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Konkurrierende Erklärungen ethnischer Schulsegregation: Schellings Präferenzdynamik oder „nur“ eine Folge ethnischer Wohnsegregation?

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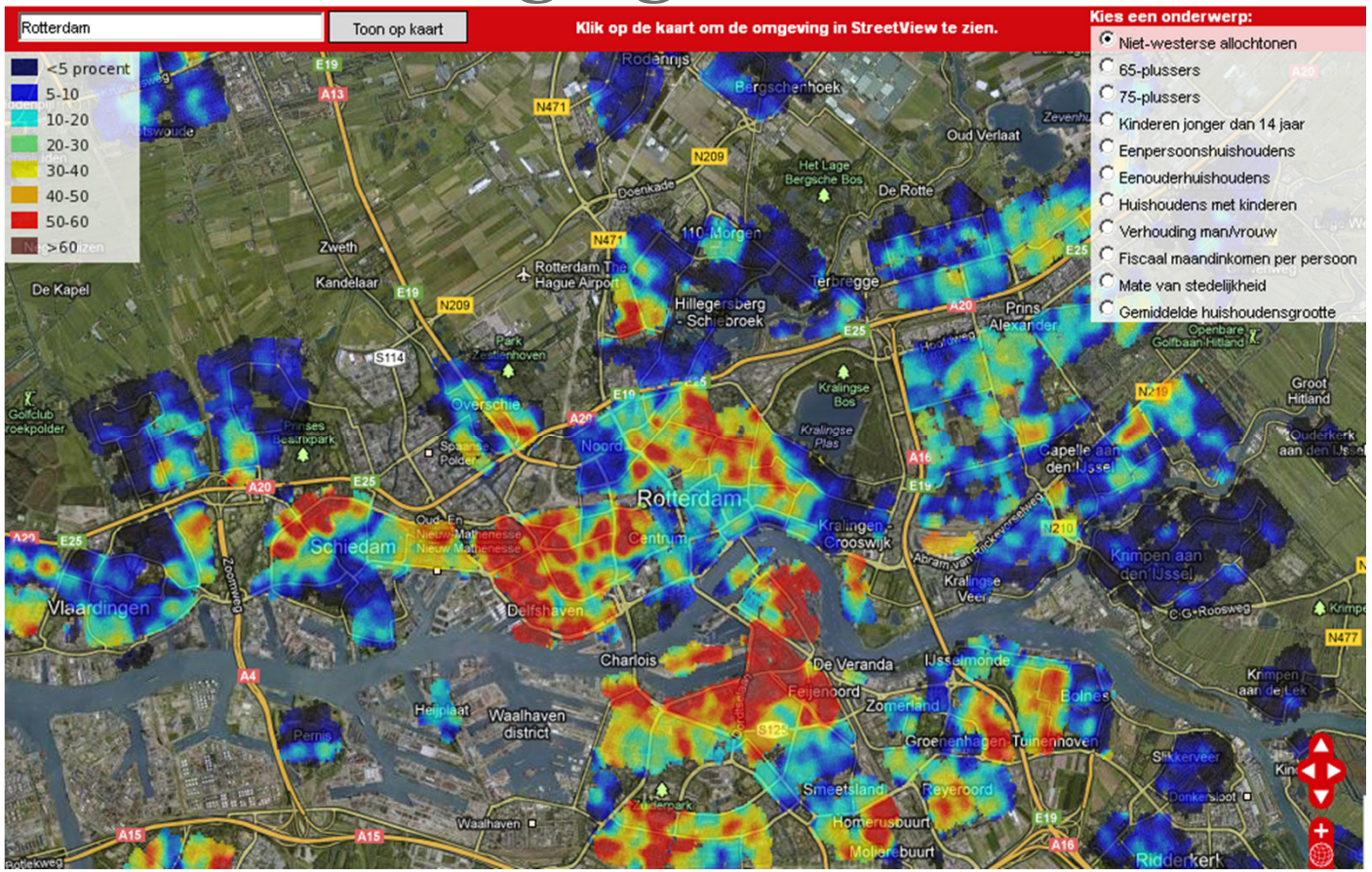
Vortrag für Tagung „Theoretische und empirische Modellierung von Segregation und Diskriminierung“

Frühjahrstagung der Sektion „Modellbildung und Simulation“ der Deutschen Gesellschaft für Soziologie, 21. und 22. März 2013 in Konstanz

Segregation between primary schools (in NL)

- For example: about half of all primary schools in 4 biggest cities are "black schools" (in 2001)
  (> 50% students with "non-western cultural background")
- Concerns
  - Educational inequality, integration under pressure
  - Desegregation policies?
- Why is there school segregation?
  - Strong residential segregation in big cities
  - Constitutionally guaranteed freedom of school choice: parents' "ethnic preferences" for own group (e.g. 'white flight').
  - But how important is each mechanism?

