

September 2004

**Should We Reduce Class Size
or School Segregation ?**

Theory and Evidence from France

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Question : In order to improve school achievement of lower-class children and reduce the inequality of educational opportunities, should we put more money into lower-class schools (lower class size) (=”positive discrimination”), or should we force lower-class and upper-class kids to go to the same school (peer effects, via busing or housing policy) (“social integration”)?

One possible answer: we should do both!

... Except that there is a trade-off: in case of complete social integration, all schools are alike and it is no longer possible to target resources toward disadvantaged children; conversely, social integration is less valuable when there is substantial positive discrimination

>>> Are positive discrimination and social integration complementary or substitute?

What I do this paper

1. I construct a simple theoretical model to investigate this trade-off. Key results:

(a) It all depends on the relative strength of the class size effect and the peer effect...

(b) Interior optima can exist

2. I estimate the coefficients of the model using French data (“panel primaire 1997” = panel of 10,000 primary school students, test scores in 1st and 3rd grade) and regression discontinuity design (Angrist-Lavy 1999). Key results:

(a) IV class size effects larger than OLS estimates. Class size effects much larger than peer effects.

(b) For these parameters, Rawlsian social optimum = full segregation (even if integration costless!)

(c) However for realistic levels of positive discrimination, increasing integration (as compared to current situation) is always better.

Theoretical model: social integration vs positive discrimination

Total number of children = N

Type 0 = socially disadvantaged children

Type 1 = socially advantaged children

Proportion of advantaged children = p^*

Two neighborhoods/zones :

Zone 0 = fraction $1-\mu$ of children

Zone 1 = fraction μ of children

Fraction of advantaged children in zone 0 = p_0

Fraction of advantaged children in zone 1 = p_1

$p_0 \leq p_1$ (zone 0 = disadvantaged zone)

$$(1-\mu) p_0 + \mu p_1 = p^*$$

$$\text{i.e. } p_1 = (p^* - (1-\mu)p_0)/\mu$$

Class size in zone 0 = n_0

Class size in zone 1 = n_1

In principle $n_0 \leq n_1$, i.e. positive discrimination benefits the disadvantaged zone

Average class size = n^*

$$(1-\mu)/n_0 + \mu/n_1 = 1/n^*$$

$$\text{i.e. } n_1 = \mu / (1/n^* - (1-\mu)/n_0)$$

s_{00} = average test score obtained by disadvantaged children in disadvantaged zone

s_{01} = average test score obtained by disadvantaged children in advantaged zone

s_{10} = average test score obtained by advantaged children in disadvantaged zone

s_{11} = average test score obtained by advantaged children in advantaged zone

Assumption: scores vary linearly with peer group composition and class size:

$$s_{00} = s_{00i} + a_0 (p - p_{0i}) - b_0 (n - n_{0i})$$

$$s_{01} = s_{01i} + a_0 (p - p_{1i}) - b_0 (n - n_{1i})$$

$$s_{10} = s_{10i} + a_1 (p - p_{0i}) - b_1 (n - n_{0i})$$

$$s_{11} = s_{11i} + a_1 (p - p_{1i}) - b_1 (n - n_{1i})$$

a_0 , a_1 = peer effects parameter

b_0 , b_1 = class size parameter

(simulations: $a_0 = 5$, $a_1 = 0$, $b_0 = 0,7$, $b_1 = 0,25$)

s_0 = average score of disadvantaged children
(weighted average of s_{00} and s_{01})

s_1 = average score of advantaged children
(weighted average of s_{10} et s_{11})

Question : what are the policy parameters (p_0, n_0) which maximize $s_0(p_0, n_0)$?

For a given p_0 , the maximum $s_0(p_0, n_0)$ is obtained for $n_0^*(p_0)$ given by :

$$n_0^*(p_0) = (1-\mu) n^* + \mu n^* (1-(p^*-p_0)/(\mu(1-p_0)))^{0,5}$$

$n_0^*(p_0)$ is an increasing function of p_0

I.e. socially optimal disadvantaged class size is lower when social segregation is greater (better targeting of resources)

$n_0^*(p_0) = n^*$ if $p_0=p^*$ (i.e. positive discrimination is useless in case of complete social integration).

For a given n_0 , the maximum of $s_0(p_0, n_0)$ is obtained for $p_0^*(n_0)$ given by :

If $n_0 < n_0^{**}$, then $p_0^*(n_0) = 0$

If $n_0 > n_0^{**}$, then

$$p_0^*(n_0) = p^* - \mu b_0 (\mu n^* / (1 - (1 - \mu)n^*/n_0) - n_0) / 2a_0$$

-

$$\text{(with } n_0^{**} = (n^* - 2a_0p^*/\mu b_0 + ((n^* - 2a_0p^*/\mu b_0)^2 + 8a_0p^*n^*(1 - \mu)/\mu b_0)^{0,5})/2 \text{)}$$

$p_0^*(n_0)$ is an increasing function of n_0

I.e. socially optimal segregation is an increasing function of the level of class size targeting

$p_0^*(n_0) = p^*$ if $n_0 = n^*$ (i.e. complete social integration is optimal in the absence of positive discrimination).

For the estimated parameters, $n_0^{**} = 18,41$ (cf. graph 7 below).

Global Rawlsien Optimum : it all depends on $q = a_0/b_0$

Proposition : There exists q^* , $q^{**} > 0$ such that :

(a) If $q < q^{**}$, then the global optimum is $p_0^* = 0$ and $n_0^* = n_0^*(0)$ (maximal positive discrimination).

(b) If $q > q^*$, then the global optimum is $p_0^* = p^*$ and $n_0^* = n^*$ (complete sociale integration).

(c) Si $q^* < q < q^{**}$, then the global optimum is interior

For the given parameters, $q^*=13,2$. With $a_0=5$ and $b_0=0,7$, we have $q=7,1$. So it looks as if we are well into the $q < q^*$ range, i.e. social optimum = complete segregation and extreme positive discrimination.

Data

Main data source : panel primaire 1997

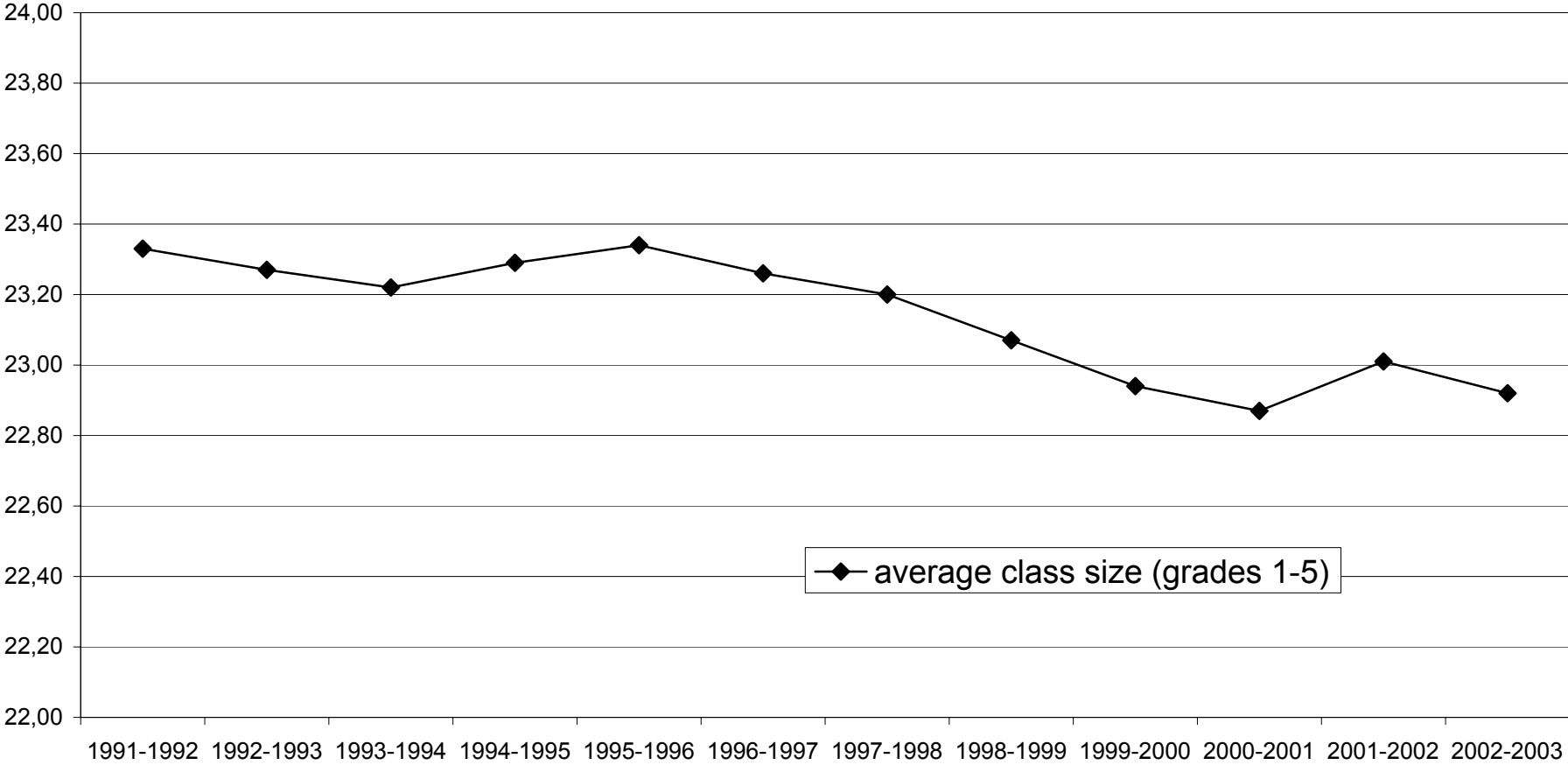
Panel based upon a national representative sample of 9639 children entering grade 1 in 1997.

