N m'a faamu[a]
Boosting Learning Through Bilingual Education: Quasi-Experimental Evidence from Mali

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[a] "I don't understand" in Bamanakan

Motivation (1)

Learning crisis in SSA (UNESCO, 2013) , characterized by:

- Massive increase in primary school enrollment, close to 100% in most countries
- But such progress is not visible in terms of literacy (cf all evaluations from PASEC, SACMEQ, etc.)
- Shift in the research focus from education quantity to quality (Bold et al., 2017)

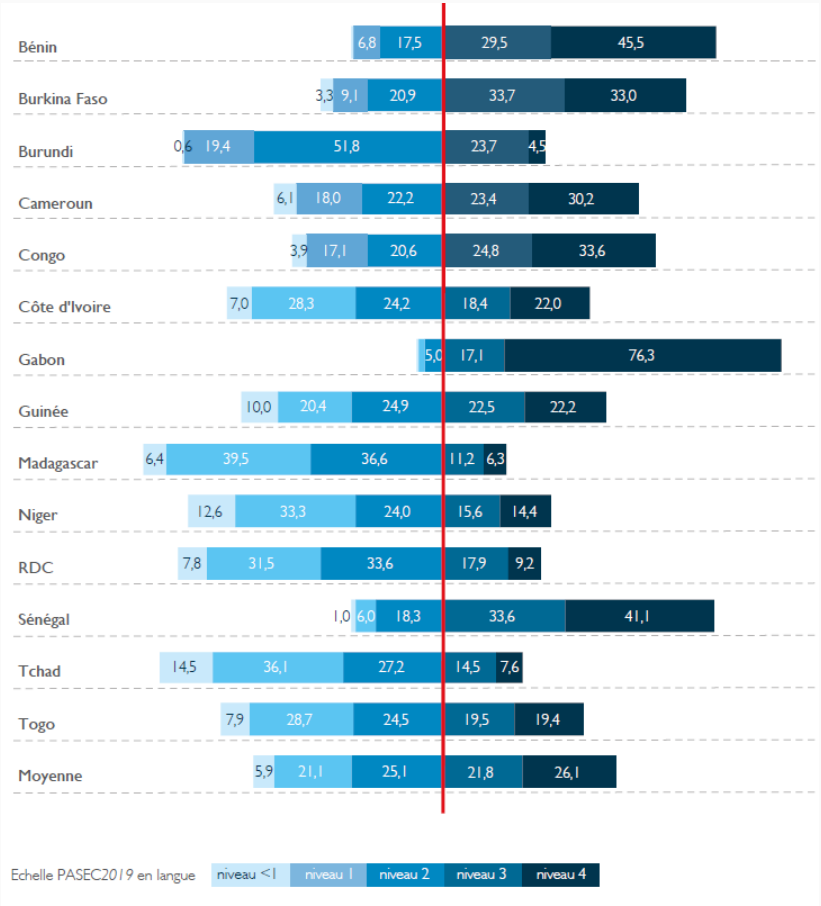


Figure 1: Fraction of students having a sufficient level in language at the end of the primary cycle (Source: PASEC 2019)

Motivation (2)

Figure 2: Map of the LoIs in Africa (2023)

Among other education innovations aiming at improving quality of education, **bilingual or mother-tongue education** appears to be promising (Evans & Mendez Acosta, 2021) :

- The student learns in a familiar language during the first grades and then switches to a foreign one after (in SSA, often the colonial language)
- As of today, out of 54 African countries, 36 adopted this system

This Paper

- I use the 1999 reform in Mali, introducing bilingual education in 11 national languages in public primary schools. Exploiting granular data on its implementation, I estimate its effect on education in adulthood (DiD).
- Using accurate data on literacy from the LSMS, I show an increase of 1/3 in proficiency in the local language and 10% in French (both writing and reading). I also find positive impacts on schooling outcomes.
- Positive impacts are concentrated among girls (especially for schooling)
- Mechanisms:
  - On the supply side: bilingual education is beneficial when the ratio pupil-per-school is low
  - On the demand side: educated mothers play a key role in the success of this policy
- No political cost: bilingual education does not harm nation-building

Context

1999 bilingual education policy in Mali:

- Part of the PRODEC reform that started to be implemented at the beginning of the 2001 academic year, to answer the growing and unanswered demand for primary education
- Introduction of 11 local languages as languages of instruction at the primary level, documented and experimented throughout the previous experiments ▸ Language tree
- Slow transition from the local language to French:
  1. First two years to be taught in one of the eleven national languages
  2. Grade 3 & 4 50% French 50% the local language
  3. Grade 5 & 6, French is main LoI
- Minor changes on the input side:
  - Slight training for the teachers on the new curriculum (20 days).
  - Teachers not in their linguistic areas in only 13% of cases (MEN, 2002)
  - New curriculum means new textbooks... but logistic issues reported (Traoré, 2001)

Illustration (1)

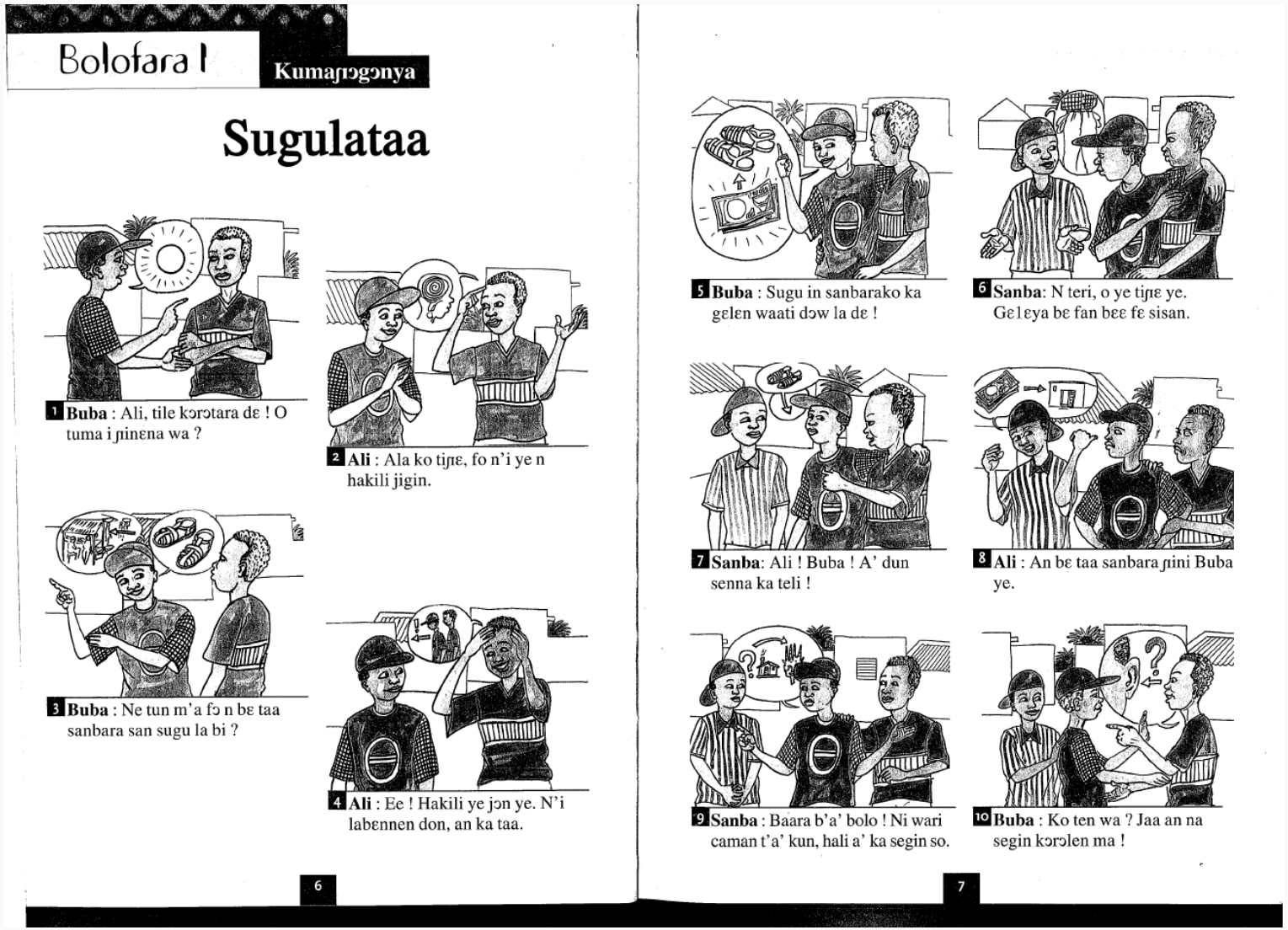


Figure 3: Textbook in Bamanankan for grade 1 students

Illustration (2)

Figure 4: A class in Songhai (Source: Zakaria Nounta, 2015)

Data

- **Roll-out of the bilingual education program:**
  - In 2011, census done by the MoE of all bilingual schools that opened since 2002, in the main four regions in Mali (accounting for almost 80% of the population)
  - Information on their status (still bilingual or only French) and on the extent of local language use.
  - 3.784 bilingual schools, with 3.129 still using the bilingual curriculum (out of $\sim$10.000 primary public schools)
- **1998 and 2009 census:** Panel of the school supply at the village level
- **2018 LSMS** (Living Standards and Measurement Survey):
  - *Tested* literacy in French, in the local language, and in another language, in both reading and writing.
  - Schooling: school attendance, completion of primary education, and success at the end-of-the-first-primary cycle exam.
  - Sample restricted to 10 years around the reform (1984 - 2003)

$\rightarrow$ All dataset matched at the **commune** level

Empirical strategy (1)

TWFE (Two-Way Fixed Effects), with the two following dimensions:

1. **Time:** Birth cohorts exposed to bilingual education after 2001 and to French-only before 2001, i.e. birth cohorts born after 1994 and before 1994 (primary school officially starts at 7) ▸ Evidence
2. **Local intensity of bilingual education:** Communes less and more exposed to BE, i.e. below and above the median share of bilingual schools among the total school supply at the district level (Duflo, 2001) . ▸ Map of BE supply

I estimate the following equation, with $\beta_{t,c}$ capturing the effect of bilingual education:

$$Y_{i,y,c,d} = \alpha_{1,t}\mathbb{1}[\text{y} \geq 1994] + \alpha_{2,c}\mathbb{1}[\text{c} \in \text{BS}] +$$

$$\beta_{y,c}\mathbb{1}[\text{y} \geq 1994] * \mathbb{1}[\text{c} \in \text{BS}] + \theta_d + u_{i,y,c,d}$$

c = commune
y = year of birth
d = district
BS = high-exposed communes

Empirical strategy (2)