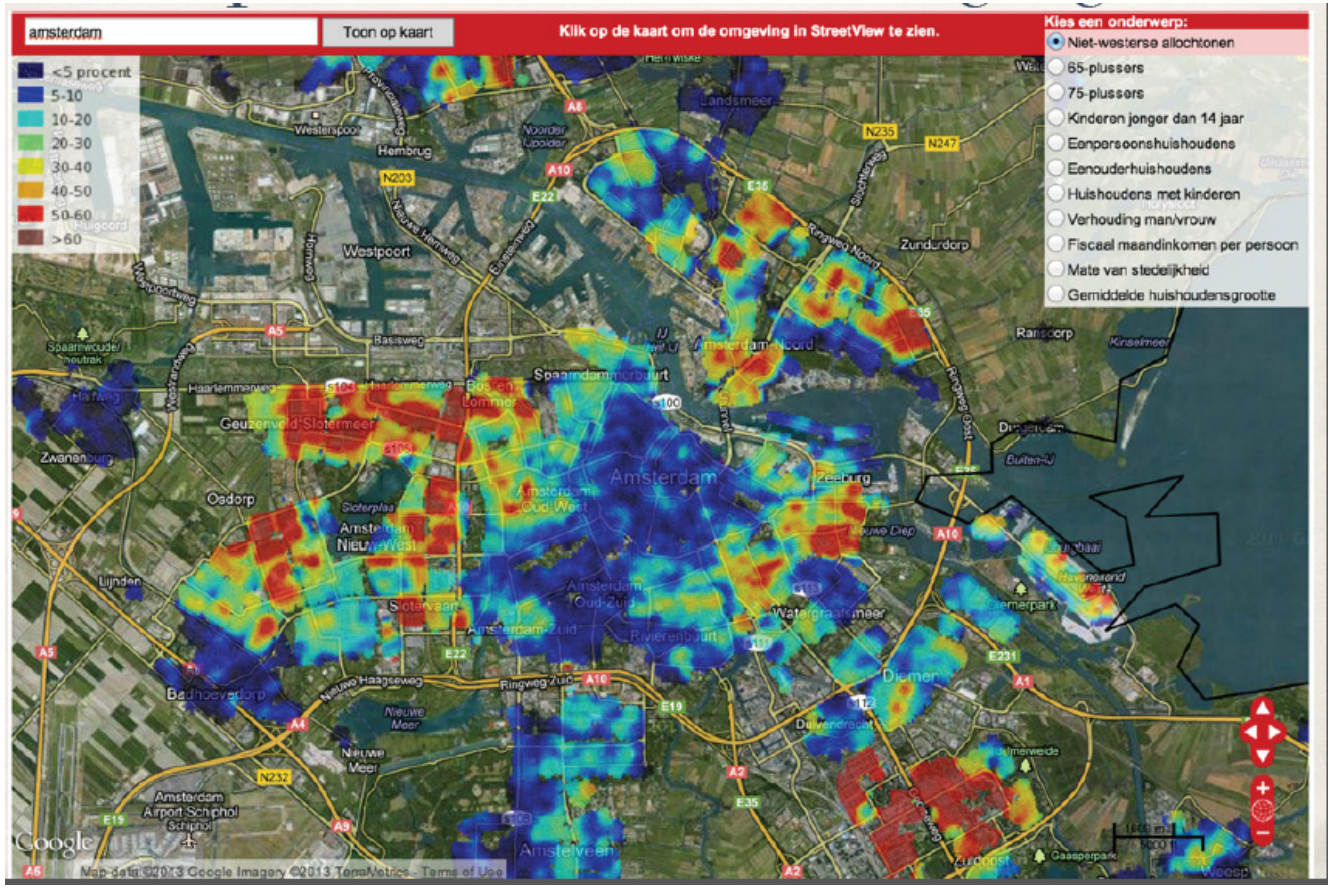
Residential segregation in Rotterdam



CBS (Statistics Netherlands), 2013