Annual administrative data + 1999 family survey

Test scores in French and Maths at the beginning of grade 1 (sept 1997) and grade 3 (sept 1999)

Other data set : exhaustive administrative files covering all French primary schools

Graph 1: Average class size in French primary schools, 1991-2003



Source: Author's computations based upon exhaustive administrative files for French primary schools ("enquête n°19")

Table 1: Test scores in grade 1 and 3 in "panel primaire 1997" - Descriptive statistics

	N. observations (% N.obs.tot.)	Average class size gr.1 (1997-1998)	Average class size gr.2 (1998-1999)	Global test score grade 1 (0-100) (sept. 1997)	Maths test score grade 3 (0-100) (sept. 1999)	French test score grade 3 (0-100) (sept. 1999)
All children		22,27	23,16	68,99	66,73	68,20
(s.d)	100,0%	(3,56)	(3,72)	(12,90)	(15,13)	(15,49)
[N.obs.]		[9 639]	[8 835]	[9 529]	[7 191]	[7 191]
Zep = 0	87,4%	22,36	23,33	70,00	67,64	69,24
(s.e.)		(0,04)	(0,04)	(0,14)	(0,18)	(0,18)
Zep = 1	12,6%	21,67	21,91	62,02	58,62	58,99
(s.e.)		(0,08)	(0,10)	(0,39)	(0,60)	(0,63)
PCS parents = cadre	16,3%	23,15	24,14	75,68	73,54	75,94
(s.e.)		(0,09)	(0,08)	(0,27)	(0,37)	(0,36)
PCS parents = prof.int.	16,8%	22,35	23,51	72,79	69,70	71,10
(s.e.)		(0,08)	(0,09)	(0,28)	(0,38)	(0,38)
PCS parents = indép.	11,8%	22,03	22,81	70,41	67,71	68,82
(s.e.)		(0,11)	(0,13)	(0,36)	(0,48)	(0,51)
PCS parents = employé	13,5%	22,45	23,35	68,03	64,79	66,95
(s.e.)		(0,09)	(0,11)	(0,35)	(0,48)	(0,49)
PCS parents = ouvrier	38,9%	21,89	22,64	65,18	62,78	63,73
(s.e.)		(0,06)	(0,07)	(0,21)	(0,30)	(0,30)
PCS par. = sans prof.	2,7%	22,28	22,58	58,44	55,91	56,58
(s.e.)		(0,21)	(0,26)	(0,83)	(1,44)	(1,49)
PCS par. = advantaged	44,9%	22,56	23,55	73,21	70,57	72,26
(s.e.)		(0,09)	(0,10)	(0,30)	(0,40)	(0,41)
PCS par. = disadvantaged	55,1%	22,05	22,81	65,55	62,94	64,17
(s.e.)		(0,07)	(0,09)	(0,27)	(0,40)	(0,40)

Table 1: Test scores in grade 1 and 3 in "panel primaire 1997" - Descriptive statistics (following)

Degree mother >= bac (s.e.)	38,7%	22,72 (0,06)	23,65 (0,07)	74,93 (0,19)	72,08 (0,26)	74,19 (0,26)
Degree mother < bac (s.e.)	61,3%	21,97 (0,05)	22,83 (0,06)	66,60 (0,18)	63,61 (0,25)	64,73 (0,25)
Nat. children = French (s.e.)	94,5%	22,29 (0,04)	23,18 (0,04)	69,57 (0,13)	67,18 (0,18)	68,77 (0,18)
Nat. children = foreign (s.e.)	5,5%	22,08 (0,14)	22,79 (0,16)	59,05 (0,58)	56,81 (0,87)	55,63 (0,94)
Children = boy (s.e.)	50,9%	22,25 (0,05)	23,17 (0,06)	68,39 (0,19)	66,92 (0,26)	66,03 (0,26)
Children = girl (s.e.)	49,1%	22,29 (0,05)	23,15 (0,06)	69,63 (0,19)	66,54 (0,25)	70,38 (0,25)
Birth semester = 1 (s.e.)	49,9%	22,23 (0,05)	23,15 (0,06)	71,17 (0,18)	68,58 (0,24)	69,60 (0,25)
Birth semester = 2 (s.e.)	50,1%	22,32 (0,05)	23,18 (0,06)	66,83 (0,19)	64,75 (0,26)	66,71 (0,27)

Source : Author's computations using "panel primaire 1997" (MEN-DEP)

Note : "Zep" means "priority education zone". During school year 1997-1998, grade 1 children in Zep schools (12,6% of all children) had an average class size of 21,67, vs 22,36 in non-Zep schools (87,4% of all children). "PCS" refers to INSEE occupational scale.

Empirical Estimates

OLS Estimates

$$s_i = b n_i + f x_i + \varepsilon_i$$

s_i = grade 3 test score

n_i = grade 2 class size

x_i = controls (socio-dem controls + grade 1 test score)

ε_i = error term

Table 2: The impact of class size on test scores: naïve estimates (OLS)

Panel A: Impact on grade 3 Maths test scores (sept 1999)

		All children		Children with gr.1 score below median	Children with gr.1 score above median
Class size grade 2 (s.e.)	0,169 ** (0,066)	-0,205 *** (0,077)	-0,312 *** (0,065)	-0,449 *** (0,109)	-0,183 ** (0,082)
Socio-dem controls	No	Yes	Yes	Yes	Yes
Grade 1 global score controls	No	No	Yes	Yes	Yes
[N.obs.]	[4 718]	[3 320]	[3 300]	[1 652]	[1 648]

Panel B: Impact on grade 3 French test scores (sept 1999)

		All children		Children with gr.1 score below median	Children with gr.1 score above median
Class size grade 2 (s.e.)	0,255 *** (0,068)	-0,145 * (0,076)	-0,254 *** (0,065)	-0,447 *** (0,105)	-0,103 (0,084)
Socio-dem controls	No	Yes	Yes	Yes	Yes
Grade 1 global score controls	No	No	Yes	Yes	Yes
[N.obs.]	[4 718]	[3 320]	[3 300]	[1 652]	[1 648]

Source : Author's computations using "panel primaire 1997" (MEN-DEP)

Note : The table reads as follows: when grade 2 class size increases by one unit, average math score at the beginning of grade 3 increases by 0,169 point.

