Quasi-market competition in public service provision: user sorting and cream skimming

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Introduction

1 Market structure in public service provision

- ▶ user choice
- ▶ activity-based funding
- ▶ managerial autonomy

$\Rightarrow$ efficiency gains (?)

2 Potential consequences

- ▶ user sorting
- ▶ strategic behavior

$\Rightarrow$ segregation & inequality (?)

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- Public service: high schools in Denmark.
- Quasi-market structure: budget reform 2007-2008
- Segregation by student quality.

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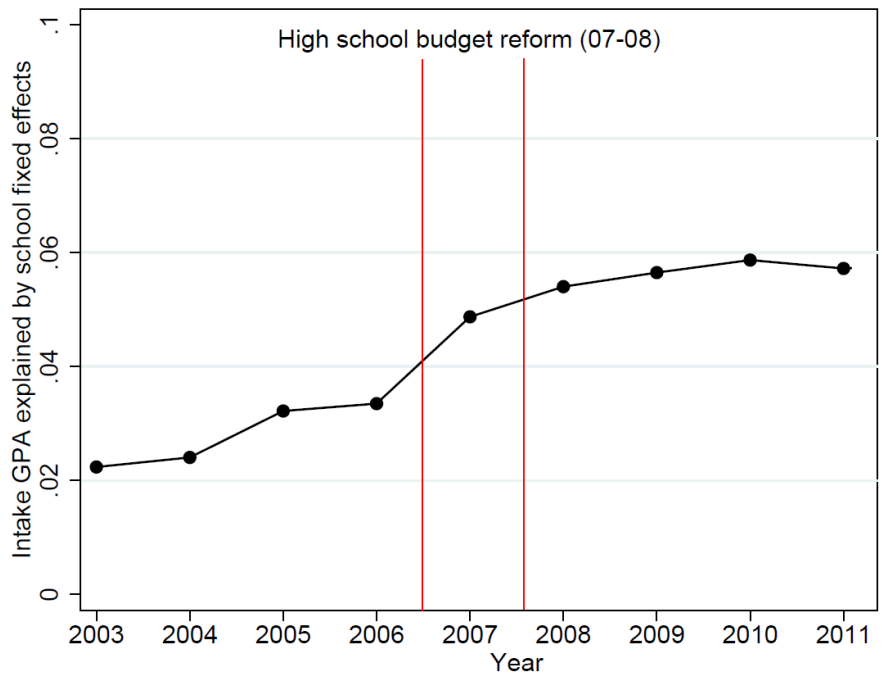
Figure: High-school segregation by 9th grade GPA



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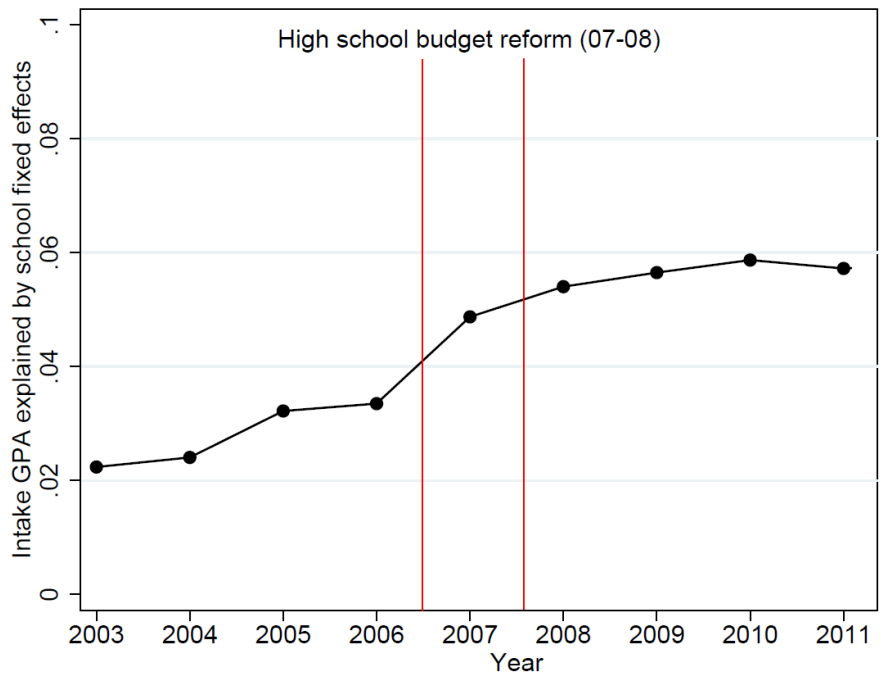

- RQ: Is the increase in segregation linked to sorting or cream skimming following the reform?

Plan

1. Related literature on performance management & quasi-markets
2. The 2007-08 high school budget reform.
3. Research design
4. Results
5. Discussion and next steps

(Unintended) consequences of performance management

"Effort substitution"

- Multitasking (Holmstrom and Milgrom, 1991)
- Kelman and Friedman (2009): Improve incentivized indicators, neglect the rest.
- Jacob (2005): "Teaching to the test".
- Reback (2008) "Teaching to the rating".

"Gaming"

- Kelman and Friedman (2009): Manipulate incentivized indicators.
- Jacob and Levitt (2003): Manipulate test scores.

Quasi-Markets: Le Grand (1991)

Quasi

- Demand not expressed in monetary purchasing power.
- Supply: not necessary profit maximizing.

Markets

- Monopolist public sector replaced by competitive providers.

Potential Consequences

1. Inefficient establishment costs.
2. Inefficient spending (marketing).
3. High labor costs.
4. Focus away from "productive" to "unproductive" inputs.
5. Inequality and segregation.

(Unintended) consequences of quasi-markets

Requirements for identification

- Variation in degree of quasi-markets structure
- Measurable "consequence"

Andersen and Serritzlew (2007)

- No effect of competition on public school performance.
  - Provision becomes more challenging.
  - Costs increase.
  - Quality is hard to observe.

Cookson et al. (2010)

- No evidence of socio-economic inequality in health care quality.

The 2007-08 high school budget reform.

Pre

- Academic high schools were governed and funded by 15 self-governed counties.

Post

- Self-governed institutions with activity-based funding from the central government:
  - 80% of budget is Government funding (2008).
  - 92% of Government funding is activity based (2008).
  - Example: students enrolled in the program (9,000 USD per student per year).
  - Budget autonomy

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The 2007-08 high school budget reform

Objectives (UVM)

- "to institute a system of financial management that [is] **oriented towards results and incentives**. The institutions [...] have an **incentive** to adjust the capacity to fit the demand and to continually look for ways **to economise and become more efficient**"

- "to ensure that **funds** are efficiently **transferred from** educational programmes with **decreasing** amounts of **activity to** programmes that are experiencing **growth**, partly to support **free educational choice** and to provide institutions allocation security through open admissions or open access."