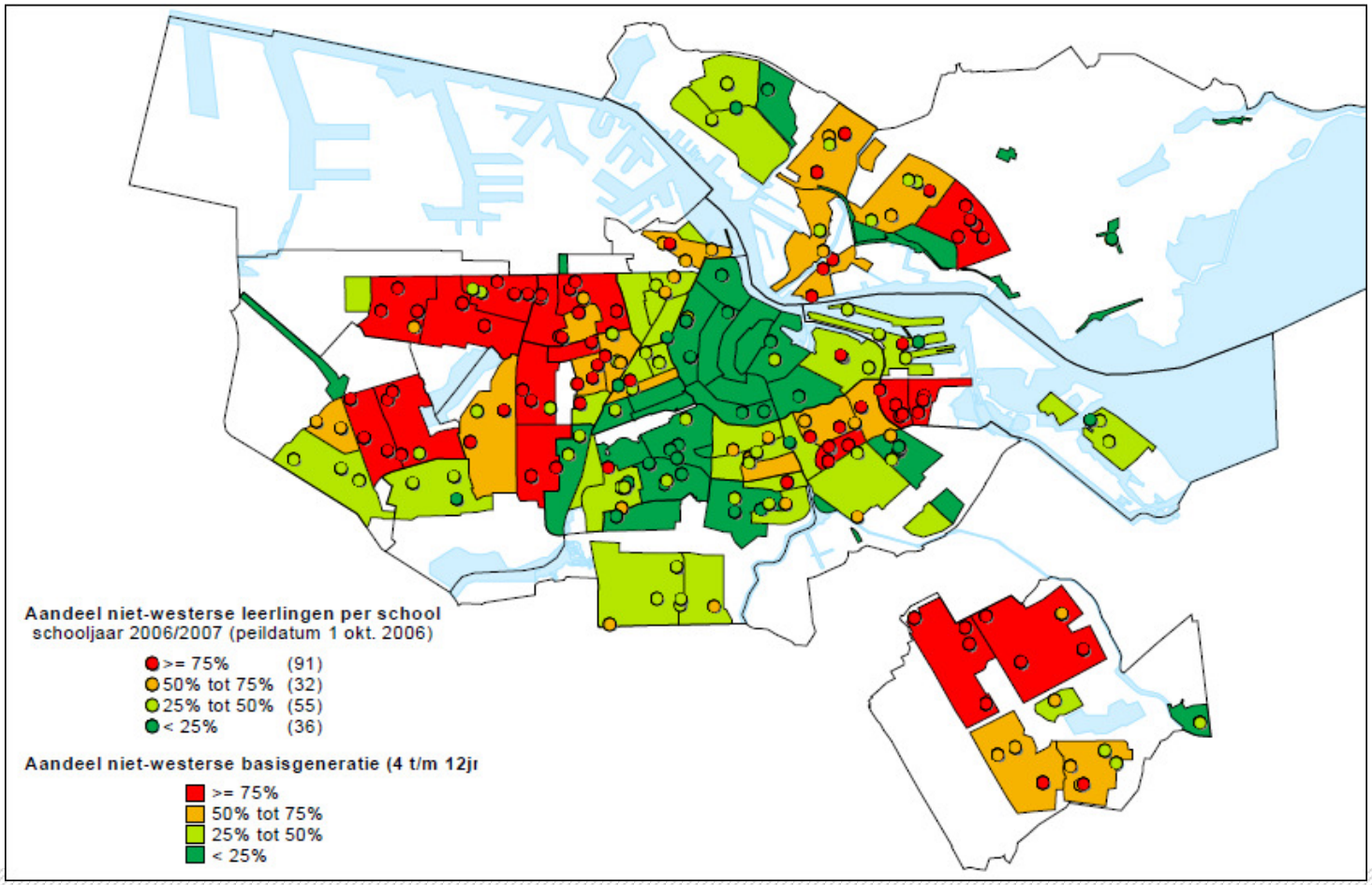
Flache et al. Modellierung von Schulsegregation. DGS Modsim Konstanz, März 2013