Theoretical class size

$$c^*(e) = \text{int} (e/30) + 1$$

$$n^*(e) = e/c^*(e) = e / [\text{int}(e/30)+1]$$

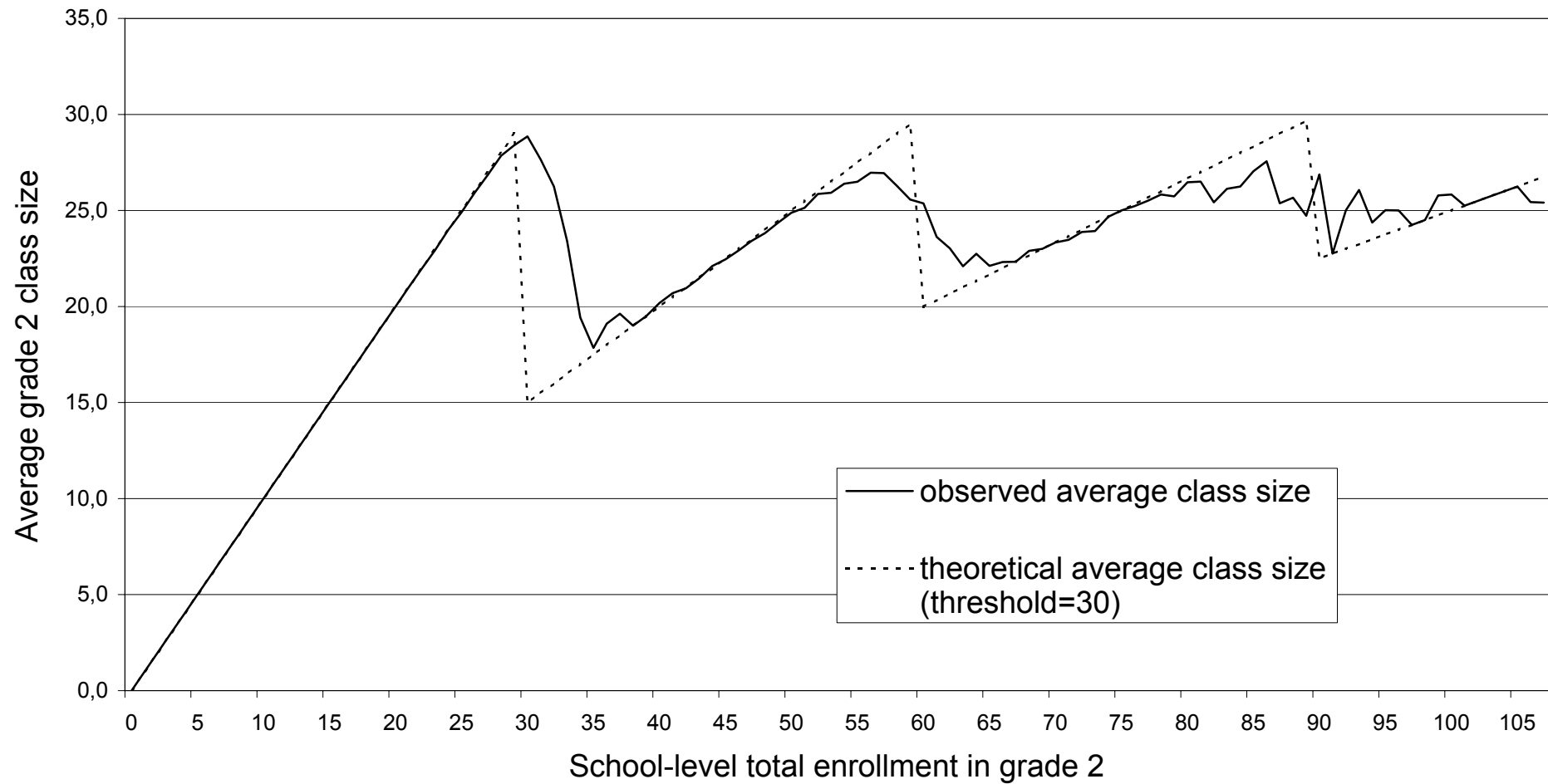
$\text{int}(x)$ = closest integer below x

e = school-level total grade 2 enrollment

$c^*(e)$ = theoretical number of grade 2 classes

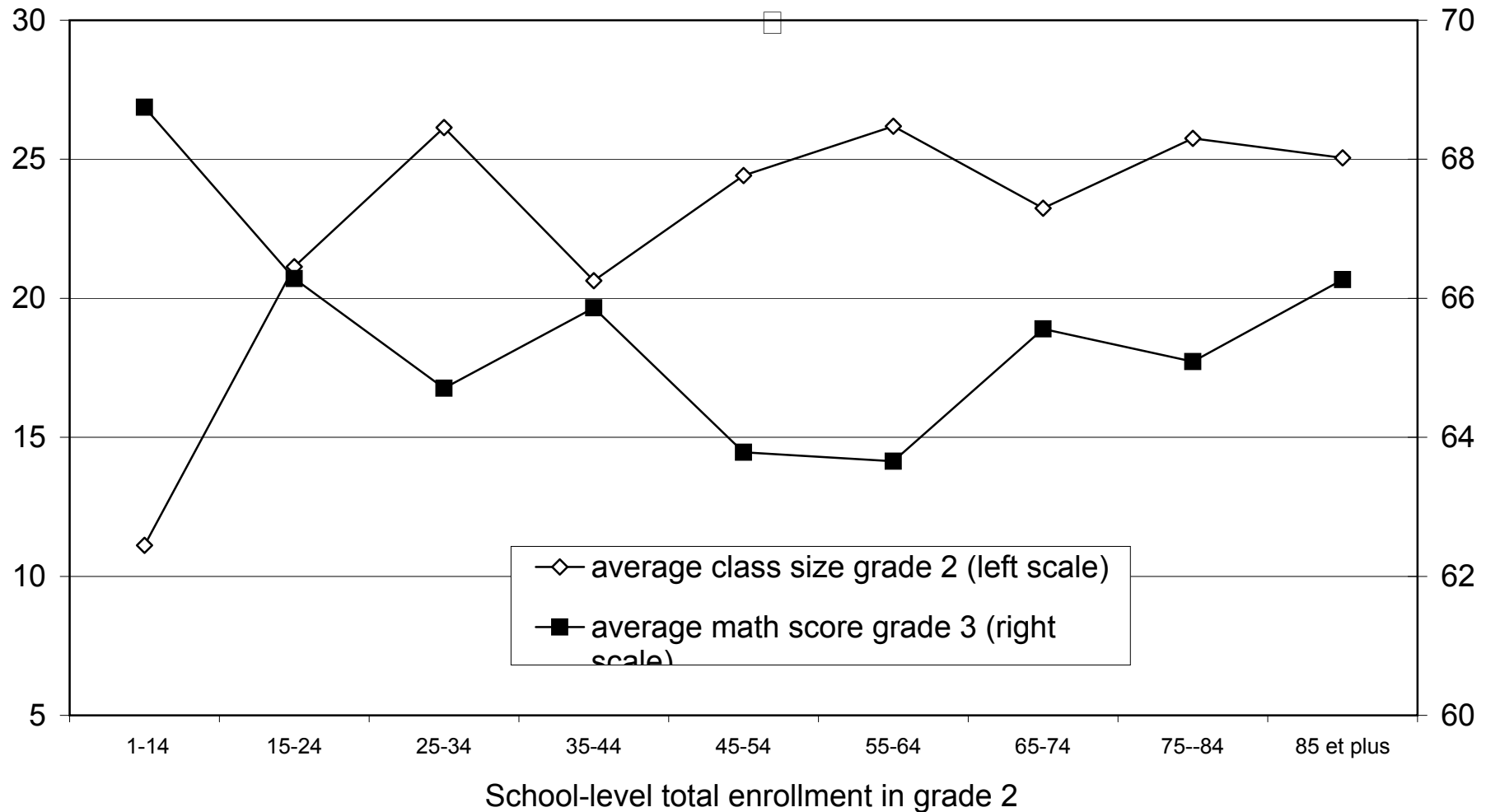
$n^*(e)$ = average theoretical class size

Graph 2: Average grade 2 class size as a function of school-level total grade 2 enrollment in French primary schools in 1998-1999 (schools with single grade classes in grade 2)



