentile bins based on the share of migrants among the nearest 200 neighbors. Thus, for each of the 12 sub-populations (defined by ethnicity and geographical neighborhood type) the mean percentile income has been computed for the different ethnic-composition percentile bins. The rationale for using binning is that this allows a graphical representation of the results with graphs showing the mean percentile income on the vertical axis and the neighborhoods concentration of migrants on the horizontal axis. Of course, by computing the mean percentile income of the individuals in each

neighborhood bin, variation is reduced and it becomes possible to see if increasing migrant density in the neighborhoods is linked to an increasing concentration of low-income individuals.

5. INTERPRETING THE ROLE OF INCOME

The results of the analysis are presented in Figure 1 where there is one graph for each combination of ethnic group and geographical context. Using a graphical approach is helpful since it gives a clear view of what the income gradient looks like for the different sub-populations.

The graphs clearly show that in dense settlements, both in metropolitan and non-metropolitan areas, there are clear signs of an income gradient across neighborhoods with different concentration of foreign born individuals. The income gradient is strongest for Swedish-born individuals with a non-Swedish background (individuals born in Sweden with one or two immigrant parents) and for foreign born individuals, but less strong for Swedish-born individuals with a Swedish background.

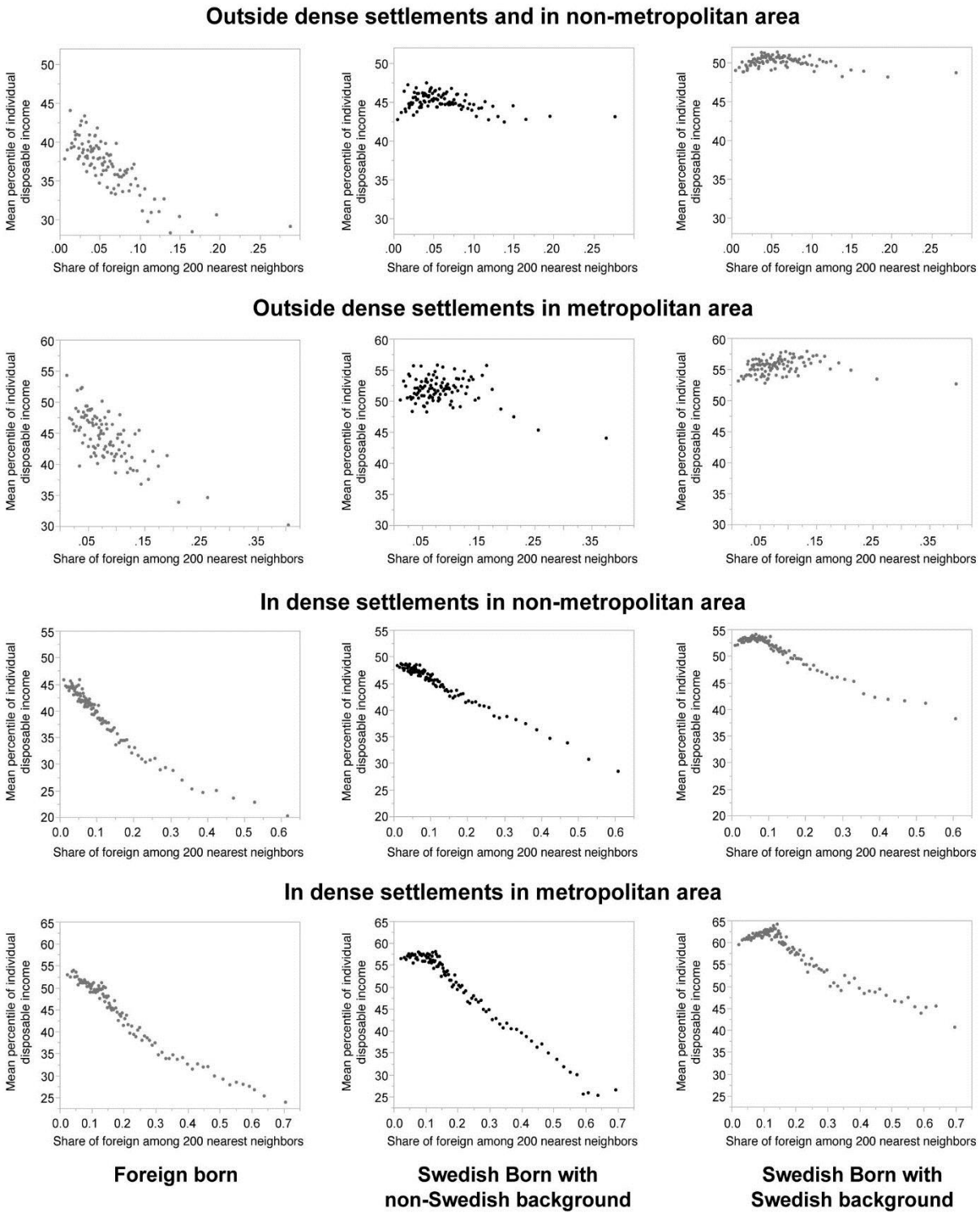

Figure 1: Income distributions by immigrant status and urban structure

In dense settlements in non-metropolitan areas, the income gradient across neighborhoods with different migrant densities, is strongest for foreign-born individuals, somewhat weaker for Swedish-born individuals with a non-Swedish background and even weaker for Swedish-born individuals with a Swedish background.

Outside dense settlements, there is essentially no income gradient for Swedish born individuals irrespective of them having a Swedish or non-Swedish background. But for foreign born individuals, there are signs of an income gradient, even though the pattern is rather diffuse.