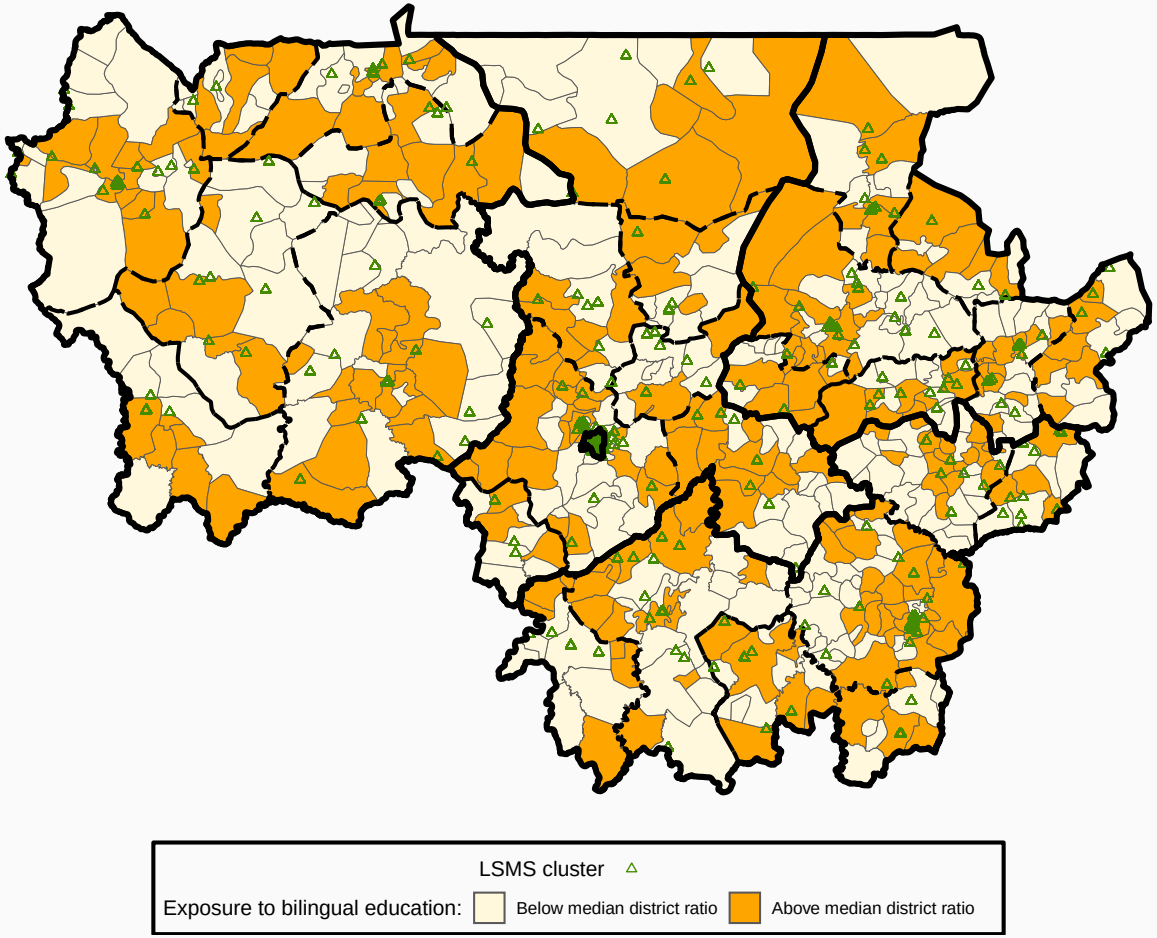


Figure 5: Map of the treatment

▶ Descriptive statistics

Results: Bilingual education increases learning (1)

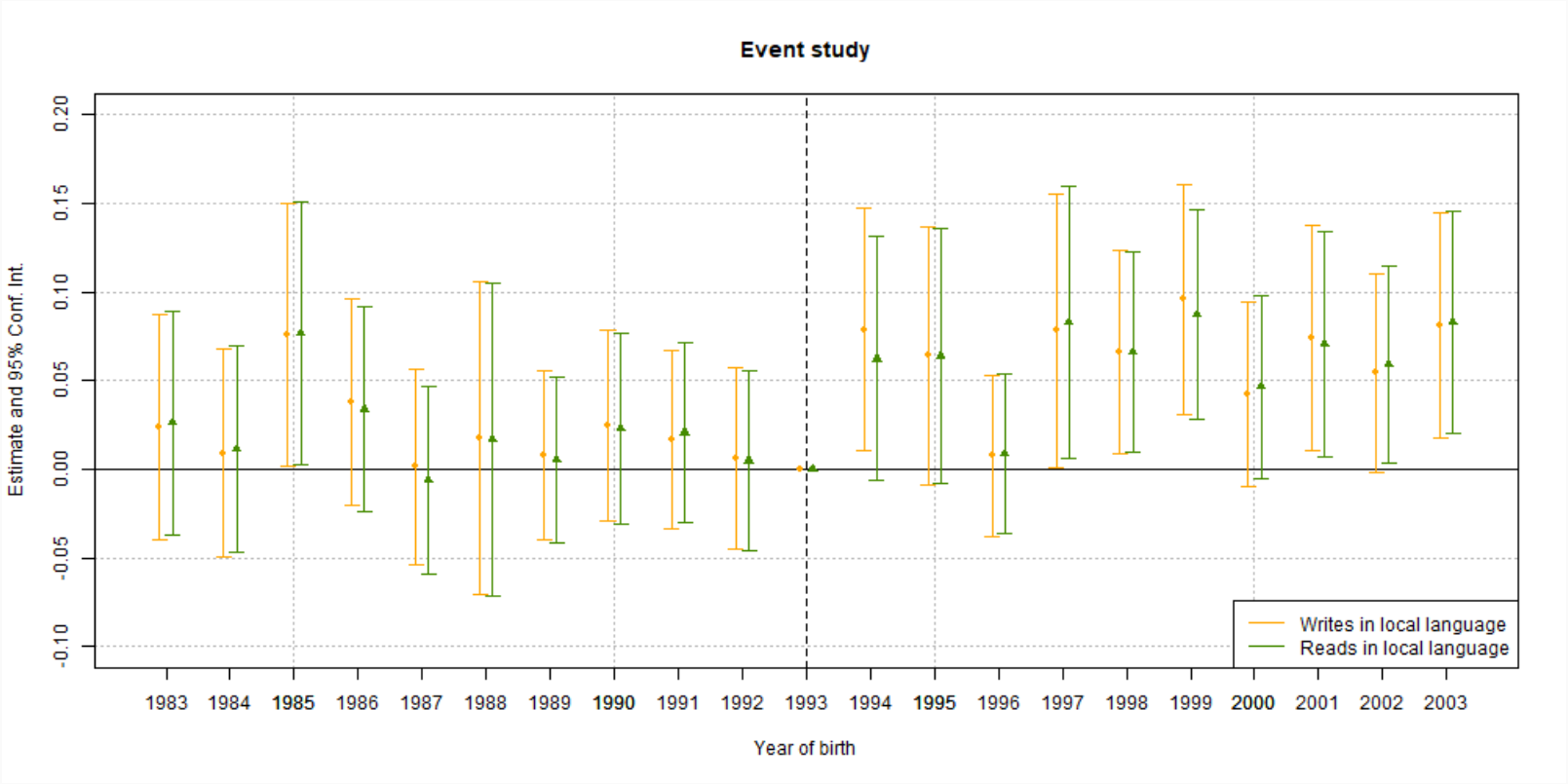


Figure 6: Event studies for learning outcomes in the local language

Results: Bilingual education increases learning (2)

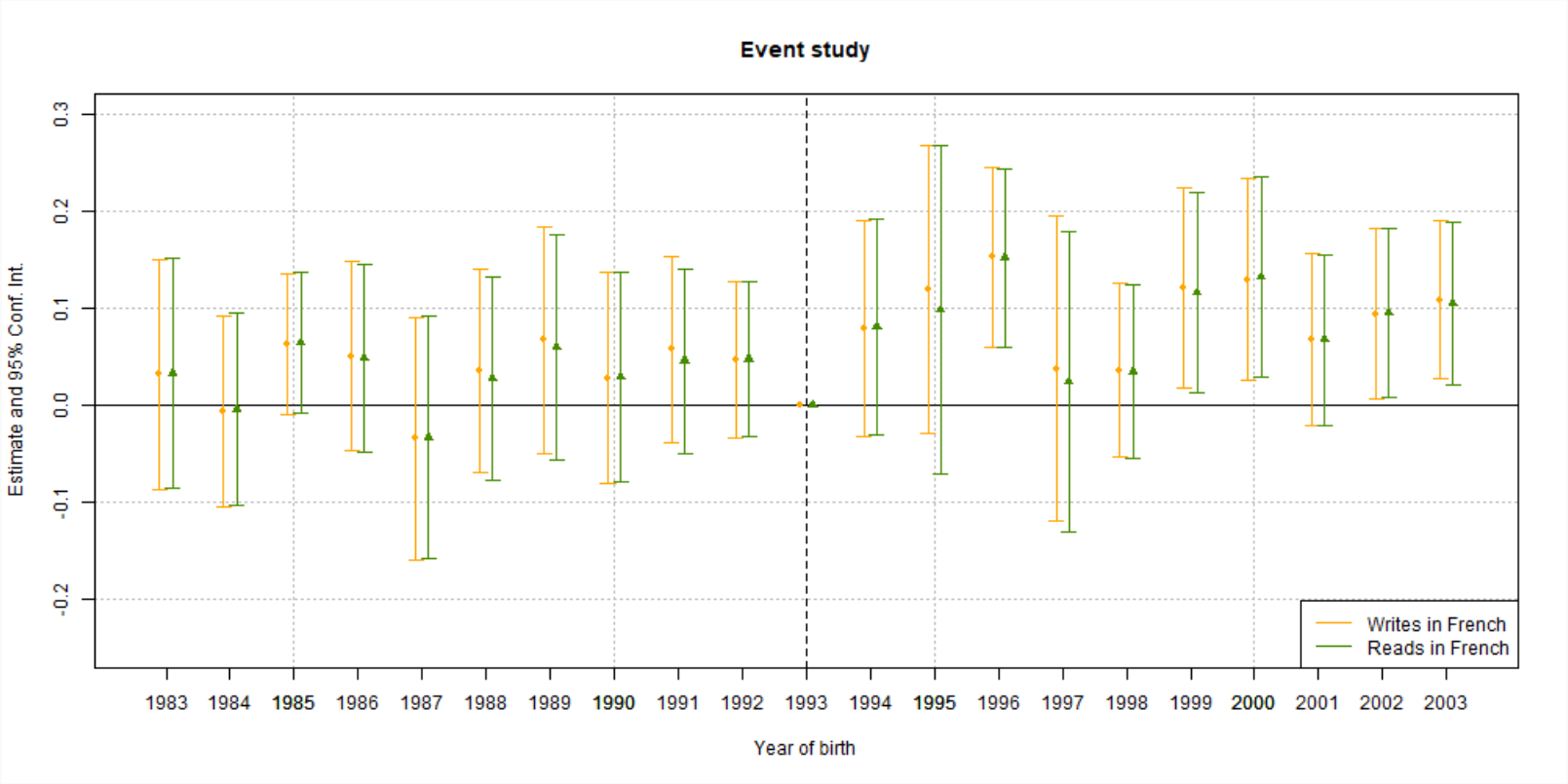


Figure 7: Event studies for learning outcomes in French

Results: Bilingual education increases learning (2)