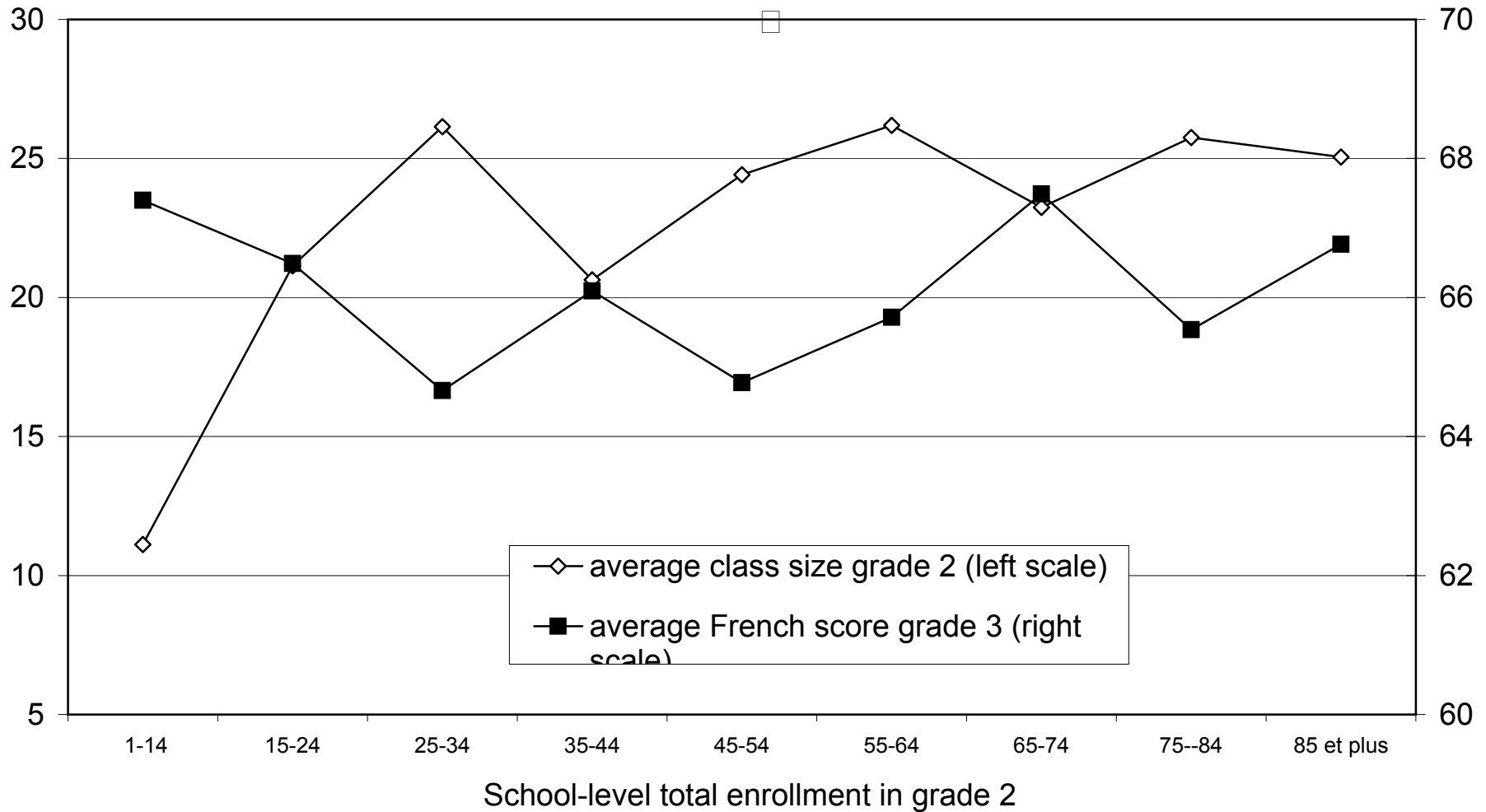
Source: Author's computations based upon exhaustive administrative files for French primary schools ("enquête n°19")

Graph 3: Maths test scores in grade 3 (sept. 1999) as a function of school-level total grade 2 enrollment



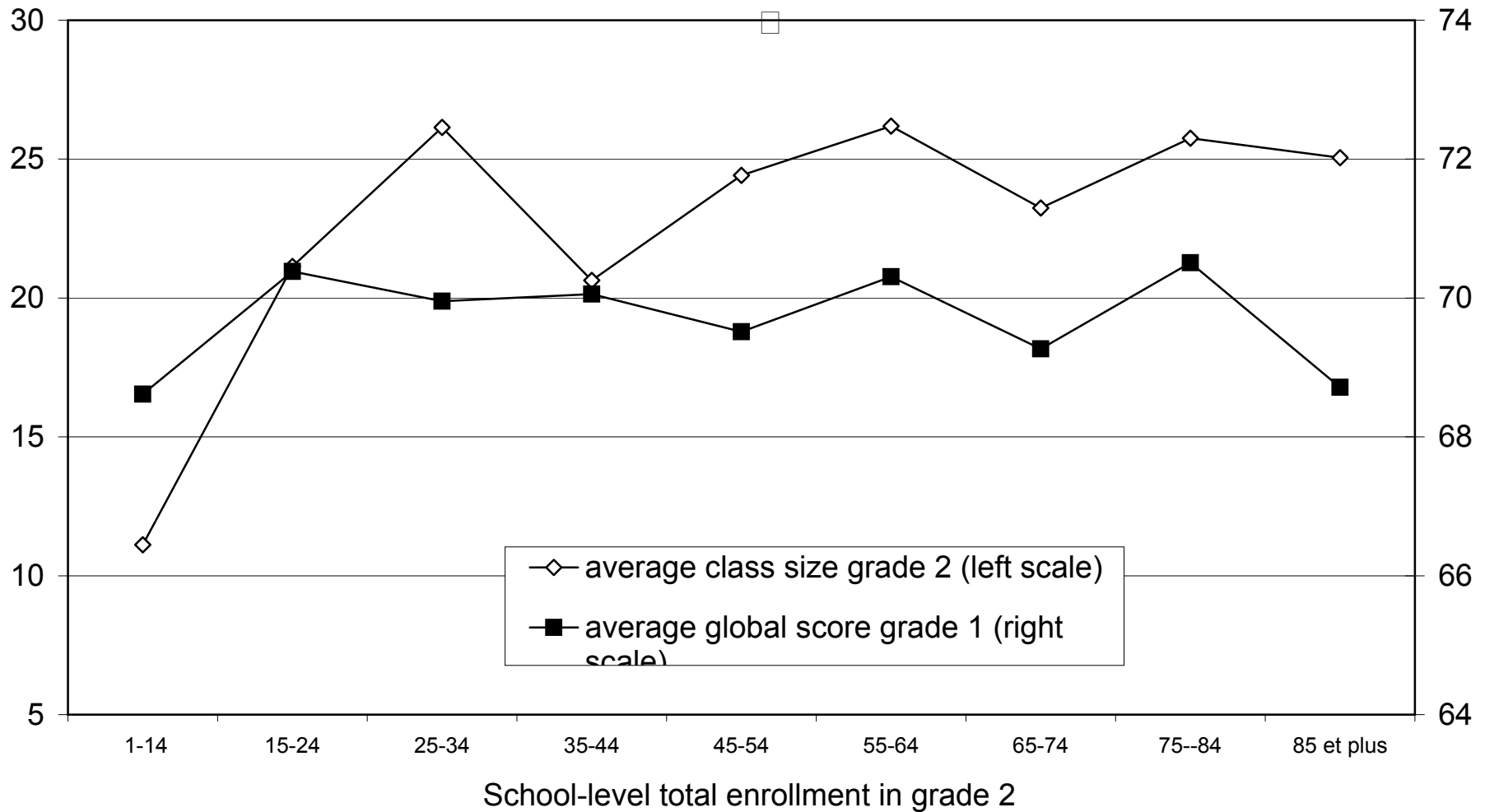
Source : Author's computations based upon "panel primaire 1997" and exhaustive administrative files for French primary schools ("enquête n°19") (cf. table A1)

Graph 4: French test scores in grade 3 (sept. 1999) as a function of school-level total grade 2 enrollment



Source : Author's computations based upon "panel primaire 1997" and exhaustive administrative files for French primary schools ("enquête n°19") (cf. table A1)

Graph 5: Global test scores in grade 1 (sept. 1997) as a function of school-level total grade 2 enrollment



