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Non-European migrants  
New results from Norway

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# **Neighbourhood Concentration and Representation of Non-European migrants**

## **New results from Norway**

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**Abstract:** In a previous study, Andersson et al. (2018) compared the patterns of residential segregation between non-European immigrants and the rest of the population in four European countries, using the k-nearest neighbours approach to compute comparable measures of segregation. This approach relies on detailed geo-coded data and can be used to assess segregation levels at different neighbourhood scales. This paper updates these findings with results from Norway. Using similar data and methods, we document both similarities and striking differences between the segregation patterns in Norway and Belgium, Denmark, the Netherlands and Sweden. While the segregation patterns in Norway at larger scales are roughly comparable to those found in Denmark, but with higher concentrations of non-European immigrants in the most immigrant-dense large-scale neighbourhoods, the micro-level segregation is much lower in Norway than in the other countries. While an important finding by Andersson et al. (2018) was that segregation levels at the micro scale of 200 nearest neighbours fell within a narrow band, with a dissimilarity index between 0.475 and 0.512 in the four countries under study, segregation levels at this scale are clearly lower in Norway, with a dissimilarity index of 0.429. We speculate that this may in part be driven by Norwegian settlement policies for refugees and asylum seekers, but other explanations are possible.

Key words: segregation, comparison, non-European immigrants, concentration, representation, Belgium, Denmark, the Netherlands, Sweden, Norway.

## 1. Introduction

In a special issue of the *European Journal of Population*, Andersson et al. (2018) presented a comparative study of segregation patterns of non-European migrants in Belgium, Denmark, the Netherlands and Sweden. In all four countries, individual level, geo-coded, register data was used to compute segregation measures based on the k-nearest neighbours approach. These individualized scalable neighbourhoods provide strictly comparable neighbourhood definitions, and allow for an analysis of segregation patterns at different scale levels. One important finding of this study was that small-scale segregation patterns, based on neighbourhoods encompassing the 200 nearest neighbours, were remarkably similar across the different countries, with dissimilarity indices (DI) in the 47.5% to 51.2% range. At larger scales, differences were much more marked. For neighbourhoods encompassing the nearest 51,200 neighbours, the DI in Belgium was 40.6% compared to only 25.3% in Denmark. These findings suggest that segregation processes are not scale-invariant: factors that influence segregation at the very local level can be different from those that influence segregation at larger scales. A tentative interpretation of these patterns was that similarities in small-scale segregation patterns might be related to the influence of ethnic preferences, whereas differences in housing policies, housing market structure and settlement policies are candidate explanations for a more pronounced large-scale segregation in Belgium.

This research note updates the results from this earlier study by adding data for Norway. In terms of its welfare state structure, Norway is similar to Denmark and Sweden, but differs from these countries in important areas such as settlement policies for refugees and asylum seekers, settlement patterns, geography, housing market structure and homeownership. Thus, extending the analysis of segregation patterns to include Norway will make it possible to evaluate, first, if small-scale segregation in Norway falls in the narrow span identified for Belgium, Denmark, the Netherlands, and Sweden. And second, if Norway, with settlements policies geared towards distributing refugees and asylum seekers to municipalities across the country, has correspondingly lower segregation levels and a more even representation of non-European immigrants.

For brevity reasons, we do not provide a review of the extant research literature on residential segregation here. A thorough review of the extensive and growing research literature on residential segregation in Europe is provided by Andersson et al. (2018).

