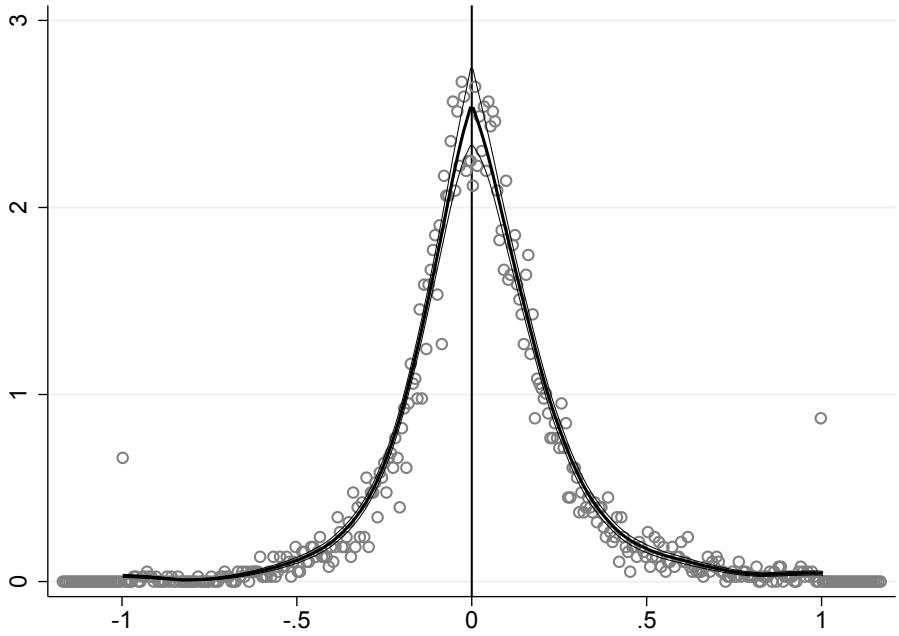
Online Appendix A. Figures and Tables
Political Turnover, Bureaucratic Turnover and the Quality of Public Services

Mitra Akhtari
Airbnb

Diana Moreira
U.C. Davis

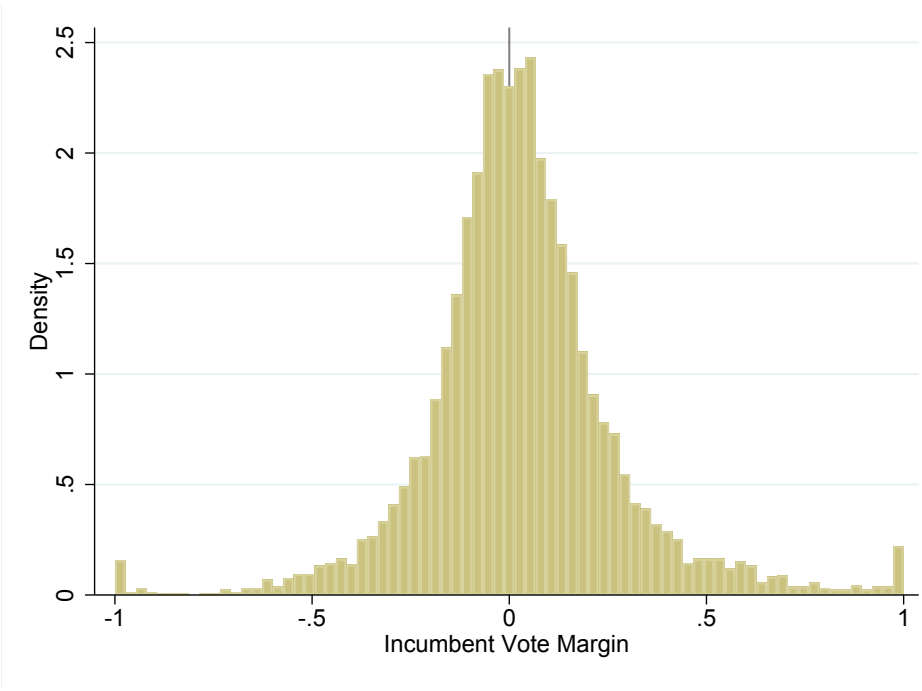
Laura Trucco
Amazon

FIGURE A.1: MCCRARY TEST FOR MANIPULATION OF INCUMBENT VOTE MARGIN



NOTES: THIS FIGURE SHOWS THE MCCRARY TEST FOR MANIPULATION OF THE RUNNING VARIABLE IN THE RDD, $IncumbVoteMargin$**. THE TEST FAILS TO REJECT THE NULL HYPOTHESIS THAT** $IncumbVoteMargin$ **IS CONTINUOUS AT THE ZERO THRESHOLD. THE ESTIMATED DISCONTINUITY IS -.0019 (LOG DIFFERENCE IN HEIGHT) WITH A STANDARD ERROR OF .0607.**

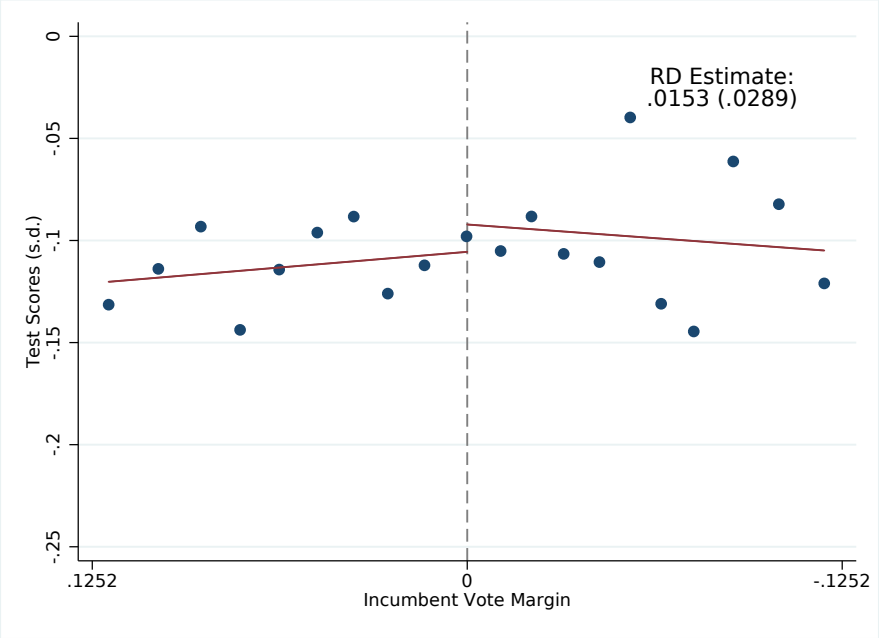
FIGURE A.2: DISTRIBUTION OF INCUMBENT VOTE MARGIN



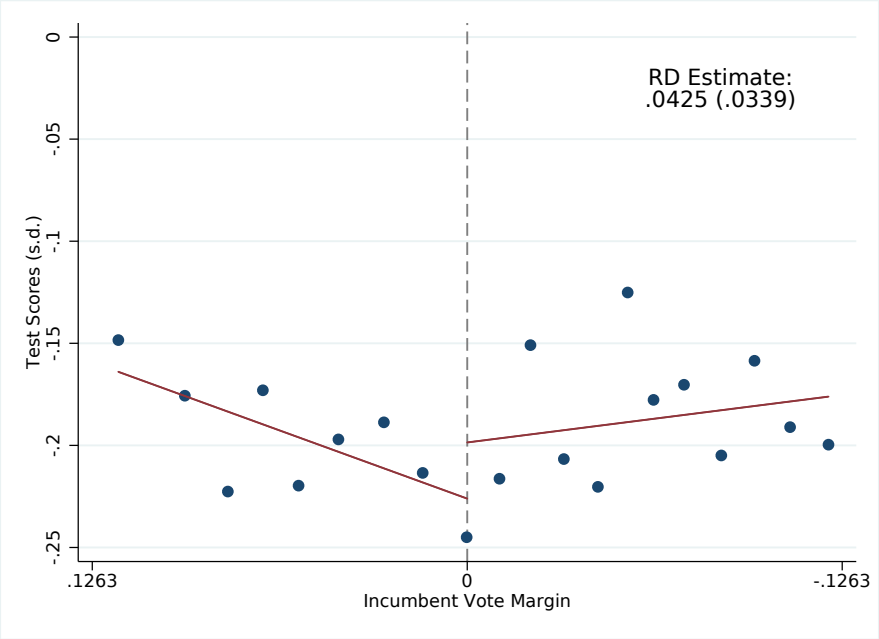
NOTES: THIS HISTOGRAM SHOWS THE DISTRIBUTION OF THE RUNNING VARIABLE IN THE RDD, $IncumbVoteMargin$**, IN OUR SAMPLE OF MUNICIPALITIES IN THE 2008 AND 2012 ELECTION CYCLE.** $IncumbVoteMargin$ **IS COMPUTED AS THE VOTE SHARE OF THE INCUMBENT POLITICAL PARTY MINUS THE VOTE SHARE OF THE INCUMBENT PARTY'S STRONGEST OPPONENT.**

FIGURE A.3: POLITICAL TURNOVER AND TEST SCORES AT BASELINE

(a) 4th Grade Test Score

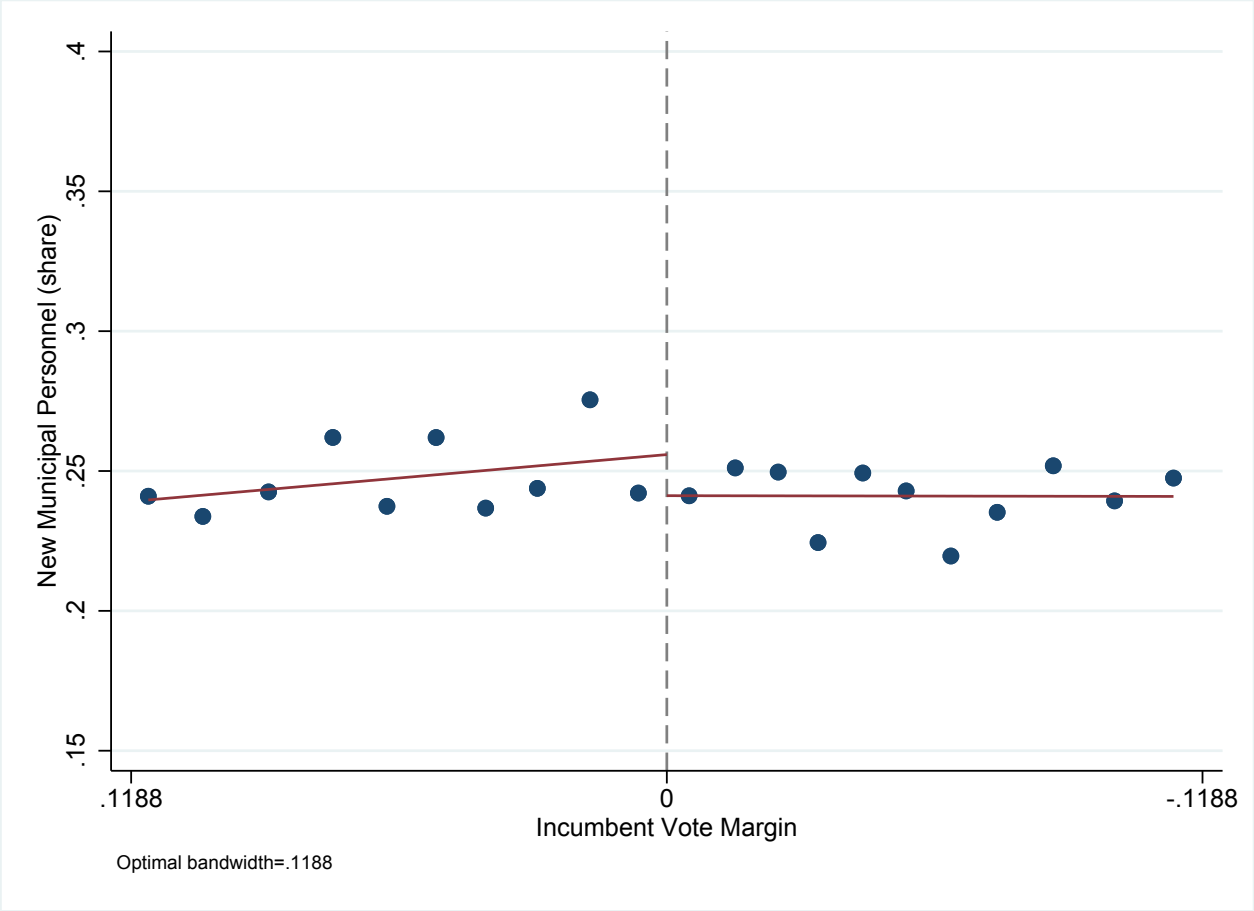


(b) 8th Grade Test Score



NOTES: THESE GRAPHS SHOW THE (LACK OF A) DISCONTINUITY IN TEST SCORES ONE YEAR PRIOR TO THE ELECTION AS A FUNCTION OF INCUMBENT VOTE MARGIN DURING THE ELECTION FOR INDIVIDUAL-LEVEL 4TH (PANEL A) AND 8TH (PANEL B) GRADE TEST SCORES. MUNICIPALITIES WITH $IncumbVoteMargin$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. TEST SCORES ARE FROM THE *Prova Brasil* EXAM AT BASELINE (THE YEAR BEFORE THE ELECTION) AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. THE SCHOOL-LEVEL AVERAGE TEST SCORES FOR THE RESPECTIVE GRADE PRIOR TO THE BASELINE YEAR IS INCLUDED AS A CONTROL.

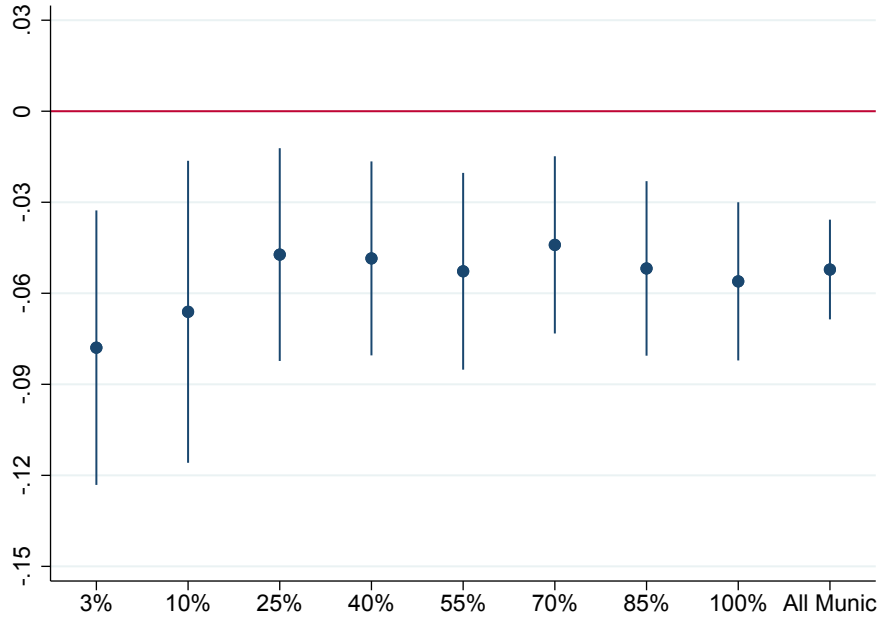
FIGURE A.4: POLITICAL TURNOVER AND NEW MUNICIPAL PERSONNEL CHANGES AT BASELINE



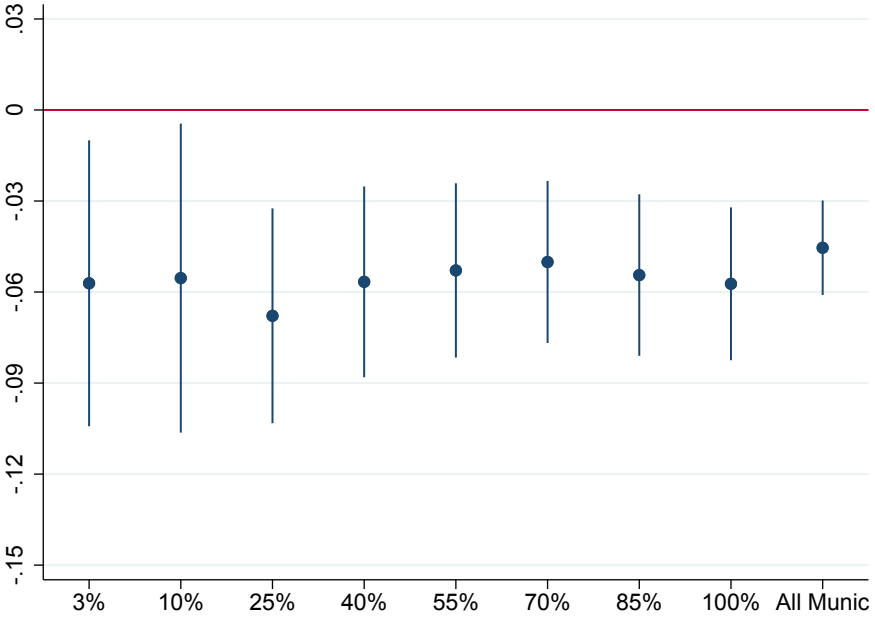
NOTES: THIS FIGURE SHOWS THE MEAN OF MUNICIPAL-LEVEL SHARE OF NEW MUNICIPAL PERSONNEL IN 2008 AND 2012 BY BINS OF *IncumbVoteMargin*. MUNICIPALITIES WITH *IncumbVoteMargin*<0 EXPERIENCED CHANGE IN THE POLITICAL PARTY OF THE MAYOR IN 2008 OR 2012 ELECTIONS. MUNICIPALITIES WITH *IncumbVoteMargin*>0 DID NOT EXPERIENCE CHANGE IN THE POLITICAL PARTY OF THE MAYOR IN 2008 OR 2012 ELECTIONS. NOTE THAT VALUES TO THE RIGHT SIDE OF THE ZERO ARE NEGATIVE (POLITICAL TURNOVER), WHILE VALUES ON THE LEFT SIDE ARE POSITIVE (NO POLITICAL TURNOVER). NEW MUNICIPAL PERSONNEL (SHARE) AT BASELINE IS THE RATIO BETWEEN THE NUMBER OF NEW LABOR CONTRACTS THAT HAD BEEN ADDED IN THE 12 MONTHS BEFORE THE ELECTION DIVIDED BY THE TOTAL NUMBER OF CONTRACTS THAT EXISTED ONE YEAR BEFORE THE ELECTION.

FIGURE A.5: EXTERNAL VALIDITY TEST SCORES

(a) 4th Grade Test Score

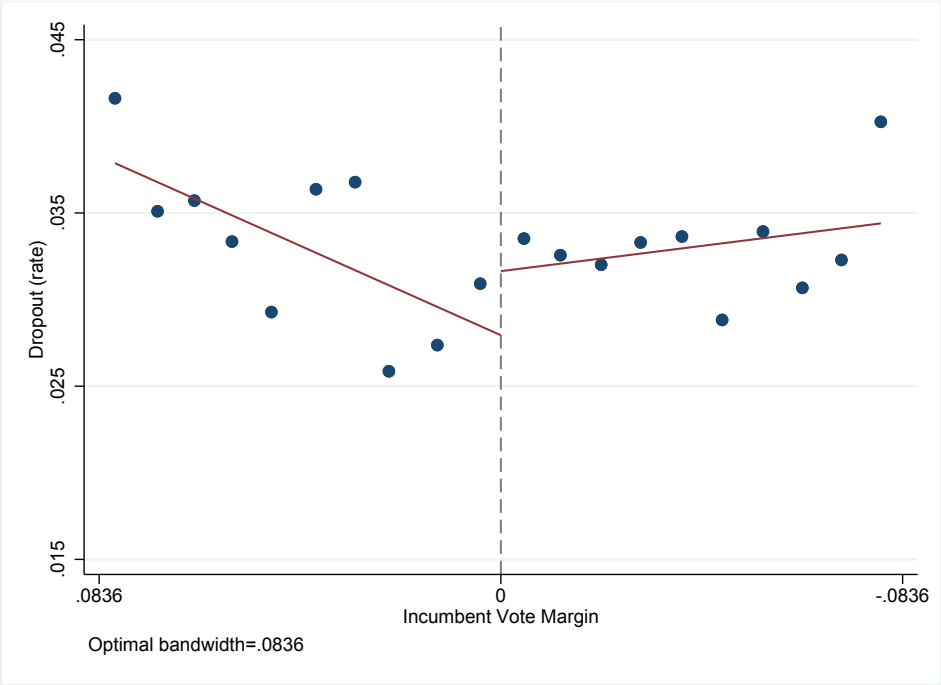


(b) 8th Grade Test Score



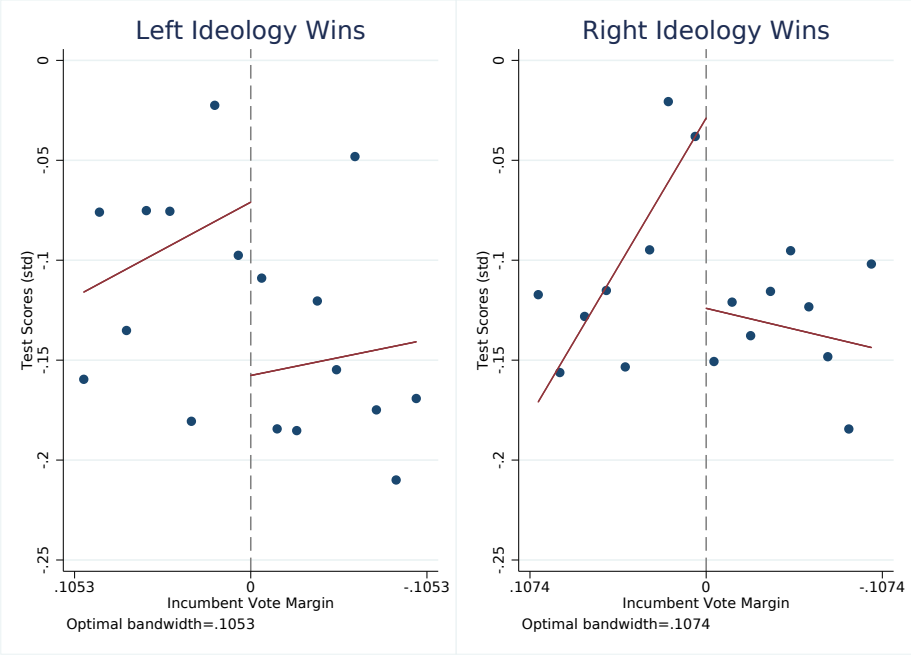
NOTES: THIS FIGURE SHOWS COEFFICIENTS ON POLITICAL TURNOVER FROM REGRESSING 1 WITHIN DIFFERENT BANDWIDTHS OF *IncumbVoteMargin* (X-AXIS). OUTCOME: INDIVIDUAL-LEVEL 4TH GRADE TEST SCORES (PANEL A) AND 8TH GRADE TEST SCORES (PANEL B). TEST SCORES ARE FROM THE PROVA BRASIL EXAM AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. ALL SPECIFICATIONS CONTROL FOR SCHOOL-LEVEL, AVERAGE TEST SCORES AT BASELINE (ONE YEAR BEFORE THE RESPECTIVE ELECTION). "ALL MUNIC" CATEGORY INCLUDES MUNICIPALITIES WHERE PARTY DID NOT RUN FOR REELECTION AND THEREFORE *IncumbVoteMargin* IS NOT DEFINED (OUT OF THE BANDWIDTH SAMPLE).