Language tested	Local language		French	
Dependent Variables:	Writing	Reading	Writing	Reading
Model:	(1)	(2)	(3)	(4)
Variables				
Born after 1994	0.008	0.007	0.138***	0.137***
	(0.012)	(0.011)	(0.020)	(0.020)
High exposed commune	0.023	0.022	0.034	0.032
	(0.015)	(0.015)	(0.037)	(0.037)
Born after 1994 × High exposed commune	0.039**	0.039**	0.055*	0.054*
	(0.018)	(0.017)	(0.028)	(0.028)
Fixed-effects				
District FE	Yes	Yes	Yes	Yes
Fit statistics				
Mean of Y	0.123	0.118	0.489	0.484
Observations	8,636	8,623	8,636	8,633
R^2	0.04228	0.04123	0.15238	0.14913

Clustered (LSMS cluster) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Results: Bilingual education increases schooling

Dependent Variables:	Attended school	Completed prim educ	Passed the CEP
Model:	(1)	(2)	(3)
Variables			
Born after 1994	0.156***	-0.020	0.073***
	(0.019)	(0.022)	(0.016)
High exposed commune	0.023	0.019	0.028
	(0.032)	(0.033)	(0.032)
Born after 1994 ×	0.059**	0.042	0.041*
High exposed commune	(0.026)	(0.031)	(0.025)
Fixed-effects			
District FE	Yes	Yes	Yes
Fit statistics			
Mean of Y	0.495	0.282	0.305
Observations	8,635	6,001	8,635
R^2	0.12179	0.10339	0.12921

Clustered (LSMS cluster) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

▸ Event studies

Heterogeneity: Girls benefit more from bilingual education

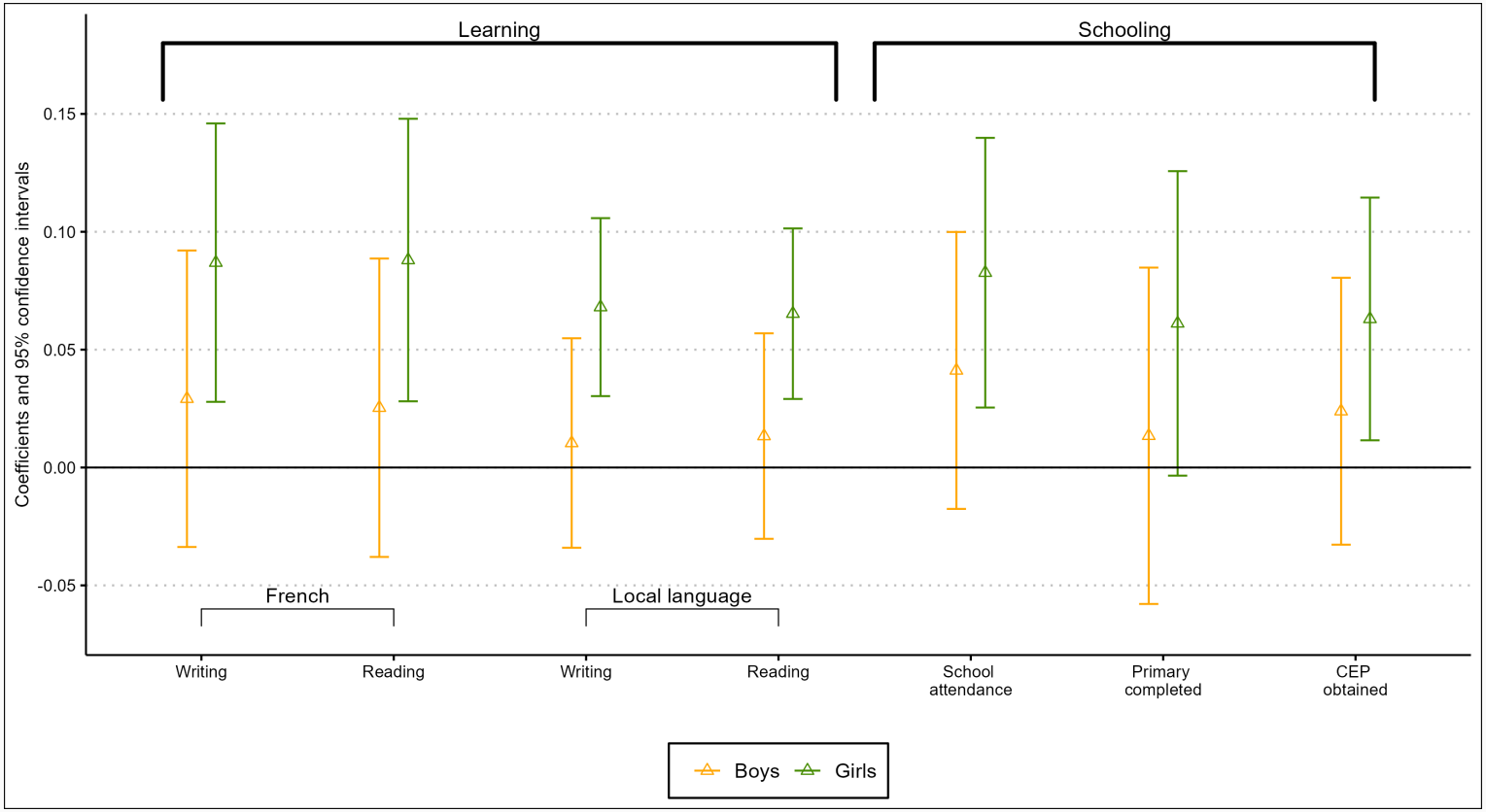


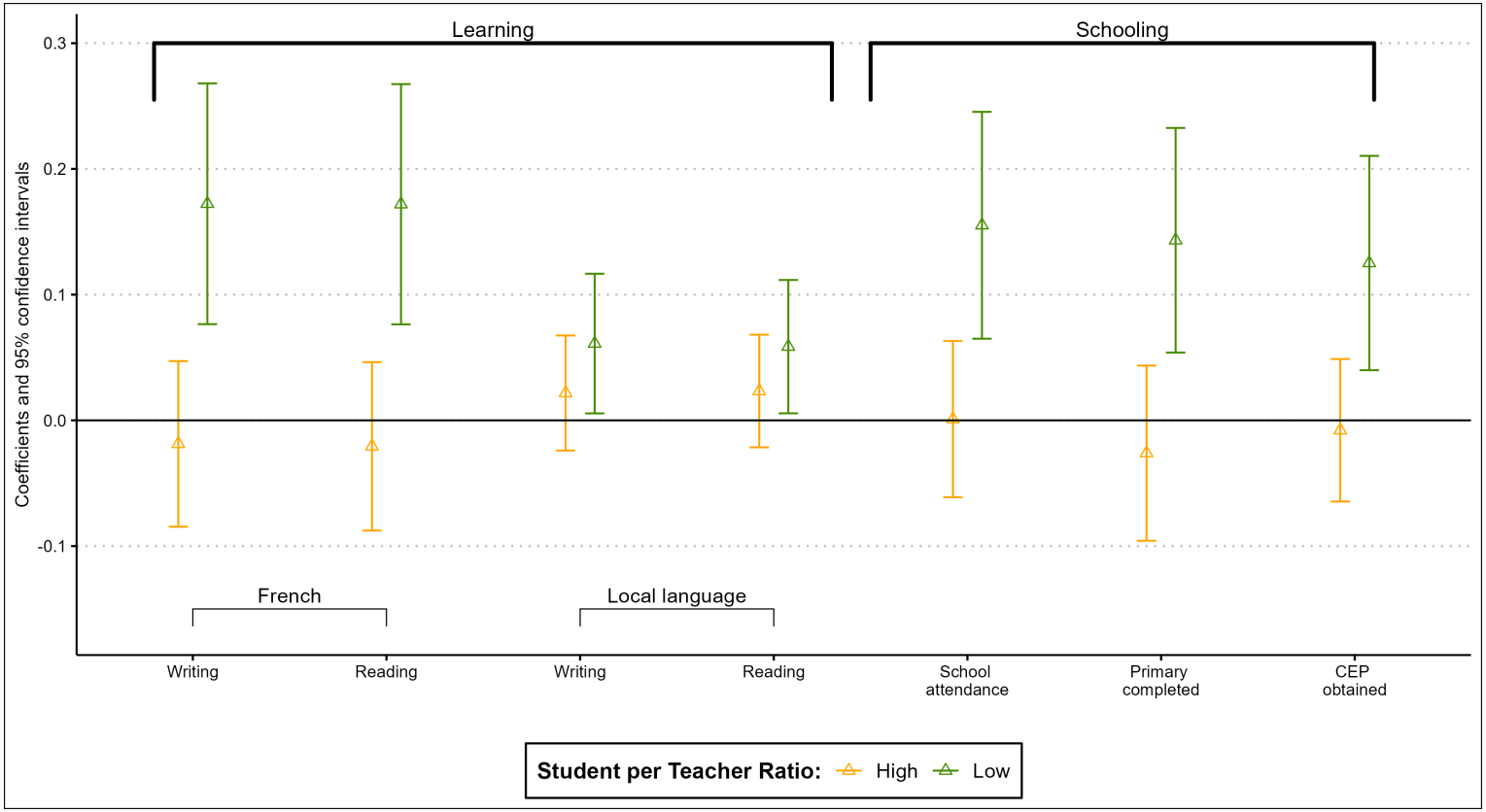
Figure 8: Education results, by sex

▸ Compared to the mean

No differential effect of bilingual education in rural areas or in areas with different linguistic diversity ▸ Results