## 2. The Norwegian context

Norway is a Nordic welfare state, commonly considered similar to Denmark and Sweden with regard to policies in areas such as healthcare, social services, education, etc. However, in some areas that are salient to residential segregation, there are marked differences between Norway and the other Nordic countries. First, unlike the four other countries, Norway is not a member of the European Union, but is part of EU's internal market through the European Economic Area agreement. Second, immigration has historically been higher in Sweden than in Denmark and Norway. Norway is generally considered to have taken an intermediate position in immigration policies, with more restrictions on immigration than Sweden, but with less restrictive policies than Denmark (Brochmann 2017). Third, Norway's settlement policies for refugees and asylum seekers have differed substantively from those of Sweden, but resemble those of Denmark. While Swedish policies emphasize voluntary settlement, asylum seekers and refugees in Norway are for the most part settled in municipalities through a system of agreements between the municipalities and the central authorities (Brochmann 2017; Directorate of Integration and Diversity na.; Ministry of Justice and Public Security 2016). While they may move freely after this initial settlement, many choose to move to the Oslo region or other major cities (Stambøl 2013). This policy leads us to expect a more dispersed non-European immigrant population in Norway than in Sweden. Fourth, Norway and Sweden are both larger in geographical terms and have a lower population density than the other countries. The total land area of mainland Norway is approximately eight times that of Denmark and the Netherlands, and ten times that of Belgium, while Sweden is 1.4 times the size of Norway (CIA na.). While the population density in central areas of Norway and Sweden is high, large areas are sparsely populated or uninhabited. Also, settlement is less centralized in Norway than in Sweden, as a smaller proportion of the Norwegian population resides in urban areas ( World Bank na.). Finally, housing policies and the housing market structures in Norway are quite different from those of Sweden, Denmark, the Netherlands and Belgium. In Norway, 77% of households own their dwelling, and public housing only comprises 4 % of the housing stock (Statistics Norway na.a na.b na.c).

In sum, these overall differences lead us to expect a more even representation of non-European immigrants in Norway, compared to Sweden, Denmark, the Netherlands and Belgium, and lower concentrations of immigrants in large-scale neighbourhoods. However, given the fact that a large proportion of the immigrant population in Norway is concentrated in areas in and around the capital

city, there is still room for segregation in the form of high concentrations or strong overrepresentation of non-European immigrants in certain neighbourhoods at the micro level in Norway.

### 3. Data and methods

#### 3.1 Data

The data used here are based on population register data for the entire Norwegian population registered as resident on January 1<sup>st</sup> 2011, provided by Statistics Norway. The results are compared to corresponding figures from Sweden, Denmark, the Netherlands and Belgium, as described in Andersson et al. (2018). We have aimed to make the data as similar as possible across countries in order to facilitate comparative analyses. The process of harmonizing the datasets for each country is documented in detail in Nielsen et al. (2017) and was the aim of the ResSegr project<sup>1</sup>.

We use the k-nearest neighbours approach to measure segregation. This approach is well suited for comparative analyses as it provides a comparable definition of a neighbourhood; the k-nearest neighbours of each individual. This partially circumvents the Modifiable Areal Unit Problem (Hennerdal and Nielsen 2017) by allowing for a comparison of residential patterns that do not rely on administrative borders. Further, the neighbourhoods are scaleable, allowing us to study segregation at both the macro-level, the micro-level and at intermediate levels. However, the geographical size of each neighbourhood is determined by the local population density, so that the area that is considered a "neighbourhood" is highly variable, as shown below.

The Norwegian data is based on a 100 x 100 m grid covering the entire country, excluding unincorporated areas. Based on this grid, we first calculate the total number of individuals and the number of non-European immigrants in each populated grid cell. Non-European immigrants are defined as people meeting two criteria; 1) being born in a non-European country to two foreign-born parents, in accordance with the standard definition by Statistics Norway, and 2) being born in

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<sup>1</sup> Urban Europe, the Joint programming initiative (JPI) with partners in Belgium, Denmark, Norway, the Netherlands and Sweden in the project 'Residential segregation in five European countries. A comparative study using individualized scalable neighbourhoods', acronym ResSegr.

a non-EU28/EFTA-country<sup>2</sup>. Using the specialized software EquiPop (Östh 2014), we calculate the proportion of non-European immigrants among the k-nearest neighbours of each grid cell, producing a dataset consisting of the composition of the egocentric neighbourhoods of each grid cell at different scale levels. The scale levels used here are k=200, k=1,600, k=12,800 and k=51,200. In analyses, these values are weighted by the population count of each grid cell. For k=51,200, a grid of 400 x 400 m cells was used in order to circumvent a technical problem in the EquiPop software.