FIGURE A.6: POLITICAL TURNOVER AND SCHOOL-LEVEL DROPOUT RATES



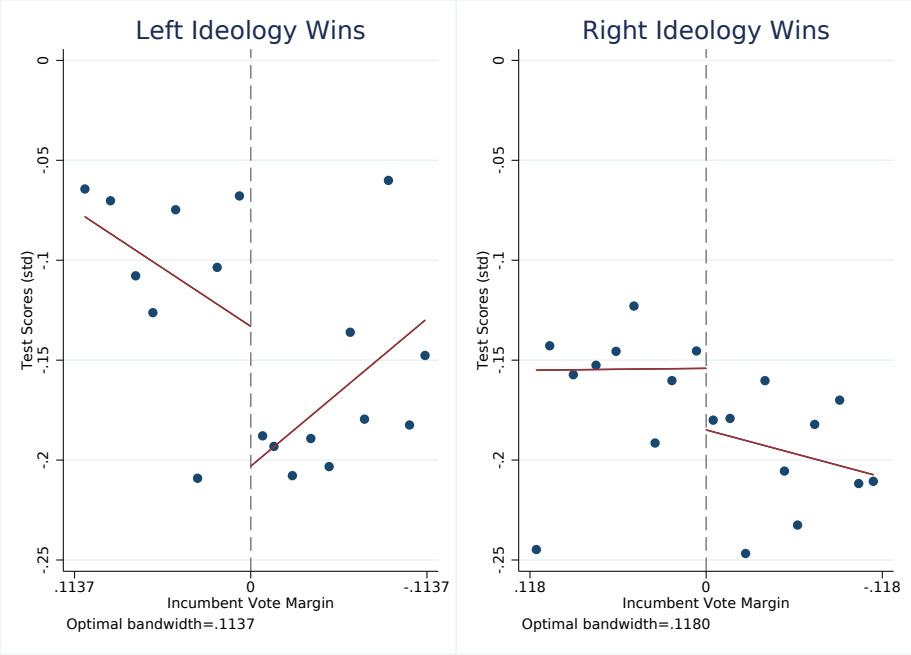
NOTES: THIS FIGURE SHOWS THE MEAN OF SCHOOL-LEVEL DROPOUT RATES BY BINS OF $IncumbVoteMargin$**. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SCHOOL-LEVEL DROPOUT RATE IS MEASURED BY THE SCHOOL CENSUS AND REFERS TO THE DROPOUT RATE FOR ALL STUDENTS WITHIN A SCHOOL (IN ALL GRADE LEVELS). THE SCHOOL-LEVEL DROPOUT RATE AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION) IS INCLUDED AS A CONTROL.**

FIGURE A.7: POLITICAL TURNOVER AND 4TH GRADE TEST SCORES IN MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT VS. THE RIGHT



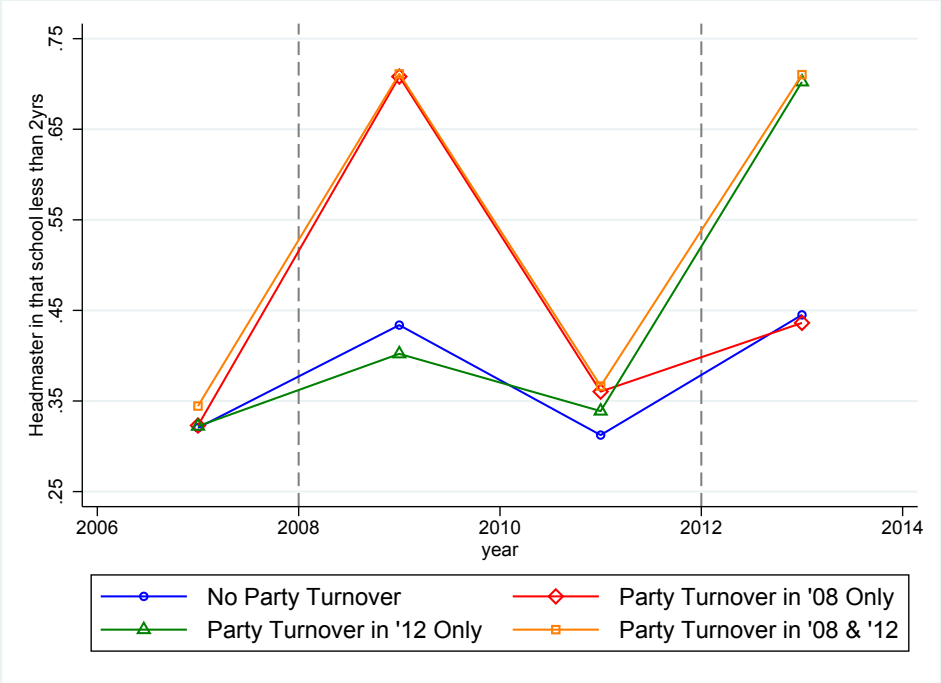
NOTES: THIS FIGURE SHOWS THE MEAN OF INDIVIDUAL-LEVEL 4TH GRADE TEST SCORES BY BINS OF $IncumbVoteMargin$ SEPARATELY FOR MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT AND THOSE WHERE THE WINNING PARTY WAS FROM THE RIGHT. MUNICIPALITIES WITH $IncumbVoteMargin$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. TEST SCORES ARE FROM THE *Prova Brasil* EXAM AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. AVERAGE, SCHOOL-LEVEL 4TH GRADE TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION) IS INCLUDED AS A CONTROL. PARTY IDEOLOGY IS CLASSIFIED AS BELONGING TO THE LEFT VS. THE RIGHT ACCORDING TO *Atlas Político – Mapa do Congresso*.

FIGURE A.8: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES IN MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT VS. THE RIGHT



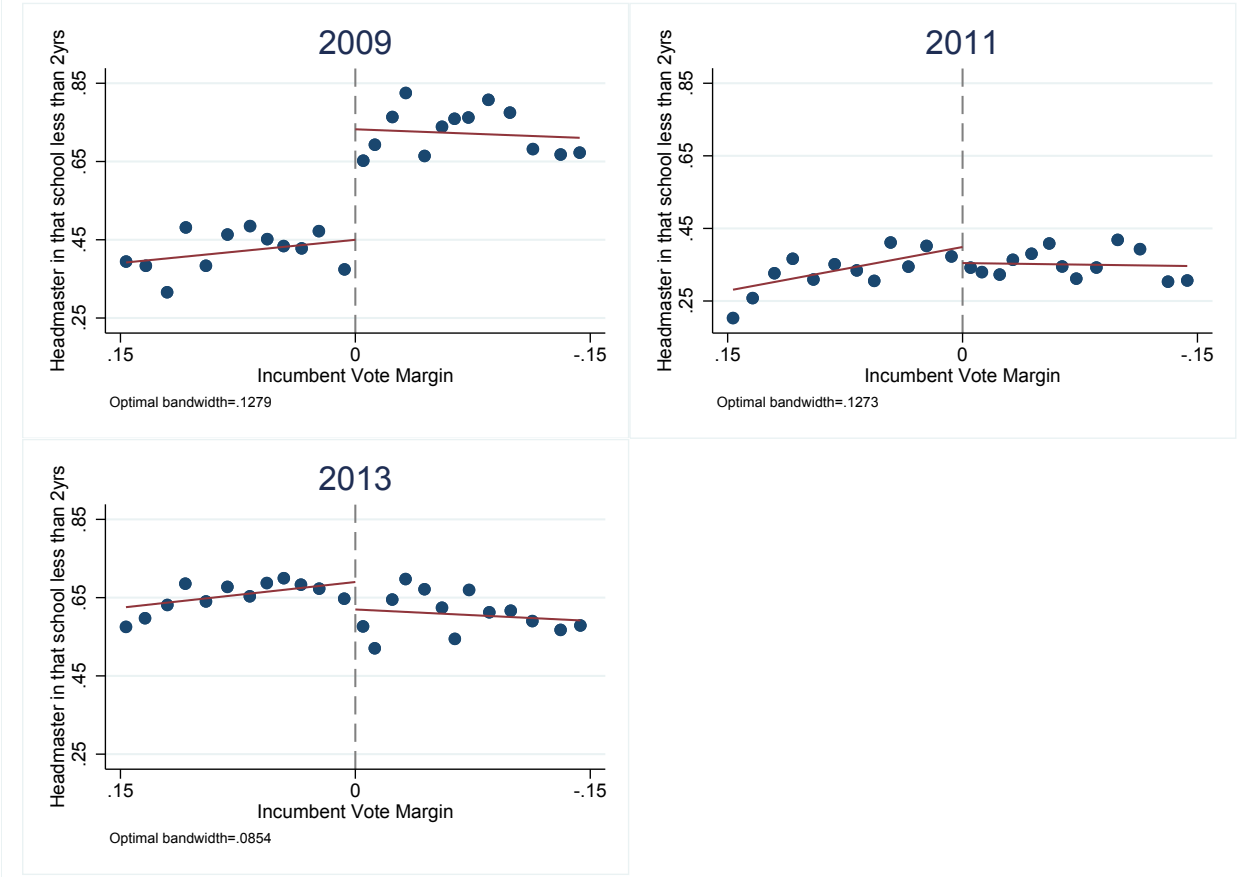
NOTES: THIS FIGURE SHOWS THE MEAN OF INDIVIDUAL-LEVEL 8TH GRADE TEST SCORES BY BINS OF $IncumbVoteMargin$ SEPARATELY FOR MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT AND THOSE WHERE THE WINNING PARTY WAS FROM THE RIGHT. MUNICIPALITIES WITH $IncumbVoteMargin$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. TEST SCORES ARE FROM THE *Prova Brasil* EXAM AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. AVERAGE, SCHOOL-LEVEL 8TH GRADE TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION) IS INCLUDED AS A CONTROL. PARTY IDEOLOGY IS CLASSIFIED AS BELONGING TO THE LEFT VS. THE RIGHT ACCORDING TO *Atlas Político – Mapa do Congresso*.

FIGURE A.9: POLITICAL TURNOVER AND HEADMASTER REPLACEMENT - EVENT STUDY



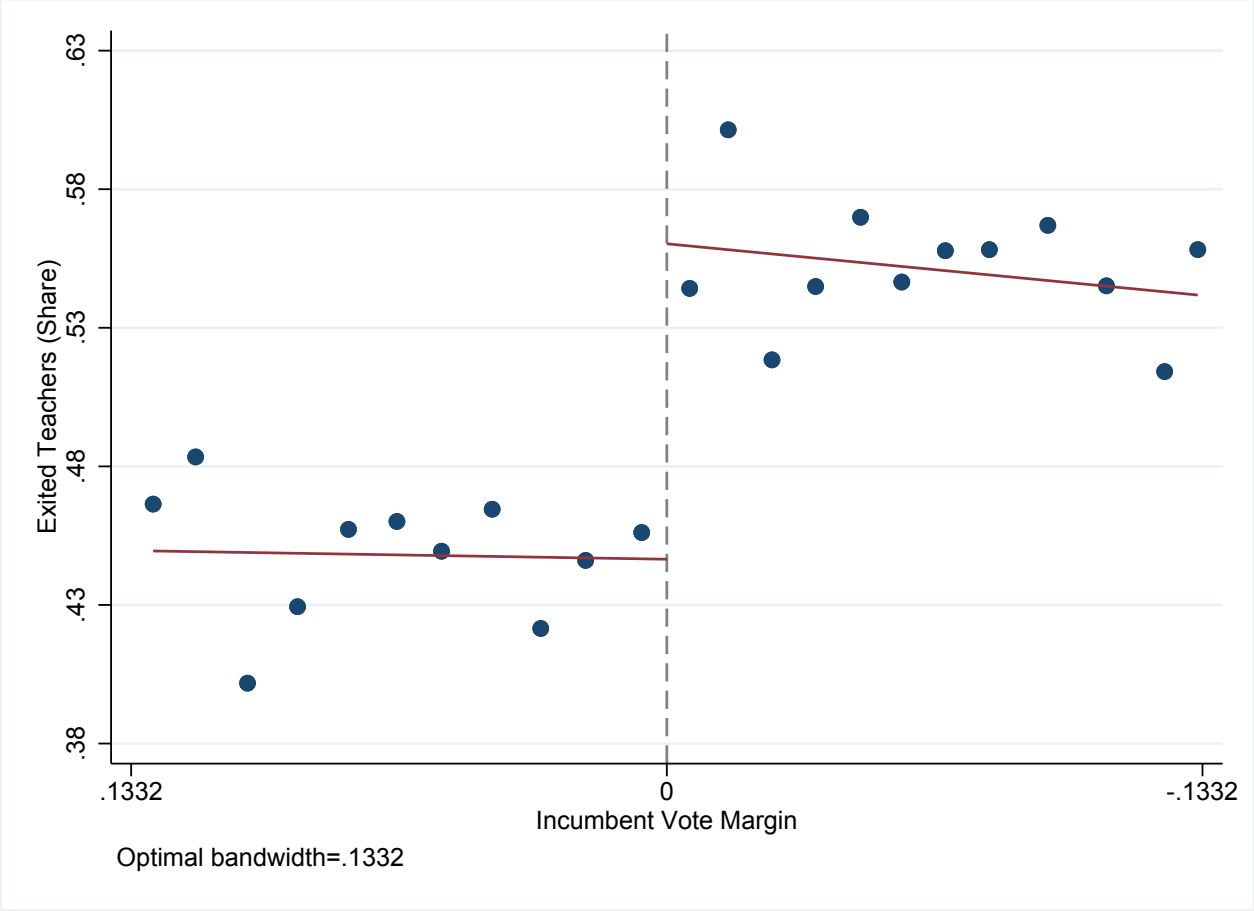
NOTES: THIS FIGURE SHOWS THE SHARE OF SCHOOLS WITH A NEW HEADMASTER IN MUNICIPALITIES THAT: DID NOT EXPERIENCE PARTY TURNOVER IN EITHER ELECTION CYCLE, EXPERIENCED PARTY TURNOVER ONLY IN 2008, EXPERIENCED PARTY TURNOVER ONLY IN 2012, OR EXPERIENCED PARTY TURNOVER IN BOTH ELECTION CYCLES. NEW HEADMASTERS ARE THOSE THAT REPORT BEING THE HEADMASTER OF THEIR CURRENT SCHOOL FOR LESS THAN TWO YEARS ON THE *Prova Brasil* HEADMASTER QUESTIONNAIRE.

FIGURE A.10: POLITICAL TURNOVER IN 2008 AND HEADMASTER REPLACEMENT 1, 3, AND 5 YEARS AFTER THE ELECTION



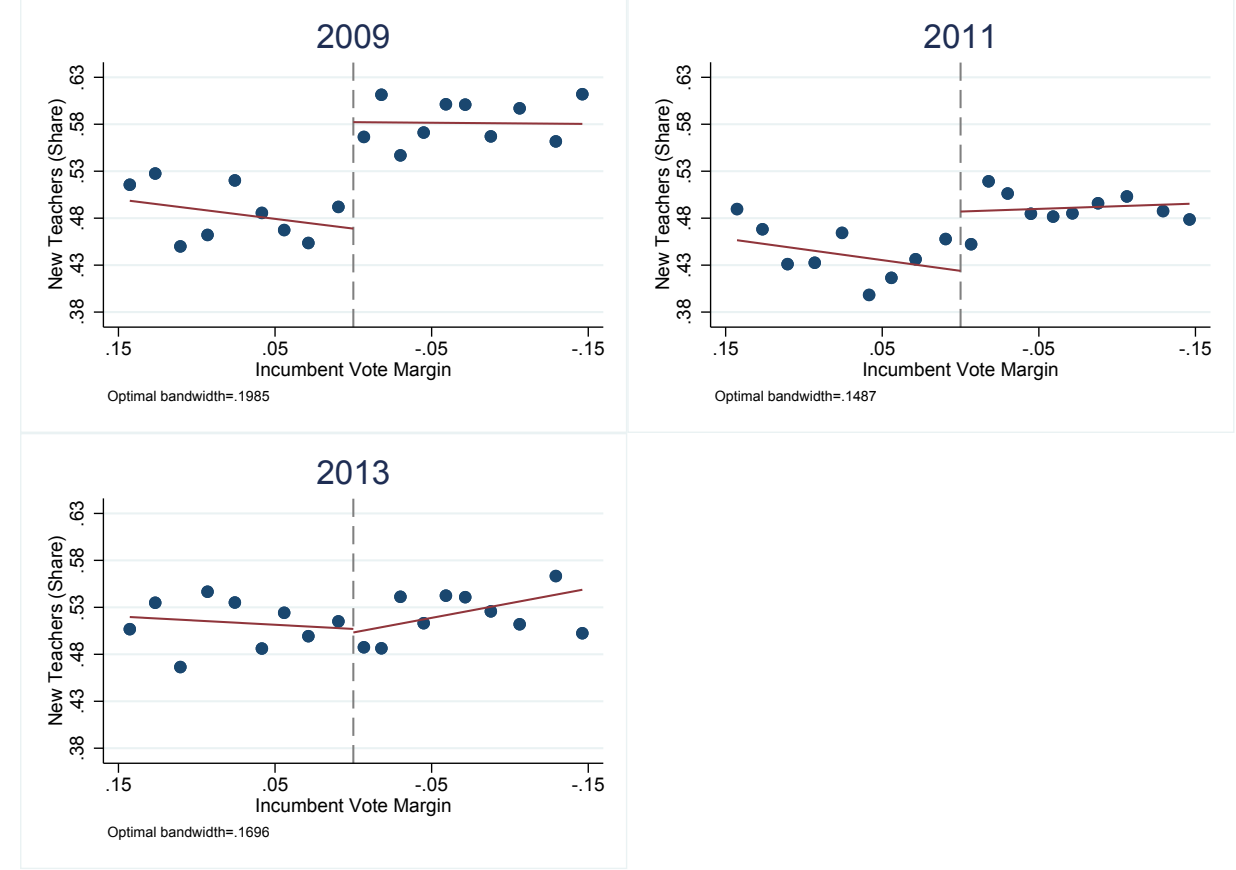
NOTES: THIS FIGURE SHOWS THE SHARE OF SCHOOLS WITH A NEW HEADMASTER BY BINS OF $IncumbVoteMargin_{2008}$ **SEPARATELY FOR EACH YEAR** t**, WHERE** t **IS ONE YEAR, THREE YEARS, AND FIVE YEARS AFTER THE 2008 ELECTION. MUNICIPALITIES WITH** $IncumbVoteMargin_{2008}$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin_{2008}$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. NEW HEADMASTERS ARE THOSE THAT REPORT BEING THE HEADMASTER OF THEIR CURRENT SCHOOL FOR LESS THAN TWO YEARS ON THE *Prova Brasil* HEADMASTER QUESTIONNAIRE.**