That there is not a clear income gradient across neighborhoods located outside dense settlements is not unexpected. Ethnic segregation is typically a urban phenomenon and there is no need for segregation processes to work the same way in urban and non-urban areas. Moreover, the lack of an income gradient in these areas gives support to the theoretical result that low income people can access areas with high concentrations of non-migrants if they choose to live outside of cities. In contrast, it can be seen as surprising that there are indications of income sorting of foreign born individuals across neighborhoods outside dense settlements. Does this suggest that foreign born are sensitive to ethnic composition in geographical contexts where native-born do not seem to be influenced by ethnic composition in their choice of where to live?

The most important finding in the paper and confirmation of the model is the finding of clear income gradients across neighborhoods in dense urban settlements. As discussed in the theoretical discussion above, we see this as evidence of how ethnic preferences increase the demand for housing in neighborhoods with few migrants and hence make such neighborhoods more difficult to access for low-income individuals. That this income gradient is more pronounced for migrants and for Swedish born with a non-Swedish background than for Swedish born with a Swedish

background is a confirmation of the observation that migrants with more resources seek to access "better" and therefore higher quality neighborhoods.

In the most migrant-dense neighborhoods in metropolitan areas the difference in mean income percentile between Swedish born with and without Swedish background is about 20 percentile points, whereas in the least migrant dense neighborhood this difference is smaller than 10 percentile points. The difference is a quantitative assessment of the willingness of the Swedish born with a non-Swedish background to use more income to access neighborhoods with lower migrant concentrations. Further studies will provide greater clarity on this process.

It is also possible that an ancillary process is taking place – that lower-income Swedish born with a Swedish background are older than Swedish born with a non-Swedish background at the same income level and thus can have a stronger place attachment that makes them more reluctant to move to less migrant dense neighborhoods, or they are income constrained.

But irrespective of what factors that are behind the steep income gradient among Swedish-born with a non-Swedish background this phenomenon as such is of strong interest. It points to very strong income sorting in this group and suggest that income sorting in this group can be an important factor behind increasing income segregation. In other words, the selection behavior of immigrants is as important as the behavior of the native born Swedish population.