Residential segregation in Amsterdam



CBS (Statistics Netherlands), 2013

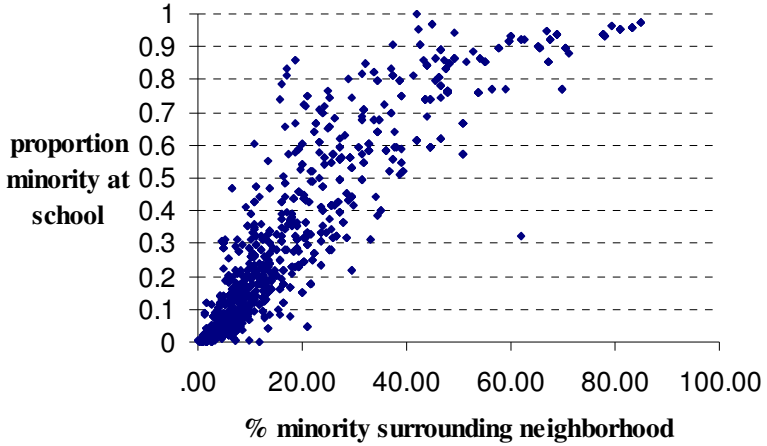
Neighborhood composition and school composition: Amsterdam 2006



Broekhuizen et al. 2008, p. 41.

Bureau research & Statistics, Amsterdam municipality.

Neighboorhood composition and school composition in 31 biggest cities (2001)



Correlation

$r = 0.79$

$p < .001$

Data from Statistics Netherlands (CBS) and Ministry of Education (1391 primary schools in 31 biggest cities)

What drives the school segregation dynamic?

- Residential segregation is an important factor
  - Surveys show that "distance from home" is an important school-choice motive for most parents

- But so are ethnic preferences…
  - Important school choice motives for native Dutch parents is that school comprises children with same cultural background "as us" (Karsten, 2003)
  - More than 75% of the native Dutch would object to school situations with immigrant majority (Coenders et al., 2004).

- And there is more…
  - Religious denomination, local geography, local distribution policies …

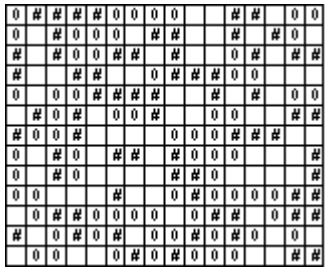
Ethnic preferences and 'unintended' segregation: Schelling's model of residential segregation

- School segregation can even arise without any initial residential segregation, driven by "preference dynamics".
- Schelling (1970, 1971) and many follow-up studies:

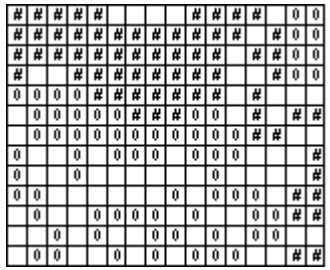
  Residential segregation can be the unintended result of the interactions of multiple autonomous agents, each having only very weak "homophilious preferences" for not being too much a local minority.

Schelling 's model in a nutshell

- Two groups of individuals "live" in cellular world
- An individual is only satisfied if "enough" others of its own group live in its local neighborhood.
- Individuals receive in random sequence options to migrate to empty locations. Only dissatisfied individuals migrate.



Initial random configuration



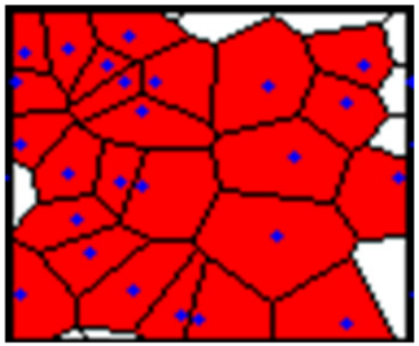
Resulting segregation

Schelling 1971: neighborhood preference not to be in minority (at least 50% "own group")

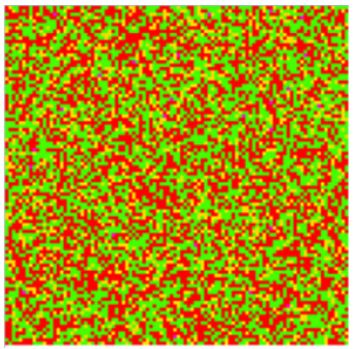
Schelling on schools: a simple model

- Two ethnic groups, households have fixed residential location
- Choice between available schools
- Two preference arguments:
  - Ethnic composition school, distance home-school

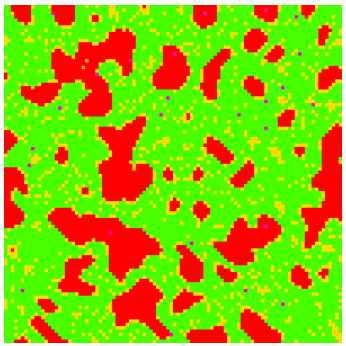
- Initial composition school depends on residential composition in 'school neighborhood' (on 100 x 100 grid)