Mechanisms: supply side

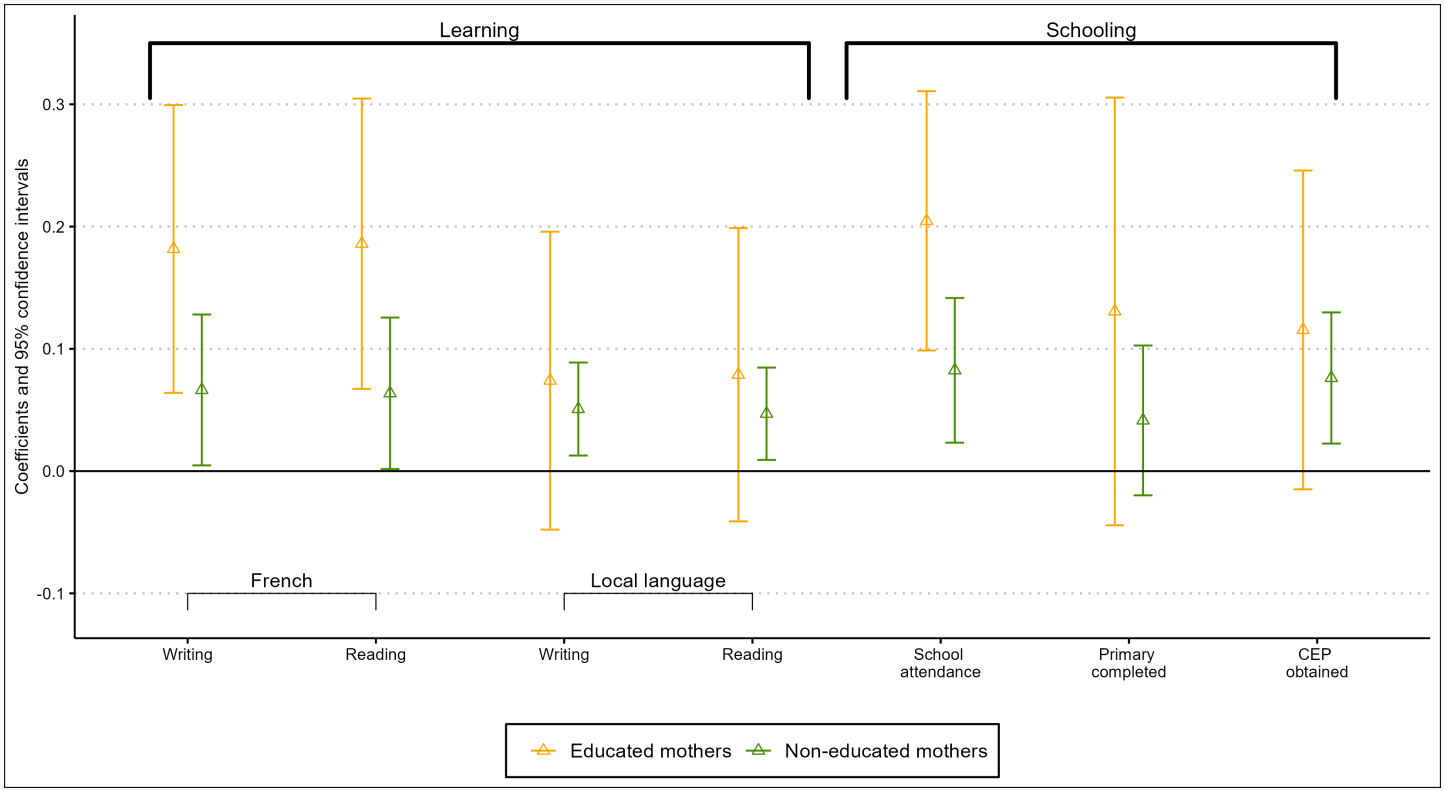
Bilingual education is effective on learning only in districts with a **low student-per-teacher ratio**.



Mechanisms: demand side

Crucial role of mother education in the success of bilingual education:

- Only 20% of mothers went to school, taught in French
- No result for father education - linked to results from Dizon-Ross & Jayachandran (2023)



Robustness checks

- Placebo test using another language. ▸ Results
- Results are driven by communes where there is no switching school. ▸ Results
- No correlation between the bilingual education supply and the school growth rate. ▸ Correlation plot ▸ Map with treatment & school growth
- Removing clusters less than 1km from the borders of a commune ▸ Results
- Staggered design using the progressive roll out from 1997 to 2011, at the district level ▸ Results: Standard errors increase because I lose precision with the higher geographical level, but results show identical results
- Potential confounders are not correlated with treatment ▸ Results
  - Migration (whether the individual was born in the commune) $\rightarrow$ causes sample selection
  - Age at which the individual started school $\rightarrow$ source of endogenous treatment exposure (time dimension of the TWFE)

At which costs? (1)

Monetary costs:

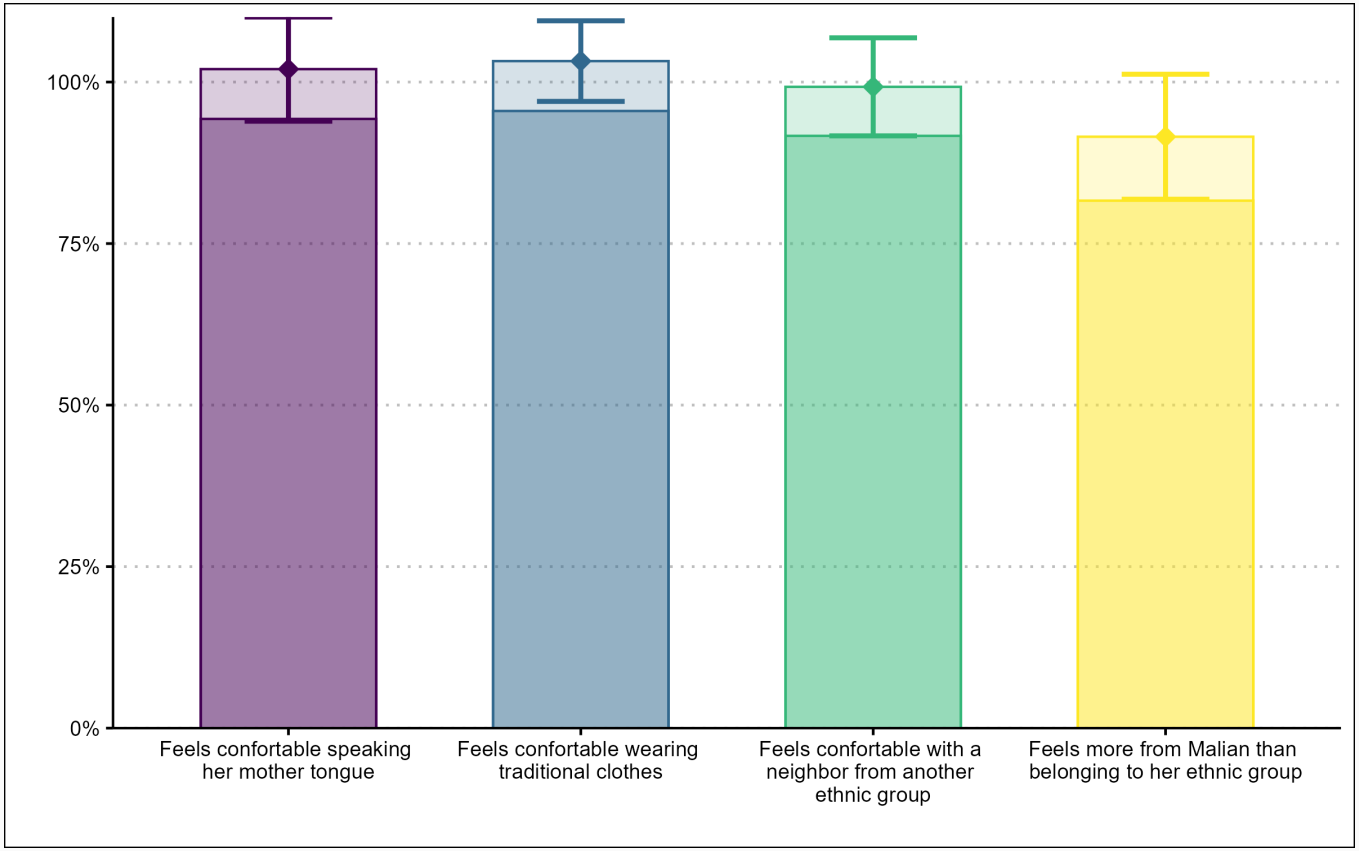
- I use report data on implementation and census data on potentially affected students
- I estimate that the cost per student is \$10.6, well below the average cost of \$17.97 of the most effective interventions in SSA (Angrist et al., 2023) .

Political costs:

- Language unification has been shown to be a key component in nation-building (Blanc and Kubo, 2023; Clots-Figueras and Masella, 2013) .
- Lack of political will because of the fear of (increased) linguistic/ethnic fragmentation

At which costs? (2)

I use the Afrobarometer data (rounds 7 and 8) and the same quasi-empirical design to answer this question, focusing on questions related to ethnicity.
→ **Bilingual education does not seem to harm nation-building**.



Conclusion

- Quasi-experimental evidence shows that bilingual education increases learning by 10% in French and 30% in the local language, with no backlash effect on nation building
- Positive but smaller results on schooling
- Benefits are concentrated among girls
- Potential complementary inputs: mother education & low pupil-school ratio

Thank you for your attention!

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Appendix: Language tree

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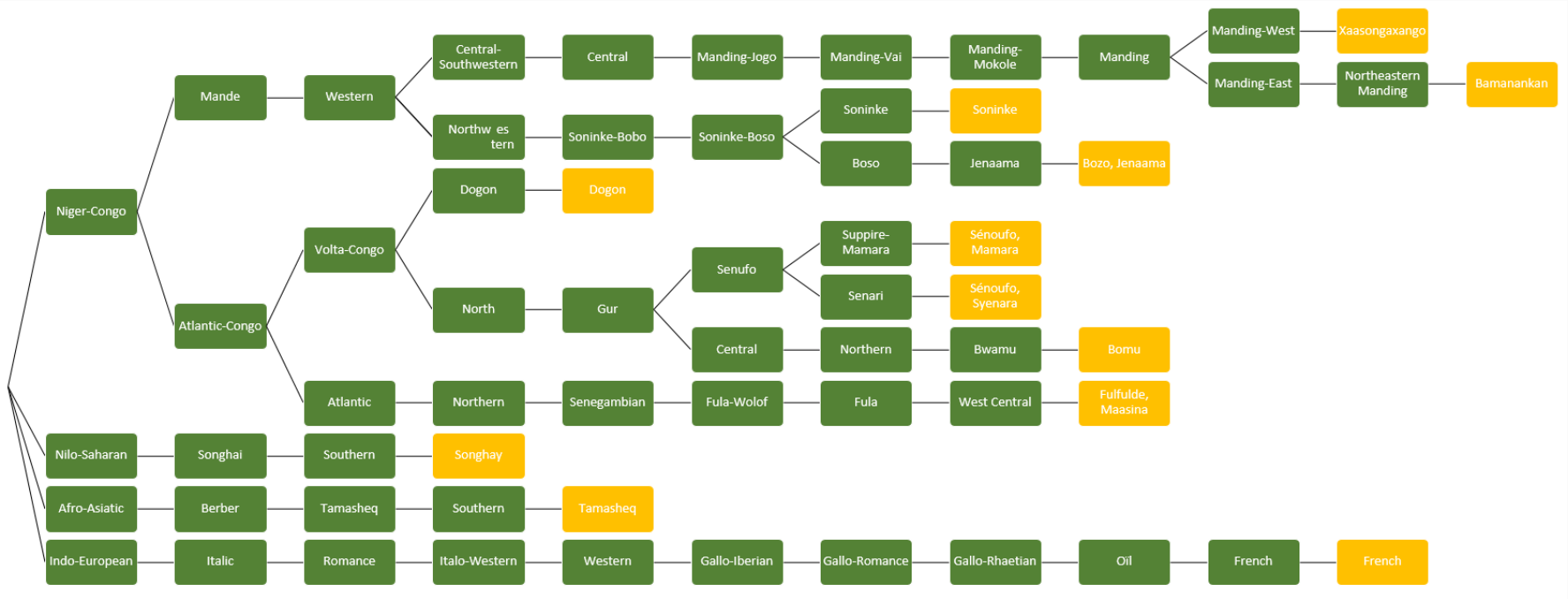