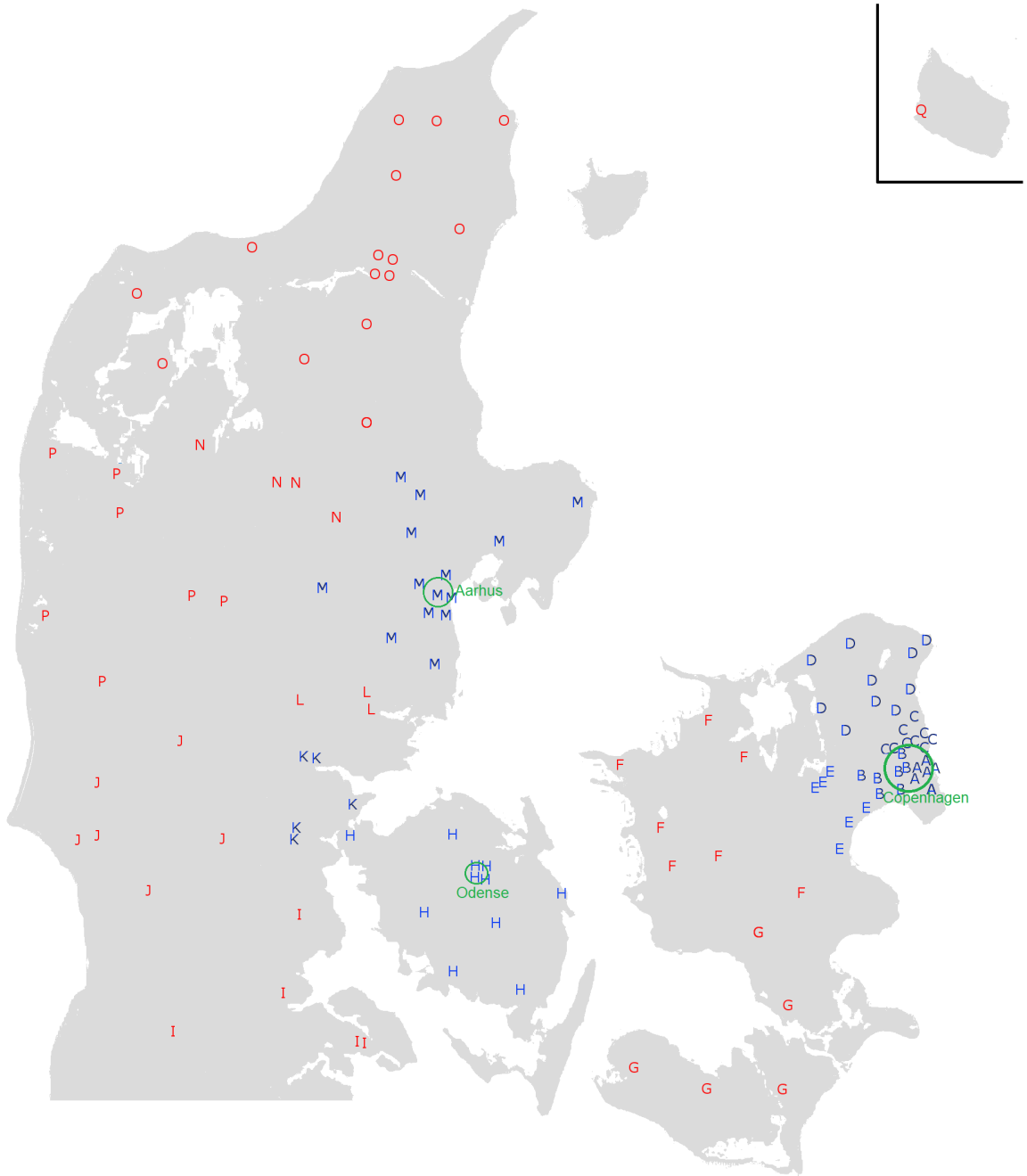
The 2007-08 high school budget reform

Variation in exposure to quasi-markets?

- Before vs after ✓

Regional variation?

- 16 new school districts.
- Students make prioritized choice.
  - Regional variation in high school concentration/competition.


Aarhus
Odense
Copenhagen

The 2007-08 high school budget reform

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  - Students make prioritized choice.
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- Across districts ✓

The 2007-08 high school budget reform

Why care about budgets?

- Job-security
- Organizational slack (non-monetary rewards).

How to improve budgets?

+ Attract students if marginal costs $\leq$ regulated price.
+ Attract "good" students (high chance of graduation etc.).

"Good" students?

Table: Regression Results. Predicting High School Performance

	Dependent variable	
	Graduted HS	HS GPA (SD)
A. Middle school GPA		
GPA (SD)	0.164*	1.110*
	(0.003)	(0.005)
R^2	0.095	0.494
B. Parental schooling		
Years of schooling	0.020*	0.119*
	(0.001)	(0.002)
R^2	0.015	0.068
Observations	86,529	73,012
Mean of dep. var	0.854	0.002

Note: The table shows the estimation results regressing the variables denoted in the column headers on a constant and, respectively, the middle school GPA (Panel A) and parental education (Panel B). The data are based on all cohorts enrolled in the years 2003–2006. Standard errors clustered on the high school level are shown in parentheses.
* indicates significance at a 5-percent level.

The 2007-08 high school budget reform

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$\Rightarrow$ segregation and inequality.

The 2007-08 high school budget reform

The allocation of students to high schools

- 16 new school districts.
- Students make prioritized choice.
- Guidelines for allocation: allocate to first-choice.
- Over-subscription?
- Districts decide on allocation mechanism ($<$ 2012).

Retsinformation

§ 29 Stk. 2. Hvis der er flere optagelsesberettigede ansøgere med 1. prioritet til en uddannelse på en institution, end institutionen har kapacitet til at optage, skal institutionens leder sende samtlige ansøgninger fra optagelsesberettigede ansøgere til den treårige stx-uddannelse og den toårige hf-uddannelse til **fordelingsudvalget, der afgør, hvilke ansøgere der af kapacitetsmæssige grunde skal henvises til en anden institution**, jf. § 30.

§ 30 Stk. 2. Er der ikke plads på nogen af de ansøgte institutioner, henviser fordelingsudvalget ansøgeren til en institution, hvis studieretningsudbud omfatter ansøgerens forhåndstilkendegivelser om ønskede studieretninger. **Ansøgerens ønsker skal imødekommes bedst muligt, dvs. i prioriteret rækkefølge. Fordelingsudvalget skal tillige tage hensyn til transporttiden mellem ansøgerens bopæl og institutionerne.**

§ 30 Stk. 4. Fordelingsudvalget kan inden for de i stk. 1-3 fastlagte rammer tillige tage hensyn til den enkelte institutions særlige profil.

Profilernes kamp

Profilernes kamp

Dato_ 08. mar 2010

Gymnasierektorerne er dybt splittede i spørgsmålet om elevfordeling og muligheden for at håndplukke elever ud fra en skoles profil. Nogle frygter, det fører til A- og B-skoler, hvor karaktergennemsnittet spiller ind, andre siger, det bryder den sociale arv. Undervisningsministeriets optagelsesbekendtgørelse er tvetydig og overlader hele slagsmålet til rektorerne.

Information

LÆSETID: 4 MIN.

Hvordan løser man problemet med ghetto-gymnasier?

Langkær Gymnasium ved Aarhus er begyndt at opdele klasserne efter etnicitet. Målet er at undgå, at de 20 procent etnisk danske elever, som netop er startet på skolen, flytter væk. Information har spurgt en debattør, en elevrådsformand og en rektor, hvad de mener om den løsning

På Langkær Gymnasium ved Aarhus udgør etnisk danske elever 50 pct. af årgangen i tre klasser.

SAMFUND

Rektorer i opråb til politikere: Sæt en stopper for »hvide og brune« gymnasier

Flere gymnasier har en voksende andel af elever med indvandrerbaggrund, og det betyder, at etnisk danske børn vælger skolerne fra. Rektorer slår alarm og opfordrer politikerne til at gøre op med de såkaldte ghettogymnasier.

Why worry about segregation?

Quality

- Positive peer effects on achievement (see e.g., Carrel et al., 2009)

$\Rightarrow$ Inequality

Segregation and polarization

- Bhattacharya (2019): neighborhoods - intercaste trust
- Rao (2019): schools - familiarity increases generosity and reduces discrimination.
- Carrel et al. (2019): college - initial exposure $\rightarrow$ contacts $\uparrow$

The 2007-08 high school budget reform

Summary

- Introduce quasi-market structure in high schools.
- Regional variation in degree of competition.
- Prioritized school choice
- Regional autonomy in allocation of students
- Incentive to enroll many good students
- Anecdotal evidence of segregation.

Research question

- Did segregation in "student quality" increase?
- Is the increase linked to variation in quasi-market structure?

Empirical Strategy

Difference-in-differences

- First difference: before & after.
- Second difference: high & low competition areas.

Competition

- Number of high schools within 20km.
- Above median: high competition.

Outcome

- Segregation in student quality
- Student quality: 9th grade GPA

Empirical Strategy

Measuring competition

1. For each high school count the number of high schools within x km.

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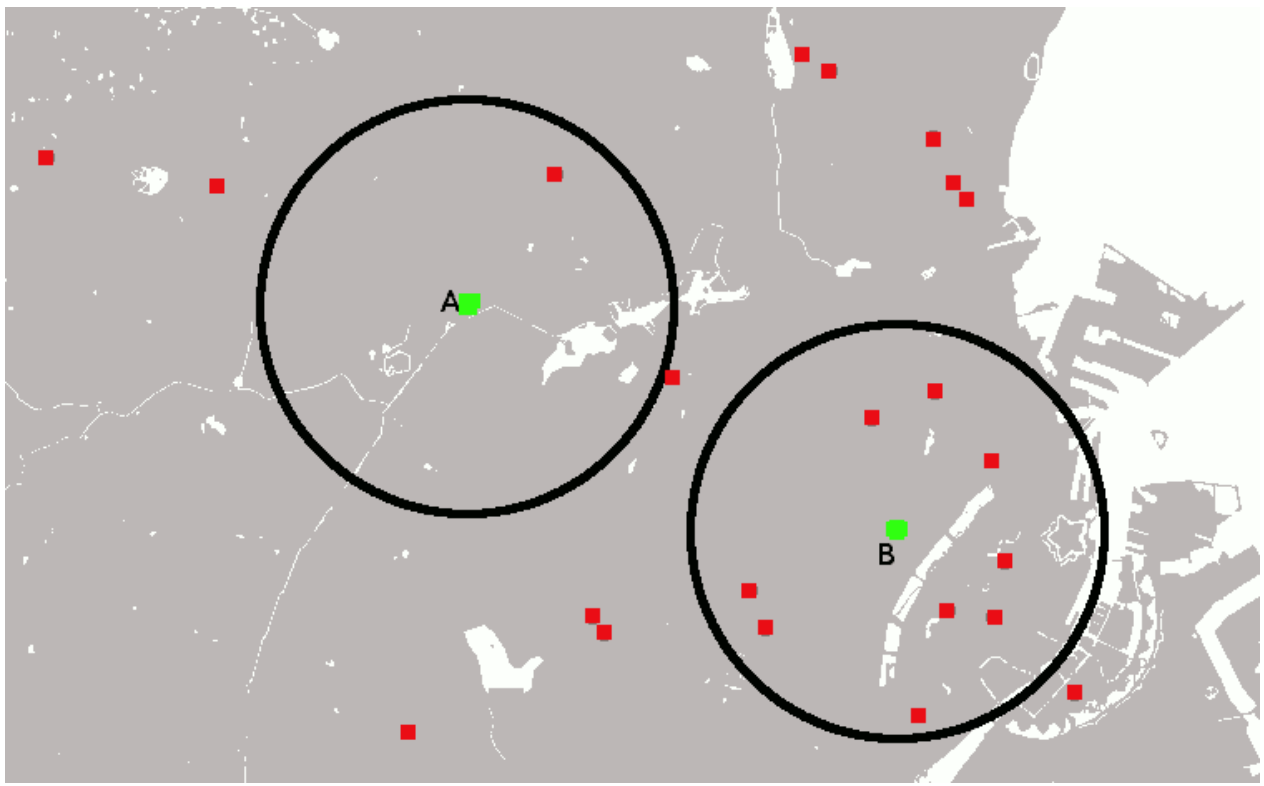