School neighborhood = voronoi cell



Residential integration



Residential segregation

Basic setup of simulation

- Household = cell = one 'child'
- Size and initial composition school ⇦ voronoi neighborhood

Then repeat:

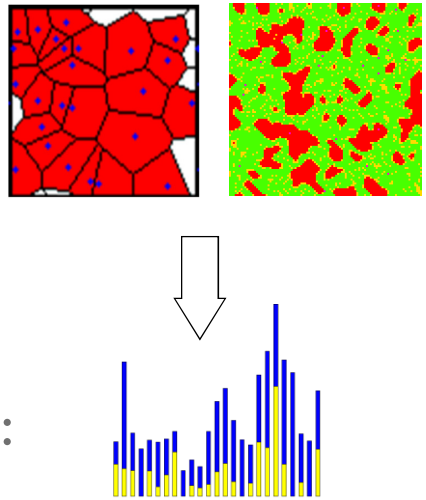
Select subset of agents at random (≅ 5%)

Pick agents from this subset in random sequence:

utility at current school ≥ threshold *T*?

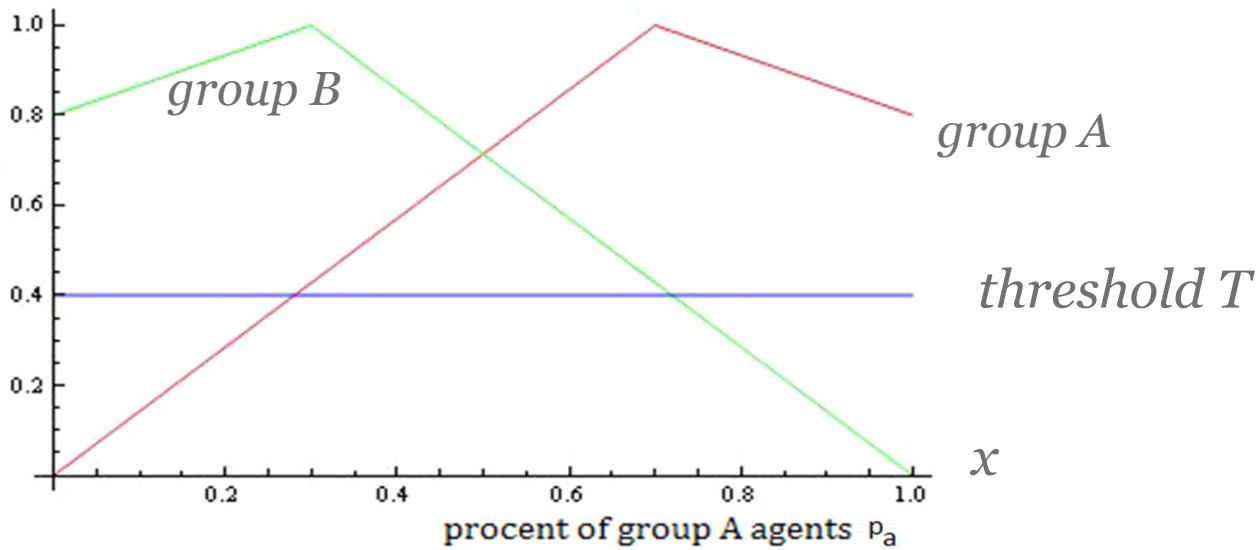
If not, then…

- inspect schools with free slots in random sequence:
- if for new school $U \geq T$ ⇨ move there.
- if no better school found: check whether there is school that is better than current school *Unew* > *Uc*.
- If found ⇨ move there.



Ethnic preference function

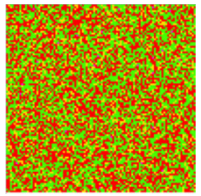
Ethnic Preference value *P* of school with composition x



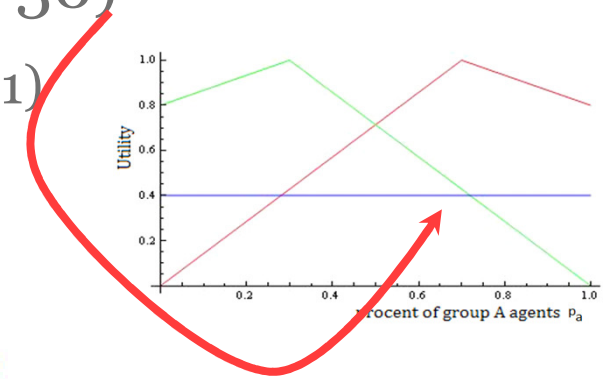
- Stable integration possible if
  - School composition acceptable for both groups
  - Global composition allows to satisfy preferences locally everywhere
- But integrated distributions can be fragile!