Figure 9: Language tree of the languages of instruction

Appendix: Evolution of the school supply

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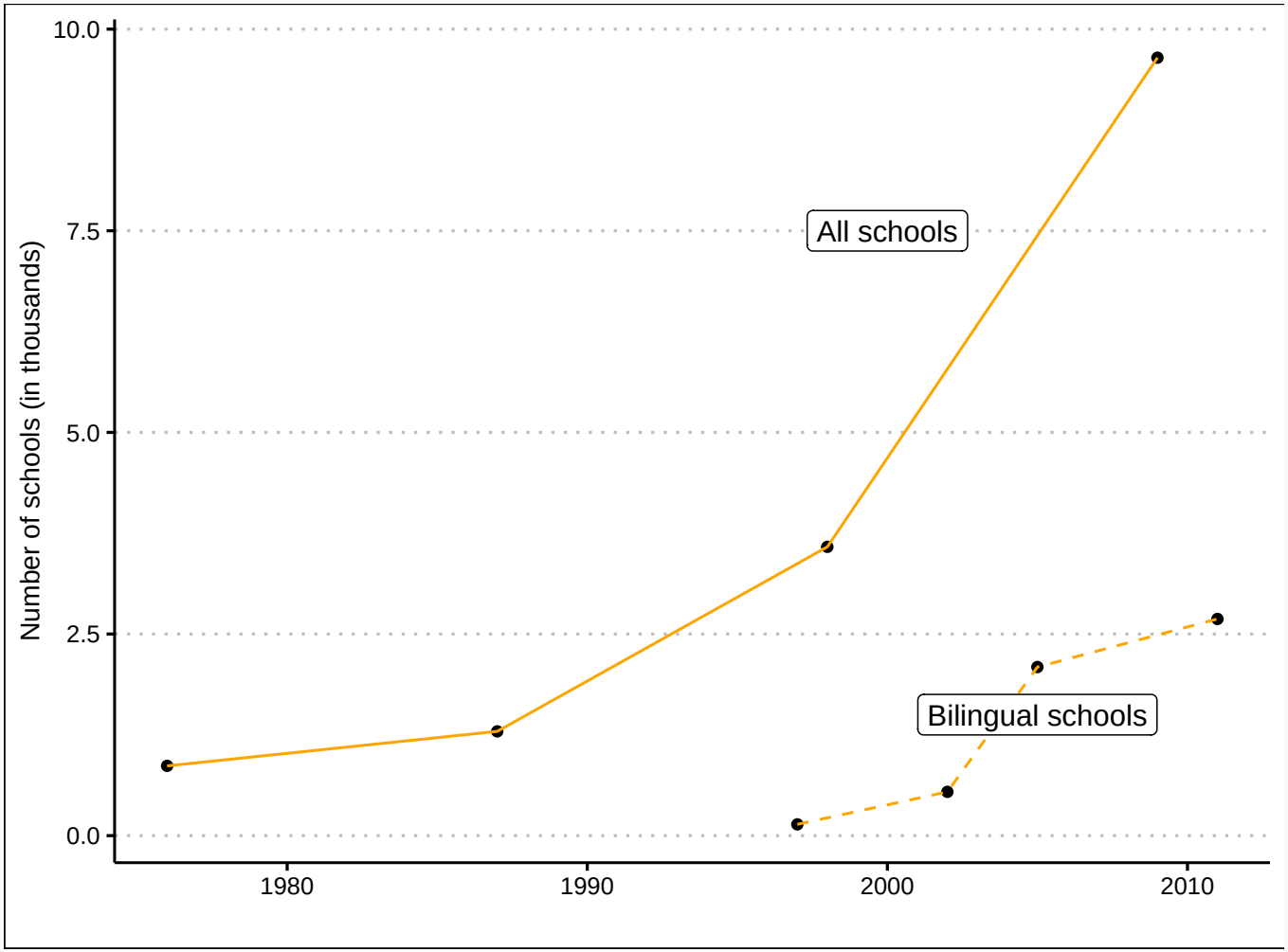

Figure 10: Evolution of school supply

Appendix: Map of the bilingual education supply

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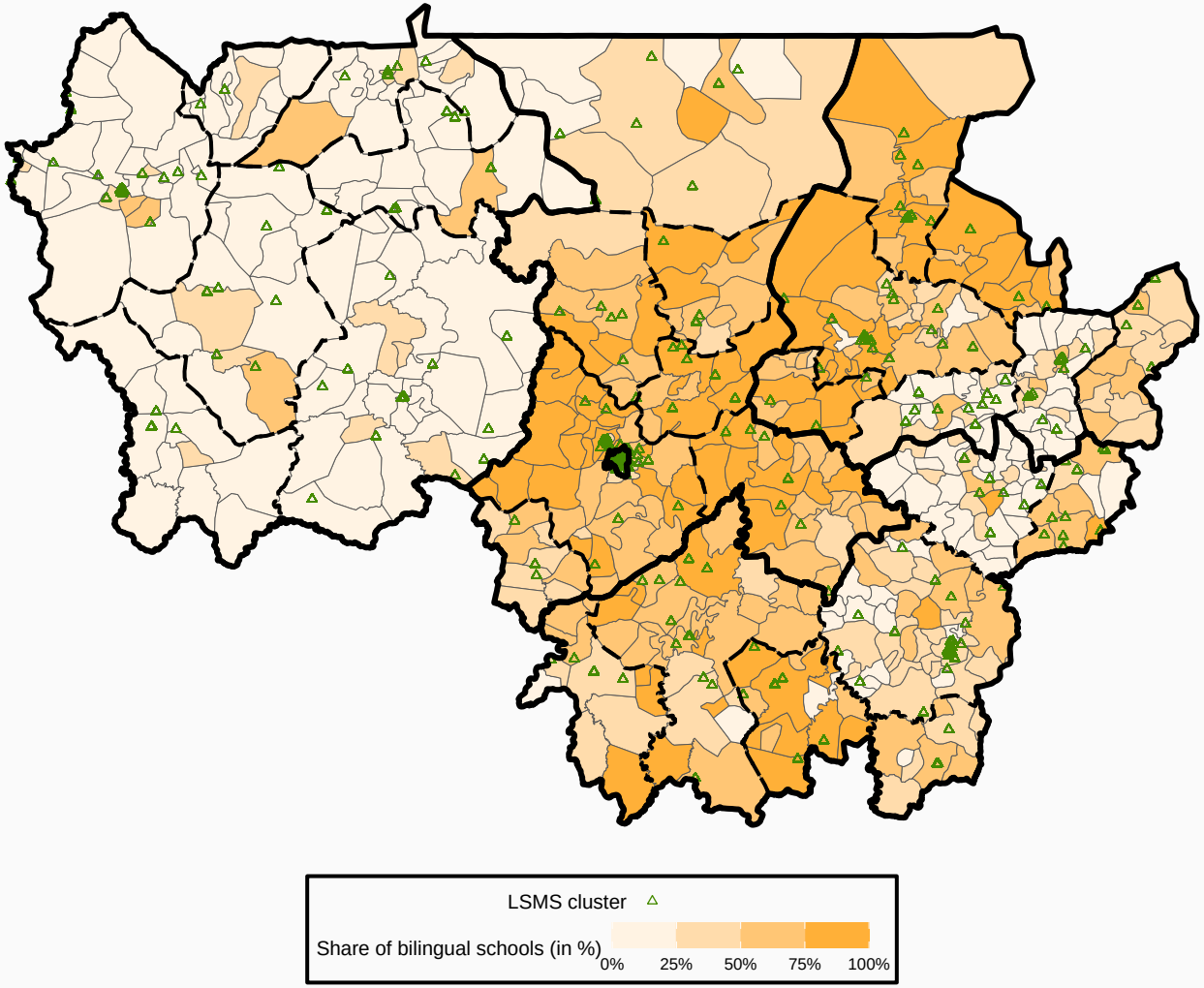