FIGURE A.11: POLITICAL TURNOVER AND TEACHERS WHO HAVE LEFT



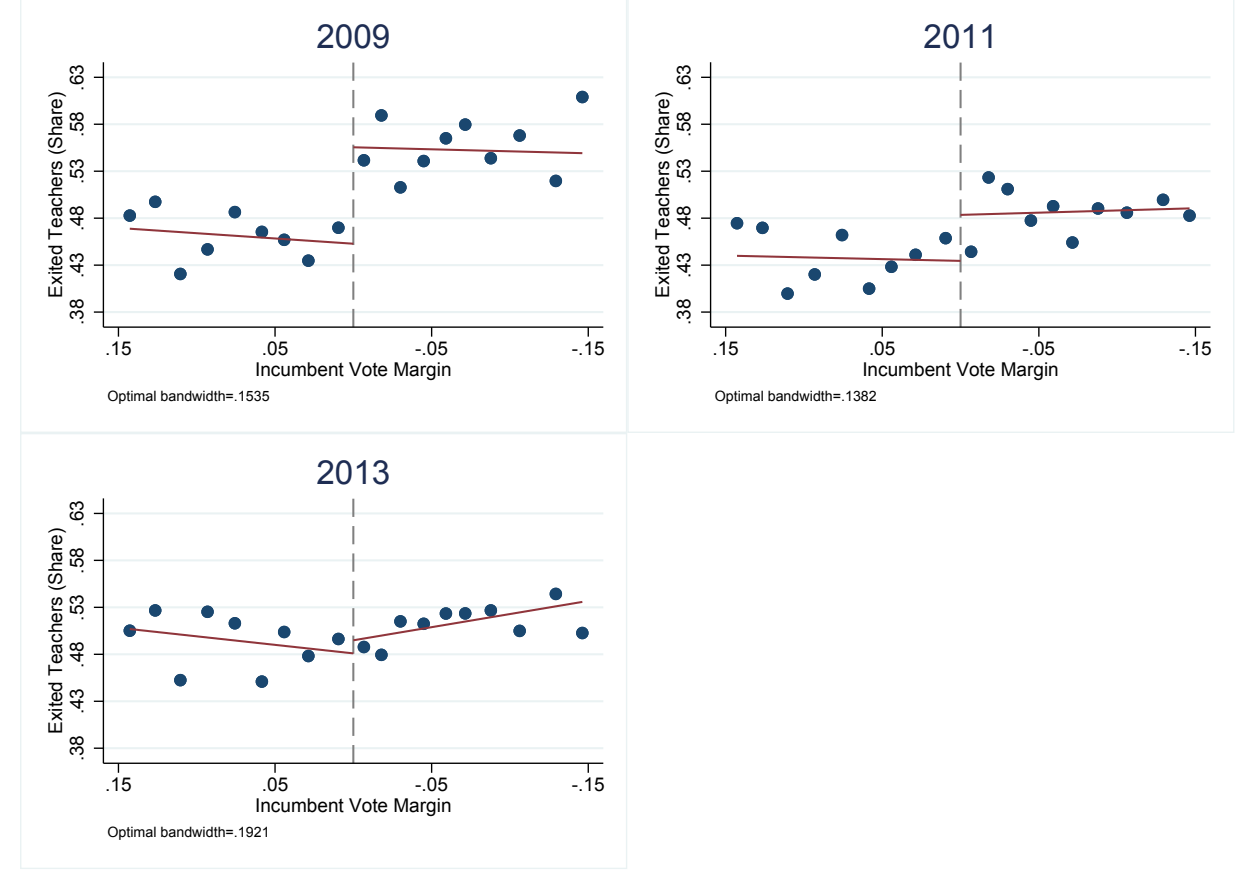
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS WHO HAVE LEFT THE SCHOOL BY BINS OF $IncumbVoteMargin$**. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS WHO HAVE LEFT A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO WERE IN THAT SCHOOL AT TIME** $t-2$ **(THE YEAR BEFORE THE RESPECTIVE ELECTION) BUT ARE NO LONGER IN THAT SAME SCHOOL AT TIME** t **(ONE YEAR AFTER THE RESPECTIVE ELECTION).**

FIGURE A.12: POLITICAL TURNOVER IN 2008 AND NEW TEACHERS 1, 3, AND 5 YEARS AFTER THE ELECTION



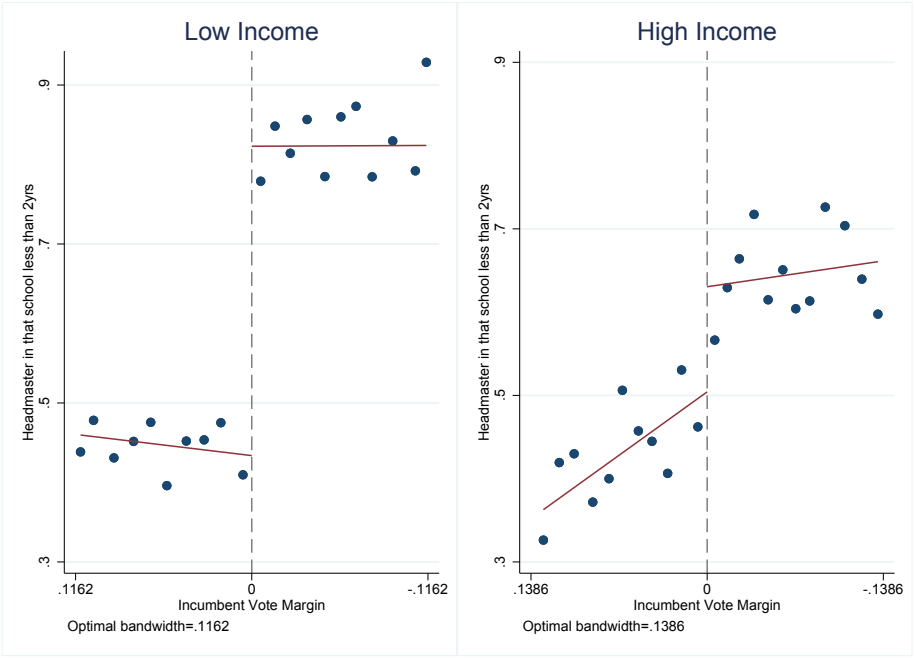
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT ARE NEW TO A SCHOOL BY BINS OF $IncumbVoteMargin_{2008}$ SEPARATELY FOR EACH YEAR t, WHERE t IS ONE YEAR, THREE YEARS, AND FIVE YEARS AFTER THE 2008 ELECTION. MUNICIPALITIES WITH $IncumbVoteMargin_{2008}$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin_{2008}$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS THAT ARE NEW TO A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO ARE IN THAT SCHOOL AT TIME t BUT WERE NOT IN THAT SAME SCHOOL AT TIME $t-2$.

FIGURE A.13: POLITICAL TURNOVER IN 2008 AND TEACHERS THAT HAVE LEFT 1, 3, AND 5 YEARS AFTER THE ELECTION



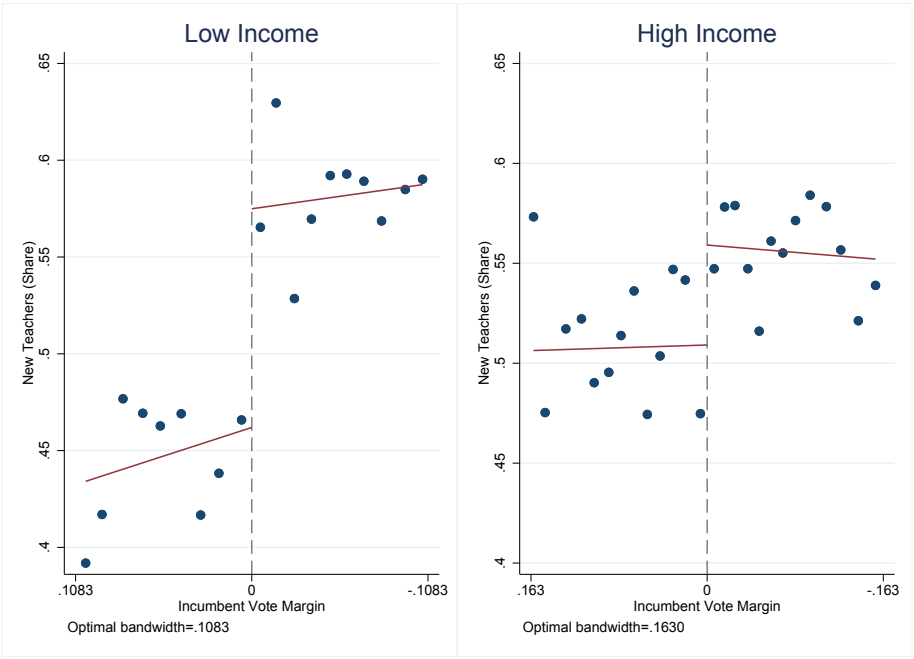
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL BY BINS OF $IncumbVoteMargin_{2008}$ **SEPARATELY FOR EACH YEAR** t**, WHERE** t **IS ONE YEAR, THREE YEARS, AND FIVE YEARS AFTER THE 2008 ELECTION. MUNICIPALITIES WITH** $IncumbVoteMargin_{2008}$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR IN 2008. MUNICIPALITIES WITH** $IncumbVoteMargin_{2008}$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR IN 2008. THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO WERE IN THAT SCHOOL AT TIME** $t-2$ **BUT ARE NO LONGER IN THAT SAME SCHOOL AT TIME** t**.**

FIGURE A.14: POLITICAL TURNOVER AND HEADMASTER REPLACEMENT IN LOW- AND HIGH-INCOME MUNICIPALITIES



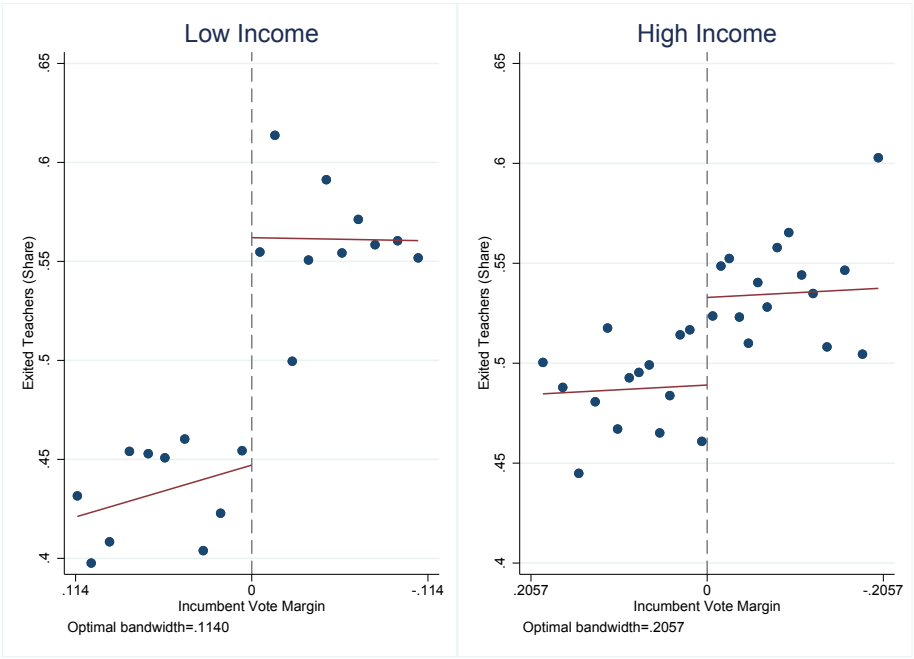
NOTES: THIS FIGURE SHOWS THE SHARE OF SCHOOLS WITH A NEW HEADMASTER BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR MUNICIPALITIES WITH HIGH AND LOW INCOME. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. NEW HEADMASTERS ARE THOSE THAT REPORT BEING THE HEADMASTER OF THEIR CURRENT SCHOOL FOR LESS THAN TWO YEARS ON THE *Prova Brasil* HEADMASTER QUESTIONNAIRE. LOW-INCOME MUNICIPALITIES ARE THOSE BELOW THE MEDIAN IN THE MUNICIPAL-LEVEL DISTRIBUTION OF MEDIAN MONTHLY HOUSEHOLD INCOME AS MEASURED IN THE 2000 CENSUS. HIGH INCOME MUNICIPALITIES ARE THOSE ABOVE THE MEDIAN IN THIS DISTRIBUTION.**

FIGURE A.15: POLITICAL TURNOVER AND NEW TEACHERS IN LOW- AND HIGH-INCOME MUNICIPALITIES



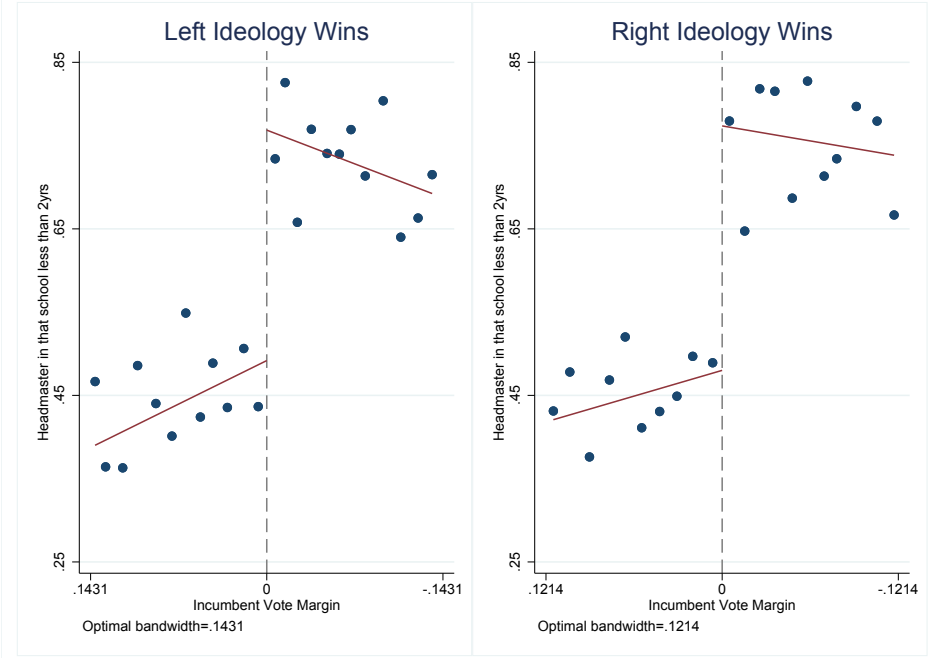
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT ARE NEW TO A SCHOOL BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR MUNICIPALITIES WITH HIGH AND LOW INCOME. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS THAT ARE NEW TO A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO ARE IN THAT SCHOOL AT TIME** t **(ONE YEAR AFTER THE RESPECTIVE ELECTION) BUT WERE NOT IN THAT SAME SCHOOL AT TIME** $t-2$ **(THE YEAR BEFORE THE RESPECTIVE ELECTION). LOW-INCOME MUNICIPALITIES ARE THOSE BELOW THE MEDIAN IN THE MUNICIPAL-LEVEL DISTRIBUTION OF MEDIAN MONTHLY HOUSEHOLD INCOME AS MEASURED IN THE 2000 CENSUS. HIGH INCOME MUNICIPALITIES ARE THOSE ABOVE THE MEDIAN IN THIS DISTRIBUTION.**

FIGURE A.16: POLITICAL TURNOVER AND TEACHERS THAT HAVE LEFT IN LOW- AND HIGH-INCOME MUNICIPALITIES



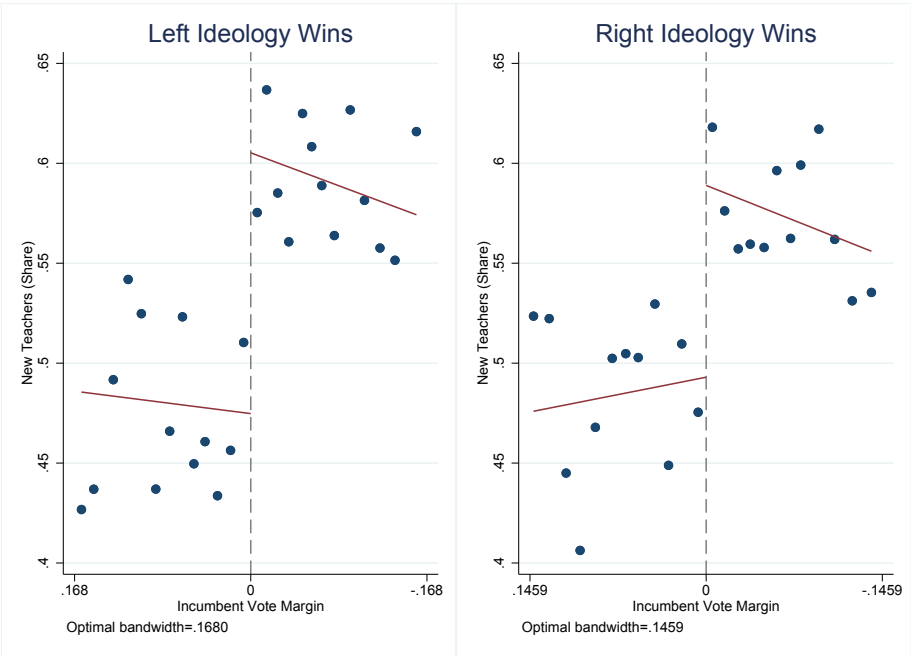
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR MUNICIPALITIES WITH HIGH AND LOW INCOME. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO WERE IN THAT SCHOOL AT TIME** $t-2$ **(THE YEAR BEFORE THE RESPECTIVE ELECTION) BUT ARE NO LONGER IN THAT SAME SCHOOL AT TIME** t **(ONE YEAR AFTER THE RESPECTIVE ELECTION). LOW-INCOME MUNICIPALITIES ARE THOSE BELOW THE MEDIAN IN THE MUNICIPAL-LEVEL DISTRIBUTION OF MEDIAN MONTHLY HOUSEHOLD INCOME AS MEASURED IN THE 2000 CENSUS. HIGH INCOME MUNICIPALITIES ARE THOSE ABOVE THE MEDIAN IN THIS DISTRIBUTION.**

FIGURE A.17: POLITICAL TURNOVER AND HEADMASTER REPLACEMENT IN MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT VS. THE RIGHT



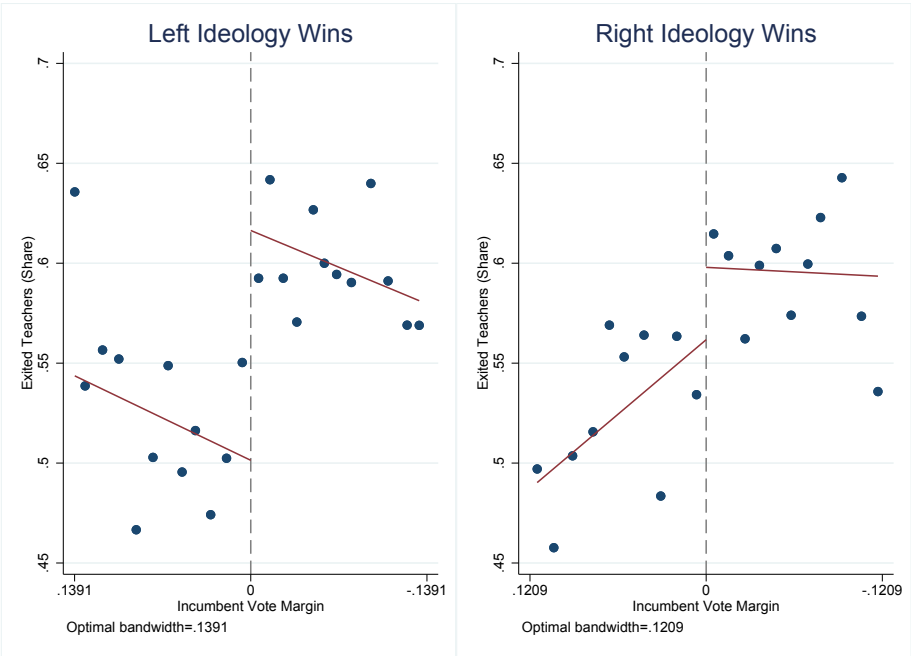
NOTES: THIS FIGURE SHOWS THE SHARE OF SCHOOLS WITH A NEW HEADMASTER BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT AND THOSE WHERE THE WINNING PARTY WAS FROM THE RIGHT. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. NEW HEADMASTERS ARE THOSE THAT REPORT BEING THE HEADMASTER OF THEIR CURRENT SCHOOL FOR LESS THAN TWO YEARS ON THE *Prova Brasil* HEADMASTER QUESTIONNAIRE. PARTY IDEOLOGY IS CLASSIFIED AS BELONGING TO THE LEFT VS. THE RIGHT ACCORDING TO *Atlas Político – Mapa do Congresso*.**

FIGURE A.18: POLITICAL TURNOVER AND NEW TEACHERS IN MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT VS. THE RIGHT



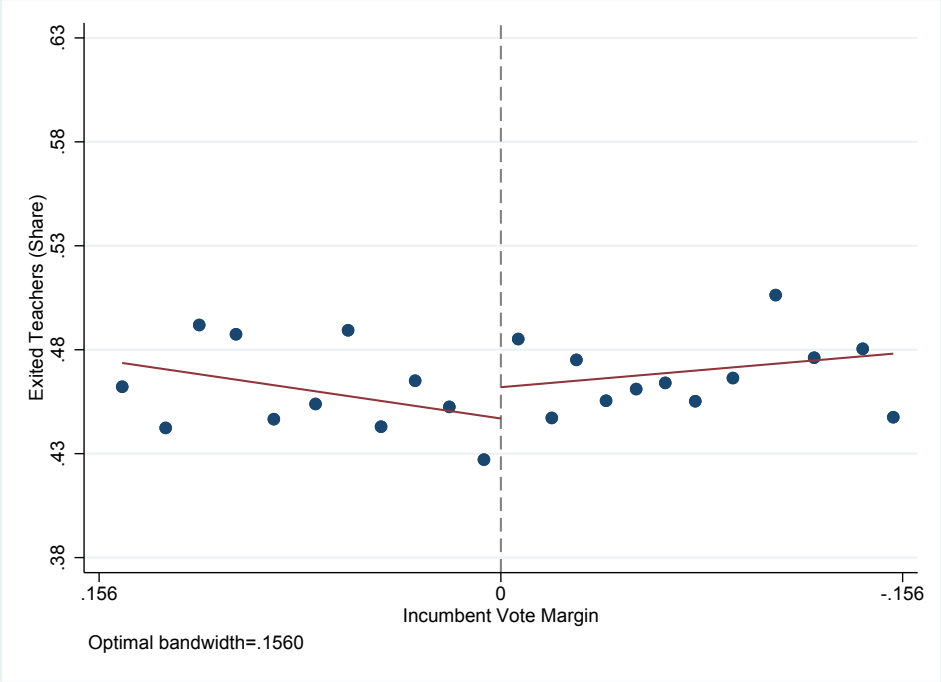
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT ARE NEW TO A SCHOOL BY BINS OF $IncumbVoteMargin$ SEPARATELY FOR MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT AND THOSE WHERE THE WINNING PARTY WAS FROM THE RIGHT. MUNICIPALITIES WITH $IncumbVoteMargin$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS THAT ARE NEW TO A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO ARE IN THAT SCHOOL AT TIME t (ONE YEAR AFTER THE RESPECTIVE ELECTION) BUT WERE NOT IN THAT SAME SCHOOL AT TIME $t-2$ (THE YEAR BEFORE THE RESPECTIVE ELECTION). PARTY IDEOLOGY IS CLASSIFIED AS BELONGING TO THE LEFT VS. THE RIGHT ACCORDING TO *Atlas Político – Mapa do Congresso*.