Simulation experiment 1: Can school segregation arise *from residential integration*? Yes.

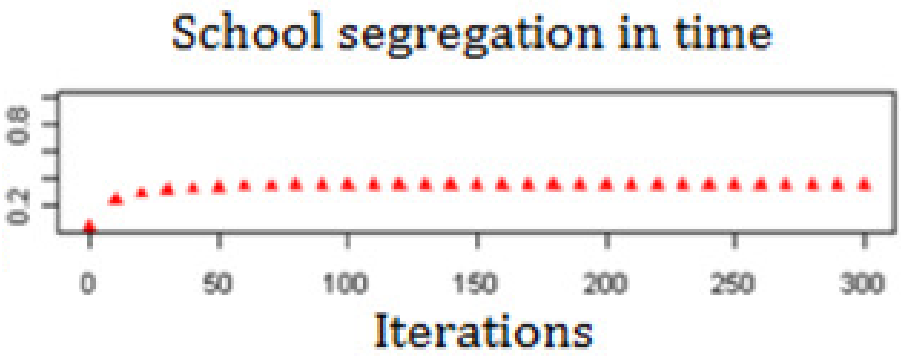
› Scenario: “fragile integration” (70/30)



- distance does not matter (alpha=1)



dissimilarity index



N=8700 pupil

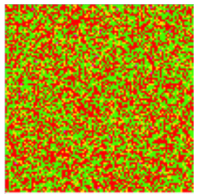
25 schools

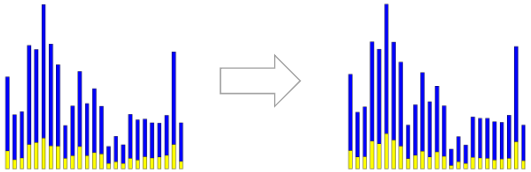
mean of 100 replications

What if distance also matters?

› Scenario: “fragile integration” (70/30)
- distance matters 50% (alpha=0.5)

⇨ Segregation hardly increases





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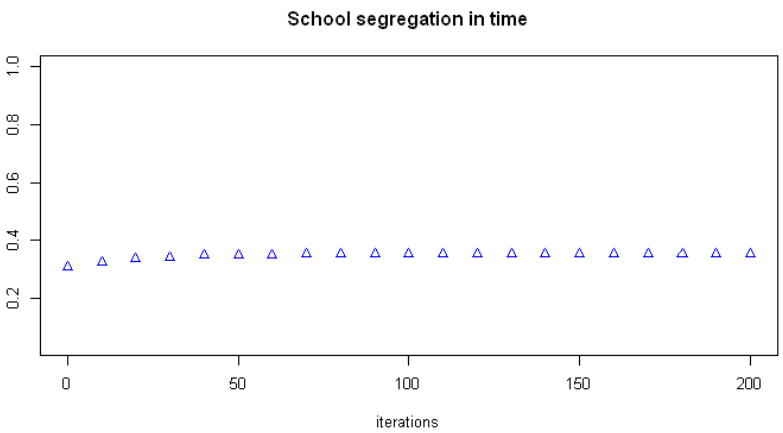
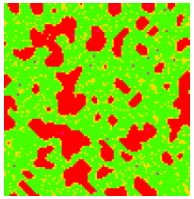