Figure 11: Bilingual education supply in Mali

Appendix: Sample description

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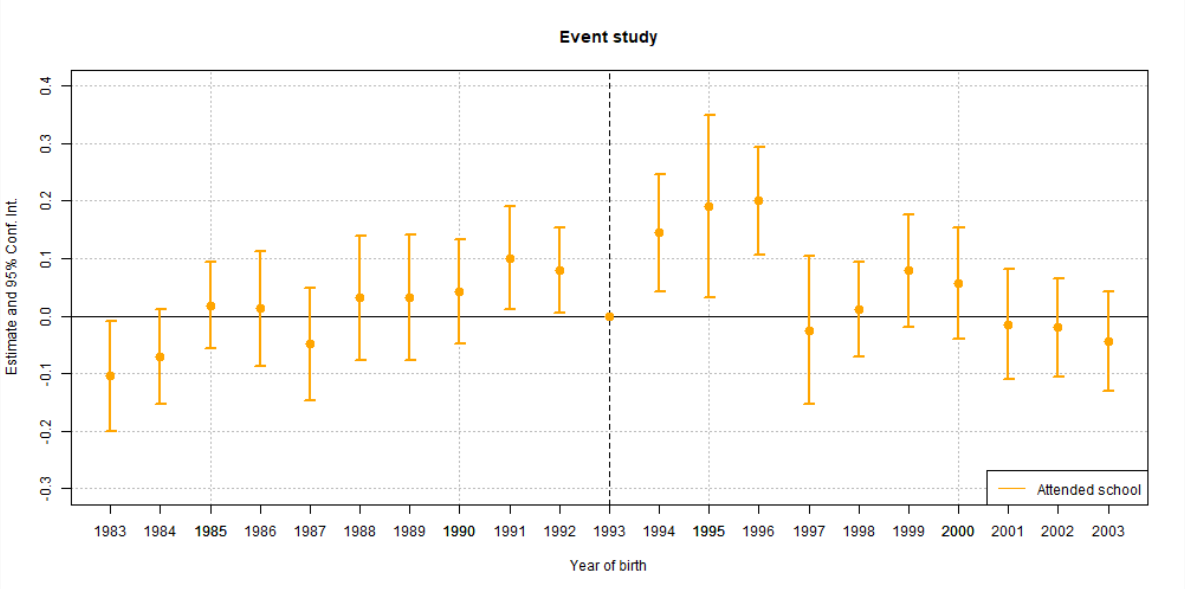
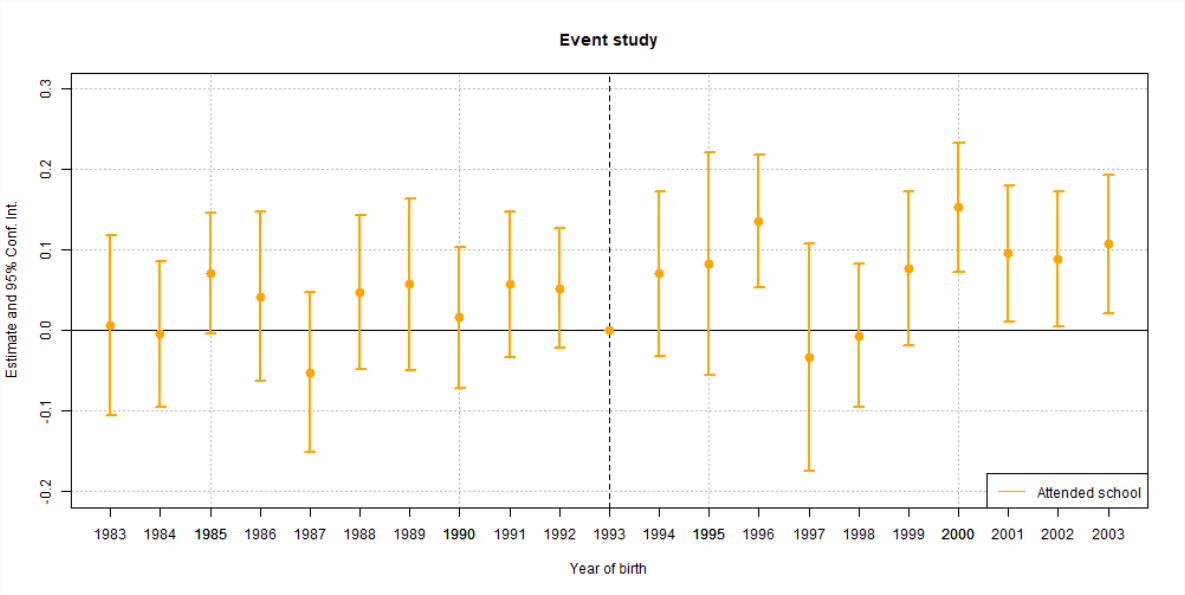
Characteristics	Mean	SD	N
A. Individual characteristics			
Female (0/1)	0.55	0.5	8636
Age	23.7	6.12	8636
Muslim (0/1)	0.95	0.22	8636
Urban (0/1)	0.49	0.48	8636
Attended school (0/1)	0.51	0.5	8635
Number of schooling years	4.01	6.25	8636
Literate in French (0/1)	0.52	0.5	8633
Literate in the local language (0/1)	0.13	0.33	8623
B. Commune characteristics			
Number of students in school age	616.65	893.63	167
Number of primary schools	24.74	35.01	167
Share of bilingual schools	0.45	0.32	167
Linguistic HHI	0.46	0.15	165

Notes: (0/1) indicates a dummy variable. SD stands for standard deviation. N stands for the number of non-missing variables. All descriptive statistics are computed using weights provided in the LSMS survey.

Appendix: Event studies for schooling





Appendix: Event studies for schooling (2)

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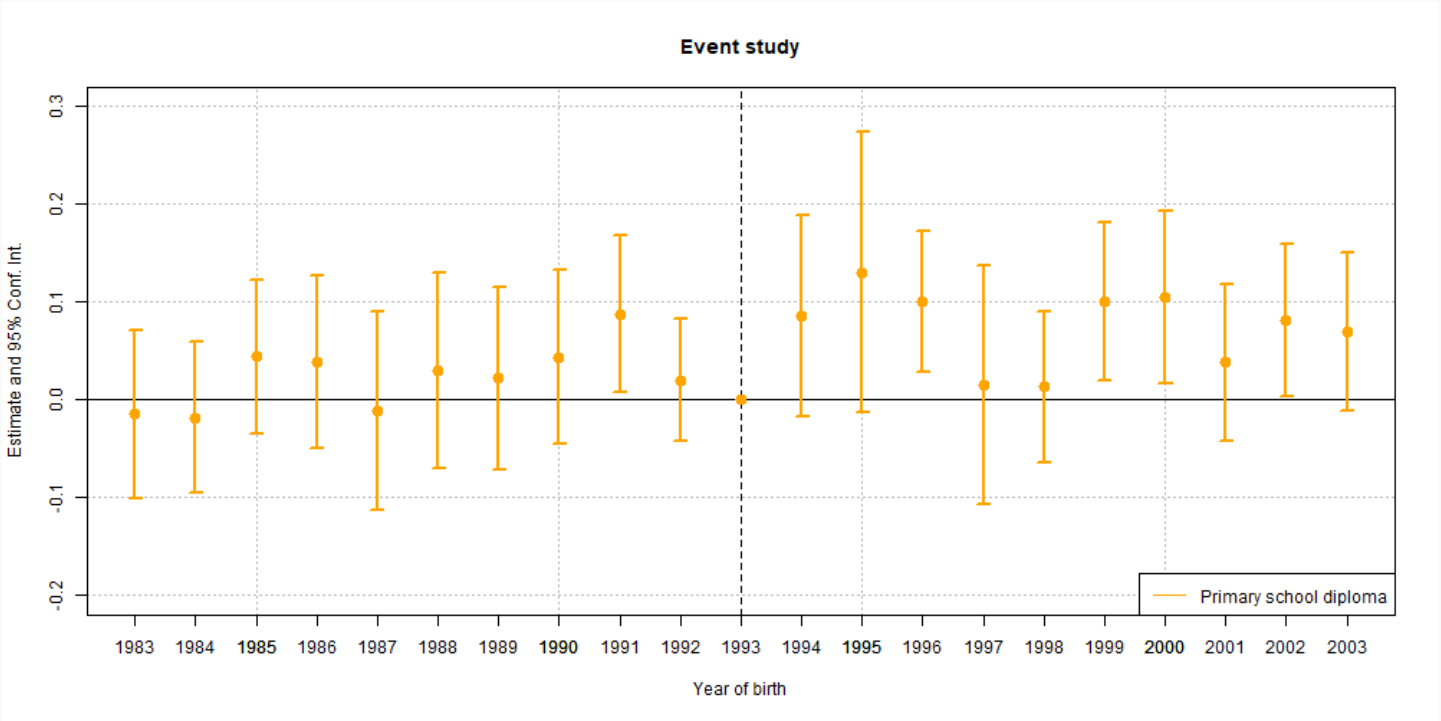

Appendix: Mean outcomes & effects

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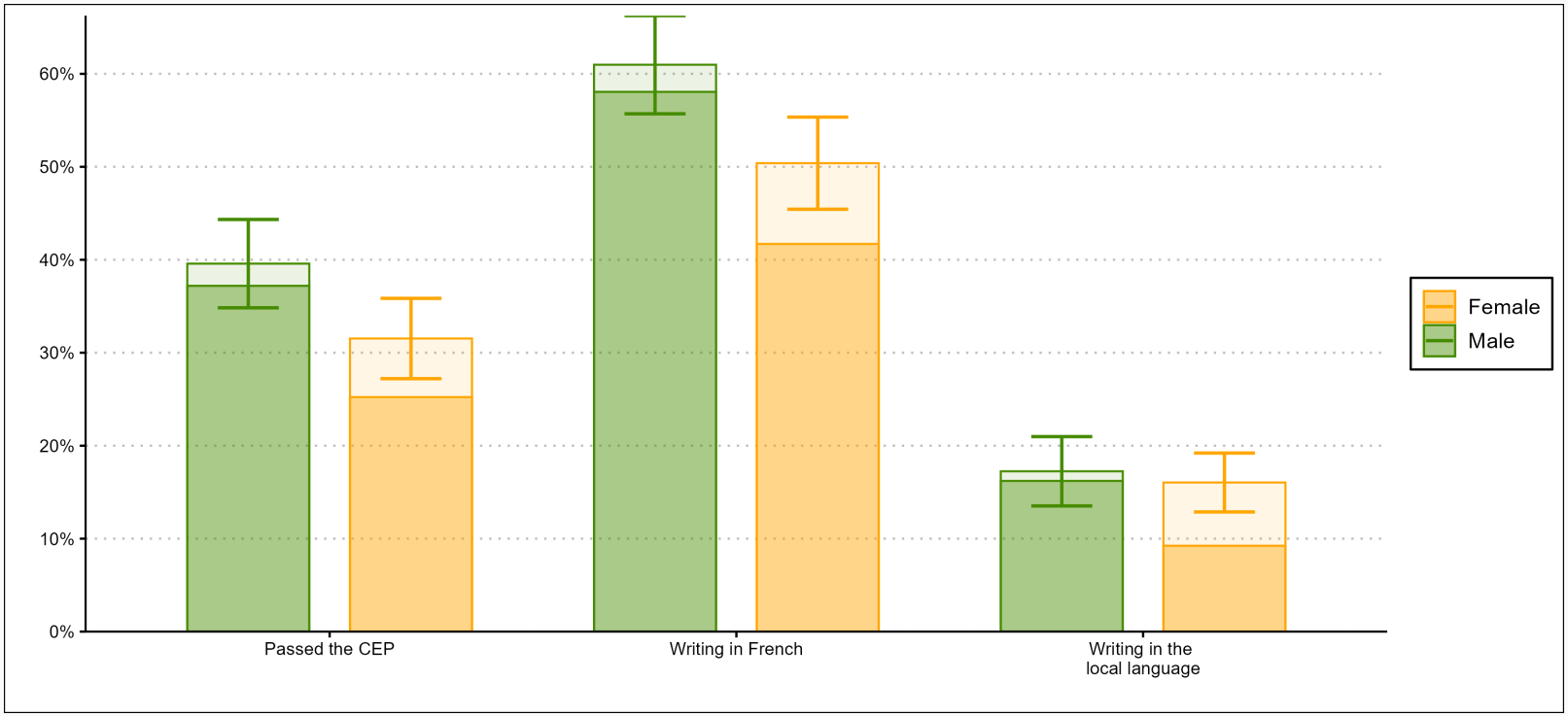