FIGURE A.19: POLITICAL TURNOVER AND TEACHERS THAT HAVE LEFT IN MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT VS. THE RIGHT



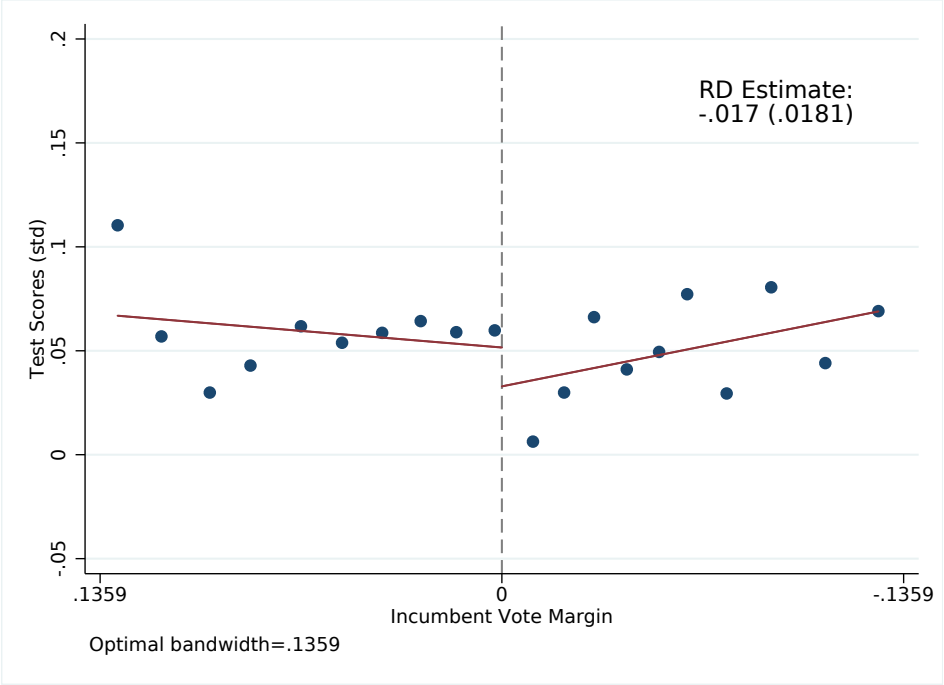
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR MUNICIPALITIES WHERE THE WINNING PARTY WAS FROM THE LEFT AND THOSE WHERE THE WINNING PARTY WAS FROM THE RIGHT. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO WERE IN THAT SCHOOL AT TIME** $t-2$ **(THE YEAR BEFORE THE RESPECTIVE ELECTION) BUT ARE NO LONGER IN THAT SAME SCHOOL AT TIME** t **(ONE YEAR AFTER THE RESPECTIVE ELECTION). PARTY IDEOLOGY IS CLASSIFIED AS BELONGING TO THE LEFT VS. THE RIGHT ACCORDING TO *Atlas Político – Mapa do Congresso*.**

FIGURE A.20: POLITICAL TURNOVER AND TEACHERS THAT HAVE LEFT IN NON-MUNICIPAL SCHOOLS



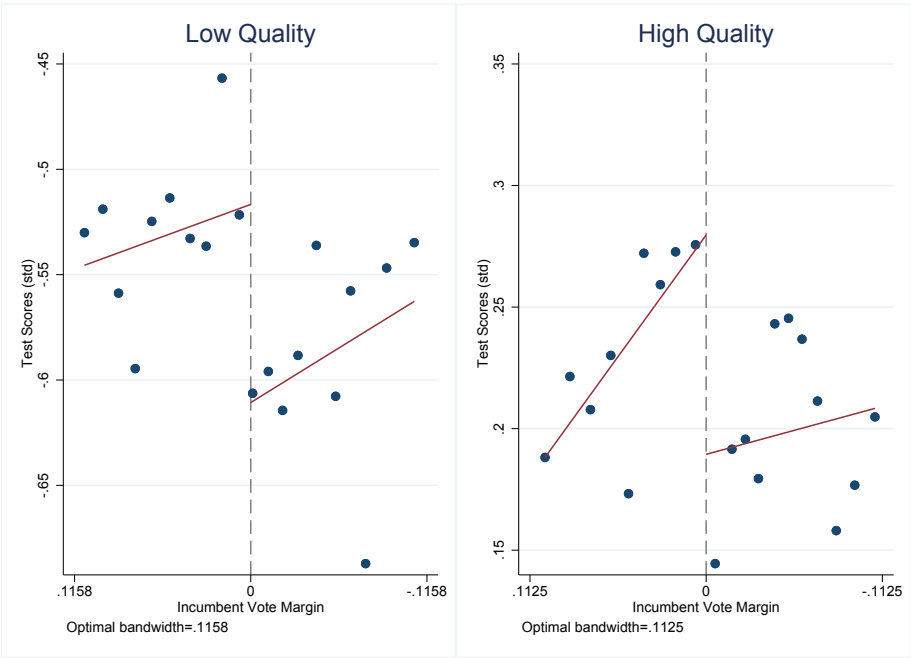
NOTES: THIS FIGURE SHOWS THE SHARE OF TEACHERS THAT HAVE LEFT *non-municipal* SCHOOLS BY BINS OF $IncumbVoteMargin$. MUNICIPALITIES WITH $IncumbVoteMargin$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. THE SHARE OF TEACHERS THAT HAVE LEFT A SCHOOL IS COMPUTED USING THE SCHOOL CENSUS AND CORRESPONDS TO THE SHARE OF TEACHERS IN A SCHOOL WHO WERE IN THAT SCHOOL AT TIME $t-2$ (THE YEAR BEFORE THE RESPECTIVE ELECTION) BUT ARE NO LONGER IN THAT SAME SCHOOL AT TIME t (ONE YEAR AFTER THE RESPECTIVE ELECTION). THE SET OF *non-municipal* SCHOOLS FOR THIS OUTCOME IS COMPRISED OF STATE, FEDERAL, AND PRIVATE SCHOOLS.

FIGURE A.21: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES IN NON-MUNICIPAL SCHOOLS



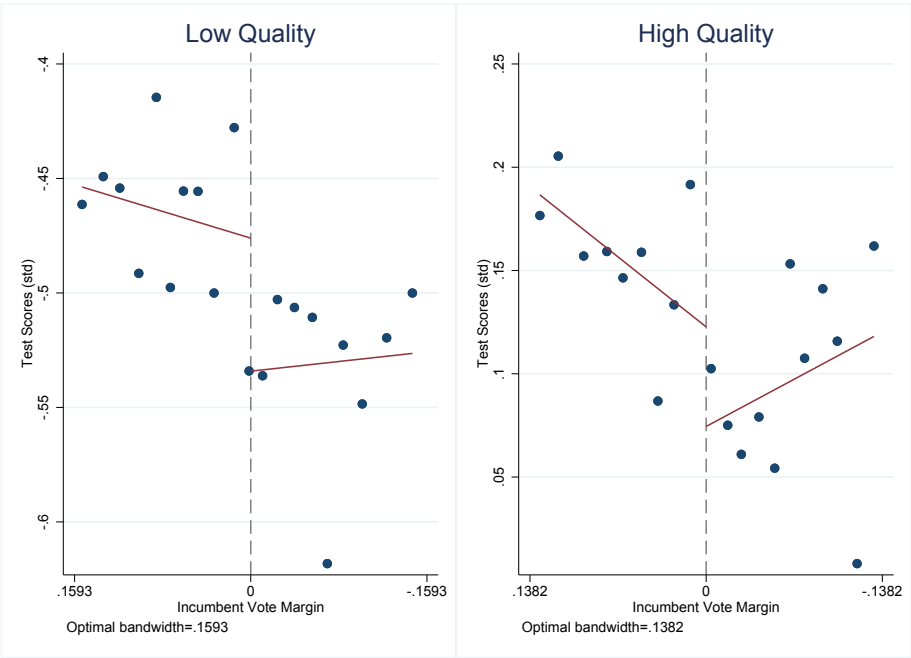
NOTES: THIS FIGURE SHOWS THE MEAN OF INDIVIDUAL-LEVEL 8TH GRADE TEST SCORES FOR STUDENTS IN *non-municipal* SCHOOLS BY BINS OF $IncumbVoteMargin$. MUNICIPALITIES WITH $IncumbVoteMargin$<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH $IncumbVoteMargin$>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. TEST SCORES ARE FROM THE *Prova Brasil* EXAM AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. AVERAGE, SCHOOL-LEVEL 8TH GRADE TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION) IS INCLUDED AS A CONTROL. THE SET OF *non-municipal* SCHOOLS FOR THIS OUTCOME IS COMPRISED OF STATE AND FEDERAL SCHOOLS, SINCE ONLY PUBLIC SCHOOLS PARTICIPATE IN THE *Prova Brasil* EXAM.

FIGURE A.22: POLITICAL TURNOVER AND 4TH GRADE TEST SCORES IN LOW- AND HIGH-QUALITY SCHOOLS



NOTES: THIS FIGURE SHOWS THE MEAN OF INDIVIDUAL-LEVEL 4TH GRADE TEST SCORES BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR LOW- AND HIGH-QUALITY *municipal* SCHOOLS. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. TEST SCORES ARE FROM THE *Prova Brasil* EXAM AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. AVERAGE, SCHOOL-LEVEL 4TH GRADE TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION) IS INCLUDED AS A CONTROL. LOW-QUALITY SCHOOLS ARE THOSE BELOW THE MEDIAN IN THE SCHOOL-LEVEL DISTRIBUTION OF TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION). HIGH-QUALITY SCHOOLS ARE THOSE ABOVE THE MEDIAN IN THIS DISTRIBUTION.**

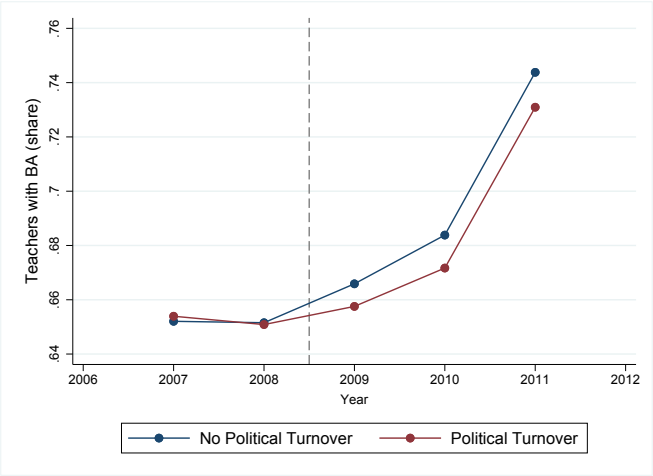
FIGURE A.23: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES IN LOW- AND HIGH-QUALITY SCHOOLS



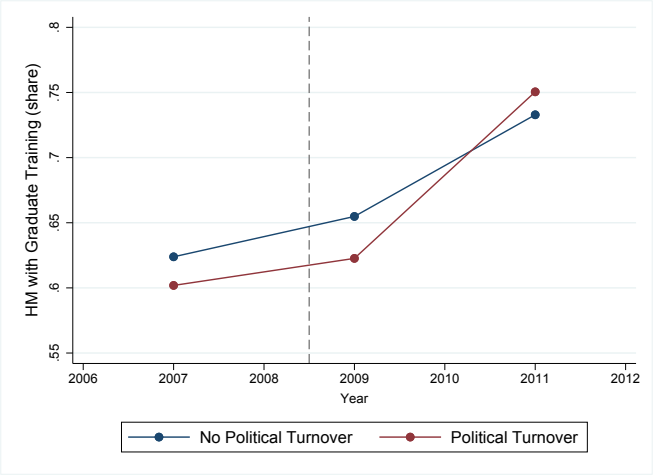
NOTES: THIS FIGURE SHOWS THE MEAN OF INDIVIDUAL-LEVEL 8TH GRADE TEST SCORES BY BINS OF $IncumbVoteMargin$ **SEPARATELY FOR LOW- AND HIGH-QUALITY *municipal* SCHOOLS. MUNICIPALITIES WITH** $IncumbVoteMargin$**<0 EXPERIENCED A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. MUNICIPALITIES WITH** $IncumbVoteMargin$**>0 DID NOT EXPERIENCE A CHANGE IN THE POLITICAL PARTY OF THE MAYOR. TEST SCORES ARE FROM THE *Prova Brasil* EXAM AND ARE STANDARDIZED BASED ON THE DISTRIBUTION OF INDIVIDUAL-LEVEL TEST SCORES IN MUNICIPALITIES WITH NO CHANGE IN THE RULING PARTY. AVERAGE, SCHOOL-LEVEL 8TH GRADE TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION) IS INCLUDED AS A CONTROL. LOW-QUALITY SCHOOLS ARE THOSE BELOW THE MEDIAN IN THE SCHOOL-LEVEL DISTRIBUTION OF TEST SCORES AT BASELINE (THE YEAR BEFORE THE RESPECTIVE ELECTION). HIGH-QUALITY SCHOOLS ARE THOSE ABOVE THE MEDIAN IN THIS DISTRIBUTION.**

FIGURE A.24: SCHOOL PERSONNEL CHARACTERISTICS 2007-2011

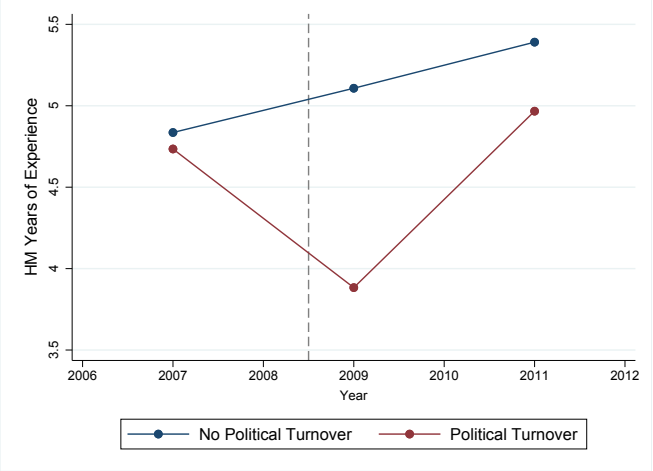
(a) Teacher with B.A.



(b) Headmasters with Graduate Training



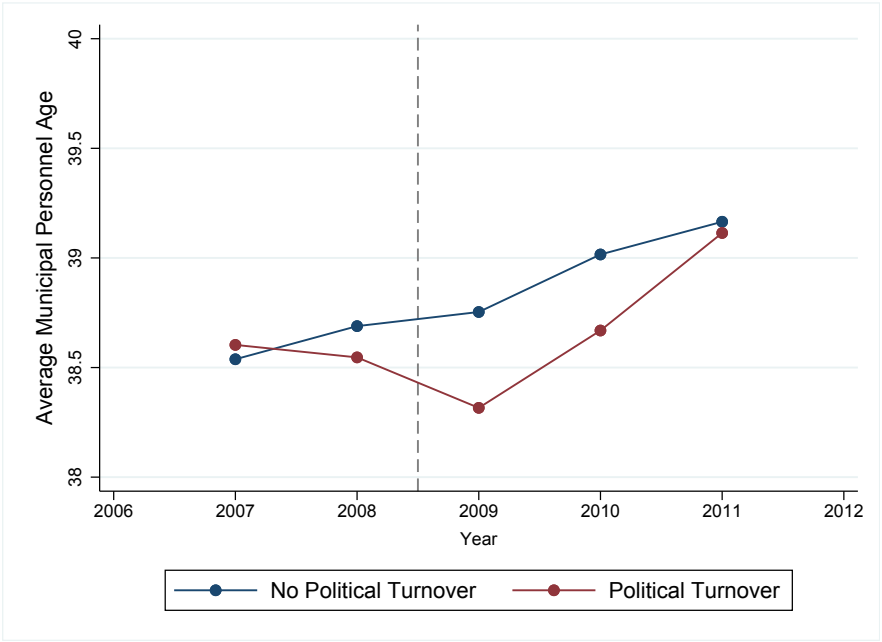
(c) Headmasters Experience (as Headmaster)



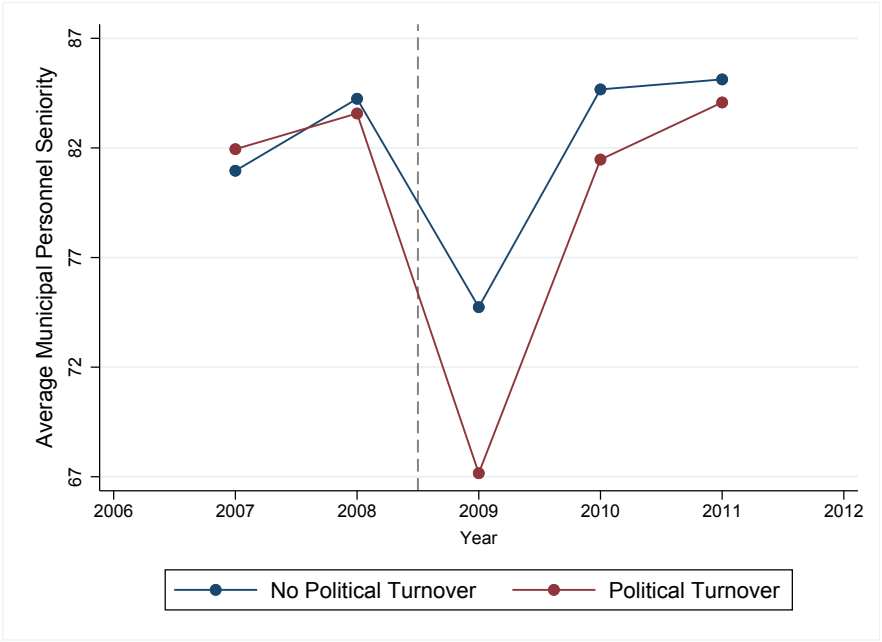
NOTES: THIS FIGURE SHOWS SCHOOL PERSONNEL CHARACTERISTICS IN MUNICIPALITIES THAT EXPERIENCED POLITICAL TURNOVER IN 2008 AND MUNICIPALITIES THAT DID NOT EXPERIENCE. SAMPLE RESTRICTED TO MUNICIPALITIES WITH CLOSE ELECTIONS($|ImcumbVoteMargin_{2008}| < 0.09$). DASHED VERTICAL LINE REPRESENTS END OF MAYOR'S TERM. THE SHARE OF TEACHERS WITH B.A. (PANEL A) IS FROM THE SCHOOL CENSUS, AVERAGED AT THE MUNICIPAL-LEVEL. HEADMASTER CHARACTERISTICS ARE SHARE OF HEADMASTERS WITH GRADUATE TRAINING (PANEL B) AND NUMBER OF YEARS OF EXPERIENCE AS HEADMASTER (PANEL C), EXTRACTED FROM THE PROVA BRASIL HEADMASTER QUESTIONNAIRE AND AVERAGED AT THE MUNICIPAL-LEVEL.

FIGURE A.25: MUNICIPAL PERSONNEL CHARACTERISTICS 2007-2011

(a) Average Municipal Personnel Age



(b) Average Municipal Personnel Seniority



NOTES: THIS FIGURE SHOWS SCHOOL PERSONNEL CHARACTERISTICS IN MUNICIPALITIES THAT EXPERIENCED POLITICAL TURNOVER IN 2008 AND MUNICIPALITIES THAT DID NOT EXPERIENCE. SAMPLE RESTRICTED TO MUNICIPALITIES WITH CLOSE ELECTIONS($|ImcumbVoteMargin_{2008}| < 0.09$). DASHED VERTICAL LINE REPRESENTS END OF MAYOR'S TERM. THE MUNICIPAL PERSONNEL CHARACTERISTICS ARE FROM *RAIS*. THE VARIABLES AGE AND SENIORITY WERE CALCULATED AS THE AVERAGE ATTRIBUTE AMONG WORKERS EMPLOYED IN THE MUNICIPALITY ONE YEAR AFTER THE ELECTION.

TABLE A.1: POLITICAL TURNOVER AND 4TH GRADE TEST SCORES FOR ALL MUNICIPALITIES

	Outcome: Individual 4th Grade Test Scores (standardized)					
	(1)	(2)	(3)	(4)	(5)	(6)
Party Turnover	-0.065	-0.066	-0.070	-0.066	-0.070	-0.070
	(0.031)	(0.029)	(0.036)	(0.033)	(0.031)	(0.028)
School-level baseline scores	0.841	0.713	0.827	0.701	0.838	0.711
	(0.018)	(0.019)	(0.024)	(0.026)	(0.017)	(0.018)
N	582,788	582,788	405,856	405,856	601,125	601,125
R-squared	0.199	0.235	0.189	0.225	0.197	0.233
Controls	No	Yes	No	Yes	No	Yes
Clusters	2153	2153	1606	1606	2193	2193
Using Bandwidth	0.107	0.107	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.107	0.107	0.107	0.107	0.107	0.107

This table includes the sample of **all** municipalities, including those with irregular elections and those that could potentially go to a second round of elections (population$\geq$200,000). The endogenous variable, Party Turnover, is instrumented for using the incumbent political party's vote margin from the first round of regular elections. The first-stage coefficients for the instrument range from .80-.81 across bandwidths (not reported). All specifications control for school-level, average test scores for 4th graders at baseline (one year before the respective election). Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet), individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading), and a 2012 election-cycle indicator.