Table 1 provides descriptive statistics for the grids. Not surprisingly, given the similar population size, the Norwegian grid data are similar to the Danish data in most regards, except for the maximum population density in the cells

Table 1. The gridded population, descriptive statistics, 2011.

	Number of populated grid squares	Median population	Maximum population	Median number of non-European migrants	Maximum number of non-European migrants	Total population
Belgium	608,850	9	1,753	0	516	11,000,638
Denmark	421,365	5	1,129	0	275	5,566,100
Netherlands	559,504	11	1,105	0	771	16,727,659
Sweden	202,067	157	4,114	7	1345	9,466,727
<i>Norway</i>	<i>456,528</i>	<i>5</i>	<i>573</i>	<i>0</i>	<i>266</i>	<i>4,906,695</i>

*Source for data on Belgium, Denmark, the Netherlands and Sweden:* Andersson et al. (2018). Authors' calculations based on register data from Statistics Belgium, Statistics Denmark, Statistics Netherlands, Statistics Sweden and Statistics Norway. The individual-level data were aggregated to a geographical grid of 100 by 100 m (in Denmark, the Netherlands, Belgium and Norway) and, for Sweden, to a geographical grid of 250 by 250 m (in densely populated areas, due to data restrictions), or 1000 by 1000 m (in sparsely populated areas).

As mentioned above, the k-nearest neighbours approach produces neighbourhoods that are comparable in terms of population size, but highly variable in geographical size. This is clearly shown in Table 2, which summarizes the geographical size of neighbourhoods at k=200 and k=51,200. Norwegian neighbourhoods at the micro level of k=200 are roughly similar to those found in the other countries up to the 50<sup>th</sup> percentile. However, many Norwegian neighbourhoods

<sup>2</sup> Strictly speaking, people are defined as born abroad if their mother was not registered as resident in Norway at the time of birth, and they are defined as born in a non-EU28/EFTA country if their mother was not resident in one of these countries at the time of birth.

at this scale level are much larger than those of Belgium, Denmark and the Netherlands. In Norway, 10% of the population live in places where we have to draw a circle with a radius of approximately 1.5 km or more in order to encompass their 200 nearest neighbours. The corresponding figures for Belgium, Denmark and the Netherlands are 0.4, 1 and 0.2 km, respectively. At the macro level of  $k=51,200$ , the Norwegian neighbourhoods are much larger in size than those of Belgium, Denmark and the Netherlands across most of the distribution, but they are comparable in size to Swedish neighbourhoods.

Table 2. Size of individualised neighbourhoods in Belgium, Denmark, the Netherlands, Sweden and Norway, radius in meters (percentiles based on population count), 2011

	Belgium	Denmark	Netherlands	Sweden	<i>Norway</i>
Percentile	k=200	k=200	k=200	k=200	<i>k=200</i>
10	100	100	100	0	<i>100</i>
25	100	100	100	0	<i>141</i>
50	141	141	100	250	<i>200</i>
75	224	224	141	250	<i>412</i>
90	424	1,000	224	1,414	<i>1,486</i>
95	608	1,513	500	2,236	<i>2,500</i>
99	1,105	2,200	1,265	5,000	<i>6,135</i>
	k=51,200	k=51,200	k=51,200	k=51,200	<i>k=51,200</i>
10	1,500	1,664	1,712	2,000	<i>2,561</i>
25	2,865	3,354	2,302	3,162	<i>4,472</i>
50	5,049	7,912	3,612	10,050	<i>11,005</i>
75	7,200	15,008	6,379	22,472	<i>29,221</i>
90	9,411	20,132	9,080	35,609	<i>56,292</i>
95	12,394	23,308	10,515	44,294	<i>73,645</i>
99	20,096	36,111	14,091	104,346	<i>139,384</i>