Appendix: Heterogeneity results for urban vs rural status

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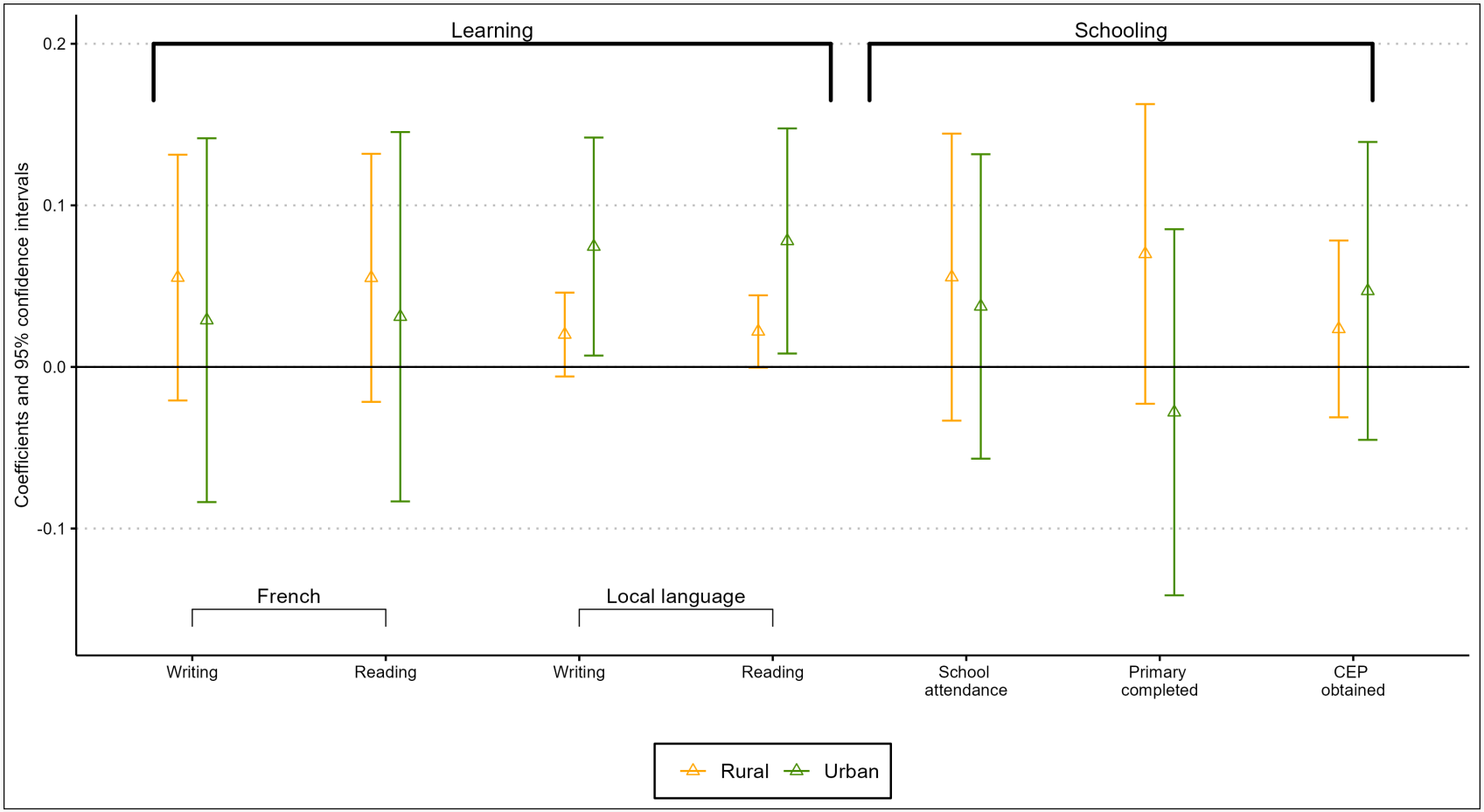

Figure 12: Results, by urban vs rural status

Appendix: Robustness check - Results for another language

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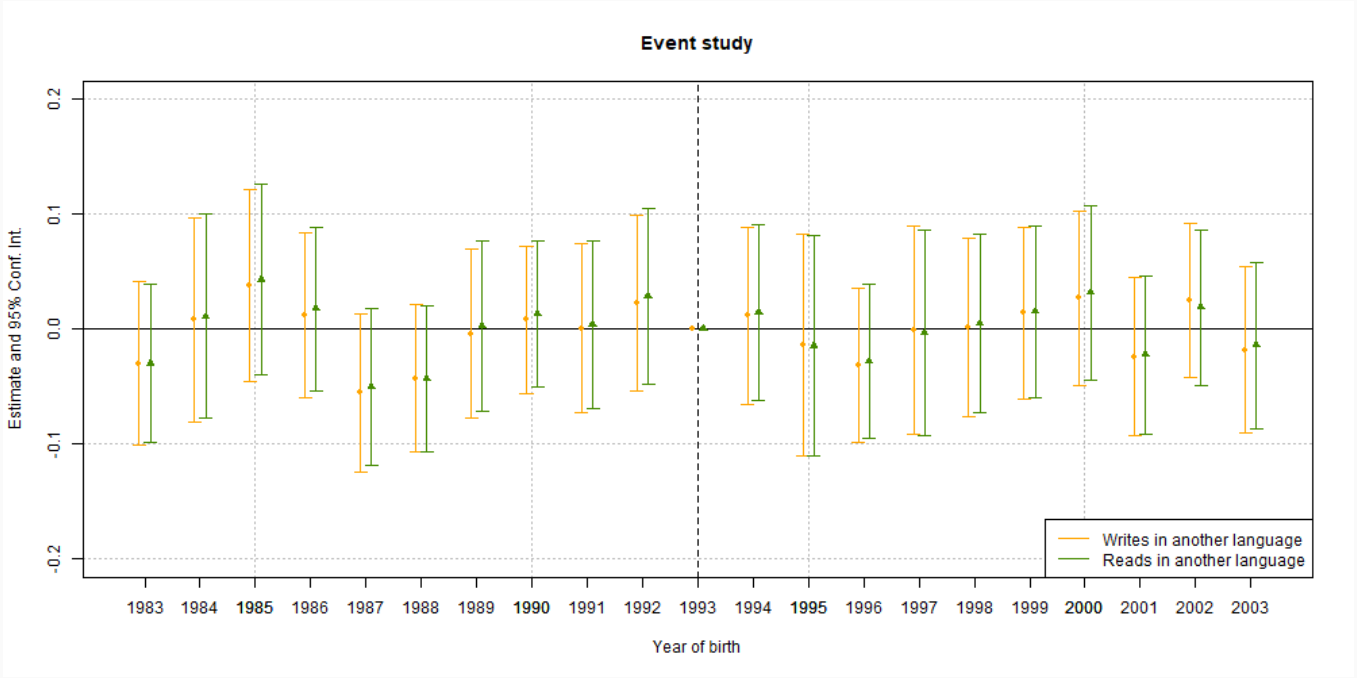

Appendix: Robustness check - Drop schools which switched to French only

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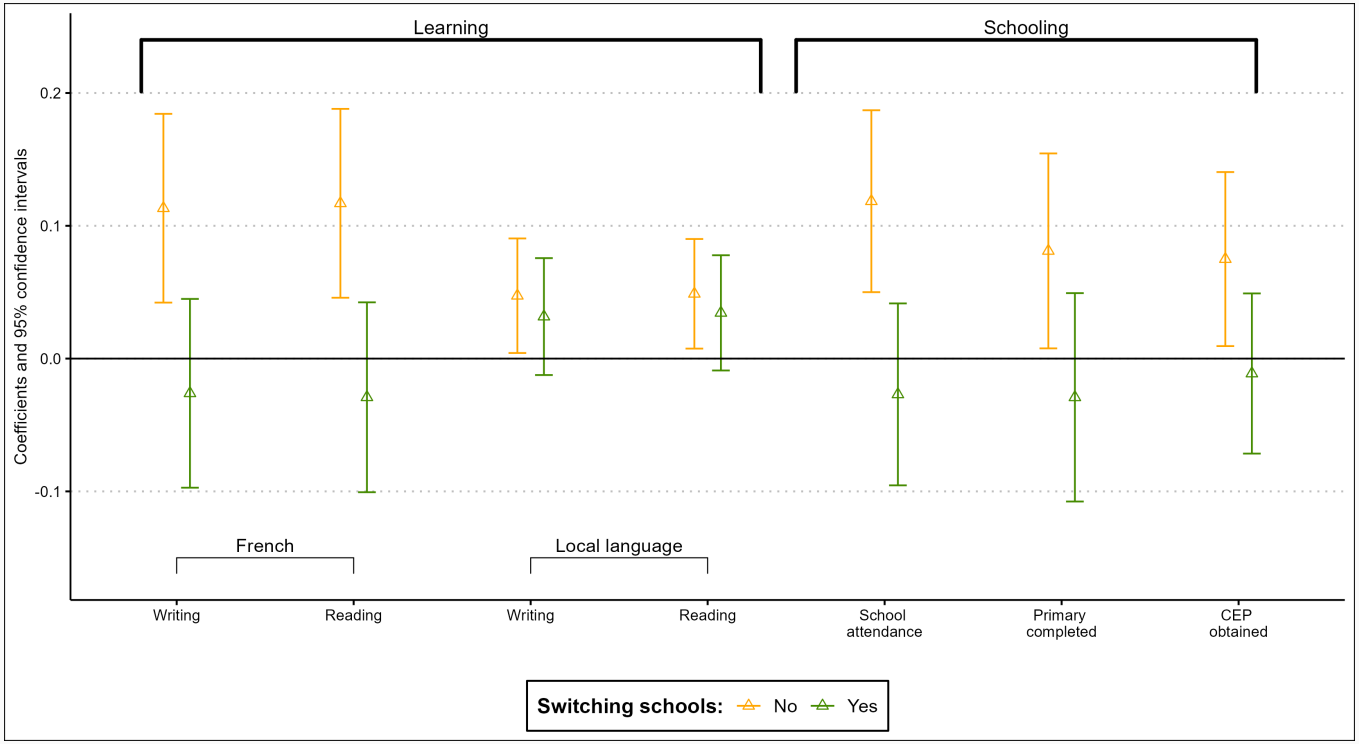