Empirical Strategy

Measuring competition

1. For each high school count the number of high schools within x km.
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3. Split the districts in high and low competition:
   - Few neighbours $\Rightarrow$ low competition
   - Many neighbours $\Rightarrow$ high competition

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Measuring Segregation

R^2 approach

1. $GPA9_{is}$: 9th grade GPA for child i enrolling in high school s.
2. Ω: A vector of school indicators that equal 1 if child i enrolled in that school.
3. Estimate

$$GPA9_{is} = \alpha + \beta' \Omega_{is} + e_{is} \tag{1}$$

4. Calculate $R^2 \rightarrow$ measure of segregation.
   High R^2:
   - Variation intake GPA is well-explained by differences across schools (school indicators).

   Low R^2:
   - Variation intake GPA is poorly-explained by differences across schools (school indicators).

   $\Rightarrow$ Main outcome variable: R^2

   (see e.g. Söderström and Uusitalo 2010).

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Alternative Segregation Measure

Duncan's-Dissimilarity Index

- Allen et al (2015): "The most widely used measure of segregation"

1. GPA^{High} is equal to one if the 9th grade GPA is above the median.
2. GPA^{Low} is equal to one if the 9th grade GPA is below the median.
3. Subscript s denotes the high school.
4. Calculate

$$D = \frac{1}{2} \sum_{s=1}^{S} \left| \frac{GPA_s^{High}}{GPA^{High}} - \frac{GPA_s^{Low}}{GPA^{Low}} \right| \tag{2}$$

- Interpretation I: The share of a group that needs to move to obtain equal distribution.
- Interpretation II: Lorenz curve.

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Identifying assumptions

Strategy

- Compare segregation measures:
  - before and after 2007-08 reform.
  - across low and high competition areas.

Common trends assumption

- Low and high competition areas would have similar development in absence of reform.

- No other reform affecting low and high competition areas differentially.
  - 1 Municipality Reform in 2007: larger municipalities and different structure
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A new baseline

Establishing the relevant comparison

- So far: compare segregation to "zero segregation".
- What if? "Zero segregation" is an uneven benchmark across low and high competition over time?

- Solution: Create a relevant benchmark ⇒ What would segregation be if students were randomly allocated to schools within districts?

1. Randomly reallocate students 50 times.

   Keep school size constant.
2. Calculate segregation in each random allocation.
3. Compare actual segregation to average segregation across 50 random allocation.

- Takes structure of district and grading scale into account.

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Inference

Cluster bootstrap: 200 times...

Step 1: calculate actual segregation measure.

Step 2: 50 times:

a randomly reallocate students to schools within districts.
b calculate segregation measure

Step 3: calculate average segregation in 50 random allocation.

Step 4: subtract average "randomized" segregation from actual segregation

Step 5: calculate difference between before and after 2007 reform.

Step 6: calculate difference between high and low competition districts.

Step 7: subtract differences$\Rightarrow$ DiD estimate.

Data

Administrative records

- 9th grade GPA (standardized by cohort)
- high school enrollment (school id's)
- school records.
- personal characteristics.

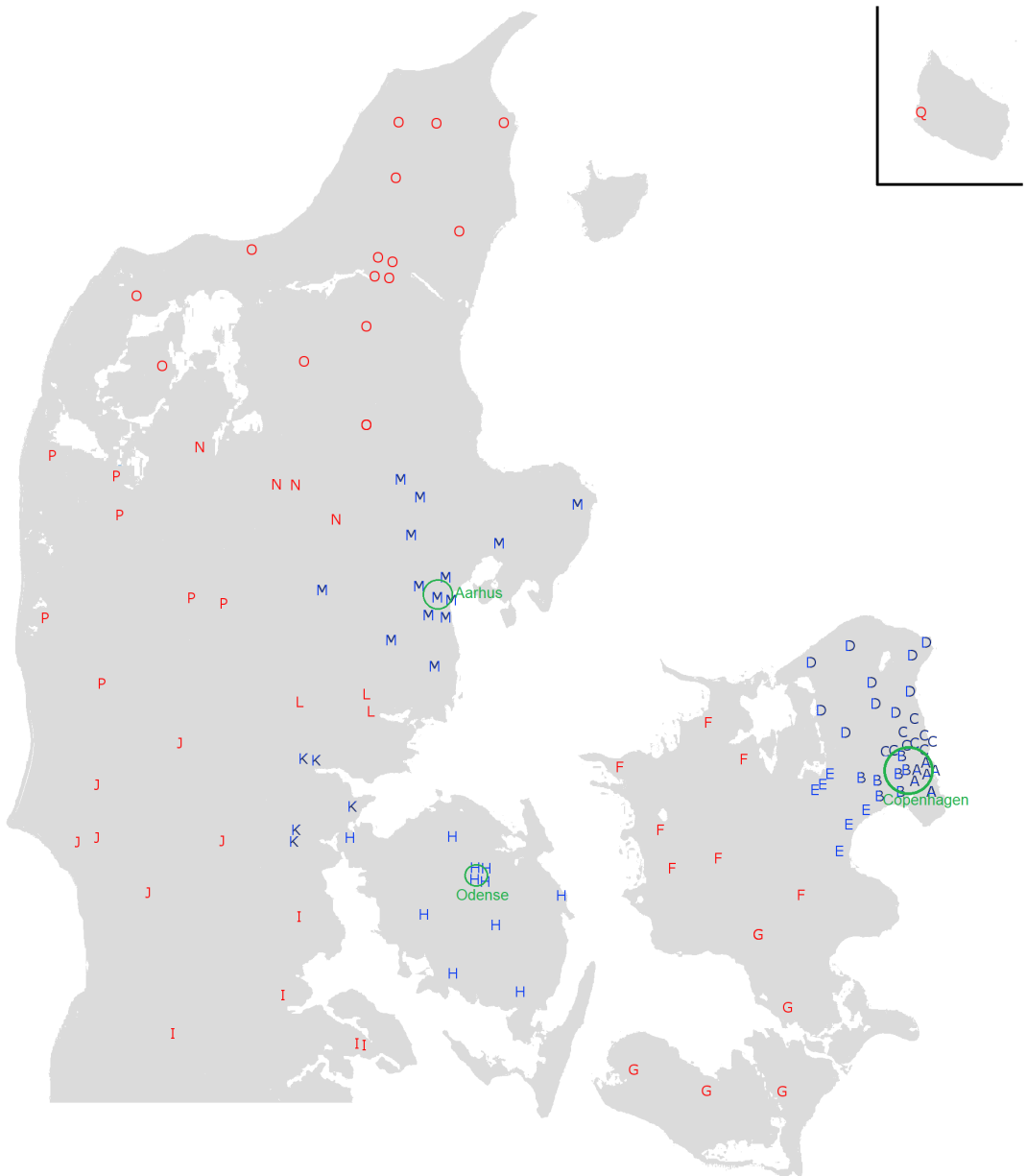
Table: Sample Selection

	Schools	Students
All students enrolled in public high schools 2003-2011	144	227,207
School not observed in all years	-25	-9,145
Unknown school district	-3	-2,809
Student 9^{th} grade GPA not observed	0	-5,736
Analysis Sample	116	209,517