A caveat with respect to these results in relation to the theoretical model is that a substantial part of Swedish dwellings are in rent controlled buildings (Wilhelmsson, Andersson et al. 2011). For such dwellings there will not be observable market rents that will influence housing decisions. However, also rent controlled dwellings can have quasi-prices, mainly in the form of different queue-lengths for dwellings that varies with the demand for dwellings in different areas.

6. CONCLUSIONS

In this paper we have argued that there is a need to understand ethnic segregation and income segregation not as two separate processes but as linked processes that interact with each other. We believe that this paper by emphasizing ethnic preferences within the constraint of income based sorting offers a way to understand a range of relatively well established findings, especially the empirical finding that there is income based sorting across neighborhoods with varying migrant density.

Our theoretical analysis shows that housing costs are a central component of locational selection. Because housing costs as a result of ethnic composition are higher in neighborhoods with lower migrant densities, neighborhoods with lower ethnic densities become less easy to access for low income individuals.

Our empirical analysis has shown that there is indeed income sorting across neighborhoods with varying migrant density. This sorting is strong and the sorting is leading to a concentration of low income households in migrant dense neighborhoods. Thus, the association between high migrant density and a concentration of low income groups at the neighborhood level is not simply a reflection of lower income levels among migrants. Instead, foreign born persons, native-born individuals with foreign born parents, and native-born individuals with a Swedish background with higher incomes tend to be found in neighborhood with lower concentration of migrants than individuals with lower income.

We have also argued that this income based sorting can be a factor that counteracts tendencies toward increased ethnic segregation. If there is an increased concentration of foreign born in the most migrant dense areas, a preference for neighborhoods with low migrant densities may increase differences in housing cost between areas with different migrant densities, making

neighborhoods with low migrant density increasingly unaffordable for low income groups. In many cases, such low income groups are foreign born or have a migrant background but there are also native born with a native background with a low income that will be sorted into neighborhoods with high migrant density. And as a result, migrant dense neighborhood, will have a substantial proportion of non-migrants. And, in the same way, foreign born high income individuals or native born, high income individuals with a migrant background will be sorted into less migrant dense neighborhoods. Thus, in combination, this income based sorting can lead to ethnic segregation levels that are strong or moderately strong but far from the extreme case of total segregation.

Thus, we propose that income based sorting across neighborhoods with different migrant density is a potential explanation for relatively moderate levels of ethnic segregation in many urban areas, and also for the stable or declining trends in ethnic segregation that have been identified in different national contexts. At the same time, the mechanism that we have discussed could explain that such trends in ethnic segregation has not been accompanied by declining socio-economic segregation and possibly also by increasing income segregation.

From a policy point of view, this sorting of low income individuals into migrant dense neighborhoods is a challenge since it creates concentrated poverty in these areas. Additionally, though not exclusively, because migrants have low income, and because low-income migrants, low-income Swedish-born with a non-Swedish background, and low-income Swedish-born with a Swedish background are over-represented in migrant dense areas. Although most research results concerning the effects of concentrated poverty are based on US studies (Jargowsky,,1996, Sampson 2012) there is little to suggest that the effects of concentrated poverty should be very different in the Swedish context. And indeed, a recent longitudinal study by Andersson and

Malmberg (2016) suggests that growing up in poverty neighborhoods in Sweden implies increased risk of adult poverty and decreased probabilities of having a positive income career.

Theoretically, our paper provides a rationale for reconsidering the extent to which the original Schelling model adequately captures current segregation trends in European and American cities. According to our analysis, ethnic preferences still are an important determinant of segregation trends but the effect of ethnic preferences on segregation processes are not as simple as suggested by the Schelling model. We have also demonstrated that empirical evidence put forward in support of the Schelling model can be interpreted in alternative ways. Patterns that seen as evidence of a tipping point and white flight are in fact compatible with processes of neighborhood change that leave aggregate segregation unchanged.

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