Source : Author's computations based upon "panel primaire 1997" and exhaustive administrative files for French primary schools ("enquête n°19") (cf. table A1)

IV Estimates

First stage : $n_i = g x_i + h z_i + \varepsilon_i$

n_i = observed grade 2 class size

x_i = controls

z_i = IV (e.g. $n^*(e_i)$)

ε_i = error term

Second stage : $s_i = b n_i^p + f x_i + \varepsilon_i$

s_i = grade 3 test score

n_i^p = predicted class size

x_i = controls

z_i = IV (e.g. $n^*(e_i)$)

ε_i = error term

Table 3: The impact of class size on test scores (IV estimates)

Panel A: Impact on grade 3 Maths test scores (sept 1999)

	All children			Children with gr.1 score below median	Children with gr.1 score above median
	OLS	IV (1)	IV (2)	IV (2)	IV (2)
Class size grade 2 (s.e.)	-0,332 *** (0,074)	-0,422 *** (0,113)	-0,470 *** (0,118)	-0,697 *** (0,199)	-0,256 * (0,145)
Socio-dem controls	Yes	Yes	Yes	Yes	Yes
Grade 1 global score controls	Yes	Yes	Yes	Yes	Yes
[N.obs.]	[2 308]	[2 308]	[2 308]	[1 169]	[1 139]

Panel B: Impact on grade 3 French test scores (sept 1999)

	All children			Children with gr.1 score below median	Children with gr.1 score above median
	OLS	IV (1)	IV (2)	IV (2)	IV (2)
Class size grade 2 (s.e.)	-0,229 *** (0,075)	-0,339 *** (0,120)	-0,334 *** (0,120)	-0,543 *** (0,201)	-0,095 (0,150)
Socio-dem controls	Yes	Yes	Yes	Yes	Yes
Grade 1 global score controls	Yes	Yes	Yes	Yes	Yes
[N.obs.]	[2 308]	[2 308]	[2 308]	[1 169]	[1 139]

Panel C: Impact on grade 1 global test scores (sept 1997)

	All children			Children with gr.1 score below median	Children with gr.1 score above median
	OLS	IV (1)	IV (2)	IV (2)	IV (2)
Class size grade 2 (s.e.)	0,101 (0,064)	0,074 (0,098)	-0,031 (0,103)	-0,098 (0,110)	0,013 (0,084)
Socio-dem controls	Oui	Oui	Oui	Oui	Oui
[N.obs.]	[2 308]	[2 308]	[2 308]	[1 169]	[1 139]

Source : Author's computations using "panel primaire 1997" and exhaustive administrative files for French primary schools (MEN-DEP)

Note : The table reads as follows: when grade 2 class size increases by one unit, average math score at the beginning of grade 3 decreases by 0,332

**Table 4: The impact of class size on test scores as a function of social background
(impact on grade 3 Maths test scores (sept 1999))**

	Children with disadvant. parental PCS IV (2)	Children with advant. parental PCS IV (2)	Children with low mother degree IV (2)	Children with high mother degree IV (2)	Children in Zep schools IV (2)	Children in non-Zep schools IV (2)
Class size grade 2 (s.e.)	-0,715 *** (0,189)	-0,274 * (0,155)	-0,575 *** (0,170)	-0,261 (0,166)	-1,375 (1,181)	-0,411 *** (0,116)
Socio-dem controls	Oui	Oui	Oui	Oui	Oui	Oui
Grade 1 global score controls	Oui	Oui	Oui	Oui	Oui	Oui
[N.obs.]	[1 075]	[1 233]	[1 245]	[1 063]	[261]	[2 047]

Source : Author's computations using "panel primaire 1997" and exhaustive administrative files for French primary schools (MEN-DEP)

Do ZEP work?

Zep = « priority education zone » (disadvantaged schools with more financial means ; policy introduced in 1982; lots of skepticism in France; see Benabou-Kramarz-Prost 2003)

Current situation: average class size = 21,9 in Zep schools, 23,3 in non-Zep schools (grade 2)

According to my estimates, this led to a 10% decline in the inequality of school achievement between Zep and non-Zep children

Simulations : with a class size of 18,0 in Zep schools (and 24,2 in non-Zep schools), the inequality in test scores could be reduced by 40%

Table 5: The impact of targeted class size reduction on the inequality of school simulations based upon previous estimates (targeting based upon Zep vs non-Zep)

	Reference point: zero targeting	Current situation: low targeting in favor of Zep schools	Policy experiment n°1: high targeting	Policy experiment n°2: extreme targeting
Average class size in Zep schools	23,16	21,91	18,00	10,65
Average class size in non-Zep schools	23,16	23,33	24,16	27,88
Average grade 3 Math score in Zep schools	57,75	58,62	61,36	66,50
Average grade 3 Math score in non-Zep schools	67,68	67,64	67,43	66,50
Absolute difference in points	9,94	9,02	6,08	0,00
Reduction of the difference as compared to reference point (%)		9,2%	38,9%	100,0%

Source : Simulations based upon previous estimates (cf. tables 1 and 4). We used class size parameter of 0,7 (children in Zep schools) and 0,25 (children in non-Zep schools).

Peer effects estimates

$$s_i = a y_i + f x_i + \varepsilon_i$$

s_i = grade 3 test score

y_i = peer effect variables (percentage of disadvantaged children in class, etc.)

x_i = individual controls

ε_i = error term

Table 6: The Impact of School Segregation on Test Scores

Impact on grade 3 Math scores	All children					
PCS parents = advantaged (individual level)	2,046 *** (0,322)	2,003 *** (0,319)	2,112 *** (0,322)	2,102 *** (0,319)	2,174 *** (0,318)	2,328 *** (0,316)
% PCS parents = advantaged in class	1,373 ** (0,554)	3,701 *** (0,588)				
Degree mother = high (individual level)	2,567 *** (0,327)	2,474 *** (0,324)	2,588 *** (0,327)	2,512 *** (0,324)	2,655 *** (0,325)	2,709 *** (0,322)
% Degree mother = high in class			0,788 (0,545)	2,961 *** (0,578)		
Nationality = foreigner (individual level)	-1,242 (1,016)	-1,163 (1,007)	-1,369 (1,020)	-1,377 (1,011)	-1,106 (1,020)	-0,885 (1,012)
% Nationality = foreigner in class					-2,709 ** (1,365)	-5,866 *** (1,390)
Grade 1 score (individual level)	0,795 *** (0,014)	0,851 *** (0,015)	0,796 *** (0,014)	0,850 *** (0,015)	0,796 *** (0,014)	0,848 *** (0,015)
Average grade 1 score in class		-0,241 *** (0,022)		-0,233 *** (0,022)		-0,212 *** (0,021)
Children = girl (individual level)	-1,053 *** (0,287)	-1,078 *** (0,284)	-1,056 *** (0,287)	-1,087 *** (0,285)	-1,052 *** (0,287)	-1,071 *** (0,284)
% Children = girl in class	-0,396 (0,688)	-0,060 (0,682)	-0,415 (0,689)	-0,167 (0,683)	-0,467 (0,688)	-0,268 (0,683)
Birth semester = 2 (individual level)	-1,236 *** (0,290)	-0,988 *** (0,288)	-1,275 *** (0,290)	-1,074 *** (0,288)	-1,260 *** (0,290)	-1,076 *** (0,288)
Birth semester = 2 in class	-0,665 (0,672)	-1,469 ** (0,670)	-0,776 (0,672)	-1,645 ** (0,671)	-0,798 (0,671)	-1,692 ** (0,672)
[N.obs.]	[6 288]	[6 288]	[6 274]	[6 274]	[6 288]	[6 288]

Source : Author's computations using "panel primaire 1997" and exhaustive administrative files for French primary schools (MEN-DEP)