*Source for data on Belgium, Denmark, the Netherlands and Sweden: Andersson et al. (2018). Authors' calculations based on register data from Statistics Belgium, Statistics Denmark, Statistics Netherlands, Statistics Sweden and Statistics Norway.*



### 3.2 Measures of segregation

**Concentration.** A concentration measure of segregation is obtained through EquiPop, which calculates the proportion of non-European immigrants among the  $k$ -nearest neighbours of each grid cell. Weighted by the number of residents in each cell, the percentiles of the distribution of these neighbourhood compositions correspond to the percentile distribution of all individuals' neighbourhood composition. This means that the interpretation of the percentile values is straightforward; if, for instance, the 10<sup>th</sup> percentile is 1%, 10 percent of the population resides in neighbourhoods where 1% or less of the population are non-European immigrants

**Representation.** Our measure of the representation of non-European immigrants is calculated from the percentile distribution of the concentration of non-European immigrants. A measure of representation of non-European immigrants is calculated for each percentile bin  $i$  of the concentration distribution, for each  $k$ -level  $k$ :

$$representation_{i,k} = 100 \cdot \frac{\bar{c}_{i,k}}{\sum_1^{100} \bar{c}_{i,k}}$$

where  $\bar{c}_{i,k}$  is the mean concentration in percentile bin  $i$  at  $k$ -level  $k$ . This calculation is identical to that in Andersson et al. (2018), though with different notation. Our measure of representation can be interpreted in such a way that non-Europeans are overrepresented in a percentile bin if the value is above 1, and underrepresented if the value is below 1, since each bin contains 1 percent of the population (see Andersson et al. 2017; 2018 and Hennerdal and Nielsen 2017 for additional details).

**Dissimilarity index.** We calculate the DI for each  $k$ -level based on the percentile distribution of our concentration measure, in the same fashion as Andersson et al. (2018):

$$DI_k = 100 \cdot \frac{1}{2} \cdot \sum_{i=1}^{i=100} \left| \frac{\bar{c}_{i,k}}{\sum_1^{100} \bar{c}_{i,k}} - \frac{1 - \bar{c}_{i,k}}{\sum_1^{100} 1 - \bar{c}_{i,k}} \right|$$

The DI is an aggregate measure of over- and underrepresentation that will be zero in the case of perfectly even representation, and one if the non-European population is perfectly segregated from the rest of the population. The DI can be interpreted as the proportion of the non-European population that would have to move in order to achieve an even representation.

#### 4. Results

The proportion of non-European immigrants in the different countries in 2011 are summarized in Table 3. The lowest proportion can be found in Denmark, followed by Norway, Belgium and the Netherlands, while the proportion is highest in Sweden. This order has remained stable until 2015, despite increasing proportions in all countries.

Table 3. Population share of non-European migrants in Belgium, Denmark, the Netherlands, Sweden and Norway, percent

Country	2011	2015)
Denmark	4.8%	6.9%
Belgium	7.3%	8.5%
Netherlands	8.0%	8.7%
Sweden	9.1%	11.1%
<i>Norway</i>	<i>5.7%</i>	<i>7.8%</i>

Source for 2011 data on Belgium, Denmark, the Netherlands and Sweden: Andersson et al. (2018). Source for 2011 data no Norway: authors' data. Source for Eurostat data: non-EU foreign born population on January 1.