TABLE A.2: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES FOR ALL MUNICIPALITIES

	Outcome: Individual 8th Grade Test Scores (standardized)					
	(1)	(2)	(3)	(4)	(5)	(6)
Party Turnover	-0.080	-0.068	-0.086	-0.087	-0.086	-0.084
	(0.029)	(0.030)	(0.038)	(0.038)	(0.034)	(0.034)
School-level baseline scores	0.763	0.706	0.757	0.701	0.772	0.711
	(0.014)	(0.015)	(0.015)	(0.016)	(0.014)	(0.014)
N	335,824	335,824	169,556	169,556	255,509	255,509
R-squared	0.137	0.151	0.140	0.153	0.148	0.161
Controls	No	Yes	No	Yes	No	Yes
Clusters	1536	1536	1010	1010	1401	1401
Using Bandwidth	0.124	0.124	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.124	0.124	0.124	0.124	0.124	0.124

This table includes the sample of **all** municipalities, including those with irregular elections and those that could potentially go to a second round of elections (population$\geq$200,000). The endogenous variable, Party Turnover, is instrumented for using the incumbent political party's vote margin from the first round of regular elections. The first-stage coefficients for the instrument range from .80-.81 across bandwidths (not reported). All specifications control for school-level, average test scores for 8th graders at baseline (one year before the respective election). Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet), individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading), and a 2012 election-cycle indicator.

TABLE A.3: CANDIDATE TURNOVER AND 4TH GRADE AND 8TH GRADE TEST SCORES

Panel A	Outcome: Individual 4th Grade Test Scores (standardized)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbCandidateVoteMargin < 0\}$	-0.078	-0.094	-0.090	-0.102	-0.078	-0.094
	(0.028)	(0.025)	(0.032)	(0.029)	(0.028)	(0.024)
School-level baseline scores	0.868	0.734	0.874	0.745	0.870	0.735
	(0.014)	(0.014)	(0.013)	(0.013)	(0.013)	(0.013)
Observations	338,152	338,152	246,872	246,872	366,391	366,391
Schl Controls	No	Yes	No	Yes	No	Yes
Indiv Controls	No	Yes	No	Yes	No	Yes
Clusters	1723	1723	1309	1309	1867	1867
Using Bandwidth	0.0980	0.0980	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.0980	0.0980	0.0980	0.0980	0.0980	0.0980

Panel B	Outcome: Individual 8th Grade Test Scores (standardized)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbCandidateVoteMargin < 0\}$	-0.071	-0.070	-0.063	-0.068	-0.079	-0.078
	(0.026)	(0.026)	(0.034)	(0.034)	(0.028)	(0.028)
School-level baseline scores	0.792	0.736	0.772	0.723	0.781	0.725
	(0.014)	(0.014)	(0.017)	(0.017)	(0.015)	(0.015)
Observations	181,865	181,865	106,072	106,072	161,483	161,483
Schl Controls	No	Yes	No	Yes	No	Yes
Indiv Controls	No	Yes	No	Yes	No	Yes
Clusters	1344	1344	833	833	1191	1191
Using Bandwidth	0.128	0.128	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.128	0.128	0.128	0.128	0.128	0.128

This table reports the coefficient on candidate turnover from regressing individual-level 4th grade test scores (Panel A) and 8th grade test scores (Panel B) on the running variable of the RDD ($IncumbCandidateVoteMargin$), candidate turnover ($\mathbb{1}\{IncumbCandidateVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbCandidateVoteMargin|$ < Using Bandwidth. Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party. All specifications control for school-level, average test scores for the respective grader at baseline (one year before the respective election). Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet), individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading), and a 2012 election-cycle indicator.

TABLE A.4: 4TH GRADE TEST SCORES BY MUNICIPALITIES' CHARACTERISTICS

Outcome	Individual 4th grade Test Score (standardized)					
Characteristic	Above Median Population		Above Median N. schools		Left Ideology Wins	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.052	-0.065	-0.066	-0.072	-0.081	-0.089
	(0.051)	(0.040)	(0.041)	(0.038)	(0.042)	(0.038)
1{*Characteristic*}	-0.020	-0.045	-0.101	-0.116	-0.035	-0.035
	(0.044)	(0.036)	(0.041)	(0.036)	(0.049)	(0.045)
$\mathbb{1}\{IncumbVoteMargin < 0\}$ X **1**{*Characteristic*}	-0.035	-0.000	-0.013	0.013	0.019	0.038
	(0.061)	(0.049)	(0.056)	(0.049)	(0.064)	(0.057)
Observations	325,554	429,979	325,554	429,979	279,744	327,168
R-squared	0.218	0.218	0.220	0.220	0.208	0.208
Controls	No	No	No	No	No	No
Clusters	1669	2101	1669	2101	1487	1703
Mean LHS	-0.105	-0.117	-0.105	-0.117	-0.112	-0.127
Using Bandwidth	0.0782	0.110	0.0782	0.110	0.0910	0.110
Optimal Bandwidth	0.0782	0.0782	0.0782	0.0782	0.0910	0.0910

This table reports the coefficient on Political turnover from regressing the individual 4th grade test score estimating Equation 2. Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party. All specifications control for school-level, average test scores for 4th graders at baseline (one year before the 2008 election). Above Median Population is an indicator variable equal to 1 if municipality's population is above median of population distribution at baseline (one year before the election). Above Median N. schools is an indicator variable equal to 1 if municipality's count of schools is above median of school count distribution according to School Census at baseline (one year before the election). Left Ideology Wins is an indicator variable equal to 1 if a left-wing party won the election and 0 if a right-wing party won. Party ideology is classified as belonging to the left vs. the right according to *Atlas Político - Mapa do Congresso*.

TABLE A.5: SELECTION OF MUNICIPALITIES AND SCHOOLS INTO THE SAMPLE

	(1) All Municipalities		(2) Sample Municipalities		(3) Sample Municipalities & School takes PB	
	Mean	SD	Mean	SD	Mean	SD
Municipal Characteristics						
Municipality population	33,290.76	197,908.57	20,201.30	27,236.13	21,180.96	27,771.40
Ruling party from left	0.26	0.44	0.26	0.44	0.26	0.44
Winning party from left	0.30	0.46	0.28	0.45	0.28	0.45
Ruling party from right	0.56	0.50	0.55	0.50	0.55	0.50
Winning party from right	0.53	0.50	0.53	0.50	0.53	0.50
School Characteristics						
Number of schools per municipality	17.85	29.62	14.88	20.54	4.96	6.51
Share urban	0.34	0.47	0.31	0.46	0.73	0.45
Share connected to grid	0.85	0.36	0.86	0.35	0.99	0.11
Share connected to water network	0.45	0.50	0.43	0.50	0.80	0.40
Share connected to sewage system	0.21	0.41	0.18	0.39	0.41	0.49
Share with regular trash collection	0.45	0.50	0.44	0.50	0.85	0.35
Share with Internet	0.29	0.45	0.27	0.45	0.64	0.48
Number of teachers per school	9.67	11.42	8.79	10.17	18.83	11.27
Teacher age	37.26	6.64	37.13	6.56	38.27	3.97
Share of female teachers	0.81	0.28	0.82	0.27	0.85	0.15
Share of teachers with B.A.	0.50	0.41	0.51	0.40	0.70	0.29
Share of teachers who took *Concurso*	0.64	0.38	0.63	0.38	0.76	0.26
Number of students per school	190.37	252.30	163.43	214.72	378.56	245.30
Share of female students	0.47	0.09	0.47	0.09	0.48	0.04
Share of student with urban residence	0.32	0.42	0.29	0.40	0.64	0.39
Number classrooms per school	8.42	8.92	7.66	7.96	15.69	8.44
Students/class per school	18.51	7.38	17.72	7.15	23.41	4.91
Number of 4th graders per school	23.33	35.78	20.34	30.72	49.84	38.31
Number of 8th graders per school	10.66	30.96	8.83	26.65	24.07	41.44
N (municipality-election cycle)	11,106		5,966		5,608	

This table shows descriptive statistics for: all municipalities, municipalities in our sample, and municipalities in our sample with at least one school that participates in the *Prova Brasil* exam. Our sample is selected by dropping: municipalities with irregular elections, municipalities that could potentially go to second-round elections, and municipalities where the incumbent political party did not run for re-election. Furthermore, schools that participate in the *Prova Brasil* exam are schools with at least 20 students enrolled in the relevant grade-level. Hence the sample of schools for which we have *Prova Brasil* data for is also "selected." The unit of observations is a municipality-election cycle.

TABLE A.6: SELECTION OF MUNICIPALITIES: RD VS NON-RD SAMPLE ($|IncumbVoteMargin|$<.09)

	Non-RD Sample	RD Sample	P-value
Municipal Characteristics			
Population	35753.87	24944.40	0.02
Ruling party from left	0.26	0.24	0.14
Winning party from left	0.30	0.28	0.01
Ruling party from right	0.56	0.57	0.34
Winning party from right	0.52	0.54	0.15
Number of Candidates Running	3.04	3.04	0.99
School Characteristics			
Number of schools	18.63	15.21	0.00
Share urban	0.34	0.32	0.00
Share connected to water network	0.45	0.44	0.00
Share connected to sewage system	0.22	0.20	0.00
Share with Internet	0.29	0.29	0.08
Number of school staff	20.41	19.29	0.00
Number of teachers per school	9.75	9.37	0.00
Teacher age	37.23	37.38	0.00
Share of female teachers	0.81	0.82	0.00
% teachers born same munic	0.63	0.64	0.00
Share of teachers with B.A.	0.49	0.53	0.00
Share of temporary teachers	0.35	0.33	0.00
Classrooms taught per teacher	1.97	1.94	0.00
Schools taught per teacher	1.32	1.32	0.43
% teach only municipal school	0.92	0.92	0.21
Number of students per school	193.98	175.40	0.00
% students with schl transport	0.26	0.29	0.00
Number classrooms per school	8.49	8.10	0.00
Students/class per school	18.68	17.81	0.00

This table shows descriptive statistics for municipalities that did not experience close elections (column 1) and close election municipalities (column 2). Column 3 represents p-value of t-test of difference in means between the two samples. Close elections defined by ($|IncumbVoteMargin|$<.09)

TABLE A.7: DESCRIPTIVE STATISTICS AND TEST FOR DISCONTINUITY IN BASELINE CHARACTERISTICS, $|IncumbVoteMargin|$<.09

	(1) No Party Turnover	(2) Party Turnover	(3) P-value
Number of Municipalities	1,233	1,195	.
School Characteristics			
Teacher experience (only in PB)	12.46	12.40	0.88
Share of female headmasters (only in PB)	0.85	0.85	0.27
Headmaster age (only in PB)	40.91	41.44	0.70
Headmaster education experience (only in PB)	14.23	14.59	0.28
Headmaster experience (only in PB)	4.99	5.39	0.69
Number of students per school	152.24	160.96	0.74
Share of students who use school transportation	0.26	0.27	0.11
Number classrooms per school	7.02	7.41	0.73
Students/class per school	17.97	18.08	0.53
Number of 4th graders per school	18.55	20.16	0.93
Number of 8th graders per school	7.62	8.23	0.65
Share connected to grid	0.83	0.84	0.30
Share with regular trash collection	0.37	0.40	0.70
Share of female students	0.46	0.47	0.82
Share of students born in same municipality	0.62	0.63	0.72
Share of student with urban residence	0.25	0.27	0.64

This table shows additional descriptive statistics for school-level characteristics in municipalities that did not have political party turnover and municipalities that did have political party turnover in close elections, $|IncumbVoteMargin|$<.09, in Columns 1-2. Column 3 tests for a discontinuity in baseline characteristics at the $IncumbVoteMargin$=0 threshold: This column reports the p-value corresponding to the coefficient on $\mathbb{1}\{IncumbVoteMargin < 0\}$ in our main specification, Equation 1, with the corresponding variable at baseline used as the dependent variable. The remaining set of characteristics are shown in Table 1.

TABLE A.8: TEST SCORES AND (UNCONDITIONAL) POLITICAL TURNOVER

Outcome	Individual 4th Grade Test Scores (standardized)	
	(1)	(2)
Unconditional Party Turnover	-0.033	-0.016
	(0.011)	(0.011)
Unconditional Candidate Turnover	-0.027	-0.017
	(0.011)	(0.009)
School-level Test Scores at Baseline	0.851	0.430
	(0.007)	(0.009)
Observations	1,848,228	1,848,228
R-squared	0.216	0.292
Controls and FE	No	Yes
Clusters	4988	4988
Mean LHS	-0.0948	-0.0948

This table reports the coefficient on unconditional party and candidate turnover estimating OLS regressions. Outcome: the individual-level 4^{th} grade test scores. Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party. Controls include school-level, average test scores for 4th graders at baseline (one year before the 2008 election), school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet), individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading), a 2012 election-cycle indicator and municipal fixed effects. Unconditional party turnover equals one if the incoming party is different than incumbent party and zero otherwise. It is well defined even if the incumbent party did not participate in the election. Unconditional candidate turnover is equal to one if newly elected candidate is different than incumbent candidate and zero otherwise. Likewise the variable is well defined even if the candidate chose not to participate in the election.

TABLE A.9: POLITICAL TURNOVER AND MUNICIPAL PERSONNEL REPLACEMENT AT BASELINE

Panel A: Municipal Personnel up to 1 month before the Election

Outcome	New Municipal Personnel (Share)			Municipal Personnel Who Left (Share)			Net New Municipal Personnel (Share)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.0138	0.0007	-0.0159	-0.0016	0.0237	-0.0019	-0.0083	-0.0158	-0.0054
	(0.0152)	(0.0203)	(0.0164)	(0.0133)	(0.0181)	(0.0142)	(0.0080)	(0.0118)	(0.0099)
Observations	2,745	1,655	2,380	2,650	1,655	2,380	3,519	1,655	2,380
R-squared	0.0015	0.0040	0.0017	0.0006	0.0033	0.0004	0.0054	0.0094	0.0054
Clusters	2306	1506	2051	2244	1506	2051	2800	1506	2051
Mean Dep Variable	0.245	0.251	0.246	0.163	0.169	0.163	0.0886	0.0841	0.0874
Using Bandwidth	0.132	0.0700	0.110	0.125	0.0700	0.110	0.194	0.0700	0.110
Optimal Bandwidth	0.132	0.132	0.132	0.125	0.125	0.125	0.194	0.194	0.194

Panel B: Municipal Personnel up to 1 year before the Election

Outcome	New Municipal Personnel (Share)			Municipal Personnel Who Left (Share)			Net New Municipal Personnel (Share)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.0120	-0.0230	-0.0162	-0.0126	0.0026	-0.0112	-0.0106	-0.0284	-0.0097
	(0.0166)	(0.0229)	(0.0185)	(0.0159)	(0.0207)	(0.0164)	(0.0116)	(0.0182)	(0.0147)
Observations	2,814	1,654	2,376	2,498	1,654	2,376	3,227	1,654	2,376
R-squared	0.0545	0.0594	0.0578	0.0017	0.0007	0.0012	0.0954	0.0929	0.1029
Clusters	2346	1505	2047	2136	1505	2047	2609	1505	2047
Mean Dep Variable	0.291	0.299	0.292	0.172	0.179	0.173	0.126	0.129	0.126
Using Bandwidth	0.137	0.0700	0.110	0.117	0.0700	0.110	0.166	0.0700	0.110
Optimal Bandwidth	0.137	0.137	0.137	0.117	0.117	0.117	0.166	0.166	0.166

This table reports the coefficient on political party turnover estimating Equation 1. Outcome variables: in columns 1-3, Panel A, New municipal personnel (share) is the ratio between the number of new labor contracts that had been added on a annual basis up to 1 month *before* the election divided by the total number of contracts that existed 12 month prior to the election, in Columns 4-6, Panel A, Municipal Personnel Who Left (share) is analogous and uses number of terminated contracts; in Columns 7-9, Panel A Net Municipal Personnel (Share) is the difference between New municipal personnel (share) and Municipal Personnel Who Left (share). Panel B uses the corresponding outcome variables where new and terminated contracts were measured 12 months before the election.

TABLE A.10: MUNICIPAL PERSONNEL BY THREE MONTHS INTERVALS

Panel A: New Municipal Personnel (Share)

Outcome	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep
	(1)	(2)	(3)	(4)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0048	0.0410	0.0135	0.0080
	(0.0026)	(0.0158)	(0.0084)	(0.0077)
Observations	2,381	2,381	2,381	2,381
R-squared	0.0168	0.0207	0.0126	0.0046
Clusters	2052	2052	2052	2052
Mean Dep Variable	0.0103	0.209	0.0581	0.0461
Using Bandwidth	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.140	0.112	0.168	0.140

Panel B: Municipal Personnel Who have Left (Share)

Outcome	Oct-Dec	Jan-Mar	Apr-Jun	Jul-Sep
	(1)	(2)	(3)	(4)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0174	0.0013	-0.0009	-0.0029
	(0.0122)	(0.0058)	(0.0056)	(0.0062)
Observations	2,381	2,381	2,381	2,381
R-squared	0.0106	0.0034	0.0050	0.0032
Clusters	2052	2052	2052	2052
Mean Dep Variable	0.129	0.0377	0.0317	0.0375
Using Bandwidth	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.122	0.182	0.175	0.126

This table reports the coefficient on political party turnover estimating Equation 1. Outcome variables: New municipal personnel (share) is the ratio between the number of new labor contracts that had been added every quarter after the election divided by the total number of contracts that existed the month prior to the election (Panel A). Column 1 (Oct-Dec) uses contracts added on the quarter following the election, on the same year and under same mayor term. Column 2-4 use contracts added on each one of the first three quarters over the year after the election in chronological order and are thus under a new term for the elected mayor. Municipal Personnel Who Left (share) is analogous and uses number of terminated contracts (Panel B).

TABLE A.11: POLITICAL TURNOVER AND TYPE OF ACTIVE CONTRACT

Panel A: New Municipal Personnel by Contract Type (% of personnel with that contract type)

Outcome	Type of Contract		Hierarchical Level			Sector				
	Civil Servant	Contract	High Manager	Low Manager	Not Manager	All Sectors	Education	Health	Construction	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.0365	0.1068	0.0789	0.0566	0.0541	0.0744	0.0637	0.0663	0.0717	0.0672
	(0.0198)	(0.0298)	(0.0305)	(0.0391)	(0.0202)	(0.0314)	(0.0210)	(0.0220)	(0.0223)	(0.0203)
Observations	2,277	2,276	2,166	1,744	2,372	2,381	2,370	2,369	2,368	2,381
R-squared	0.0067	0.0262	0.0315	0.0269	0.0219	0.0140	0.0279	0.0329	0.0383	0.0428
Cluster	1966	1976	1884	1543	2045	2052	2043	2043	2042	2052
Mean Dep Variable	0.159	0.618	0.590	0.432	0.280	0.330	0.302	0.305	0.292	0.316
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110

Panel B: Municipal Personnel Who have Left by Contract Type (% of personnel with that contract type)

Outcome	Type of Contract		Hierarchical Level			Sector				
	Civil Servant	Contract	High Manager	Low Manager	Not Manager	All Sectors	Education	Health	Construction	Other
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.0135	0.0739	0.1267	0.1036	0.0240	0.0268	0.0241	0.0239	0.0302	0.0283
	(0.0155)	(0.0322)	(0.0337)	(0.0389)	(0.0177)	(0.0217)	(0.0189)	(0.0192)	(0.0187)	(0.0175)
Observations	2,277	2,276	2,166	1,744	2,372	2,381	2,370	2,369	2,368	2,381
R-squared	0.0010	0.0347	0.0507	0.0344	0.0124	0.0103	0.0160	0.0205	0.0245	0.0265
Cluster	1966	1976	1884	1543	2045	2052	2043	2043	2042	2052
Mean Dep Variable	0.121	0.493	0.417	0.334	0.211	0.234	0.225	0.222	0.215	0.227
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110

This table reports the coefficient on political party turnover estimating Equation 1. Outcome variables: New Municipal Personnel by contract type (as % of total personnel in that contract type) is the ratio between the number of new labor contracts (of a given type) that had been added 12 months after the election divided by the total number of contracts (of a given type) in the month prior to the election; in Panel B, Municipal Personnel Who have Left by contract type (as % of total personnel in that contract type) is analogous and uses number of terminated contracts. Attributes come from *RAIS* and are type of contract, hierarchical level and sector employed.

TABLE A.12: MUNICIPAL PERSONNEL REPLACEMENT BY SECTOR-SPECIFIC CONTRACTS

Panel A: New Municipal Personnel by contract type (as % of total personnel in that contract type)

Outcomes	Multiple	Education-specific	Health-specific	Construction-specific	Specific to other sectors
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0708	0.0207	0.0414	-0.0019	0.0360
	(0.0224)	(0.0240)	(0.0269)	(0.0288)	(0.0261)
Observations	2,367	2,266	2,217	1,831	2,331
R-squared	0.0384	0.0058	0.0090	0.0034	0.0115
Cluster	2041	1968	1929	1604	2016
Mean Dep Variable	0.303	0.295	0.296	0.189	0.364
Using Bandwidth	0.110	0.110	0.110	0.110	0.110

Panel B: Municipal Personnel that have Left by contract type (as % of total personnel in that contract type)

Outcomes	Multiple	Education-specific	Health-specific	Construction-specific	Specific to other sectors
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0338	0.0033	0.0093	0.0613	0.0391
	(0.0189)	(0.0223)	(0.0245)	(0.0252)	(0.0224)
Observations	2,367	2,266	2,217	1,831	2,331
R-squared	0.0271	0.0029	0.0100	0.0101	0.0163
Cluster	2041	1968	1929	1604	2016
Mean Dep Variable	0.219	0.226	0.222	0.167	0.255
Using Bandwidth	0.110	0.110	0.110	0.110	0.110

This table reports the coefficient on political party turnover estimating Equation 1. Outcome variables: New Municipal Personnel by contract type (as % of total personnel in that contract type) is the ratio between the number of new labor contracts (of a given type) that had been added 12 months after the election divided by the total number of contracts (of a given type) in the month prior to the election; in Panel B, Municipal Personnel Who have Left by contract type (as % of total personnel in that contract type) is analogous and uses number of terminated contracts.