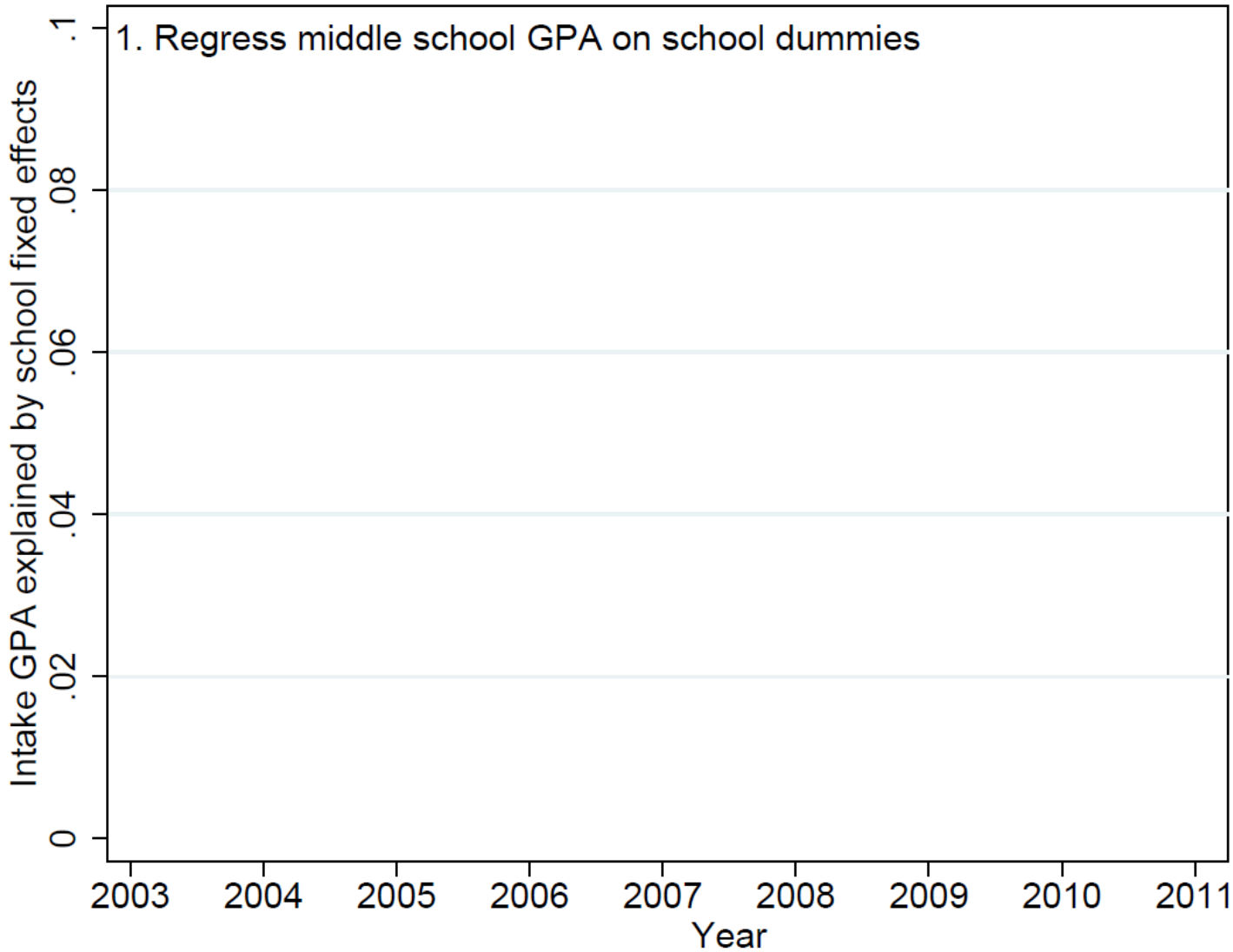
Table: Descriptive Statistics

	All schools		Low comp.	High comp.
	Mean	SD	Mean	Mean
A. Pre period 2003–2006				
Female	0.61	0.05	0.64	0.60
Ninth grade GPA	0.72	0.11	0.72	0.73
GPA above cohort median	0.84	0.05	0.84	0.84
Parental years of schooling	14.29	0.54	14.06	14.47
Age at enrollment	16.59	0.14	16.65	16.55
High-competition area	0.58	0.50	0.00	1.00
Enrollment	175.34	52.19	160.39	186.27
Schools in school district	8.5	3.51	7.53	9.21
Unemployment rate (%)	5.78	1.37	6.17	5.5
B. Post period 2007–2011				
Female	0.61	0.05	0.64	0.60
Ninth grade GPA	0.63	0.17	0.61	0.64
GPA above cohort median	0.79	0.07	0.78	0.79
Parental years of schooling	14.28	0.57	14.04	14.46
Age at enrollment	16.65	0.12	16.68	16.63
High-competition area	0.58	0.50	0.00	1.00
Enrollment	220.97	68.11	199.95	236.34
Schools in school district	8.5	3.51	7.53	9.21
Unemployment rate (%)	3.66	0.77	3.83	3.53
Number of priorities used	1.67	0.70	1.19	2.02
1st priority/Enrolled	0.85	0.16	0.85	0.84
Number of schools	116		49	67

Regional variation, 20km & median



Graphical Results



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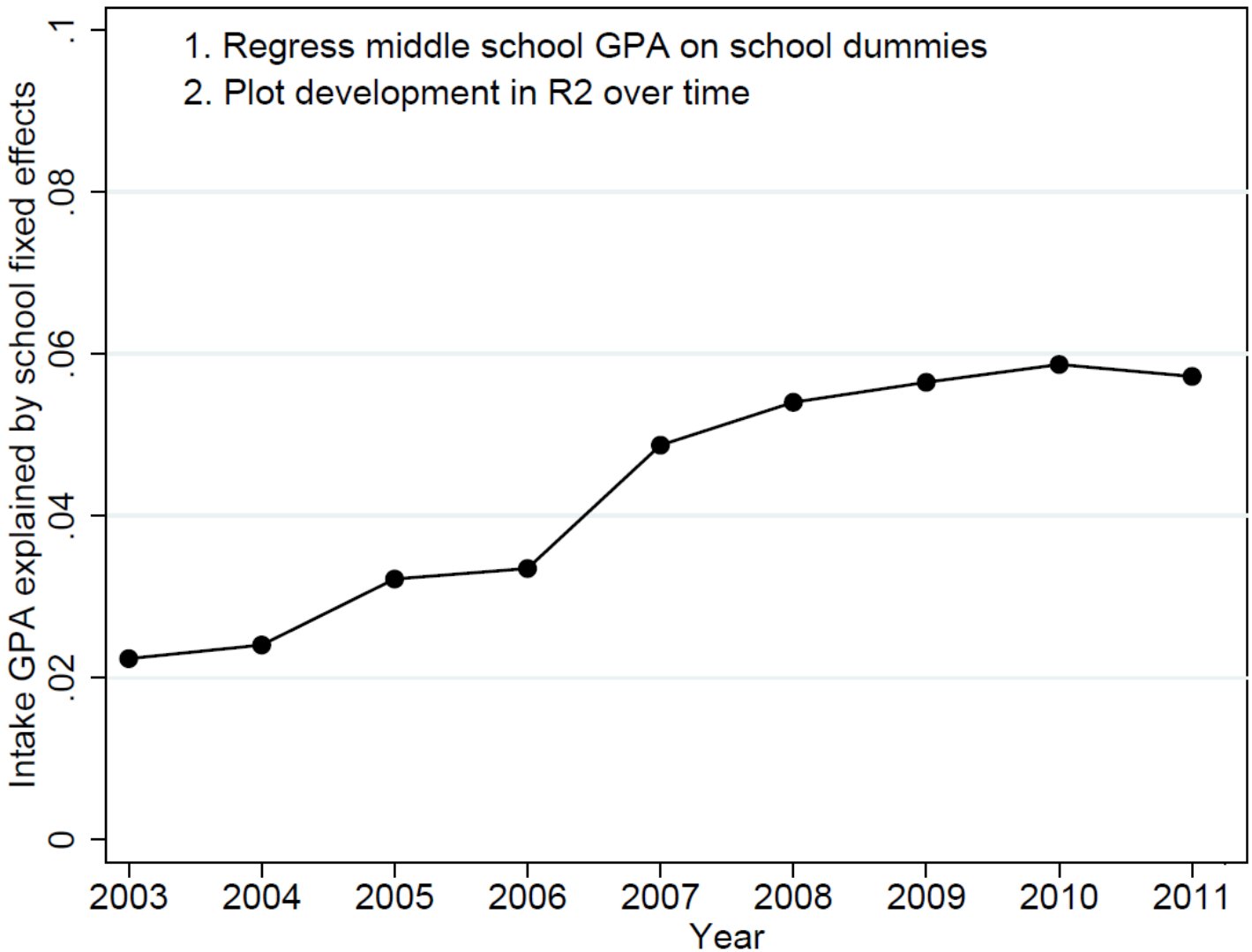