#### *Concentration*

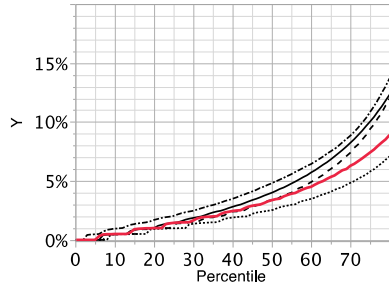
The concentrations of non-European immigrants for each percentile and k-level are plotted in Figure 1. The left-hand column shows the concentrations in the lower part of the percentile distribution, while the right-hand column shows the higher part. The concentration of non-European immigrants closely follows the pattern found in the other countries up to about the 50<sup>th</sup> percentile, at all k-levels. Above the 50<sup>th</sup> percentile, the neighbourhood concentrations in Norway closely resemble those in Denmark at the micro level, but with slightly higher concentration levels. The concentration of non-European immigrants among the 200 nearest neighbours in Norway only exceeds 20% around the 95<sup>th</sup> percentile, telling us that 95 percent of the Norwegian population lives in neighbourhoods where non-European immigrants constitute less than 20% of their 200 nearest neighbours. The exception to the resemblance with Denmark is at higher k-levels, where the Norwegian neighbourhoods with the highest concentration levels have much higher concentrations of non-European immigrants. This is indicative of macro-scale segregation patterns in Norway, likely related to ethnic segregation in and around the capital city Oslo, where the highest concentrations of non-European immigrants can be found. This result also illustrates the importance of considering segregation at different scales (Reardon et al. 2008). However,

compared to Sweden, the Netherlands and Belgium, concentration levels in Norway are for the most part relatively modest at all neighbourhood scales. The same pattern can be seen in Table 4, which shows the values at selected percentiles.

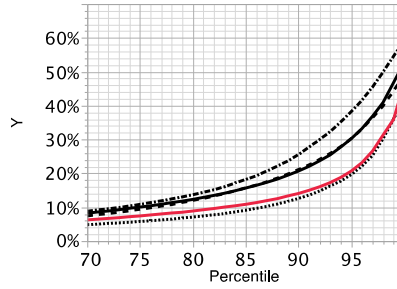
### *Representation*

Our measure of representation also tells an interesting story about segregation in Norway; non-European immigrants appear more evenly represented in Norway than in the other countries – especially at low and intermediate neighbourhood scales of  $k=200$ ,  $k=1,600$  and  $k=12,800$  (see Figure 2). As noted, a horizontal line at 1% would indicate perfectly even representation in all percentile bins. Although the differences are modest, the representation measure is overall closer to 1% in Norway than in the other countries at the low and intermediate scale levels. This suggests that non-European immigrants are more evenly distributed across the country in Norway. While there may be several explanations for this, it is entirely possible that this pattern is driven in part by the Norwegian settlement policies for refugees and asylum seekers.

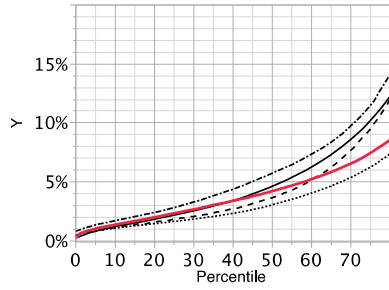
Calculating the DI for the neighbourhood bins largely confirms the impression from Figure 2. Belgium has the highest DI at all levels, indicating stronger segregation. At the micro level of  $k=200$ , the DI values are of similar magnitude in Denmark, the Netherlands and Sweden, at between 47.5 and 48.9%, but lower in Norway (42.9%). At higher  $k$ -levels, the values for Sweden and the Netherlands remain similar, while the levels in Norway and Denmark converge. The DI is lower in Norway than in Denmark at  $k=1,600$  and  $k=12,800$ , but slightly higher at  $k=51,200$ .