Table 7: The Differential Impact of Cognitive and Social Capital

Impact on grade 3 Math scores	All children		Children with grade 1 score below class average	Children with grade 1 score above class average
PCS parents = advantaged (individual level)	2,056 *** (0,323)	1,972 *** (0,320)	2,123 *** (0,477)	1,830 *** (0,427)
% PCS parents = advantag. in class	1,191 *** (0,669)	2,724 *** (0,674)	3,256 *** (1,000)	2,171 *** (0,904)
Degree mother = high (individual level)	2,541 *** (0,328)	2,394 *** (0,325)	2,471 *** (0,497)	2,328 *** (0,422)
% Degree mother = high in class	0,008 (0,656)	1,493 *** (0,661)	1,730 * (0,995)	1,214 (0,872)
Nationality = foreigner (individual level)	-1,209 (1,023)	-1,018 (1,012)	-1,286 (1,336)	-0,521 (1,624)
% Nationality = foreigner in class	-2,181 (1,391)	-4,866 *** (1,395)	-3,727 * (2,249)	-5,739 *** (1,734)
Grade 1 score (individual level)	0,795 *** (0,014)	0,854 *** (0,015)	0,849 *** (0,032)	0,823 *** (0,034)
Average grade 1 score in class		-0,266 *** (0,023)	-0,254 *** (0,043)	-0,242 *** (0,037)
Children = girl (individual level)	-1,058 *** (0,287)	-1,095 *** (0,284)	-0,810 * (0,426)	-1,367 *** (0,376)
% Children = girl in class	-0,412 (0,688)	-0,122 (0,682)	-0,247 (1,024)	0,040 (0,903)
Birth semester = 2 (individual level)	-1,262 *** (0,290)	-1,016 *** (0,288)	-1,371 *** (0,430)	-0,651 * (0,385)
Birth semester = 2 in class	-0,733 (0,674)	-1,670 ** (0,671)	-1,385 (1,008)	-2,064 ** (0,888)
[N.obs.]	[6 274]	[6 274]	[3 165]	[3 109]

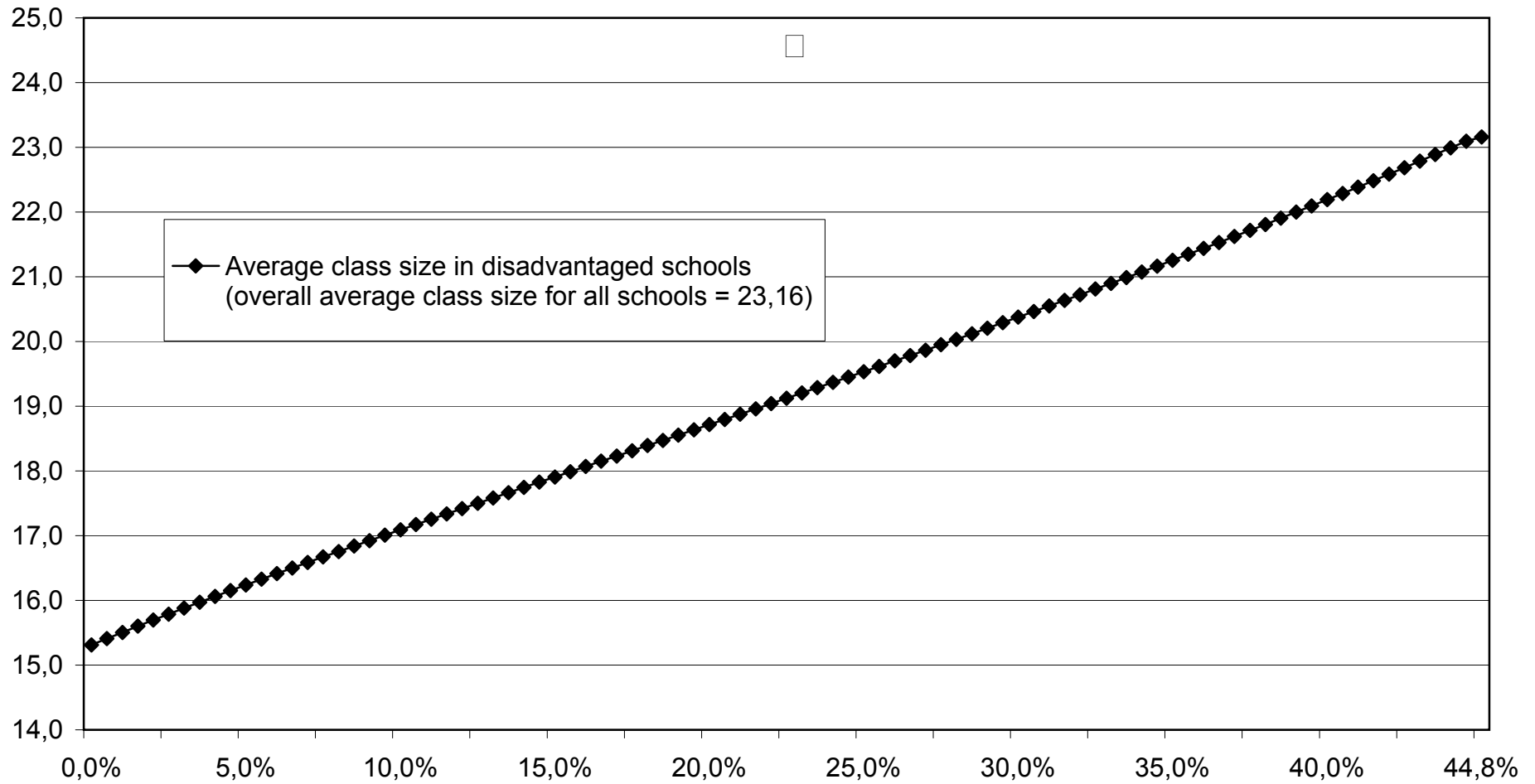
Table 8: The differential impact of social capital as a function of children's position

Impact on Grade 3 Maths score	All children	Disadvantaged children in disadvantaged schools	Disadvantaged children in advantaged schools	Advantaged children in disadvantaged schools	Advantaged children in advantaged schools
PCS parents = advantaged (individual level)	2,046 *** (0,322)				
% PCS parents = advantaged in class	1,373 ** (0,554)	5,707 *** (1,521)	2,263 (2,933)	0,899 (3,533)	0,677 (1,104)
Degree mother = high (individual level)	2,567 *** (0,327)	2,269 *** (0,643)	2,904 *** (0,865)	2,734 *** (0,833)	2,743 *** (0,484)
% Degree mother = high in class					
Nationality = foreigner (individual level)	-1,242 (1,016)	0,328 (1,369)	-1,710 (2,796)	-3,254 (3,471)	-3,597 (2,502)
% Nationality = foreigner in class					
Grade 1 score (individual level)	0,795 *** (0,014)	0,854 *** (0,025)	0,748 *** (0,039)	0,759 *** (0,039)	0,766 *** (0,022)
Average grade 1 score in class					
[N.obs.]	[6 288]	[2 218]	[964]	[835]	[2 271]

**Table 9: Should we reduce class size or school segregation?
Simulations based upon previous estimates**

	% advantaged children		Average class size		Average score		Absolute gap in points	Reduction of gap as compared to ref. point
	Disadv. schools	Advant. schools	Disadv. schools	Advant. schools	disadv. children	advant. children		
Current situation: low class size targeting, high segregation	44,8%		23,16		66,44			
	23,1%	66,5%	22,62	23,73	63,05	70,62	7,56	2,7%
Reference point: no targeting, high segregation	44,8%		23,16		66,39			
	23,1%	66,5%	23,16	23,16	62,91	70,69	7,78	0,0%
Policy experiment n°1: unchanged segregation, but increasing class size targeting	23,1%	66,5%	22,62	23,73	63,05	70,62	7,56	2,7%
	23,1%	66,5%	22,00	24,45	63,20	70,52	7,32	5,9%
	23,1%	66,5%	21,00	25,81	63,40	70,33	6,93	10,9%
	23,1%	66,5%	20,00	27,50	63,53	70,08	6,56	15,7%
	23,1%	66,5%	19,00	29,65	63,56	69,75	6,19	20,4%
	23,1%	66,5%	18,00	32,46	63,45	69,29	5,84	24,9%
	23,1%	66,5%	16,00	41,90	62,42	67,67	5,24	32,6%
Rawlsian optimum	23,1%	66,5%	19,22	29,14	63,56	69,83	6,27	19,4%
Policy experiment n°2: unchanged targeting, but decreasing segregation	23,1%	66,5%	22,62	23,73	63,05	70,62	7,56	2,7%
	30,0%	59,6%	22,62	23,73	63,23	70,64	7,41	4,8%
	35,0%	54,6%	22,62	23,73	63,31	70,65	7,34	5,6%
	40,0%	49,6%	22,62	23,73	63,34	70,67	7,33	5,8%
	42,0%	47,6%	22,62	23,73	63,34	70,67	7,33	5,7%
	44,8%	44,8%	22,62	23,73	63,33	70,68	7,36	5,4%
Rawlsian optimum	40,9%	48,7%	22,62	23,73	63,34	70,67	7,33	5,8%
Global Rawlsian optimum	0,0%	89,6%	15,44	46,35	64,89	64,89	0,00	100,0%