TABLE A.13: POLITICAL TURNOVER AND STUDENT COMPOSITION

Outcome:	Female	White	Asset Index	Mother's Education	Mother Reads	Parental Support Index	Works Outside	Previously Failed	Previously Dropped Out
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.007	-0.011	0.059	0.085	-0.000	-0.002	-0.006	-0.005	-0.002
	(0.006)	(0.013)	(0.215)	(0.097)	(0.011)	(0.038)	(0.004)	(0.012)	(0.004)
Observations	933,305	933,305	933,143	933,305	933,305	933,143	933,305	691,559	700,956
R-squared	0.001	0.015	0.055	0.010	0.008	0.003	0.002	0.016	0.005
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	2294	2294	2294	2294	2294	2294	2294	2287	2287
Mean LHS	0.381	0.231	-1.358	4.091	0.628	-0.0834	0.134	0.369	0.0818
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.133	0.103	0.117	0.137	0.133	0.112	0.134	0.0972	0.114

This table reports the coefficient on political party turnover from regressing each of the student characteristic variables on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin|$<Using Bandwidth. The Asset Index is constructed as follows. We standardize the responses to a series of questions – regarding the number of household items (colored TV, radio, fridge, bathroom), whether or not the student has other items (a VCR/DVD player, a freezer, a vacuum cleaner, a computer, Internet), and how often a domestic worker comes to the student's house – by subtracting the overall mean and dividing by the standard deviation of all student responses for each question. We then add all these standardized question responses to arrive at the "Asset Index." The Parental Involvement Index is constructed as follows. We standardize responses to a series of questions – regarding how often the students' parents attend Parent-Teacher Council meetings, whether parents talk to the student about what happens in school, and whether parents incentivize the student to do homework, read, and attend school – by subtracting the overall mean and dividing by the standard deviation of all student responses for each question. We then add all these standardized question responses to arrive at the "Parental Involvement Index." Student characteristics are from the *Prova Brasil* questionnaire filled out by students. Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

TABLE A.14: POLITICAL TURNOVER AND NUMBER OF STUDENTS ENROLLED

Outcome	Students Enrolled per school					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.445	3.132	2.058	5.090	1.104	2.202
	(10.308)	(6.047)	(11.773)	(7.239)	(9.855)	(5.872)
Observations	38,512	38,512	27,553	27,553	41,191	41,191
R-squared	0.000	0.473	0.000	0.471	0.000	0.471
Controls	No	Yes	No	Yes	No	Yes
Clusters	2286	2286	1789	1789	2419	2419
Mean LHS	147	147	149.3	149.3	146.9	146.9
Using Bandwidth	0.101	0.101	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.101	0.101	0.101	0.101	0.101	0.101

This table reports the coefficient on political party turnover estimating Equation 1. Outcome variables: Students Enrolled per School comes from School Census and is defined as the number of all students enrolled across all grades in given school. Controls include a 2012 election-cycle indicator and school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet).

TABLE A.15: POLITICAL TURNOVER AND DROPOUT RATES

Outcome:	School-level Dropout Rates					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0039	0.0042	0.0049	0.0052	0.0031	0.0036
	(0.0036)	(0.0035)	(0.0034)	(0.0034)	(0.0033)	(0.0032)
Baseline Dropout rate	0.3423	0.3280	0.3399	0.3272	0.3380	0.3225
	(0.0248)	(0.0246)	(0.0284)	(0.0281)	(0.0207)	(0.0206)
Observations	31,742	31,742	26,492	26,492	39,661	39,661
R-squared	0.1446	0.1524	0.1502	0.1566	0.1391	0.1473
Controls	No	Yes	No	Yes	No	Yes
Clusters	2029	2029	1783	1783	2412	2412
Mean LHS	0.0337	0.0337	0.0323	0.0323	0.0335	0.0335
Using Bandwidth	0.0836	0.0836	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.0836	0.0836	0.0836	0.0836	0.0836	0.0836

This table reports the coefficient on political party turnover from regressing school-level dropout rates on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin|$<Using Bandwidth. The school-level dropout rate is measured by the School Census and refers to the dropout rate for all students within a school (in all grade levels). All specifications control for the school-level, dropout rate at baseline (the year before the respective election). Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

TABLE A.16: POLITICAL TURNOVER IN 2008 AND 4TH GRADE TEST SCORES 1, 3, AND 5 YEARS AFTER THE ELECTION

Outcome:	Individual 4th Grade Test Scores (standardized)			
	(1)	(2)	(3)	(4)
$\mathbb{1}\{IncumbVoteMargin_{2008} < 0\}$	-0.113	-0.106	-0.063	-0.060
	(0.046)	(0.041)	(0.039)	(0.035)
$\mathbb{1}\{IncumbVoteMargin_{2008} < 0\} \times$ 2011	0.019	0.013	0.016	0.011
	(0.049)	(0.046)	(0.042)	(0.040)
$\mathbb{1}\{IncumbVoteMargin_{2008} < 0\} \times$ 2013	0.033	0.038	-0.013	-0.013
	(0.056)	(0.051)	(0.046)	(0.042)
Observations	384,233	384,233	535,315	535,315
R-squared	0.165	0.203	0.163	0.200
Controls	No	Yes	No	Yes
Clusters	728	728	1013	1013
Using Bandwidth	0.0700	0.0700	0.110	0.110

This table reports the coefficient on political party turnover from regressing individual-level 4th grade test scores on the running variable of the RDD ($IncumbVoteMargin_{2008}$), political party turnover ($\mathbb{1}\{IncumbVoteMargin_{2008} < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin_{2008}|$<Using Bandwidth, as well as the interaction for each year t, where t is one year, three years, and five years after the 2008 election. Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party. All specifications control for school-level, average test scores for 4th graders at baseline (one year before the 2008 election). Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading). Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party.

TABLE A.17: POLITICAL TURNOVER IN 2008 AND 8TH GRADE TEST SCORES 1, 3, AND 5 YEARS AFTER THE ELECTION

Outcome:	Individual 8th Grade Test Scores (standardized)			
	(1)	(2)	(3)	(4)
$\mathbb{1}\{IncumbVoteMargin_{2008} < 0\}$	-0.043	-0.059	-0.037	-0.043
	(0.049)	(0.049)	(0.040)	(0.040)
$\mathbb{1}\{IncumbVoteMargin_{2008} < 0\} \times$ 2011	-0.010	-0.007	0.004	0.003
	(0.061)	(0.059)	(0.048)	(0.046)
$\mathbb{1}\{IncumbVoteMargin_{2008} < 0\} \times$ 2013	-0.068	-0.074	-0.047	-0.056
	(0.075)	(0.071)	(0.065)	(0.061)
Observations	148,709	148,709	216,249	216,249
R-squared	0.138	0.154	0.131	0.148
Controls	No	Yes	No	Yes
Clusters	432	432	607	607
Using Bandwidth	0.0700	0.0700	0.110	0.110

This table reports the coefficient on political party turnover from regressions of individual-level 8th grade test scores on the running variable of the RDD ($IncumbVoteMargin_{2008}$), political party turnover ($\mathbb{1}\{IncumbVoteMargin_{2008} < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin_{2008}|$<Using Bandwidth, as well as the interaction for each year t, where t is one year, three years, and five years after the 2008 election. All specifications control for school-level, average test scores for 8th graders at baseline (one year before the 2008 election). Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading). Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party.

TABLE A.18: POLITICAL TURNOVER IN 2008 AND HEADMASTER REPLACEMENT 1, 3, AND 5 YEARS AFTER THE ELECTION

Outcome:	Headmaster is new to the school (as Headmaster)					
	2009		2011		2013	
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.274	0.271	-0.056	-0.054	-0.056	-0.064
	(0.050)	(0.051)	(0.042)	(0.042)	(0.056)	(0.055)
N	4,882	4,882	3,966	3,966	3,794	3,794
R-squared	0.090	0.091	0.002	0.005	0.005	0.014
Controls	No	Yes	No	Yes	No	Yes
Clusters	1082	1082	995	995	969	969
Mean Dep Variable	0.438	0.438	0.348	0.348	0.665	0.665
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.128	0.128	0.152	0.152	0.0785	0.0785

This table shows the coefficient on political party turnover in 2008 from regressing an indicator variable for whether the school has a new headmaster on the running variable of the RDD ($IncumbVoteMargin_{2008}$), political party turnover ($\mathbb{1}\{IncumbVoteMargin_{2008} < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin_{2008}|$<Using Bandwidth, separately for each year t, where t is one year, three years, and five years after the 2008 election. New headmasters are those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet).

TABLE A.19: POLITICAL TURNOVER IN 2008 AND TEACHER REPLACEMENTS 1, 3, AND 5 YEARS AFTER THE ELECTION

Outcome:	Share of Teachers New to the School						Share of Teachers that have Left the School					
	2009		2011		2013		2009		2011		2013	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.093	0.093	0.047	0.046	-0.001	-0.002	0.080	0.079	0.035	0.034	0.007	0.006
	(0.030)	(0.030)	(0.035)	(0.035)	(0.036)	(0.036)	(0.031)	(0.031)	(0.035)	(0.035)	(0.033)	(0.033)
Observations	15,172	15,172	15,172	15,172	15,172	15,172	15,172	15,172	15,172	15,172	15,172	15,172
R-squared	0.024	0.025	0.007	0.010	0.000	0.004	0.022	0.022	0.007	0.009	0.001	0.004
Schl Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Clusters	1109	1109	1109	1109	1109	1109	1109	1109	1109	1109	1109	1109
Mean LHS	0.476	0.476	0.433	0.433	0.512	0.512	0.455	0.455	0.431	0.431	0.489	0.489
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.199	0.199	0.149	0.149	0.170	0.170	0.154	0.154	0.138	0.138	0.192	0.192

This table shows the coefficient on political party turnover in 2008 from regressing the share of teachers the are new to the school or the share of teachers that have left a school on the running variable of the RDD ($IncumbVoteMargin_{2008}$), political party turnover ($\mathbb{1}\{IncumbVoteMargin_{2008} < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin_{2008}|$<Using Bandwidth, separately for each year t, where t is one year, three years, and five years after the 2008 election. The share of teachers that are new to a school is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t but were not in that same school at time $t-2$. The share of teachers that have left a school is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ but are no longer in that same school at time t. Controls include school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet).

TABLE A.20: HETEROGENEITY BY TYPE OF HEADMASTER APPOINTMENT AT BASELINE

Outcome:	Test Scores		Headmaster Turnover		New Teachers		Teachers that have left	
Panel A	Politically Appointed at Baseline							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.055	-0.048	0.354	0.350	0.096	0.098	0.100	0.101
	(0.024)	(0.023)	(0.032)	(0.032)	(0.016)	(0.016)	(0.016)	(0.016)
School-level baseline scores	0.849	0.728						
	(0.014)	(0.015)						
Observations	284,998	284,998	5,916	5,916	6,669	6,669	6,669	6,669
R-squared	0.216	0.250	0.159	0.162	0.088	0.095	0.079	0.086
Controls	No	Yes	No	No	No	No	No	No
Clusters	1818	1818	1736	1736	1725	1725	1725	1725
Mean Dep. Variable	-0.196	-0.196	0.459	0.459	0.452	0.452	0.435	0.435
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.0860	0.0860	0.113	0.113	0.156	0.156	0.152	0.152
Panel B	Not Politically Appointed at Baseline							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.112	-0.092	0.036	0.038	0.050	0.054	0.054	0.057
	(0.052)	(0.045)	(0.067)	(0.065)	(0.029)	(0.028)	(0.027)	(0.026)
School-level baseline scores	0.855	0.731						
	(0.022)	(0.023)						
Observations	112,413	112,413	2,061	2,061	2,017	2,017	2,017	2,017
R-squared	0.188	0.223	0.009	0.020	0.015	0.027	0.013	0.021
Controls	No	Yes	No	No	No	No	No	No
Clusters	554	554	560	560	532	532	532	532
Mean Dep. Variable	0.0419	0.0419	0.415	0.415	0.468	0.468	0.456	0.456
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.103	0.103	0.149	0.149	0.145	0.145	0.155	0.155

This table reports the coefficient on political party turnover estimating Equation 1. The outcomes are the individual-level 4^{th} grade test scores (columns 1 and 2), an indicator variable for whether the school has a new headmaster (columns 3 and 4), share of teachers that are new to the school (columns 5 and 6) and share of teachers that have left a school (columns 7 and 8). Test scores are from the *Prova Brasil* exam and are standardized based on the distribution of individual-level test scores in municipalities with no change in the ruling party. Headmaster Turnover is an indicator variable for whether the school has a new headmaster, those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. The share of teachers that are new to a school is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t (one year after the respective election) but were not in that same school at time $t-2$ (the year before the respective election). The share of teachers that have left a school is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ (the year before the respective election) but are no longer in that same school at time t (one year after the respective election). Controls include a 2012 election-cycle indicator and school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet). In Columns 1 and 2 only, there are also for school-level, average test scores for 4th graders at baseline (one year before the 2008 election) and, in Column 2, individual-level controls (an indicator variable for gender, whether the student is white, and whether the student sees their mother reading). The analysis is made separately for schools that had a politically appointed headmaster at baseline (Panel A) and those that did not (Panel B). Politically appointed headmasters are those who report being some type of "appointee" on the *Prova Brasil* headmaster questionnaire.

TABLE A.21: POLITICAL TURNOVER AND HEADMASTER REPLACEMENT IN LOW- AND HIGH-INCOME MUNICIPALITIES

Outcome:	Headmaster is new to the school (as Headmaster)					
Panel A	Low Income Municipalities (Below Median Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.389	0.389	0.371	0.370	0.379	0.379
	(0.038)	(0.037)	(0.047)	(0.045)	(0.039)	(0.038)
Observations	6,703	6,703	4,294	4,294	6,447	6,447
R-squared	0.151	0.154	0.160	0.167	0.156	0.159
Controls	No	Yes	No	Yes	No	Yes
Clusters	1073	1073	754	754	1030	1030
Mean Dep. Variable	0.447	0.447	0.447	0.447	0.445	0.445
Using Bandwidth	0.116	0.116	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.116	0.116	0.116	0.116	0.116	0.116
Panel B	High Income Municipalities (Above Median Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.126	0.125	0.136	0.138	0.107	0.112
	(0.044)	(0.043)	(0.065)	(0.064)	(0.049)	(0.049)
Observations	5,809	5,809	3,114	3,114	4,560	4,560
R-squared	0.050	0.051	0.030	0.032	0.045	0.046
Controls	No	Yes	No	Yes	No	Yes
Clusters	1220	1220	764	764	1048	1048
Mean Dep. Variable	0.430	0.430	0.467	0.467	0.448	0.448
Using Bandwidth	0.139	0.139	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.139	0.139	0.139	0.139	0.139	0.139

This table shows the same analysis as in Table 4 separately for low-income (Panel A) and high-income (Panel B) municipalities. Low-income municipalities are those below the median in the municipal-level distribution of median monthly household income as measured in the 2000 Census. High income municipalities are those above the median in this distribution.

TABLE A.22: POLITICAL TURNOVER AND TEACHER REPLACEMENTS IN LOW- AND HIGH-INCOME MUNICIPALITIES

Outcome:	Share of Teachers New to the School						Share of Teachers that have Left the School					
Panel A	Low Income Municipalities (Below Median Income)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.113	0.114	0.130	0.130	0.117	0.118	0.115	0.116	0.127	0.127	0.114	0.114
	(0.024)	(0.024)	(0.028)	(0.028)	(0.024)	(0.024)	(0.024)	(0.024)	(0.028)	(0.028)	(0.025)	(0.024)
Observations	24,003	24,003	16,008	16,008	24,337	24,337	25,052	25,052	16,008	16,008	24,337	24,337
R-squared	0.036	0.038	0.032	0.034	0.035	0.037	0.032	0.034	0.029	0.031	0.032	0.034
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Clusters	965	965	707	707	975	975	1001	1001	707	707	975	975
Mean Dep. Variable	0.447	0.447	0.453	0.453	0.447	0.447	0.434	0.434	0.439	0.439	0.433	0.433
Using Bandwidth	0.108	0.108	0.0700	0.0700	0.110	0.110	0.114	0.114	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.108	0.108	0.108	0.108	0.108	0.108	0.114	0.114	0.114	0.114	0.114	0.114
Panel B	High Income Municipalities (Above Median Income)											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.050	0.055	0.049	0.050	0.041	0.046	0.044	0.049	0.039	0.040	0.040	0.045
	(0.022)	(0.022)	(0.032)	(0.032)	(0.026)	(0.026)	(0.019)	(0.019)	(0.031)	(0.030)	(0.025)	(0.024)
Observations	10,983	10,983	5,458	5,458	7,881	7,881	12,640	12,640	5,458	5,458	7,881	7,881
R-squared	0.008	0.018	0.008	0.018	0.009	0.018	0.008	0.018	0.008	0.020	0.008	0.019
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Clusters	1286	1286	762	762	1028	1028	1425	1425	762	762	1028	1028
Mean Dep. Variable	0.508	0.508	0.507	0.507	0.506	0.506	0.487	0.487	0.487	0.487	0.487	0.487
Using Bandwidth	0.163	0.163	0.0700	0.0700	0.110	0.110	0.206	0.206	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.163	0.163	0.163	0.163	0.163	0.163	0.206	0.206	0.206	0.206	0.206	0.206

This table shows the same analysis as in Table 5 (Panel A) separately for low-income (Panel A) and high-income (Panel B) municipalities. Low-income municipalities are those below the median in the municipal-level distribution of median monthly household income as measured in the 2000 Census. High income municipalities are those above the median in this distribution.

TABLE A.23: POLITICAL TURNOVER AND 4TH GRADE TEST SCORES IN LOW- AND HIGH-INCOME MUNICIPALITIES

Outcome:	Individual 4th Grade Test Scores (standardized)					
Panel A	Low Income Municipalities (Below Median Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.060	-0.038	-0.069	-0.053	-0.061	-0.047
	(0.037)	(0.035)	(0.039)	(0.037)	(0.032)	(0.031)
School-level baseline scores	0.737	0.667	0.738	0.669	0.726	0.654
	(0.025)	(0.024)	(0.024)	(0.023)	(0.022)	(0.022)
Observations	148,635	148,635	127,443	127,443	188,065	188,065
R-squared	0.111	0.152	0.112	0.152	0.109	0.151
Controls	No	Yes	No	Yes	No	Yes
Clusters	802	802	718	718	987	987
Using Bandwidth	0.0812	0.0812	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.0812	0.0812	0.0812	0.0812	0.0812	0.0812
Panel B	High Income Municipalities (Above Median Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.035	-0.023	-0.101	-0.085	-0.068	-0.059
	(0.034)	(0.031)	(0.043)	(0.037)	(0.035)	(0.032)
School-level baseline scores	0.717	0.635	0.726	0.638	0.736	0.650
	(0.020)	(0.019)	(0.027)	(0.026)	(0.022)	(0.020)
Observations	267,939	267,939	162,548	162,548	234,096	234,096
R-squared	0.100	0.135	0.099	0.135	0.106	0.141
Controls	No	Yes	No	Yes	No	Yes
Clusters	1148	1148	776	776	1054	1054
Using Bandwidth	0.125	0.125	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.125	0.125	0.125	0.125	0.125	0.125

This table shows the same analysis as in Table 3 (Panel A) separately for low-income (Panel A) and high-income (Panel B) municipalities. Low-income municipalities are those below the median in the municipal-level distribution of median monthly household income as measured in the 2000 Census. High income municipalities are those above the median in this distribution.

TABLE A.24: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES IN LOW- AND HIGH-INCOME MUNICIPALITIES

Outcome:	Individual 8th Grade Test Scores (standardized)					
Panel A	Low Income Municipalities (Below Median Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.032	-0.027	-0.034	-0.027	-0.015	-0.007
	(0.028)	(0.028)	(0.037)	(0.037)	(0.031)	(0.031)
School-level baseline scores	0.687	0.659	0.663	0.633	0.687	0.655
	(0.020)	(0.021)	(0.032)	(0.031)	(0.024)	(0.024)
Observations	143,725	143,725	74,190	74,190	113,464	113,464
R-squared	0.081	0.092	0.072	0.084	0.082	0.093
Controls	No	Yes	No	Yes	No	Yes
Clusters	936	936	549	549	770	770
Using Bandwidth	0.154	0.154	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.154	0.154	0.154	0.154	0.154	0.154
Panel B	High Income Municipalities (Above Median Income)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.078	-0.050	-0.086	-0.075	-0.123	-0.099
	(0.040)	(0.038)	(0.051)	(0.050)	(0.044)	(0.042)
School-level baseline scores	0.763	0.721	0.755	0.712	0.749	0.703
	(0.031)	(0.027)	(0.033)	(0.032)	(0.033)	(0.029)
Observations	95,630	95,630	50,338	50,338	73,955	73,955
R-squared	0.098	0.119	0.092	0.111	0.093	0.113
Controls	No	Yes	No	Yes	No	Yes
Clusters	615	615	390	390	527	527
Using Bandwidth	0.141	0.141	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.141	0.141	0.141	0.141	0.141	0.141

This table shows the same analysis as in Table 3 (Panel B) separately for low-income (Panel A) and high-income (Panel B) municipalities. Low-income municipalities are those below the median in the municipal-level distribution of median monthly household income as measured in the 2000 Census. High income municipalities are those above the median in this distribution.