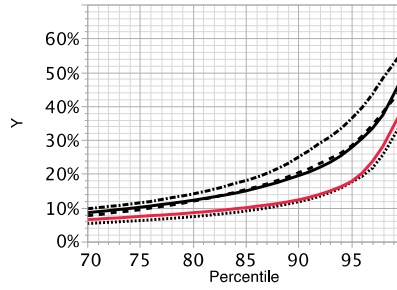
Plot for variable=200



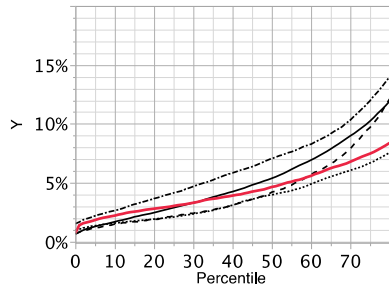
Plot for variable=200



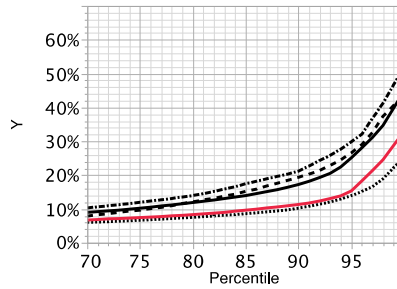
Plot for variable=1600



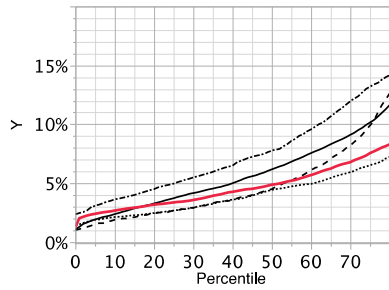
Plot for variable=1600



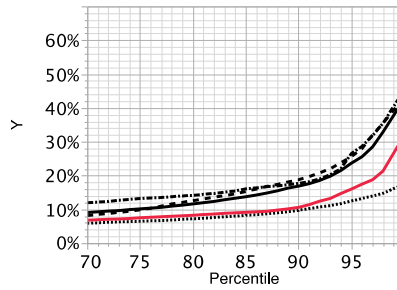
Plot for variable=12800



Plot for variable=12800



Plot for variable=51200



Plot for variable=51200

Y - - Belgium    ..... Denmark    — Netherlands  
 - - - Sweden    — Norway

Y - - Belgium    ..... Denmark    — Netherlands  
 - - - Sweden    — Norway

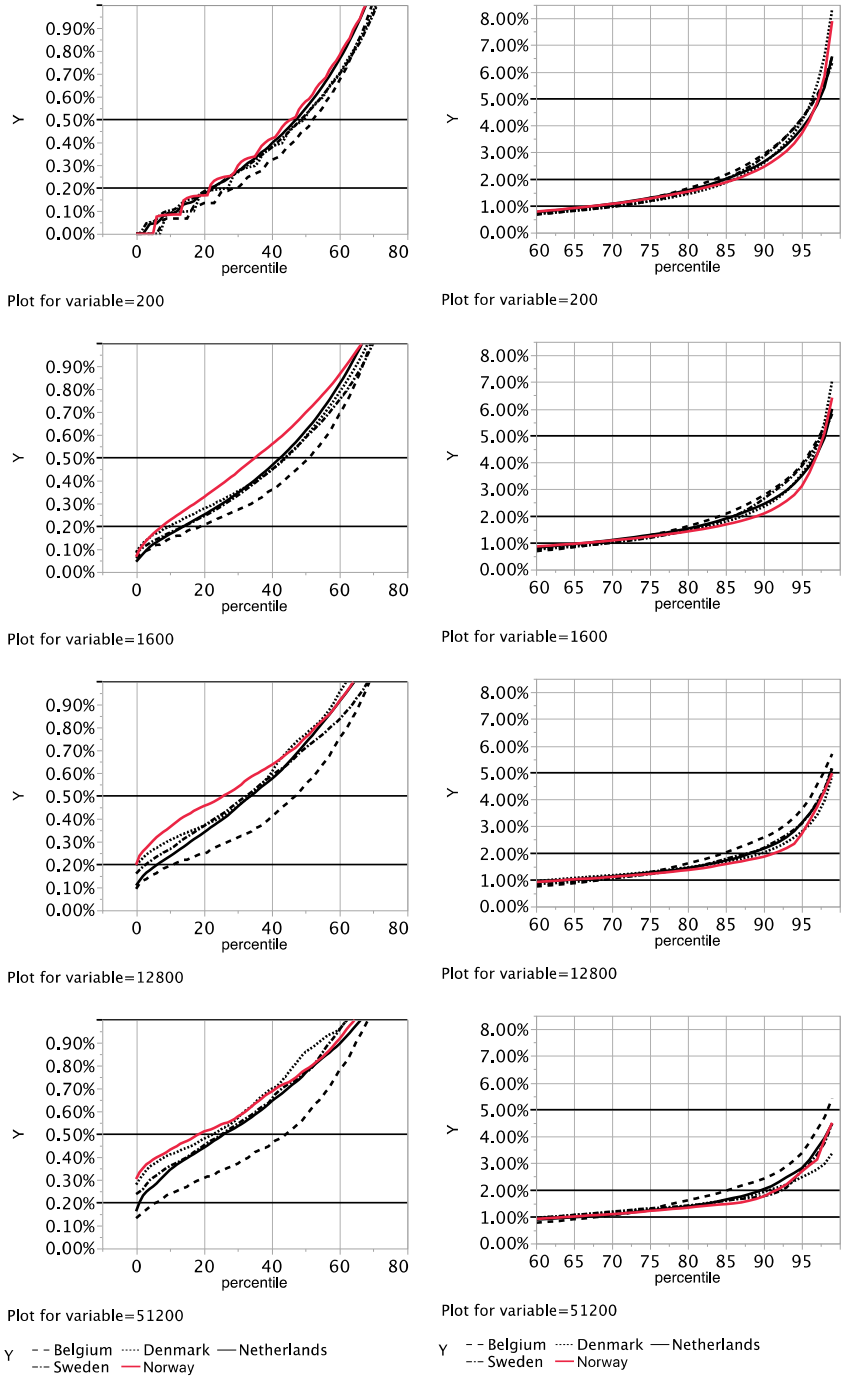
Figure 1. Concentration of non-European migrants in individualised neighbourhoods in Belgium, Denmark, the Netherlands, Sweden and Norway, 2011