Graph 6: Optimal class size targeting as a function of social segregation



Percentage of advantage children in disadvantaged schools (0% = complete social segregation; 44,8% = complete social integration)

Graph 7: Optimal social segregation as a function of class size targeting

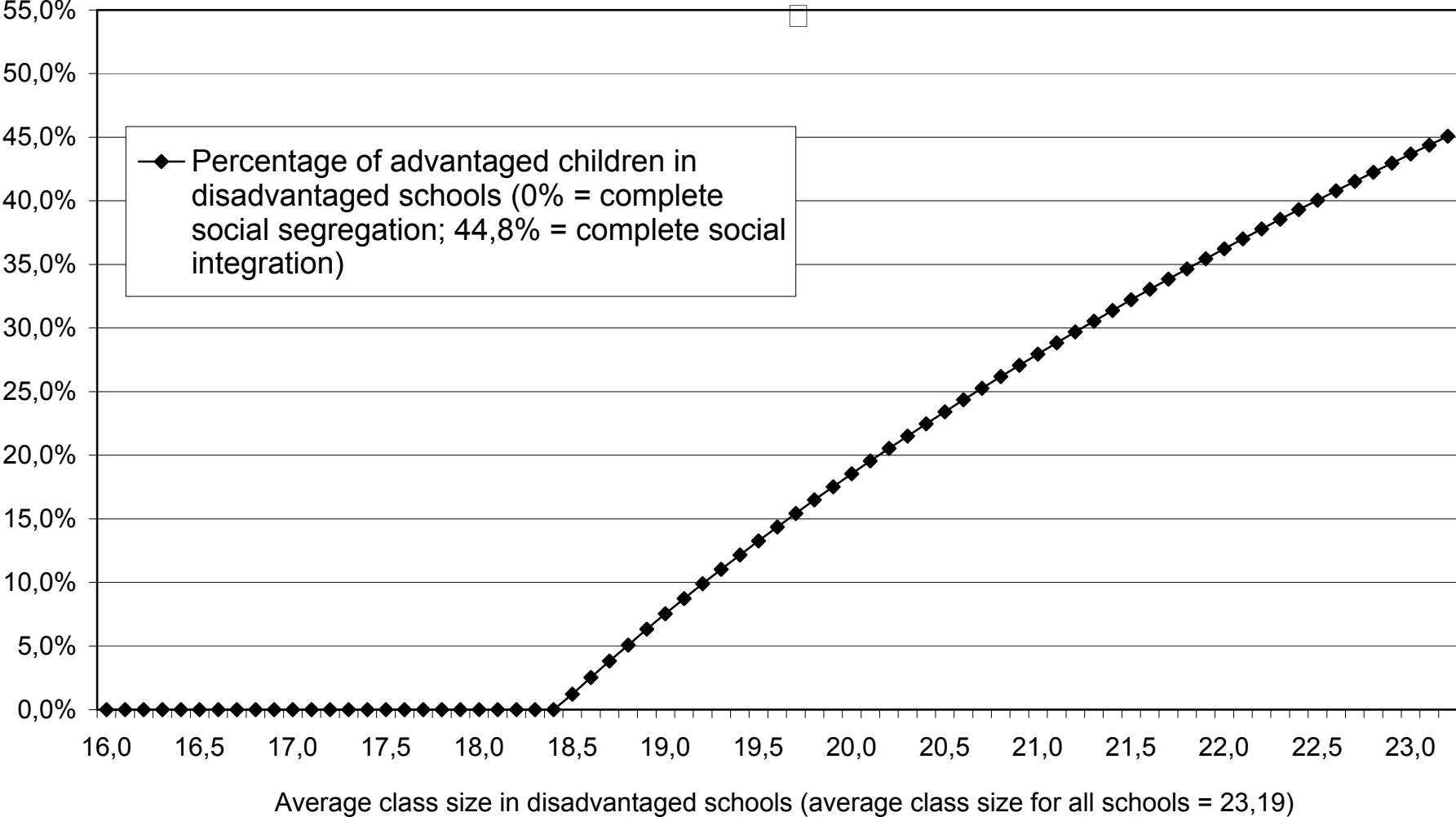


Table A1: Grade 3 scores as a function of school-level total grade 2 enrollment

School-level total grade 2 enrollment	Average class size grade 2	Average grade 3 math score	Average grade 3 French score	Average grade 1 global score
1-14	11,11	68,75	67,40	68,61
[18]	(0,65)	(2,05)	(2,47)	(2,18)
15-24	21,14	66,28	66,49	70,38
[637]	(0,58)	(0,49)	(0,48)	(0,41)
25-34	26,14	64,71	64,66	69,96
[552]	(0,56)	(0,52)	(0,54)	(0,43)
35-44	20,63	65,86	66,09	70,06
[317]	(0,53)	(0,73)	(0,70)	(0,63)
45-54	24,42	63,78	64,77	69,51
[784]	(0,55)	(0,43)	(0,43)	(0,37)
55-64	26,19	63,66	65,71	70,31
[262]	(0,74)	(0,75)	(0,78)	(0,65)
65-74	23,24	65,56	67,49	69,27
[258]	(0,33)	(0,82)	(0,85)	(0,76)
75--84	25,76	65,09	65,54	70,51
[201]	(0,42)	(0,79)	(0,80)	(0,73)
85 and over	25,05	66,27	66,76	68,71
[166]	(0,60)	(0,89)	(1,10)	(0,94)
Total	23,78	65,02	65,69	69,88
[3 195]				

Table A2: The Impact of School Segregation on Test Scores

Impact on grade 3 French scores	All children					
PCS parents = advantaged (individual level)	1,933 *** (0,327)	1,892 *** (0,324)	2,037 *** (0,326)	2,027 *** (0,324)	2,118 *** (0,322)	2,259 *** (0,320)
% PCS parents = advantaged in class	2,001 ** (0,561)	4,178 *** (0,597)				
Degree mother = high (individual level)	3,384 *** (0,332)	3,298 *** (0,329)	3,447 *** (0,332)	3,377 *** (0,330)	3,510 *** (0,329)	3,561 *** (0,327)
% Degree mother = high in class			1,125 ** (0,553)	3,103 *** (0,588)		
Nationality = foreigner (individual level)	-3,141 *** (1,030)	-3,066 *** (1,022)	-3,254 *** (1,035)	-3,261 *** (1,027)	-2,920 *** (1,033)	-2,716 *** (1,027)
% Nationality = foreigner in class					-4,346 ** (1,383)	-7,245 *** (1,411)
Grade 1 score (individual level)	0,789 *** (0,014)	0,842 *** (0,015)	0,791 *** (0,014)	0,840 *** (0,015)	0,791 *** (0,014)	0,838 *** (0,015)
Average grade 1 score in class		-0,223 *** (0,022)		-0,212 *** (0,022)		-0,194 *** (0,021)
Children = girl (individual level)	3,692 *** (0,290)	3,678 *** (0,288)	3,704 *** (0,291)	3,676 *** (0,289)	3,692 *** (0,291)	3,675 *** (0,289)
% Children = girl in class	-0,415 (0,697)	-0,101 (0,692)	-0,468 (0,699)	-0,242 (0,694)	-0,525 (0,698)	-0,342 (0,693)
Birth semester = 2 (individual level)	-0,486 (0,294)	-0,255 (0,293)	-0,531 * (0,295)	-0,349 (0,293)	-0,522 * (0,294)	-0,353 (0,293)
Birth semester = 2 in class	-1,075 (0,681)	-1,828 ** (0,679)	-1,243 * (0,682)	-2,035 ** (0,682)	-1,274 * (0,680)	-2,095 *** (0,682)
[N.obs.]	[6 288]	[6 288]	[6 274]	[6 274]	[6 288]	[6 288]

