# Unveiling the Urban Divide

Novel Insights into Economic Segregation Using Fine-Grained Data

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#### Urban economic segregation

The uneven distribution of population groups throughout the urban area on the basis of their economic status



#### Equally unequal, unequally segregated



## Why do we care about urban economic segregation?



#### **Research puzzles:**

## Why do we care now?

#### Inequality is (seemingly) rising

Segregation is (seemingly) rising

Several cities record diverging evolutions of inequality and segregation (Van Ham *et al.*, 2021)

Data is often incomplete, relies on approximate proxies and is based on decennial censuses

The link between inequality and segregation is probably mediated, multi-level and time-delayed



What do we aim to study?

Economic inequality — Economic segregation

#### What do we aim to study?

What is the effect of income inequality on segregation?

What are the levels of income inequality in the Netherlands?

Economic inequality

How was income inequality evolved from 2004 to 2021?

What are the levels of income segregation in the Netherlands?

#### **Economic segregation**

How was income segregation evolved from 2004 to 2021?

Is there a time lag in the relationship? How long is it?

# Data

Household microdata from Statistics Netherlands (CBS)

Data on the annual income of households + residential location:

- From 2004 to 2021
- Covering the entire population of the Netherlands
- Geo-coded at a very high resolution (100m x 100m grid cells)





## Measuring urban segregation

#### Rank-Ordered Information Theory Index

Ratio of within-unit (grid cell) income rank variation to overall (metropolitan area) income rank variation

- Adapted to a continuous/ordinal variable
- Does not rely on arbitrary thresholds and takes advantage of all income information
- Independent of actual income inequality

The Rank-Order Information Theory Index

Reardon et al. (2006) describe the rank-order information theory index in detail; we summarize its key features here. First, let p denote income percentile ranks (scaled to range from zero to one) in a given income distribution (i.e., p = F(Y), where Y measures income and F is the cumulative income density function). Now, for any given value of p, we can dichotomize the income distribution at p and compute the residential (pairwise) segregation between those with income ranks less than p and those with income ranks greater than or equal to p. Let H(p) denote the value of the traditional information theory index (Theil and Finezza 1971; Theil 1972; Zoloth 1976; James and Taeuber 1985) of segregation computed between the two groups so defined. Likewise, let E(p) denote the entropy of the population when divided into these two groups (Theil and Finezza 1971; Theil 1972; Pielou 1977). That is,

$$E(p) = p \log_2 \frac{1}{p} + (1-p) \log_2 \frac{1}{1-p}$$
(1)

and

$$H(p) = 1 - \sum_{j} \frac{t_{j} E_{j}(p)}{T E(p)},$$
(2)

where T is the population of the metropolitan area and  $t_j$  is the population of neighborhood j. Then the rank-order information theory index  $(H^R)$  can be written as

$$H^{R} = 2 \ln(2) \int_{0}^{1} E(p) H(p) dp.$$
 (3)

Extracted from Reardon & Bischoff (2011)

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Income distribution of a random city

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#### **Time-delayed effect**

Part of the impact of inequality takes time to get translated into space



Evolution of income inequality from 2011 to 2021



#### Evolution of urban economic segregation from 2011 to 2021





#### Relationship between inequality and segregation in 2021



Relationship between changes in inequality and changes in segregation



	(1A) Static values	(1B)	(2A) Annual changes	(2B)	(3A) 5-year intervals	(3B)	(4A) 10-year intervals	(4B)
Gini	0.2439***	0.1518***	0.0947***	0.0938***	0.6132***	0.6255***	0.0743*	0.1080***
	(0.0367)	(0.0370)	(0.0115)	(0.0113)	(0.0521)	(0.0521)	(0.0296)	(0.0256)
Change in data collection methods	0.0194***	0.0139***	0.0221***	0.0220***	-0.0143***	-0.0125***	-0.0277***	-0.0221***
	(0.0007)	(0.0001)	(0.0004)	(0.0004)	(0.0008)	(0.0014)	(0.0008)	(0.0009)
Number of households (log)		0.0136		-0.0046		0.0313929		0.0034
		(0.0118)		(0.0043)		(0.0199)		(0.01059)
Average income (log)		0.0222***		-0.0019		-0.0202*		-0.0421***
		(0.0044)		(0.0014)		(0.0083)		(0.0048)
Ν	630	650	595	595	455	455	280	280
Adjusted R <sup>2</sup>	0.7279	0.7517	0.8452	0.8514	0.4612	0.4663	0.8175	0.87258







# Obrigado!



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