Percentile values for k-levels 200, 1600, 12,800, and 51,200. Lower percentiles in column one and percentiles above 70 in column two.

Table 4. Concentration of non-European immigrants in Belgium, Denmark, Netherlands, Sweden and Norway, percentiles for different scales (k-levels), 2011

Percentile	Belgium <i>k=200</i>	Denmark <i>k=200</i>	Netherlands <i>k=200</i>	Sweden <i>k=200</i>	<i>Norway</i> <i>k=200</i>
10	0.5%	0.5%	0.5%	0.9%	<i>0.49%</i>
25	1.3%	1.0%	1.4%	2.0%	<i>1.43%</i>
50	3.4%	2.5%	4.0%	4.8%	<i>3.37%</i>
75	9.4%	5.8%	10.0%	10.8%	<i>7.41%</i>
90	21.1%	12.6%	20.7%	25.5%	<i>14.03%</i>
95	30.3%	19.6%	30.2%	38.3%	<i>20.67%</i>
99	44.4%	36.1%	46.8%	54.6%	<i>38.81%</i>
	<i>k=1,600</i>	<i>k=1,600</i>	<i>k=1,600</i>	<i>k=1,600</i>	<i>k=1,600</i>
10	1.1%	1.0%	1.2%	1.7%	<i>1.31%</i>
25	1.8%	1.6%	2.1%	2.8%	<i>2.28%</i>
50	3.6%	3.0%	4.6%	5.7%	<i>4.17%</i>
75	9.4%	6.2%	10.1%	11.4%	<i>7.38%</i>
90	20.3%	11.7%	19.5%	24.9%	<i>12.31%</i>
95	28.2%	17.5%	27.7%	36.2%	<i>17.68%</i>
99	42.1%	31.0%	43.4%	52.6%	<i>34.07%</i>
	<i>k=12,800</i>	<i>k=12,800</i>	<i>k=12,800</i>	<i>k=12,800</i>	<i>k=12,800</i>
10	1.5%	1.6%	1.7%	2.6%	<i>2.21%</i>
25	2.2%	2.1%	2.9%	4.1%	<i>3.02%</i>
50	4.2%	4.0%	5.4%	7.1%	<i>4.64%</i>
75	9.7%	6.7%	10.2%	12.0%	<i>7.47%</i>
90	19.4%	10.3%	17.3%	21.2%	<i>11.31%</i>
95	26.6%	13.9%	25.1%	29.9%	<i>15.33%</i>
99	40.6%	22.2%	39.8%	46.7%	<i>28.78%</i>
	<i>k=51,200</i>	<i>k=51,200</i>	<i>k=51,200</i>	<i>k=51,200</i>	<i>k=51,200</i>
10	1.9%	2.1%	2.4%	3.6%	<i>2.67%</i>
25	2.7%	2.7%	3.7%	5.0%	<i>3.37%</i>
50	4.5%	4.4%	6.2%	7.8%	<i>4.87%</i>
75	9.9%	6.5%	10.1%	13.2%	<i>7.55%</i>
90	18.8%	9.8%	16.8%	17.7%	<i>10.64%</i>
95	25.6%	12.5%	23.6%	26.5%	<i>16.01%</i>
99	39.3%	16.1%	37.8%	40.4%	<i>26.59%</i>