TABLE A.25: PERSONNEL REPLACEMENTS: BY WINNING PARTY IDEOLOGY

Outcome:	Headmaster Replacement	Teachers (Share)		Municipal Personnel (Share)	
		New	Who Left	New	Who Left
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.271	0.061	0.046	0.069	0.023
	(0.040)	(0.027)	(0.028)	(0.023)	(0.022)
Left Ideology Wins	-0.019	-0.049	-0.048	0.004	-0.000
	(0.044)	(0.036)	(0.037)	(0.027)	(0.027)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.018	0.082	0.059	-0.002	0.003
$\times$ Left Ideology Wins	(0.069)	(0.048)	(0.049)	(0.041)	(0.037)
Observations	8,654	31,044	31,717	2,265	2,265
R-squared	0.097	0.026	0.019	0.026	0.005
Controls	No	No	No	No	No
Clusters	1729	1867	1978	1979	1979
Mean LHS	0.453	0.478	0.478	0.309	0.236
Using Bandwidth	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.104	0.126	0.116	0.123	0.124

This table reports the coefficient on political party turnover estimating Equation 2. Outcomes: Headmaster Replacement (Column 1) is an indicator variable for whether the school has a new headmaster, those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. The share of teachers that are new to a school (Column 2) is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t (one year after the respective election) but were not in that same school at time $t-2$ (the year before the respective election). The share of teachers that have left a school (Column 3) is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ (the year before the respective election) but are no longer in that same school at time t (one year after the respective election). New municipal personnel (share) is the ratio between the number of new labor contracts that had been added 12 months after the election divided by the total number of contracts that existed the month prior to the election (Column 4) and Municipal Personnel Who Left (share) is analogous and uses number of terminated contracts (Column 5). Left Ideology Wins is an indicator variable equal to 1 if a left-wing party won the election and 0 if a right-wing party won. Party ideology is classified as belonging to the left vs. the right according to *Atlas Polìtico - Mapa do Congresso.*

TABLE A.26: POLITICAL TURNOVER AND TEACHER REPLACEMENTS BY WINNING PARTY IDEOLOGY

Outcome	Share of Teachers New to the School						Share of Teachers that have Left the School					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.074	0.076	0.099	0.100	0.061	0.062	0.045	0.048	0.074	0.075	0.046	0.049
	(0.026)	(0.026)	(0.031)	(0.031)	(0.027)	(0.027)	(0.027)	(0.027)	(0.031)	(0.031)	(0.028)	(0.028)
Left Ideology Wins	-0.060	-0.037	-0.027	-0.001	-0.049	-0.032	-0.053	-0.039	-0.024	-0.014	-0.048	-0.040
	(0.034)	(0.037)	(0.042)	(0.046)	(0.036)	(0.040)	(0.036)	(0.039)	(0.042)	(0.047)	(0.037)	(0.041)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.091	0.086	0.041	0.039	0.082	0.080	0.063	0.061	0.025	0.027	0.059	0.058
$\times$ Left Ideology Wins	(0.045)	(0.045)	(0.057)	(0.056)	(0.048)	(0.048)	(0.047)	(0.047)	(0.057)	(0.056)	(0.049)	(0.049)
Observations	35,347	35,347	21,016	21,016	31,044	31,044	33,249	33,249	21,444	21,444	31,717	31,717
R-squared	0.023	0.028	0.023	0.027	0.026	0.030	0.020	0.034	0.015	0.028	0.019	0.033
Controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Clusters	2060	2060	1354	1354	1867	1867	2049	2049	1447	1447	1978	1978
Mean LHS	0.480	0.480	0.485	0.485	0.478	0.478	0.476	0.476	0.486	0.486	0.478	0.478
Using Bandwidth	0.126	0.126	0.0700	0.0700	0.110	0.110	0.116	0.116	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.126	0.126	0.126	0.126	0.126	0.126	0.116	0.116	0.116	0.116	0.116	0.116

This table reports the coefficient on political party turnover estimating Equation 2. Outcomes: The share of teachers that are new to a school (Columns 1-6) is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t (one year after the respective election) but were not in that same school at time $t-2$ (the year before the respective election). The share of teachers that have left a school (Columns 7-12) is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ (the year before the respective election) but are no longer in that same school at time t (one year after the respective election). Controls include a 2012 election-cycle indicator and school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet). Left Ideology Wins is an indicator variable equal to 1 if a left-wing party won the election and 0 if a right-wing party won. Party ideology is classified as belonging to the left vs. the right according to *Atlas Político - Mapa do Congresso*.

TABLE A.27: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES IN NON-MUNICIPAL SCHOOLS

Outcome:	Individual 8th Grade Test Scores (standardized)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.017	-0.011	-0.030	-0.013	-0.031	-0.023
	(0.018)	(0.018)	(0.026)	(0.025)	(0.021)	(0.020)
Baseline Scores	0.760	0.697	0.753	0.688	0.762	0.699
	(0.010)	(0.010)	(0.013)	(0.013)	(0.011)	(0.011)
N	381,972	381,972	222,724	222,724	316,167	316,167
R-squared	0.106	0.125	0.106	0.125	0.107	0.126
Controls	No	Yes	No	Yes	No	Yes
Clusters	2155	2155	1409	1409	1888	1888
Using Bandwidth	0.136	0.136	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.136	0.136	0.136	0.136	0.136	0.136

This table shows a similar analysis to that of Table 3 (Panel B) with the key difference that the estimation sample for this table is *non-municipal* schools. The set of *non-municipal* schools for this outcome is comprised of state and federal schools, since only public schools participate in the *Prova Brasil* exam.

TABLE A.28: POLITICAL TURNOVER AND 4TH GRADE TEST SCORES IN LOW- AND HIGH-QUALITY MUNICIPAL SCHOOLS

Outcome:	Individual 4th Grade Test Scores (standardized)					
Panel A	Low Quality Schools (Below Median Baseline Test Scores)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.084	-0.060	-0.075	-0.050	-0.076	-0.052
	(0.033)	(0.031)	(0.040)	(0.038)	(0.034)	(0.032)
School-level baseline scores	0.836	0.674	0.840	0.675	0.832	0.668
	(0.028)	(0.027)	(0.035)	(0.033)	(0.028)	(0.028)
Observations	187,043	187,043	119,327	119,327	178,087	178,087
R-squared	0.065	0.114	0.067	0.115	0.066	0.115
Controls	No	Yes	No	Yes	No	Yes
Clusters	1219	1219	820	820	1159	1159
Using Bandwidth	0.117	0.117	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.117	0.117	0.117	0.117	0.117	0.117
Panel B	High Quality Schools (Above Median Baseline Test Scores)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.064	-0.061	-0.107	-0.096	-0.064	-0.062
	(0.030)	(0.028)	(0.038)	(0.034)	(0.031)	(0.028)
School-level baseline scores	0.791	0.682	0.801	0.690	0.796	0.686
	(0.023)	(0.022)	(0.029)	(0.028)	(0.023)	(0.023)
Observations	256,887	256,437	176,174	175,843	252,342	251,892
R-squared	0.088	0.127	0.089	0.127	0.089	0.128
Controls	No	Yes	No	Yes	No	Yes
Clusters	1469	1469	1062	1062	1450	1450
Using Bandwidth	0.112	0.112	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.112	0.112	0.112	0.112	0.112	0.112

This table shows the same analysis as in Table 3 (Panel A) separately for low-income (Panel A) and high-income (Panel B) municipalities. Low-income municipalities are those below the median in the municipal-level distribution of median monthly household income as measured in the 2000 Census. High income municipalities are those above the median in this distribution.

TABLE A.29: POLITICAL TURNOVER AND 8TH GRADE TEST SCORES IN LOW- AND HIGH-QUALITY MUNICIPAL SCHOOLS

Outcome:	Individual 8th Grade Test Scores (standardized)					
Panel A	Low Quality Schools (Below Median Baseline Test Scores)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.057	-0.048	-0.019	-0.007	-0.033	-0.019
	(0.029)	(0.028)	(0.040)	(0.039)	(0.035)	(0.035)
School-level baseline scores	0.676	0.613	0.654	0.596	0.666	0.603
	(0.030)	(0.032)	(0.043)	(0.043)	(0.036)	(0.037)
Observations	119,600	119,600	57,177	57,177	88,390	88,390
R-squared	0.038	0.052	0.034	0.048	0.038	0.052
Controls	No	Yes	No	Yes	No	Yes
Clusters	960	960	527	527	742	742
Using Bandwidth	0.163	0.163	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.163	0.163	0.163	0.163	0.163	0.163
Panel B	High Quality Schools (Above Median Baseline Test Scores)					
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.040	-0.026	-0.078	-0.077	-0.078	-0.070
	(0.033)	(0.032)	(0.041)	(0.041)	(0.034)	(0.034)
School-level baseline scores	0.846	0.773	0.864	0.791	0.839	0.762
	(0.025)	(0.026)	(0.033)	(0.034)	(0.027)	(0.028)
Observations	123,518	122,616	70,089	69,678	103,681	102,779
R-squared	0.087	0.102	0.091	0.107	0.083	0.098
Controls	No	Yes	No	Yes	No	Yes
Clusters	965	962	612	608	864	859
Using Bandwidth	0.131	0.131	0.0700	0.0700	0.110	0.110
Optimal Bandwidth	0.131	0.131	0.131	0.131	0.131	0.131

This table shows the same analysis as in Table 3 (Panel B) separately for low-quality (Panel A) and high-quality (Panel B) *municipal* schools. Low-quality schools are those below the median in the school-level distribution of test scores at baseline (the year before the respective election). High-quality schools are those above the median in this distribution.

TABLE A.30: POLITICAL TURNOVER AND SCHOOL PERSONNEL CHARACTERISTICS IN NON-MUNICIPAL SCHOOLS

Panel A: Headmaster Characteristics

Outcome:	Female	Age	B.A.	Graduate Training	Salary	Hours Worked	Experience in Education	Experience as Headmaster
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.013	0.051	0.001	0.018	57.170	0.075	0.156	0.421
	(0.024)	(0.422)	(0.008)	(0.017)	(101.458)	(0.304)	(0.199)	(0.309)
Observations	5,782	5,726	5,632	5,726	5,736	5,791	5,785	5,774
R-squared	0.006	0.021	0.015	0.092	0.240	0.322	0.208	0.020
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	1863	1853	1843	1858	1858	1862	1862	1861
Mean LHS	0.766	45	0.973	0.871	2960	39.04	15.67	5.771
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.175	0.171	0.128	0.151	0.142	0.192	0.155	0.106

Panel B: Teacher Characteristics

Outcome:	N Teachers	Age	Female	B.A.	Graduate Training	Temporary Contract	Contract Type Missing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.844	0.011	-0.002	0.010	-0.014	-0.037	0.095
	(0.688)	(0.309)	(0.015)	(0.023)	(0.021)	(0.032)	(0.030)
Observations	14,251	14,251	14,251	14,251	14,251	5,415	8,060
R-squared	0.179	0.011	0.051	0.188	0.111	0.152	0.110
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	2299	2299	2299	2299	2299	1523	1523
Mean LHS	20.38	37.84	0.753	0.744	0.288	0.434	0.292
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.109	0.114	0.173	0.117	0.114	0.138	0.139

This table reports the coefficient on political party turnover estimating Equation 1. Outcomes: Headmaster characteristics (Panel A) are from the *Prova Brasil* headmaster questionnaire. The teacher characteristics (Panel B) are from the School Census and are averaged at the school-level. Controls include a 2012 election-cycle indicator and school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet). The set of non-municipal schools in Panel A is comprised of state and federal schools, since only public schools participate in the *Prova Brasil* exam. The set of *non-municipal* schools in Panel B is comprised of state, federal, and private schools (since all schools participate in School Census).

TABLE A.31: POLITICAL TURNOVER AND HEADMASTER CHARACTERISTICS

Outcome:	Female	Age	B.A.	Graduate Training	Salary	Hours Worked	Experience in Education	Experience as Headmaster
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.019	-0.231	-0.004	-0.043	9.492	-0.096	-0.134	-1.758
	(0.019)	(0.405)	(0.014)	(0.022)	(77.119)	(0.274)	(0.222)	(0.258)
Observations	11,112	10,989	10,853	10,773	11,019	11,170	11,161	11,176
R-squared	0.032	0.055	0.050	0.252	0.275	0.323	0.148	0.046
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	2142	2141	2132	2130	2141	2144	2136	2142
Mean LHS	0.820	41.62	0.901	0.767	2056	38.69	14.14	5.047
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.137	0.139	0.142	0.113	0.117	0.145	0.166	0.134

This table reports the coefficient on political party turnover from regressing each of the headmaster characteristic variables on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin|$<Using Bandwidth. Headmaster characteristics are from the *Prova Brasil* headmaster questionnaire. Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

TABLE A.32: POLITICAL TURNOVER AND TEACHER CHARACTERISTICS

Outcome:	N Teachers	Age	Female	B.A.	Graduate Training	Temporary Contract	Contract Type Missing
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.176	-0.443	-0.018	-0.077	-0.025	0.034	0.010
	(0.274)	(0.382)	(0.017)	(0.025)	(0.014)	(0.037)	(0.006)
Observations	39,642	39,642	39,642	39,642	39,642	20,945	20,945
R-squared	0.505	0.047	0.032	0.269	0.193	0.093	0.023
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	2304	2304	2304	2304	2304	1523	1523
Mean LHS	7.859	37.31	0.815	0.485	0.155	0.344	0.0184
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.0922	0.144	0.0995	0.0917	0.0884	0.0915	0.169

This table reports the coefficient on political party turnover from regressing each of the teacher characteristic variables on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin|$<Using Bandwidth. The teacher characteristics are from the School Census and are averaged at the school-level. Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

TABLE A.33: POLITICAL TURNOVER AND MUNICIPAL PERSONNEL CHARACTERISTICS

Outcomes	Age	College	High School	Middle Edu	Mean Wage	Seniority
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.422	-0.001	0.016	-0.015	17.387	-6.595
	(0.213)	(0.011)	(0.014)	(0.011)	(24.423)	(2.739)
Observations	2,373	2,373	2,373	2,373	2,373	2,373
R-squared	0.031	0.028	0.001	0.047	0.332	0.029
Clusters	2047	2047	2047	2047	2047	2047
Mean Dep. Variable	39.16	0.272	0.389	0.273	1167	78.93
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.120	0.121	0.131	0.145	0.105	0.136

This table reports the coefficient on Political turnover from regressing municipal personnel characteristics estimating Equation 1. The municipal personnel characteristics are from *RAIS*. The variables Age, Mean Wage and Seniority were calculated as the average attribute among workers employed in the municipality one year after the election. The variables College, High School and Middle School are each the share of the workers with the respective attribute among the employed in the municipality one year after the election.

TABLE A.34: POLITICAL TURNOVER AND SCHOOL PROBLEMS (AS REPORTED BY HEADMASTER)

Outcome:	Teacher Council Meetings (1)	Coordinated Curriculum (2)	Curriculum Together (3)	Textbooks On-time (4)	Textbooks Correct (5)	Program for Dropouts (6)	Program for Tutoring (7)	Program for Failing Students (8)	Teacher Training Held (9)	Teacher Training Participation (10)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.130	-0.027	-0.047	-0.090	-0.059	-0.052	-0.076	-0.035	-0.150	-0.026
	(0.066)	(0.011)	(0.021)	(0.026)	(0.025)	(0.027)	(0.025)	(0.019)	(0.031)	(0.013)
N	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	7,058	4,228
R-squared	0.035	0.036	0.155	0.029	0.023	0.086	0.055	0.123	0.024	0.488
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	1819	1819	1819	1819	1819	1819	1819	1819	1819	1521
Mean Dep Var	2.557	0.963	0.776	0.776	0.794	0.621	0.835	0.845	0.607	0.639
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.160	0.119	0.142	0.115	0.138	0.113	0.132	0.139	0.120	0.117

This table reports the coefficient on political party turnover from regressing each of the outcome variables (survey responses) on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin|$<Using Bandwidth. The survey responses are from the *Prova Brasil* headmaster questionnaire. Teacher Council Meetings refers to the number of teacher council meetings that have been held in the school this year (ranges from 0-3). Coordinated Curriculum refers to whether the school has a teaching plan (*Projeto Pedagogico*). Curriculum Together refers to whether the headmasters and teachers developed the teaching plan together. Textbooks On-time refers to whether the school received its textbooks at the beginning of the school-year and Textbooks Correct refers to whether the appropriate textbooks were (eventually) received. Each of the Program variables refers to whether the school offers that particular program for students. Teacher Training Held refers to whether the school held any teacher training sessions. Finally, Teacher Training Participation refers to the share of teachers who participated in the teacher training sessions (conditional on the school holding at least one such session). Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

TABLE A.35: POLITICAL TURNOVER IN 2008 AND SCHOOL PROBLEMS 1 AND 3 YEARS AFTER ELECTION (AS REPORTED BY HEADMASTER)

Outcome:	Teacher Council Meetings (1)	Coordinated Curriculum (2)	Curriculum Together (3)	Textbooks On-time (4)	Textbooks Correct (5)	Program for Dropouts (6)	Program for Tutoring (7)	Program for Failing Students (8)	Teacher Training Held (9)	Teacher Training Participation (10)	Problems Index (11)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.244	-0.048	-0.057	-0.131	-0.089	-0.103	-0.147	-0.070	-0.145	-0.037	-0.246
	(0.097)	(0.021)	(0.040)	(0.036)	(0.041)	(0.039)	(0.044)	(0.036)	(0.049)	(0.012)	(0.046)
2011	-0.089	-0.001	0.101	-0.047	0.093	-0.003	-0.034	-0.034	0.018	-0.006	0.004
	(0.049)	(0.012)	(0.035)	(0.031)	(0.028)	(0.027)	(0.024)	(0.026)	(0.039)	(0.008)	(0.026)
$\mathbb{1}\{IncumbVoteMargin < 0\} \times 2011$	0.116	0.021	0.068	0.158	0.048	-0.005	0.066	-0.002	0.083	0.034	0.142
	(0.078)	(0.022)	(0.048)	(0.043)	(0.040)	(0.045)	(0.036)	(0.040)	(0.053)	(0.013)	(0.039)
Observations	6,623	6,623	6,623	6,623	6,623	6,623	6,623	6,623	6,623	3,876	6,623
R-squared	0.043	0.034	0.043	0.028	0.030	0.024	0.074	0.044	0.035	0.036	0.145
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	1138	1138	1138	1138	1138	1138	1138	1138	1138	989	1138
Mean LHS	2.579	0.956	0.683	0.802	0.806	0.484	0.789	0.738	0.596	0.448	0.0328
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.114	0.123	0.107	0.141	0.165	0.141	0.118	0.132	0.126	0.131	0.124

This table reports the coefficient on political party turnover in 2008 estimating Equation 2. Outomces: The survey responses are from the *Prova Brasil* headmaster questionnaire. Teacher Council Meetings refers to the number of teacher council meetings that have been held in the school this year (ranges from 0-3). Coordinated Curriculum refers to whether the school has a teaching plan (*Projeto Pedagogico*). Curriculum Together refers to whether the headmasters and teachers developed the teaching plan together. Textbooks On-time refers to whether the school received its textbooks at the beginning of the school-year and Textbooks Correct refers to whether the appropriate textbooks were (eventually) received. Each of the Program variables refers to whether the school offers that particular program for students. Teacher Training Held refers to whether the school held any teacher training sessions. Finally, Teacher Training Participation refers to the share of teachers who participated in the teacher training sessions (conditional on the school holding at least one such session). Problems Index (Column 11) is constructed with headmaster's survey responses in a way that a higher index corresponds to fewer problems. Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet). *2011* is an indicator for outcomes in 2011 *Prova Brasil* edition.

TABLE A.36: POLITICAL TURNOVER AND SCHOOL PROBLEMS (AS REPORTED BY THE TEACHER)

Outcome:	Teacher Council Meetings (1)	Coordinated Curriculum (2)	Curriculum Together (3)	Relationship w/ Headmaster (Index) (4)	Relationship w/ Teachers (Index) (5)	Collaborative Environment (6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.042	-0.014	-0.038	-0.234	-0.059	-0.028
	(0.064)	(0.007)	(0.017)	(0.311)	(0.157)	(0.031)
N	23,409	23,409	23,409	23,409	23,409	23,409
R-squared	0.025	0.020	0.055	0.007	0.022	0.327
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	2087	2087	2087	2087	2087	2087
Mean Dep Var	2.337	0.969	0.800	0.705	0.387	3.677
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.146	0.135	0.144	0.190	0.130	0.121

This table reports the coefficient on political party turnover from regressing each of the outcome variables (survey responses) on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin|$<Using Bandwidth. The survey responses are from the *Prova Brasil* teacher questionnaire, which is administered to teachers who proctor the exam. Teacher Council Meetings refers to the number of teacher council meetings that have been held in the school this year (ranges from 0-3). Coordinated Curriculum refers to whether the school has a teaching plan (*Projeto Pedagogico*). Curriculum Together refers to whether the headmasters and teachers developed the teaching plan together. The Relationship with Headmaster Index is constructed as follows. We standardize the responses to a series of questions – regarding whether the teacher trusts the headmaster, whether the teacher believes the headmaster motivates her, is committed to the school, innovates, cares about the students, cares about the school personnel, and cares about the school as a whole, and whether the teacher respects the headmaster/feels respected by the headmaster – by subtracting the overall mean and dividing by the standard deviation of all teacher responses for each question. We then add all these standardized responses to arrive at the "Relationship w/ Headmaster Index." The Relationship with Teacher Index is constructed as follows. We standardize the responses to a series of questions – regarding whether the teachers share ideas and whether the teachers work together – by subtracting the overall mean and dividing by the standard deviation of all teacher responses for each question. We then add all these standardized responses to arrive at the "Relationship w/ Teacher Index." Finally, Collaborative Environment refers to how collaborative the teacher feels the school is (on a scale of 1-5, where 5 is very collaborative). Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

TABLE A.37: POLITICAL TURNOVER IN 2008 AND SCHOOL PROBLEMS 1 AND 3 YEARS AFTER ELECTION (AS REPORTED BY THE TEACHER)

Outcome:	Teacher Council Meetings (1)	Coordinated Curriculum (2)	Curriculum Together (3)	Relationship w/ Headmaster (Index) (4)	Relationship w/ Teachers (Index) (5)	Collaborative Environment (6)	Problems Index (7)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.085	-0.009	-0.029	-1.061	-0.274	-0.108	-0.098
	(0.089)	(0.012)	(0.034)	(0.406)	(0.150)	(0.048)	(0.038)
2011	0.005	0.006	-0.005	0.107	0.040	0.059	0.021
	(0.045)	(0.008)	(0.026)	(0.324)	(0.144)	(0.035)	(0.028)
$\mathbb{1}\{IncumbVoteMargin < 0\}$ X 2011	-0.082	-0.013	0.040	-0.463	-0.211	0.005	-0.033
	(0.070)	(0.012)	(0.035)	(0.494)	(0.210)	(0.054)	(0.043)
Observations	21,699	21,699	21,699	21,699	21,699	21,699	21,699
R-squared	0.033	0.026	0.015	0.010	0.006	0.005	0.028
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Clusters	1224	1224	1224	1224	1224	1224	1224
Mean LHS	2.386	0.972	0.707	0.843	0.278	4.381	0.0965
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.109	0.117	0.140	0.0881	0.0998	0.108	0.0906

This table reports the coefficient on political party turnover in 2008 estimating Equation 2. Outcomes: The survey responses are from the *Prova Brasil* teacher questionnaire, which is administered to teachers who proctor the exam. Teacher Council Meetings refers to the number of teacher council meetings that have been held in the school this year (ranges from 0-3). Coordinated Curriculum refers to whether the school has a teaching plan (*Projeto Pedagogico*). Curriculum Together refers to whether the headmasters and teachers developed the teaching plan together. The Relationship with Headmaster Index is constructed as follows. We standardize the responses to a series of questions – regarding whether the teacher trusts the headmaster, whether the teacher believes the headmaster motivates her, is committed to the school, innovates, cares about the students, cares about the school personnel, and cares about the school as a whole, and whether the teacher respects the headmaster/feels respected by the headmaster – by subtracting the overall mean and dividing by the standard deviation of all teacher responses for each question. We then add all these standardized responses to arrive at the "Relationship w/ Headmaster Index." The Relationship with Teacher Index is constructed as follows. We standardize the responses to a series of questions – regarding whether the teachers share ideas and whether the teachers work together – by subtracting the overall mean and dividing by the standard deviation of all teacher responses for each question. We then add all these standardized responses to arrive at the "Relationship w/ Teacher Index." Finally, Collaborative Environment refers to how collaborative the teacher feels the school is (on a scale of 1-5, where 5 is very collaborative). Problem Index (Column 7) is constructed with teacher's survey responses in a way that a higher index corresponds to fewer problems. Controls include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet). *2011* is an indicator for outcomes in 2011 *Prova Brasil* edition.