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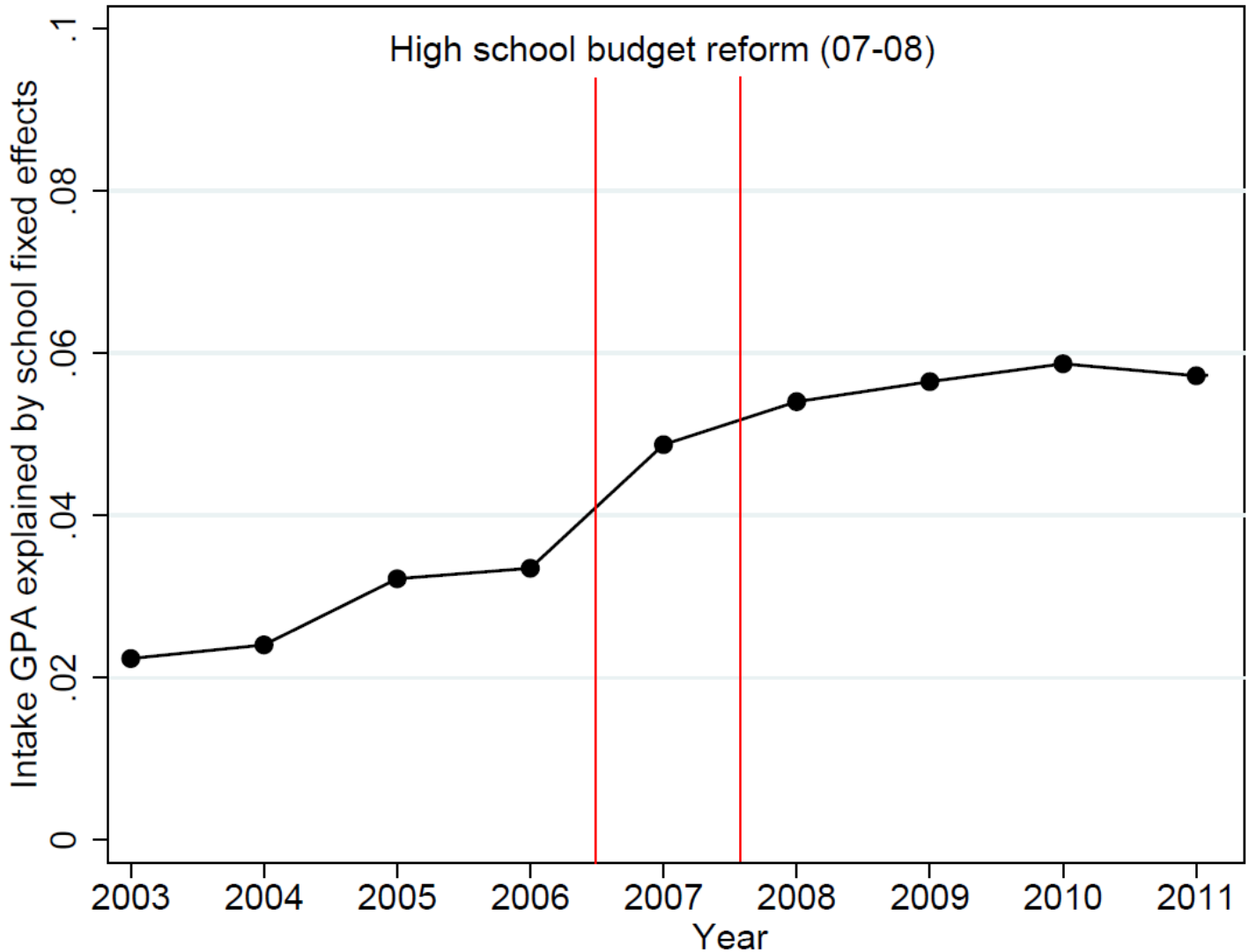

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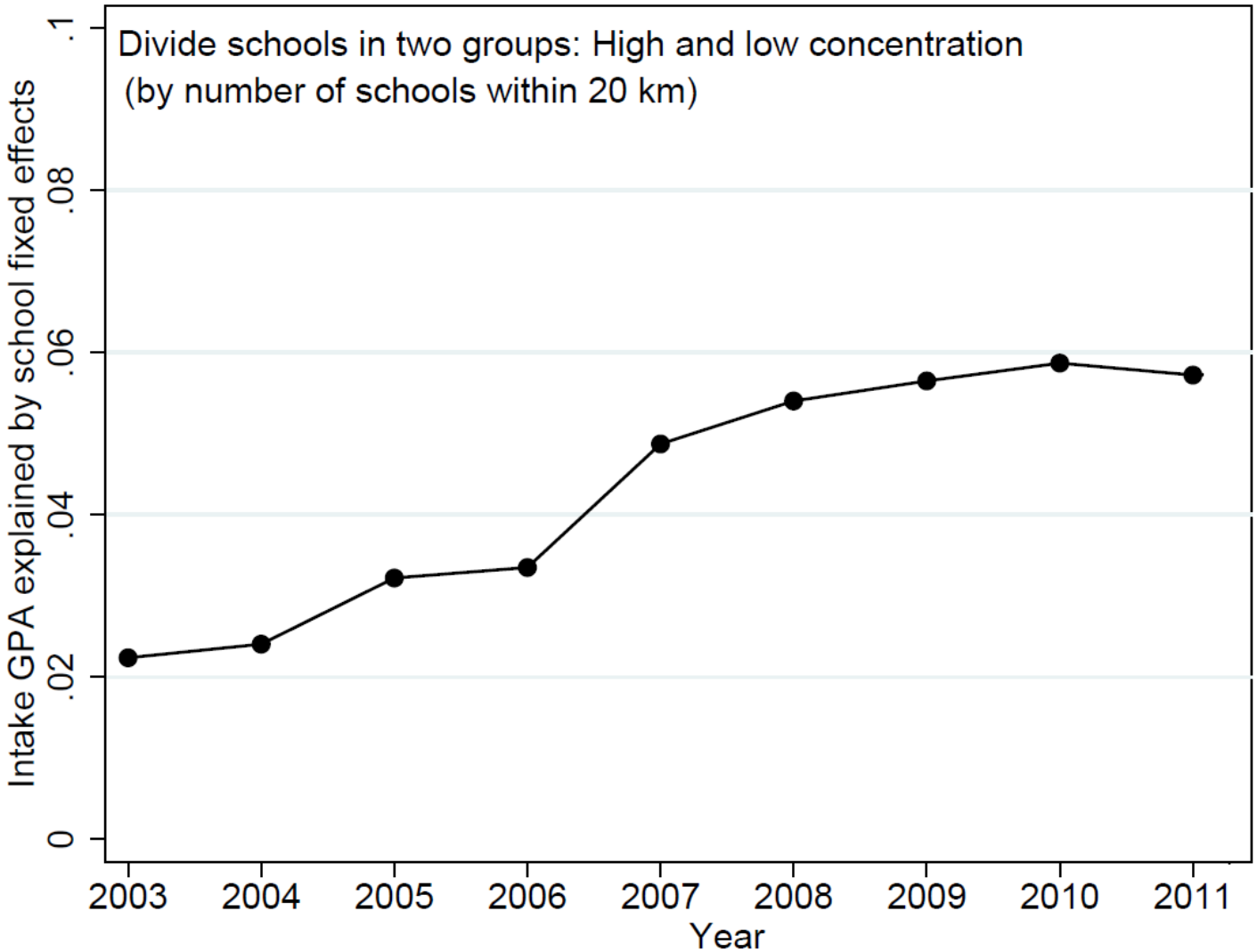