Source : Author's computations using "panel primaire 1997" and exhaustive administrative files for French primary schools (MEN-DEP)

Graph A1: Classes with multiple grades as a function of school-level total grade 2 enrollment

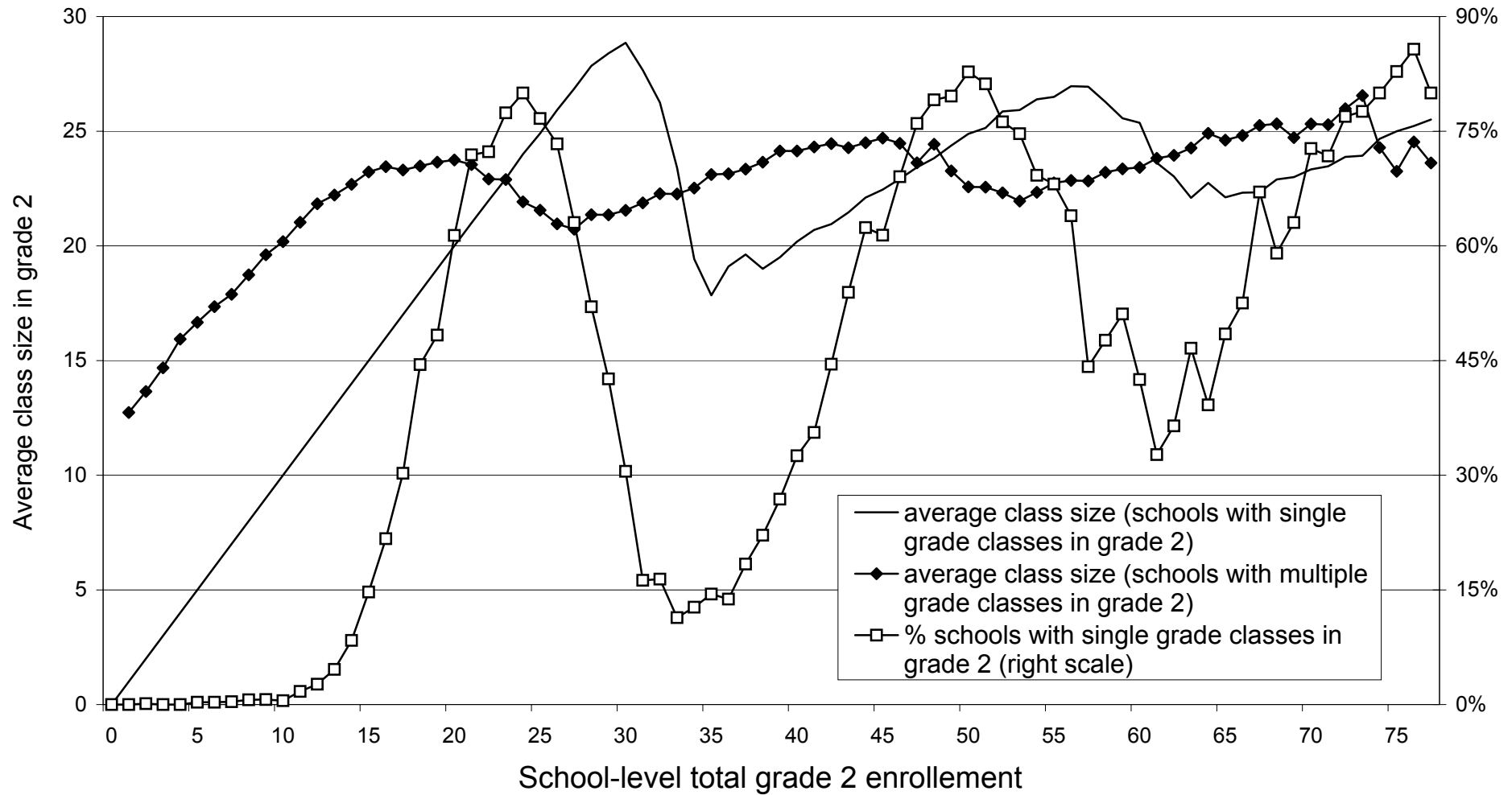


Table A4: The Impact of Multiple Classes on School Performance

Panel A: Impact on grade 3 Math test scores (sept. 1999)

	All children			
	OLS	IV	OLS	IV
Class size grade 2 (s.e.)	-0,199 *** (0,050)	-0,357 ** (0,181)		
multiple grades in grade classes (s.e.)	0,084 (0,401)	-1,374 (1,205)		
N. children grade 2 (s.e.)			-0,203 *** (0,048)	-0,252 * (0,147)
N. children grade 1 (s.e.)			-0,264 *** (0,075)	-0,451 * (0,242)
N. children grade 3-5 (s.e.)			-0,116 * (0,063)	-0,237 (0,250)
Socio-dem controls	Oui	Oui	Oui	Oui
Grade 1 score controls	Oui	Oui	Oui	Oui
[N.obs.]	[4 754]	[4 754]	[4 754]	[4 754]

Panel B: Impact on grade 3 French test scores (sept. 1999)

	All children			
	OLS	IV	OLS	IV
Class size grade 2 (s.e.)	-0,197 *** (0,051)	-0,201 (0,192)		
multiple grades in grade classes (s.e.)	0,245 (0,404)	-0,746 (1,210)		
N. children grade 2 (s.e.)			-0,192 *** (0,049)	-0,149 (0,148)
N. children grade 1 (s.e.)			-0,188 ** (0,076)	-0,205 (0,244)
N. children grade 3-5 (s.e.)			-0,124 * (0,064)	-0,201 (0,252)
Socio-dem controls	Yes	Yes	Yes	Yes
Grade 1 score controls	Yes	Yes	Yes	Yes
[N.obs.]	[4 754]	[4 754]	[4 754]	[4 754]

Table A5: The impact of grade repetition on school performance

Panel A: Impact on grade 3 Math test scores (sept. 1999)

	All children			
Repeat grade 1 or 2 = Yes (s.e.)	-11,039 *** (0,732)	4,367 *** (0,616)	5,958 *** (0,769)	
Repeat grade 1 = Yes (s.e.)				4,073 *** (1,069)
Repeat grade 2 = Yes (s.e.)				7,161 *** (0,991)
Socio-dem controls	Non	Non	Oui	Oui
Grade 1 score controls	Non	Oui	Oui	Oui
[N.obs.]	[7 647]	[7 569]	[5 556]	[5 556]

Panel B: Impact on grade 3 French test scores (sept. 1999)

	All children			
Repeat grade 1 or 2 = Yes (s.e.)	-8,557 *** (0,748)	7,053 *** (0,635)	8,153 *** (0,680)	
Repeat grade 1 = Yes (s.e.)				5,791 *** (1,083)
Repeat grade 2 = Yes (s.e.)				9,870 *** (1,004)
Socio-dem controls	Non	Non	Oui	Oui
Grade 1 score controls	Non	Oui	Oui	Oui
[N.obs.]	[7 647]	[7 569]	[5 556]	[5 556]

Table A6: Interactions between class size effects, peer effects and grade repetition

Impact on grade 3 Math scores	All children						
	OLS	OLS	IV	OLS	IV	OLS	IV
% PCS parents = advantag. in class	2,384 ** (1,178)			2,498 ** (1,174)	2,566 ** (1,176)	2,997 ** (1,166)	3,042 *** (1,169)
Average grade 1 test score in class	-0,314 *** (0,040)			-0,305 *** (0,040)	-0,299 *** (0,040)	-0,307 *** (0,039)	-0,302 *** (0,039)
Grade 2 class size		-0,320 *** (0,072)	-0,457 *** (0,115)	-0,279 *** (0,072)	-0,446 *** (0,114)	-0,257 *** (0,071)	-0,443 *** (0,115)
Repeat grade 1 or 2 = Yes						5,947 ** (1,215)	5,880 ** (1,217)
Controls socio-economic position	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls prior test score	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Controls prior test score redoubtants	No	No	No	No	No	Yes	Yes
[N.obs.]	[2 360]	[2 360]	[2 360]	[2 360]	[2 360]	[2 470]	[2 470]