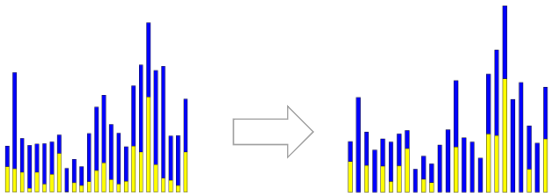
N=8700 pupil

25 schools

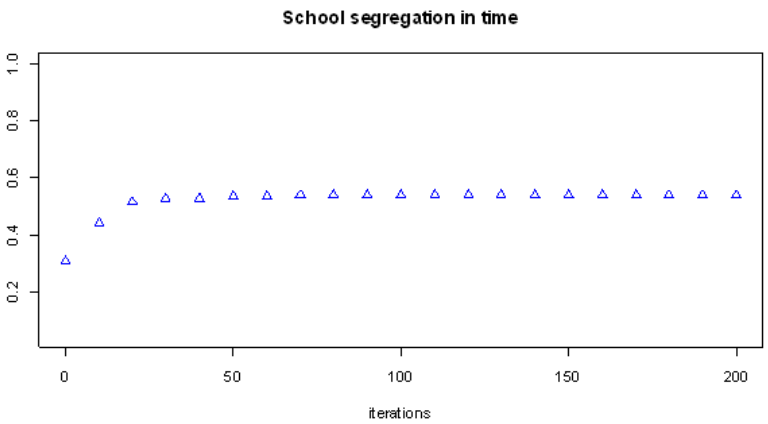
Simulation experiment 2: can ethnic preferences increase school segregation *in residentially segregated situation*?

- Scenario: "initial segregation" (70/30)
  - distance does not matter (alpha=1)
  - ⇨ Segregation increases considerably





dissimilarity index



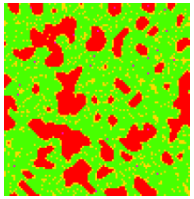
N=8700 pupil

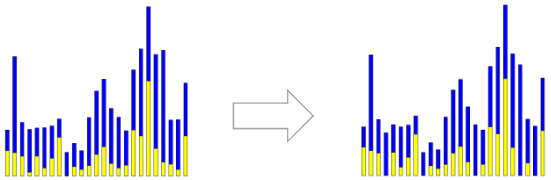
25 schools

mean of 100 replications

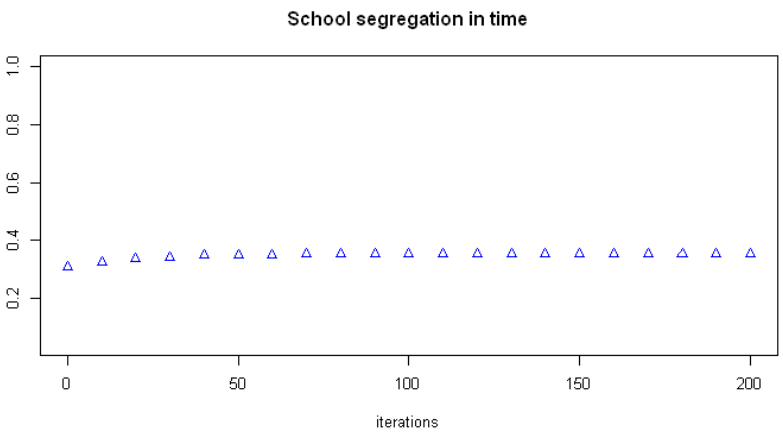
What if distance also matters?

- Scenario: "initial segregation" (70/30)
  - distance matters 50% (alpha=0.5)
  - ⇨ Segregation hardly increases





dissimilarity index



N=8700 pupil

25 schools

Tentative theoretical conclusions…

- Residential composition can explain large part of school composition…
- Preference dynamics may still add to segregation, …
- ….but this effect may be very small if there is strong residential segregation and preference for nearby schools.

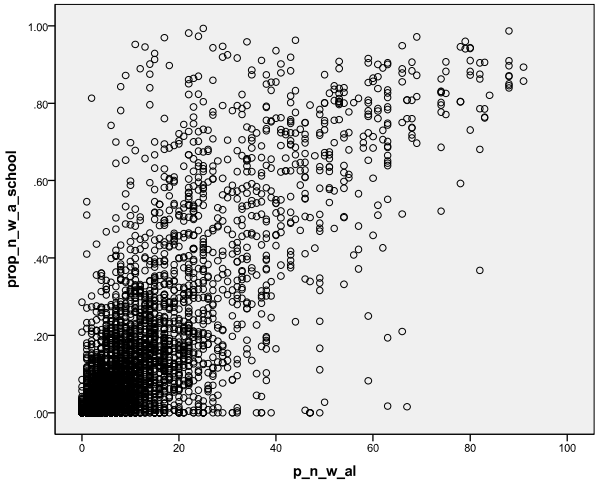
First empirical results

› Data (1998, 2006)