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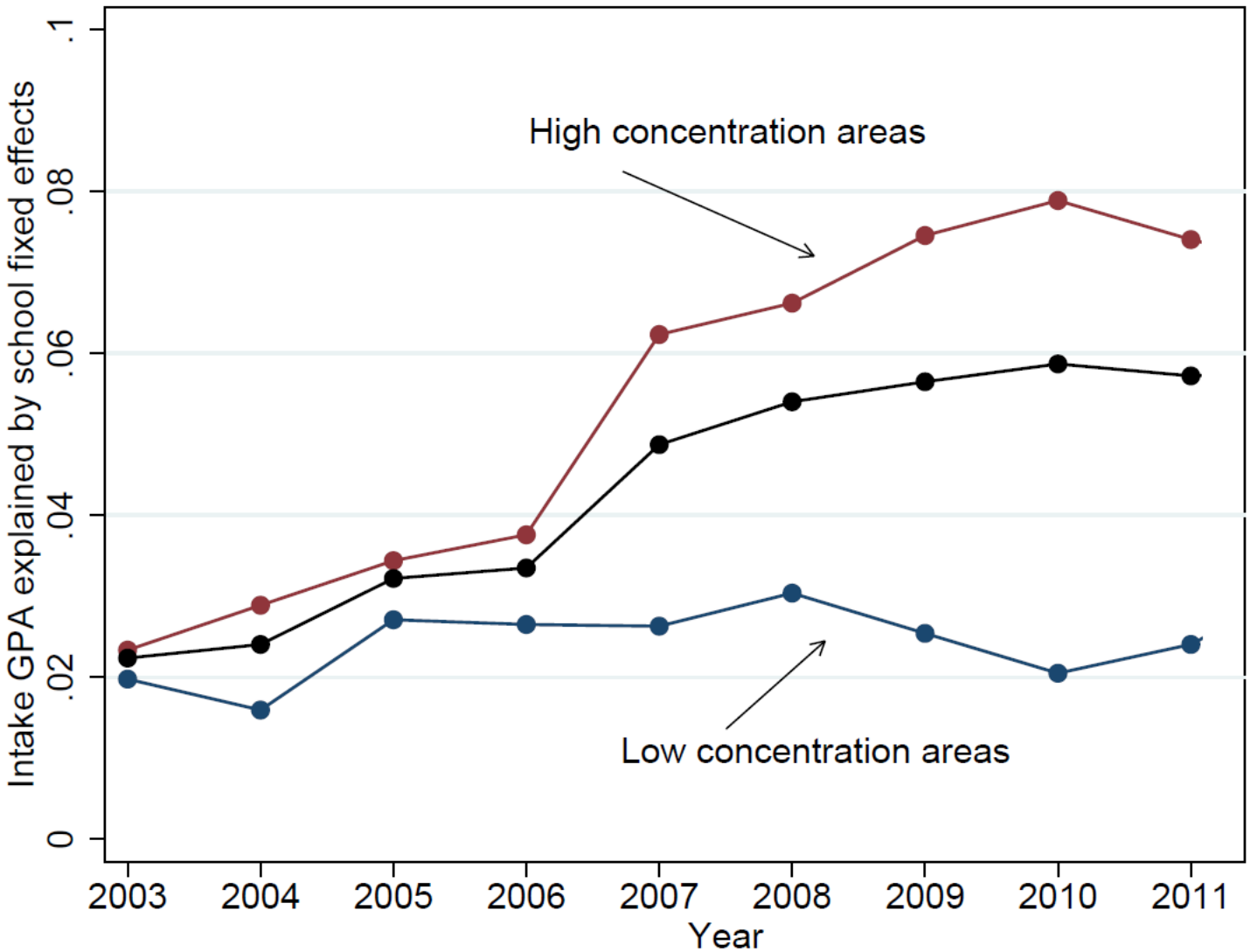

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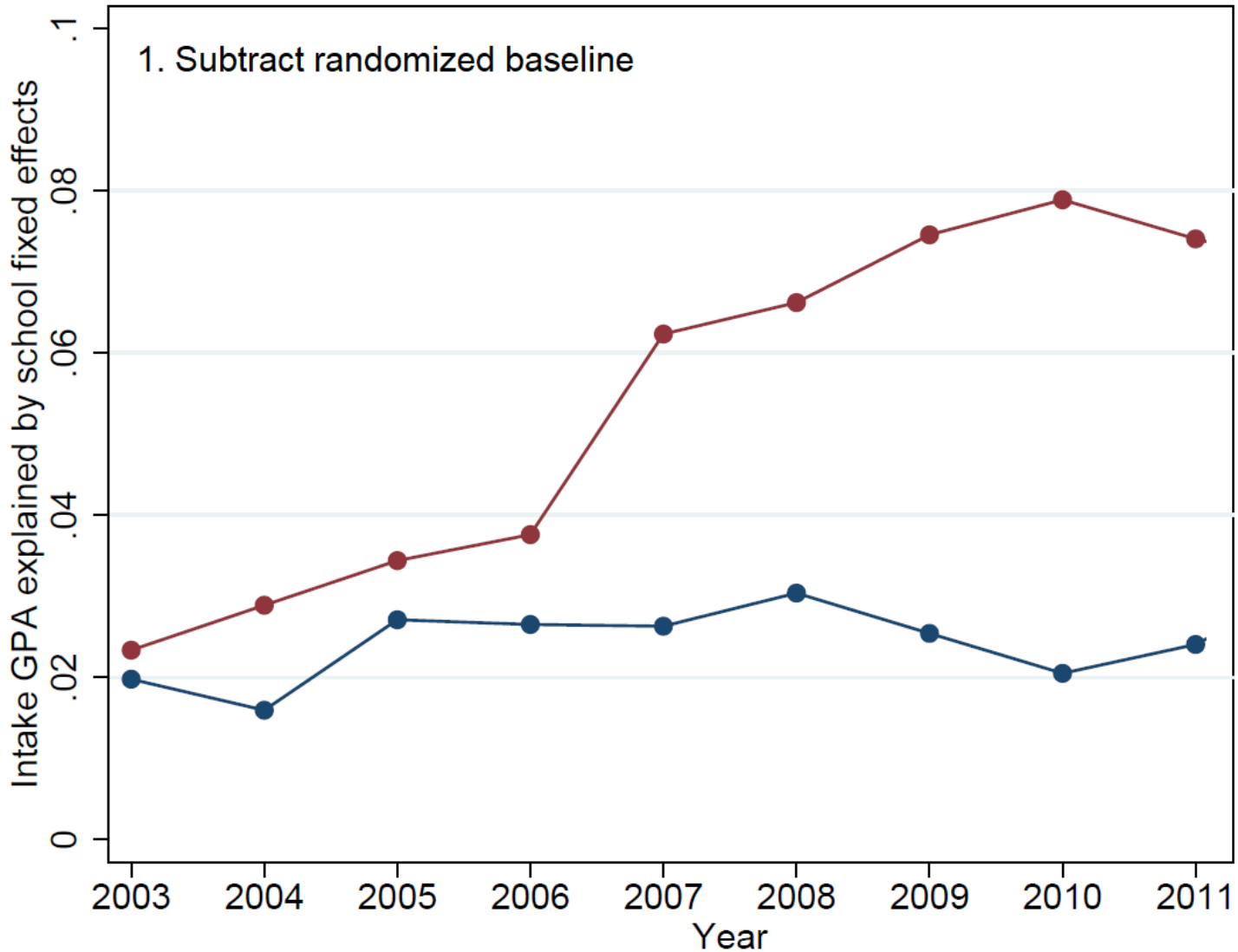

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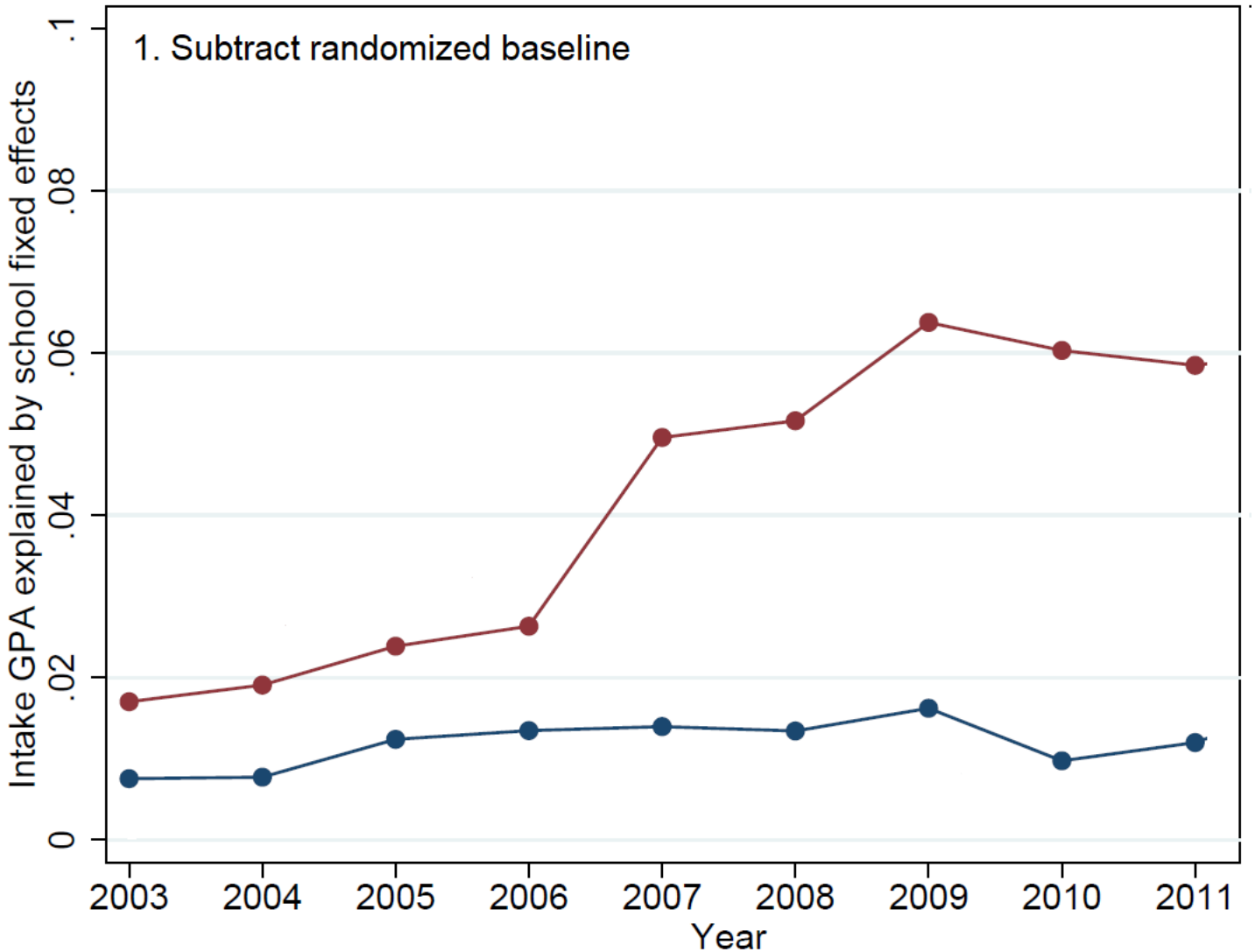