Appendix: Correlation between bilingual education supply & school growth

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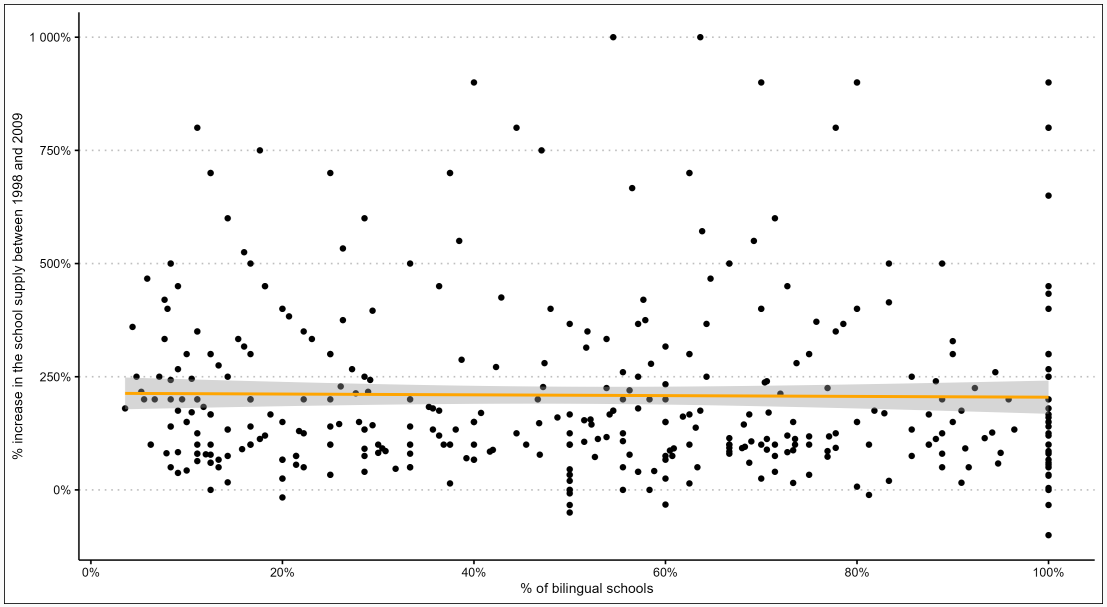

Figure 13: Correlation between the bilingual education supply and the school growth rate

Appendix: Correlation between treatment & school growth

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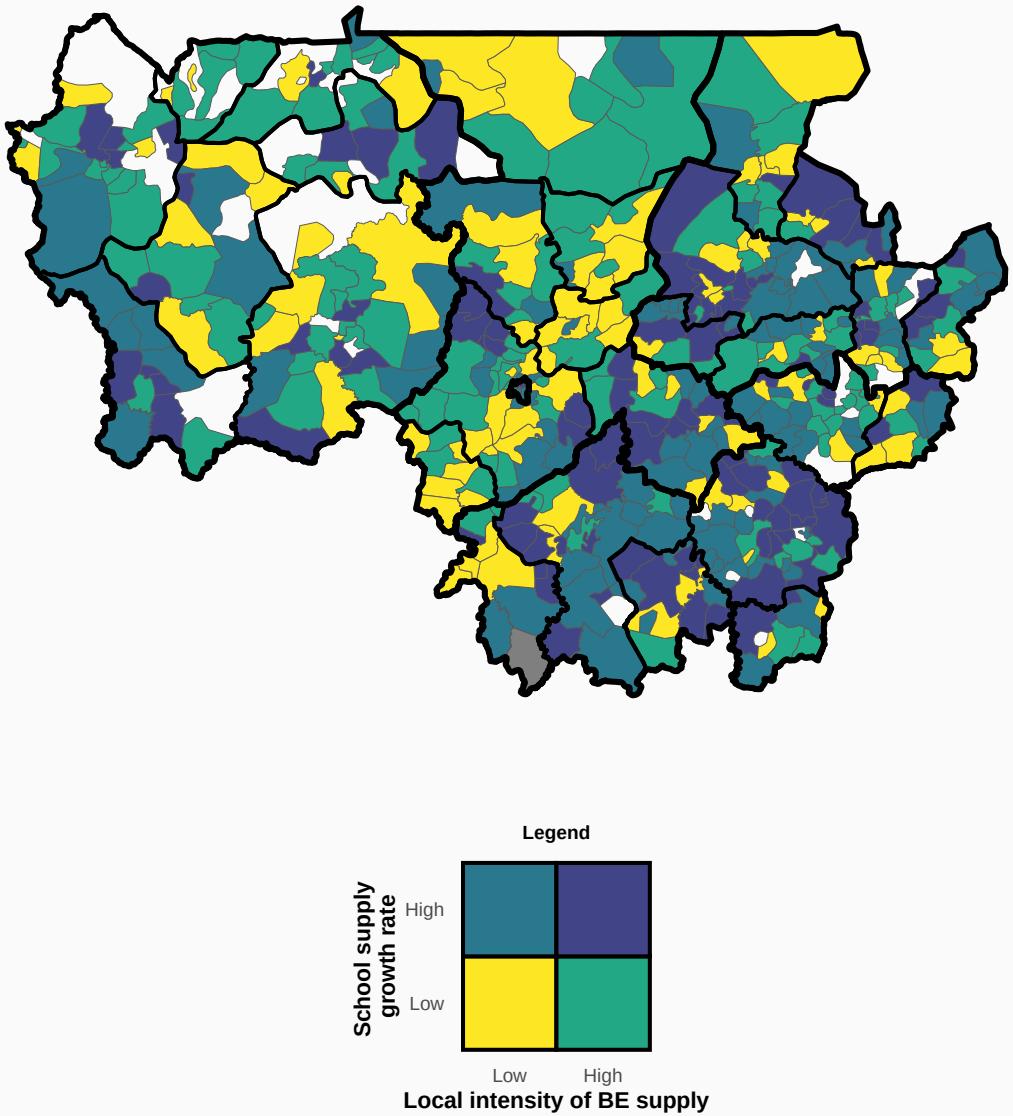

Figure 14: Correlation between treatment & school building growth rate

Appendix: Removing clusters close to the communal borders

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Language tested	Local language		French		Attended	Completed	Succeeded
Dependent Variables:	Writing		Reading		school	primary education	at the CEP
Model:	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Variables							
Born after 1994	0.148***	0.018	0.145***	0.017	0.161***	0.010	0.084***
	(0.021)	(0.013)	(0.021)	(0.012)	(0.022)	(0.020)	(0.017)
High exposed commune	0.033	0.032*	0.029	0.030*	0.029	0.047	0.051
	(0.049)	(0.018)	(0.049)	(0.018)	(0.042)	(0.041)	(0.039)
Born after 1994 ×	0.050	0.037*	0.051	0.036*	0.053*	0.016	0.018
High exposed commune	(0.031)	(0.019)	(0.031)	(0.019)	(0.032)	(0.033)	(0.028)
Fixed-effects							
District FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fit statistics							
Mean of Y	0.114	0.109	0.455	0.450	0.478	0.250	0.269
Observations	5,734	5,734	5,733	5,726	5,734	3,930	5,734
R^2	0.10913	0.06130	0.10605	0.06067	0.10695	0.07223	0.10559

Clustered (LSMS cluster) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Appendix: Staggered design

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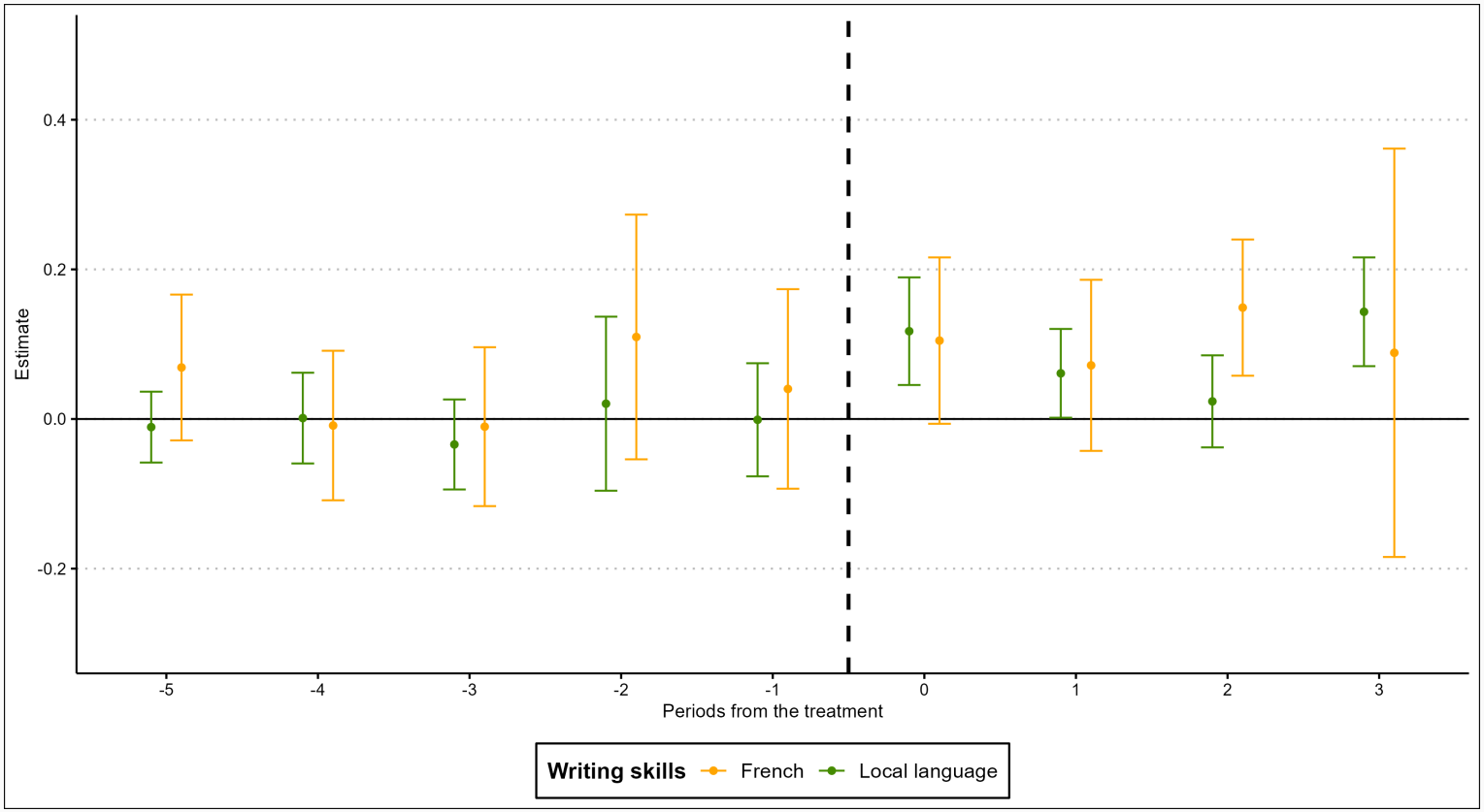

Figure 15: Event study with staggered design

Appendix: Potential confounders

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Dependent Variables:	Born here (0/1)	Age at the school entry
Model:	(1)	(2)
Variables		
High exposed commune	0.004	-0.003
	(0.003)	(0.041)
Fixed-effects		
District FE	Yes	Yes
Fit statistics		
Mean of Y	0.989	6.60
Observations	7,727	4,121
R^2	0.00713	0.08627

Clustered (LSMS cluster) standard-errors in parentheses

*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*