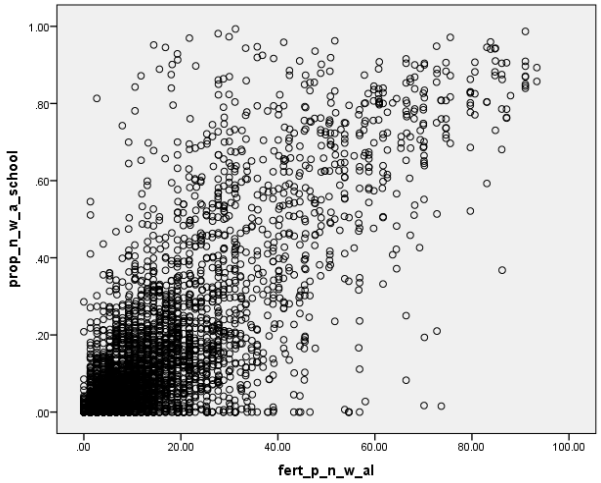
- Ethnic composition of all about 7400 primary schools in the Netherlands.
- Ethnic composition of all local neighborhoods, wider neighborhoods and municipalities.
- Data on various characteristics at municipality level (e.g. right-wing voting, only for 2006)

Unit	Number of units (2006)
Local neighborhood (buurt)	4412
Wider neighborhood (wijk)	2121
Municipality	457
Primary schools, of which…	7382
Public schools	2233
Christian schools	3745

Bivariate association proportion non-western immigrants at school and in surrounding neighborhood
(2006, N=7382)



neighborhood "raw"



neighborhood "fertility corrected"

(immigrant 2.26 vs. dutch 1.69)

Some hypotheses (cross sectional)

Dependent variable: % non-western pupil at school *i*.

- *"distance minimization"*: % non-western inhabitants in neihgborhood around school, corrected for fertility **(+)**
- "*religious homophily*": Christian school denomination (opposed to public school): less non-western **(-)**
- "*ethnic preference*": other schools in same (wider) neighborhood "too black" ⇨ focal school "too white". **(-)**
- Variation in effect between municipalities (multilevel random slope, random intercept)

	Model 1	Model 2	Model 3	Model 4
intercept	.014 (.56)	2.977*** (.648)	3.589*** (.596)	2.7*** (.607)
fertility corrected proportion non-western immigrants (pnwi)	1.22*** (.07)	1.216*** (.069)	.944*** (.063)	.853*** (.072)
Christian vs. public denomination		-4.67*** (.532)	-5.365*** (.534)	-5.375*** (.525)
Average pnwi other schools in local neighborhood			.226*** (.024)	.184*** (.024)
Average pnwi other schools in wider local neighborhood	*Results 1998*			.235*** (.021)
Variance school (e_{ij})	128.26***	123.00***	122.55***	119.79***
Variance intc	15.77***	15.72***	8.24**	7.58 n.v.
Variance slope	.222***	.223***	.099**	.234 n.v.
N schools	1901	1901	1901	1901
Deviance (emply rnd intc 16243)	14794	14718	14652	14578

intercept	-1.05**	2.244***	2.374***	1.906***	.949	-.048
fertility corrected pnwi	1.042***	1.046***	.986***	.93***	.917***	.924***
Christian vs. public		-5.258***	-5.415***	-5.362***	-5.394***	-5.33***
Pnwi other local sch			.068**	.035	.033	-.019
Pnwi other wider local				.147***	.141***	.137***
PVV voters					.21*	.375**
Interaction PVV pnwi other local						1.033*
Variance school (e_{ij})	100.98***	94.15***	94.38***	93.82***	93.921***	93.84***
Variance intcpt	2.19 *	2.59*	2.091*	3.052	2.95	2.89
Variance slopes	.101***	.106***	.094***	.184	.191	.21
N schools	2897	2897	2897	2897	2897	2897
Deviance (empty rn inct 24397)	21743	21555	21551	21498	21498	21497

Results 2006

Tentative conclusions

- Local residential composition seems to explain most of the variance in school composition
- No evidence for preference dynamics a la Schelling
- But…
  - DV and IV (other schools..) not fully independent
  - It might be better to focus on deviation from neighborhood composition as DV
  - …and on deviation other schools in local environment from neighborhood composition as IV

This is just the beginning. What's next?

- Spatial regression and GIS (autoregressive model)
- Include data on quality of school
- Test longitudinal model of school composition
- Extend simulation model and link it to data
  - Random utility model of preferences based on microdata
  - Calibrate neighboorhood composition etc on empirical data
  - Use sim-model to assess best-fitting set of preferences

Vielen Dank für Ihre Aufmerksamkeit!

Hinweise herzlich willkommen:

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