Source for data on Belgium, Denmark, the Netherlands and Sweden: Andersson et al. (2018). Source for Norwegian data based on register data from Statistics Norway.



**Figure 2.** Representation of non-European migrants in 1% population bins, 2011

Population bins sorted according to proportion of non-European migrants and diagrams showing different k-values. Left column showing under-representation (below 1%, which is at the top of the diagram) and moderate and strong under-representation with 0.5% and 0.2%. Right column illustrating over-representation above 1% and moderate and strong over-representation at 2.0% and 5.0% non-European migrants in a bin. See online appendix to Andersson et al. (2018) for a discussion of these values.

Table 5. Dissimilarity index in Belgium, Denmark, Netherlands, Sweden and Norway, 2011.

k-value	Belgium	Denmark	Netherlands	Sweden	<i>Norway</i>
200	51.2%	47.5%	48.7%	48.9%	<i>42.9%</i>
1600	47.3%	40.4%	43.6%	44.1%	<i>35.9%</i>
12,800	43.7%	31.3%	37.5%	35.7%	<i>29.2%</i>
51,200	40.6%	25.3%	32.6%	29.7%	<i>26.2%</i>

*Source:* Andersson et al. (2018), authors' calculations based on register data from Statistics Belgium, Statistics Denmark, Statistics Netherlands, Statistics Sweden and Statistics Norway.

## 5. Discussion and conclusions

An important finding by Andersson et al. (2018) was that small-scale segregation patterns of non-European migrants are similar across Belgium, Denmark, the Netherlands and Sweden, indicating a striking consistency in small-scale segregation levels across contexts. The segregation patterns presented here for Norway contradict this consistency and illustrate the diversity of segregation patterns; also at the small scale. We find overall segregation levels, as measured by the DI to be lower in Norway at the neighbourhood scales of 200 and 1,600 nearest neighbours than in the four countries studied by Andersson et al. (2018), and we find non-European immigrants to be more evenly represented across Norway than in the other national contexts. Concentration patterns in Norway are similar to those found in Denmark, but with higher concentration levels in the most immigrant-dense neighbourhoods at the macro scale, suggesting a stronger clustering of such immigrants in large-scale neighbourhoods in and around Oslo. We hypothesize that the more even representation of non-European immigrants in Norway may be driven in part by Norwegian settlement policies for refugees and asylum seekers, though we cannot test this directly, and other explanations are certainly possible. In sum, our results emphasize the highly variable and context-dependent nature of segregation patterns, the importance of comparable measures of segregation in comparative research, and the relevance of scale in the study of segregation. Also, our results are consistent with the notion put forth by Andersson et al. (2018); non-European migrants are not only concentrated in migrant-dense areas. To the contrary, they are represented more evenly in Norway than in Belgium, Denmark, the Netherlands and Sweden, especially at the small scale.

## Acknowledgements

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