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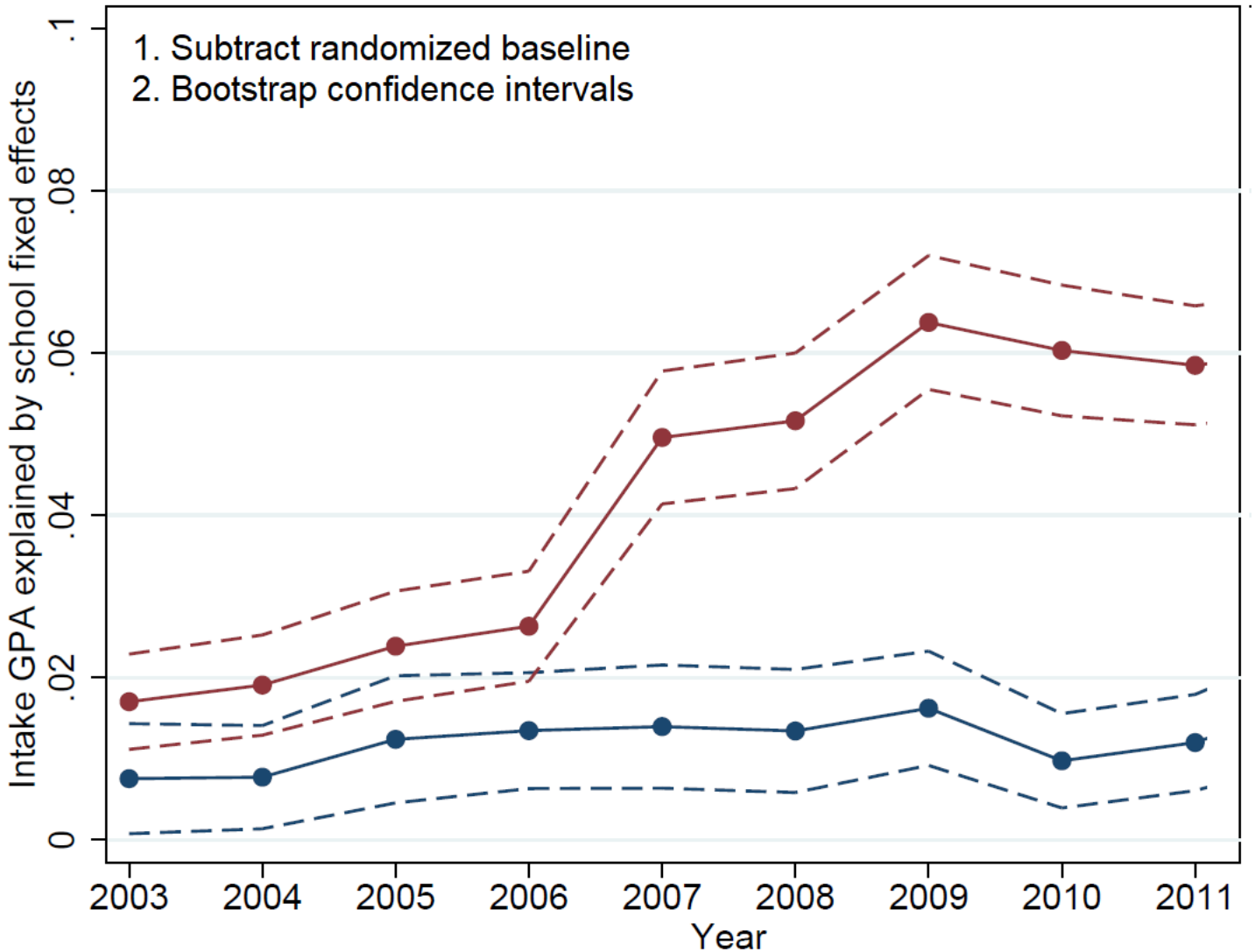


Point-estimates R^2

Table: Regression results. Polarization in high school student enrollment 2003–2011 using the R^2 approach

	School concentration		
	High	Low	Difference (high-low)
Years 2003–2006	0.021	0.010	0.011*
			(0.005)
Years 2007–2011	0.056	0.013	0.043*
			(0.012)
Difference (post-pre)	0.035*	0.002	0.032*
	(0.009)	(0.002)	(0.009)

Note: The table shows the difference in R^2 between regressing middle school GPA of actual enrollment cohorts on high school indicators and regressing 50 permutated cohorts on high school indicators. High/Low concentration is based on number of schools within 20km. Bootstrapped standard errors clustered on the high school level based on 200 iterations are shown in parentheses. * indicates significance at a 5-percent level.

Robustness: Competition measure

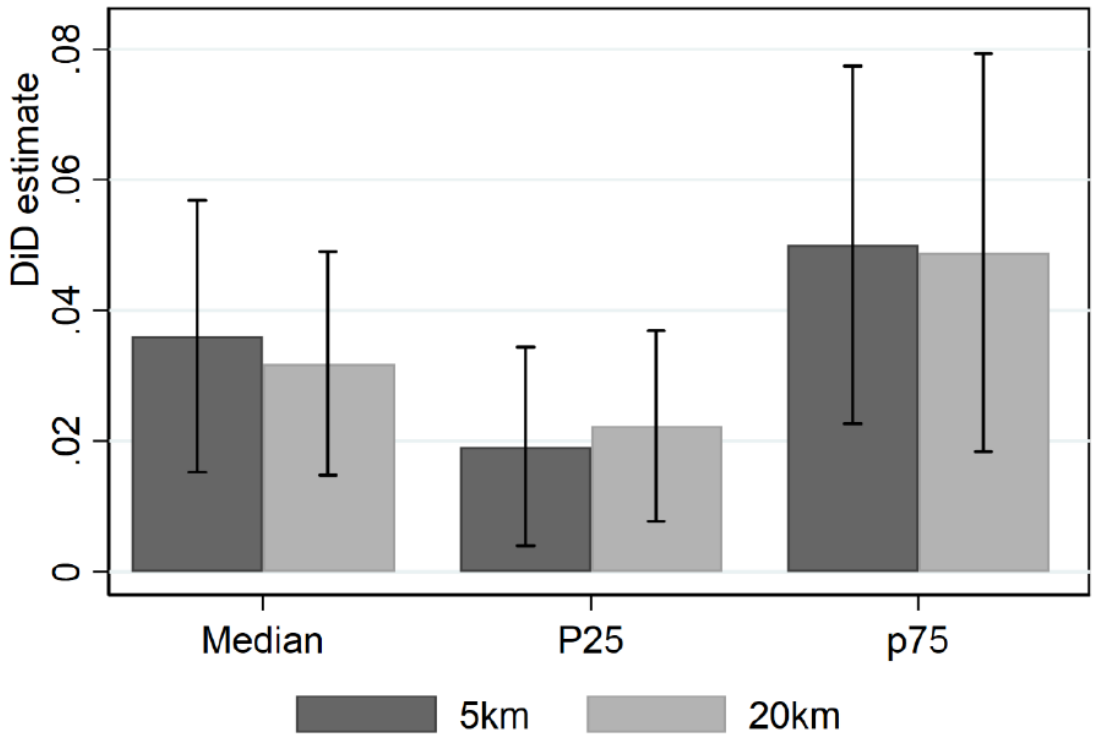


Figure : DID Estimates Permuted R^2 Approach Using Different Specifications. Note: The estimates are based on 50 permutations, and the 95% confidence intervals are calculated based on 200 bootstrap iterations clustered on the school level.

Robustness: alternative segregation measure I

Table: Regression results. Polarization in high school student enrolment 2003–2011 using the dissimilarity index

	School concentration		
	High	Low	Difference (high-low)
Years 2003–2006	0.109	0.077	0.032*
			(0.012)
Years 2007–2011	0.145	0.081	0.073*
			(0.017)
Difference (post-pre)	0.046*	0.004	0.041*
	(0.010)	(0.006)	(0.012)

Note: The table shows the Dissimilarity Index for high- and low-concentration areas before and after the reform based on number of schools within 20km. Bootstrapped standard errors clustered on the high school level based on 200 iterations are shown in parentheses. * indicates significance at a 5-percent level.

Robustness: alternative segregation measure II

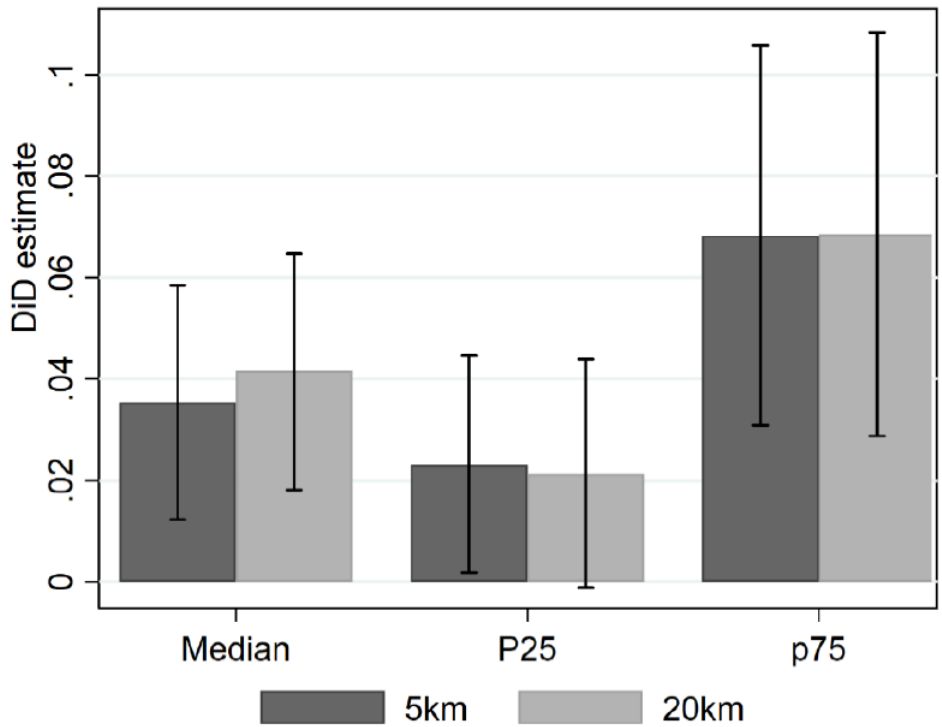


Figure : DID Estimate Dissimilarity Index Approach Using Different Specifications.
Note: The 95% confidence intervals are calculated based on 200 bootstrap iterations clustered on the high school level.

Robustness: Unbalanced Sample

Table : Regression Results. Polarization in High School Student Enrolment 2003–2011 Using R^2 Approach – Unbalanced Sample

	School concentration		
	High	Low	Difference (high-low)
Years 2003–2006	0.021	0.010	0.011*
			(0.005)
Years 2007–2011	0.056	0.013	0.043*
			(0.012)
Difference (post-pre)	0.035*	0.003	0.032*
	(0.009)	(0.002)	(0.009)

Note: The table shows the difference in R^2 between regressing middle school GPA of actual enrolment cohorts on high school indicators and regressing 50 permutated cohorts on high school indicators. High/Low concentration is based on number of schools within 20km. Bootstrapped standard errors clustered on the high school level based on 200 iterations are shown in parentheses. * indicates significance at a 5-percent level.

Robustness: Not permuted Sample

Table : Regression Results. Polarization in High School Student Enrolment 2003–2011 Using R^2 Approach – Not Permuted

	School concentration		
	High	Low	Difference (high-low)
Years 2003–2006	0.031	0.022	0.008
			(0.006)
Years 2007–2011	0.071	0.025	0.046*
			(0.016)
Difference (post-pre)	0.040*	0.003	0.037*
	(0.011)	(0.002)	(0.011)

Note: The table shows the difference in R^2 between regressing middle school GPA of actual enrolment cohorts on high school indicators and regressing permutated cohorts on high school indicators. High/Low concentration is based on number of schools within 20km. Bootstrapped standard errors clustered on the high school level based on 200 iterations are shown in parentheses. * indicates significance at a 5-percent level.

Are differences small or big?

High competition districts

- $R^2 \uparrow 0.035$ units $\approx 167\% \uparrow$
- Duncan $\uparrow 0.046$ units $\approx 33\% \uparrow$

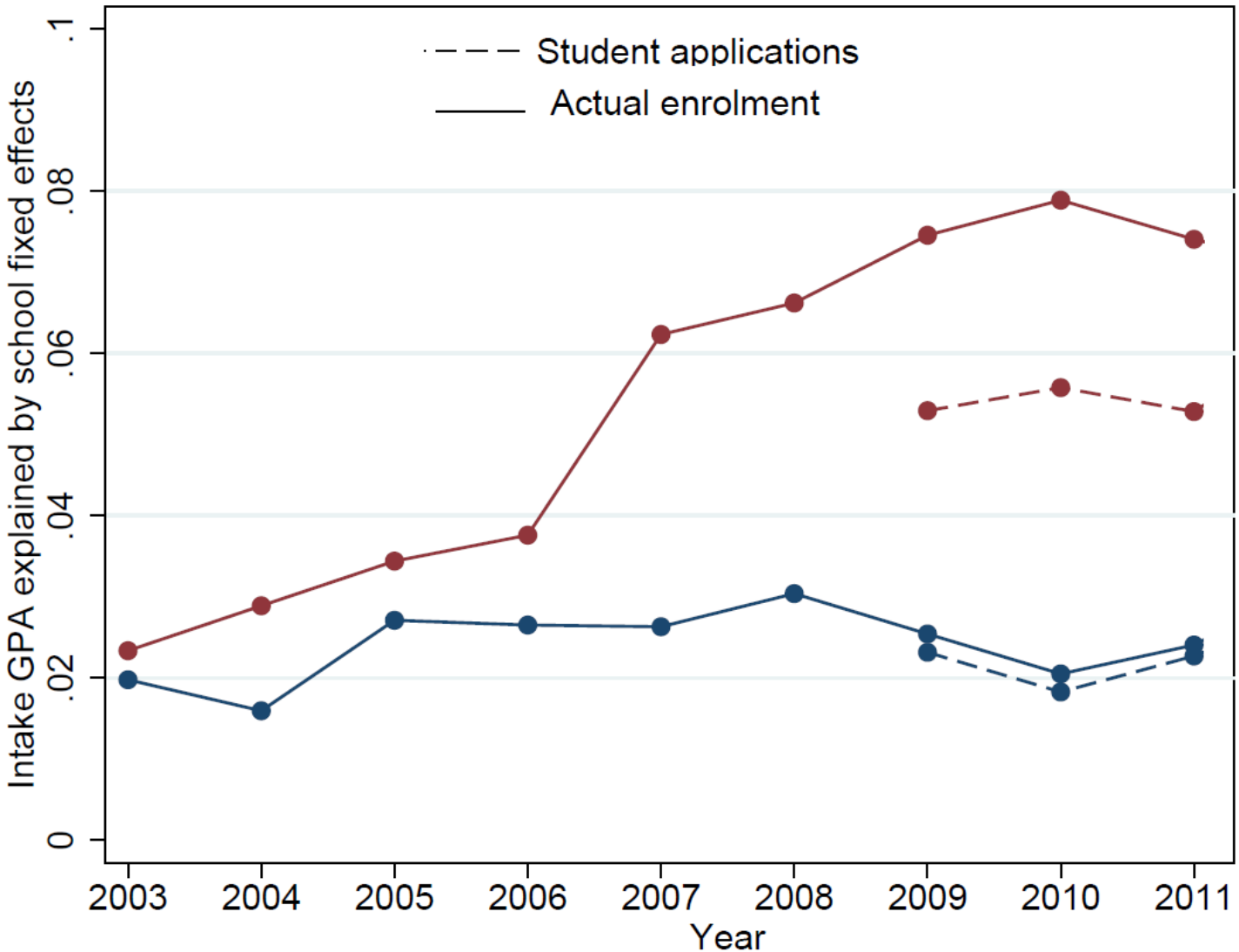
  Before: 11% should move.

  After: 15% should move.

How did this happen?

- Did students sort into schools?
- Did (oversubscribed) high schools pick the best students?

Cream-skimming or sorting?



Summary and Looking forward

Summary

- High school segregation by intake GPA ↑" 2003-2011.
- Increase is significantly larger in areas with more competitive quasi-market structure.
- Likely because of both user sorting and cream skimming.

Future projects

- 2012: Allocation by distance.

  Q1: Implication for inequality?

  Q2: How sophisticated are students?

  Q3: Manipulation?