TABLE A.38: TEACHER CHARACTERISTICS BY POLITICALLY APPOINTED HEADMASTER

	(1) Number of Teachers	(2) Age	(3) Female	(4) B.A.	(5) Graduate Training	(6) Temporary Contract	(7) Contract Type Missing
$\mathbf{1}\{IncumbVoteMargin < 0\}$	0.801	0.432	0.001	0.052	0.011	0.105	-0.019
	(1.615)	(0.727)	(0.019)	(0.047)	(0.054)	(0.073)	(0.020)
Headmaster Politically Appointed at Baseline	0.127	-0.783	-0.040	-0.027	-0.045	0.064	-0.028
	(1.110)	(0.535)	(0.014)	(0.034)	(0.035)	(0.039)	(0.018)
$\mathbf{1}\{IncumbVoteMargin < 0\}$	-0.176	-0.662	-0.032	-0.082	-0.040	-0.059	0.039
Headmaster Politically Appointed at Baseline	(1.674)	(0.774)	(0.020)	(0.050)	(0.055)	(0.074)	(0.020)
Observations	9,520	9,520	9,520	9,520	9,520	6,092	6,092
R-squared	0.004	0.012	0.023	0.029	0.034	0.017	0.006
Controls	No	No	No	No	No	No	No
Clusters	2069	2069	2069	2069	2069	1346	1346
Mean Dep. Variable	18.77	38.71	0.854	0.719	0.284	0.213	0.0266
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.134	0.153	0.122	0.123	0.112	0.107	0.158

This table reports the coefficient on Political turnover from regressing teacher characteristics estimating Equation 2. The teacher characteristics are from the School Census and are averaged at the school-level. Politically appointed headmasters are those who report being some type of "appointee" on the Prova Brasil headmaster questionnaire.

TABLE A.39: POLITICAL TURNOVER AND SCHOOL PROBLEMS (REPORTED BY HEADMASTER AND TEACHER)

Outcome	School Problems Index: Reported by Headmaster and Teacher			
	(1)	(2)	(3)	(4)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	-0.092	-0.094	-0.071	-0.069
	(0.026)	(0.026)	(0.026)	(0.026)
New 4th Grade Teachers (share)		-0.001	-0.012	
		(0.089)	(0.098)	
4th Grade Teachers that Have Left (share)		0.249	0.320	
		(0.089)	(0.098)	
New Teachers Except 4th Grade (share)			-0.122	-0.089
			(0.050)	(0.044)
Teachers Except 4th Grade that Have Left (share)			0.059	0.030
			(0.053)	(0.047)
Headmaster is new to the school (as Headmaster)			-0.114	-0.114
			(0.011)	(0.011)
New Municipal Personnel (share)			-0.019	-0.021
			(0.037)	(0.038)
Municipal Personnel Who Left (share)			0.134	0.133
			(0.043)	(0.044)
Observations	15,544	15,544	15,544	15,544
R-squared	0.117	0.118	0.148	0.146
Controls	Yes	Yes	Yes	Yes
Clusters	1594	1594	1594	1594
Using Bandwidth	0.110	0.110	0.110	0.110

This table reports the coefficient on political party turnover estimating Equation 1 and controlling by the various types of personnel replacements. Outcome: School Problems Index: Reported by Headmasters and Teacher. Index is constructed with survey responses from the Prova Brasil questionnaire, which is administered to headmasters and teachers who proctor the exam, and in a way that a higher index corresponds to fewer problems. New Headmaster are those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. The share of teachers that are new to a school is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t (one year after the respective election) but were not in that same school at time $t-2$ (the year before the respective election). The share of teachers that have left a school is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ (the year before the respective election) but are no longer in that same school at time t (one year after the respective election). The shares are split by which grade the teacher was assigned to, also according to School Census. "Except 4th Grade" category includes teachers assigned to other grades and to no specific grade, besides not assigned to teaching. New municipal personnel (share) is the ratio between the number of new labor contracts that had been added 12 months after the election divided by the total number of contracts that existed the month prior to the election and Municipal Personnel Who Left (share) is analogous and uses number of terminated contracts. Controls include a 2012 election-cycle indicator and school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet).

TABLE A.40: TEACHER REPLACEMENT BY GRADE-LEVEL

Panel A: Share of Teachers New to the School

Outcome	All	1st-4th	5th-8th	1st	2nd	3rd	4th	Multi-Grade	Residual
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.1021	0.0260	0.0015	0.0087	0.0064	0.0048	0.0062	0.0250	0.0496
	(0.0194)	(0.0083)	(0.0025)	(0.0028)	(0.0024)	(0.0022)	(0.0022)	(0.0201)	(0.0157)
Observations	32,883	32,883	32,883	32,883	32,883	32,883	32,883	32,883	32,883
R-squared	0.0309	0.0082	0.0004	0.0083	0.0033	0.0024	0.0034	0.0082	0.0077
Clusters	2056	2056	2056	2056	2056	2056	2056	2056	2056
Mean Dep Variable	0.472	0.0970	0.0117	0.0255	0.0262	0.0228	0.0225	0.220	0.143
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.130	0.122	0.108	0.144	0.130	0.127	0.0980	0.158	0.160

Panel B: Share of Teachers that Left the School

Outcome	All	1st-4th	5th-8th	1st	2nd	3rd	4th	Multi-Grade	Residual
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0985	0.0254	0.0021	0.0092	0.0049	0.0054	0.0058	0.0314	0.0396
	(0.0195)	(0.0088)	(0.0019)	(0.0030)	(0.0026)	(0.0024)	(0.0024)	(0.0198)	(0.0148)
Observations	32,883	32,883	32,883	32,883	32,883	32,883	32,883	32,883	32,883
R-squared	0.0277	0.0095	0.0013	0.0086	0.0038	0.0032	0.0038	0.0082	0.0183
Clusters	2056	2056	2056	2056	2056	2056	2056	2056	2056
Mean Dep Variable	0.454	0.101	0.0121	0.0278	0.0269	0.0230	0.0231	0.212	0.129
Using Bandwidth	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.133	0.139	0.0911	0.144	0.137	0.133	0.146	0.131	0.158

This table reports the coefficient on political party turnover estimating Equation 1. The share of teacher that are new to the school (Panel A) is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time *t* (one year after the respective election) but were not in that same school at time *t* - 2 (the year before the election). The share of teachers that have left a school (Panel B) is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time *t* - 2 (the year before the respective election) but are no longer in that same school at time *t* (one year after the respective election). In both panels, All (Column 1) includes 1st to 8th grades, Multi-Grade teachers and the Residual category and replicates our baseline results for teacher replacements. Column 2 represents teachers in Elementary School Grades and Column 3 those in Middle School. Columns 4-7 show every Elementary School grade separately. Multi-grade (Column 8) includes teachers assigned to a multi-grade classroom for Elementary or Middle School. Residual (Column 9) includes teachers that are not assigned to teaching or whose grade has not been specified.

TABLE A.41: HEADMASTER AND TEACHER REPLACEMENT BY SKILL TYPE

Otucomes	Headmaster Replacement			Individual Teacher Left		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.241	0.272	0.237	0.074	0.073	0.070
	(0.031)	(0.046)	(0.036)	(0.014)	(0.018)	(0.015)
Individual Quality Index	-0.022	-0.033	-0.006	-0.053	-0.061	-0.058
	(0.027)	(0.040)	(0.031)	(0.009)	(0.011)	(0.010)
$\mathbb{1}\{IncumbVoteMargin < 0\}$X	-0.092	-0.006	-0.093	-0.017	0.000	-0.010
Individual Quality Index	(0.040)	(0.059)	(0.047)	(0.012)	(0.016)	(0.013)
Observations	9,391	4,733	6,985	355,218	213,175	315,538
R-squared	0.105	0.090	0.097	0.014	0.014	0.015
Controls	No	No	No	No	No	No
Clusters	2413	1421	1942	2616	1786	2415
Mean LHS	0.487	0.475	0.505	0.476	0.480	0.475
Using Bandwidth	0.157	0.0700	0.110	0.124	0.0700	0.110
Optimal Bandwidth	0.157	0.157	0.157	0.124	0.124	0.124

This table reports the coefficient on political party turnover estimating Equation 2. Outcomes: Headmaster Replacement (Columns 1-3) is an indicator variable for whether the school has a new headmaster, those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. Individual Teacher Left (Columns 4-6) is an indicator variable equal to one if the teacher was in a school at time *t - 2* (the year before the respective election) but are no longer in that school at time *t* (one year after the respective election) and is computed using the School Census. Headmaster's quality index refer to the headmaster characteristic at *t - 2* and the components are age, having college, having graduate training, salary, years of experience as a headmaster and in education, according to *Prova Brasil* headmaster questionnaire. Teacher's quality index refer to the teacher characteristic at *t - 2* and the components are age, having college and having graduate training, as reported on School Census.

TABLE A.42: PERSONNEL REPLACEMENTS: BY POLITICAL TRANSITION TYPE

Outcome:	Headmaster Replacement	Teachers (Share)		Municipal Personnel (Share)	
		New	Who Left	New	Who Left
	(1)	(2)	(3)	(4)	(5)
$\mathbb{1}\{IncumbCandidateVoteMargin < 0\}$	0.363	0.101	0.075	0.081	0.039
	(0.037)	(0.026)	(0.025)	(0.024)	(0.021)
Ideology Transition	0.052	-0.069	-0.093	-0.128	-0.131
	(0.065)	(0.043)	(0.040)	(0.047)	(0.051)
$\mathbb{1}\{IncumbCandidateVoteMargin < 0\}$X	-0.099	0.077	0.116	0.127	0.114
Ideology Transition	(0.085)	(0.054)	(0.051)	(0.057)	(0.059)
Observations	9,128	35,178	35,220	2,136	2,136
R-squared	0.148	0.030	0.029	0.064	0.016
Controls	No	No	No	No	No
Clusters	1724	1852	1957	1956	1956
Mean Dep Variable	0.409	0.481	0.466	0.273	0.218
Using Bandwidth	0.110	0.110	0.110	0.110	0.110
Optimal Bandwidth	0.104	0.134	0.128	0.185	0.133

This table reports the coefficient on political party turnover estimating Equation 2. Outcome: Headmaster Replacement (Column 1) is an indicator variable for whether the school has a new headmaster, those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. The share of teachers that are new to a school (Column 2) is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t (one year after the respective election) but were not in that same school at time $t-2$ (the year before the respective election). The share of teachers that have left a school (Column 3) is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ (the year before the respective election) but are no longer in that same school at time t (one year after the respective election). New municipal personnel (share) is the ratio between the number of new labor contracts that had been added 12 months after the election divided by the total number of contracts that existed the month prior to the election (Column 4) and Municipal Personnel Who Left (share) is analogous and uses number of terminated contracts (Column 5). Ideology Transition is an indicator variable that equals 1 if the winning party is from a different ideology (Left or Right) as the incumbent party. Party ideology is classified as belonging to the left vs. the right according to *Atlas Polìtico - Mapa do Congresso*.

TABLE A.43: SCHOOL PERSONNEL REPLACEMENTS BY ABOVE-MUNICIPAL MEDIAN SCHOOL QUALITY

Outcomes	Headmaster Replacement	Teachers (Share)	
		New	Who Left
	(1)	(2)	(3)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.260	0.073	0.077
	(0.051)	(0.023)	(0.021)
$\mathbb{1}${School Rank $>$ Median}	0.017	-0.028	-0.024
	(0.034)	(0.014)	(0.013)
$\mathbb{1}\{IncumbVoteMargin < 0\}$X	0.018	0.010	0.012
$\mathbb{1}${School Rank $>$ Median}	(0.049)	(0.017)	(0.017)
Observations	6,719	8,330	8,330
R-squared	0.102	0.072	0.067
Controls	Yes	Yes	Yes
Clusters	1755	1921	1921
Using Bandwidth	0.110	0.110	0.110
Optimal Bandwidth	0.108	0.130	0.133

This table reports the coefficient on political party turnover estimating Equation 2. Outcome: Headmaster Replacement (Column 1) is an indicator variable for whether the school has a new headmaster, those that report being the headmaster of their current school for less than two years on the *Prova Brasil* headmaster questionnaire. The share of teachers that are new to a school (Column 2) is computed using the School Census and corresponds to the share of teachers in a school who are in that school at time t (one year after the respective election) but were not in that same school at time $t-2$ (the year before the respective election). The share of teachers that have left a school (Column 3) is also computed using the School Census and corresponds to the share of teachers in a school who were in that school at time $t-2$ (the year before the respective election) but are no longer in that same school at time t (one year after the respective election). $\mathbb{1}${School Rank $>$ Median} is an indicator variable equal to 1 if the school average test score is above the median of schools within a municipality. Controls include a 2012 election-cycle indicator and school-level controls (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet).

TABLE A.44: EXPENDITURE ON EDUCATION AND PERSONNEL EXPENDITURE

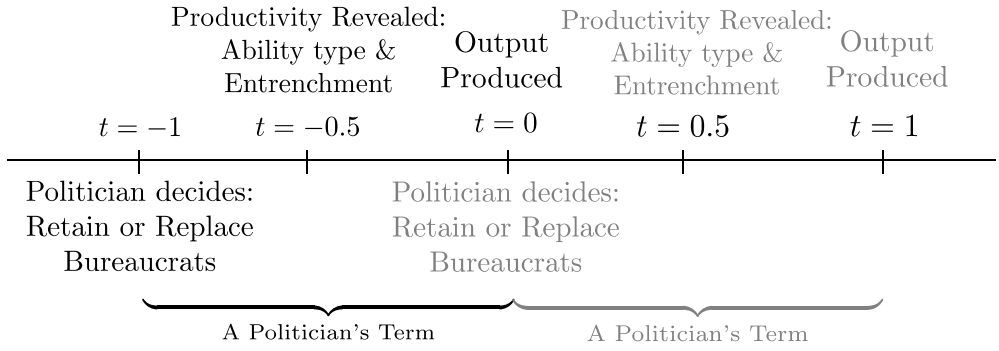
Panel A	Municipal level Financial Resources: 1 year after the election					
Outcome:	Expenditures on Education (Share)			Expenditures on Personnel (Share)		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0174	0.0184	0.0146	0.0202	0.0158	0.0178
	(0.0067)	(0.0080)	(0.0064)	(0.0054)	(0.0077)	(0.0061)
Observations	2,565	1,943	2,794	3,360	1,942	2,793
R-squared	0.0239	0.0254	0.0236	0.0896	0.0956	0.0919
Mean Dep Variable	0.299	0.297	0.299	0.497	0.498	0.497
Using Bandwidth	0.0983	0.0700	0.110	0.140	0.0700	0.110
Optimal Bandwidth	0.0983	0.0983	0.0983	0.140	0.140	0.140
Panel B	Municipal level Financial Resources: 2 years after the election					
Outcome:	Expenditures on Education (Share)			Expenditures on Personnel (Share)		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0020	0.0021	0.0017	-0.0044	-0.0115	-0.0061
	(0.0067)	(0.0083)	(0.0067)	(0.0059)	(0.0077)	(0.0060)
Observations	2,731	1,885	2,716	2,846	1,885	2,716
R-squared	0.0130	0.0125	0.0128	0.0646	0.0682	0.0651
Mean Dep Variable	0.298	0.297	0.298	0.488	0.488	0.488
Using Bandwidth	0.111	0.0700	0.110	0.117	0.0700	0.110
Optimal Bandwidth	0.111	0.111	0.111	0.117	0.117	0.117
Panel C	Municipal level Financial Resources: 3 years after the election					
Outcome:	Expenditures on Education (Share)			Expenditures on Personnel (Share)		
	(1)	(2)	(3)	(4)	(5)	(6)
$\mathbb{1}\{IncumbVoteMargin < 0\}$	0.0029	0.0046	0.0025	-0.0092	-0.0096	-0.0094
	(0.0066)	(0.0087)	(0.0069)	(0.0049)	(0.0072)	(0.0056)
Observations	2,889	1,924	2,771	3,518	1,924	2,771
R-squared	0.0105	0.0111	0.0102	0.1643	0.1484	0.1549
Mean Dep Variable	0.303	0.302	0.303	0.504	0.506	0.505
Using Bandwidth	0.116	0.0700	0.110	0.153	0.0700	0.110
Optimal Bandwidth	0.116	0.116	0.116	0.153	0.153	0.153

This table reports the coefficient on political party turnover from regressing each of the variables on the running variable of the RDD ($IncumbVoteMargin$), political party turnover ($\mathbb{1}\{IncumbVoteMargin < 0\}$), and the interaction of these two variables for the set of municipalities with $|IncumbVoteMargin| <$ Using Bandwidth. It shows municipal-level regressions, using data from the Brazilian Federal Treasury for both election cycles 2008 and 2012 in Panels A-C. Panel A refers to different categories of municipal financial resources assessed one year after the election, Panel B refers to resources assessed two years after the election and Panel C refers to resources assessed three years after the election. Expenditures on Education (share) is the share of the municipality's total budget spent on education and Expenditures on Personnel (share) is the share of the municipality's total budget spent on personnel and labor related expenses across all sectors in the municipality – not only education. Panel D shows school-level regressions, using data from the *Prova Brasil* headmaster questionnaire (for both election-cycles). Controls in Panel D include school-level controls taken from the School Census (whether: the school is located in an urban or rural area, the school is connected to the electric grid, the school is connected to the water network, the school is connected to the sewage system, the school's trash is regularly collected, and the school has Internet) and a 2012 election-cycle indicator.

Online Appendix B. Conceptual Framework
Political Turnover, Bureaucratic Turnover and the Quality of Public Services

By Mitra Akhtari, Diana Moreira & Laura Trucco

Figure B.1. : Model Timeline



A period represents a politician's term. Every period the politician in office, a *challenger* or an *incumbent*, decides to retain or replace bureaucrats. By the end of the politician's term, a bureaucrat with ability a_i and loyalty j produces a public good (a_i) and a political service (s_j). Figure **??** summarizes the timing. For each bureaucrat who is not retained, the politician can choose the loyalty of the newly-hired replacement but cannot choose his ability. Any newly-hired bureaucrat in period $t = 0$ will have ability $a_i \in \{a_1, a_2, a_3\}$ randomly drawn from a distribution with mean $E[a]$, where $a_1 < E[a] < a_2 < a_3$, and the ability is revealed only after hiring (in period $t = 0.5$).

A bureaucrat can be either loyal to the challenger or the incumbent. j $\in$ [*incumbent*, *challenger*] defines whether bureaucrat is aligned to the Incumbent's party or the challenger's party. When politicians and bureaucrats are aligned we call the bureaucrat a loyalist. A loyalist bureaucrat produces a higher political service than a non-loyalist (i.e., $s_{loyalist} > s_{non-loyalist}$). Considering the challenger is taking office, the political service output the bureaucrat produces is:

$$s_j = \begin{Bmatrix} S & \texttt{if j= challenger} \\ 0 & \texttt{if j= incumbent} \end{Bmatrix}$$

where $S > 0$

We assume that the expected total output produced by a newly hired loyalist is higher than the total output produced by a mid-ability non-loyalist (Assumption 1), but the opposite holds for the high-ability bureaucrat (i.e., Assumption 2: $s_{non-loyalist} + a_3 > s_{loyalist} + E[a]$):

Assumption 1:	$S + E[a] > 0 + a_2$
Assumption 2:	$0 + a_3 > S + E[a]$

Bureaucrats can become entrenched with probability (π). To simplify the model, only a_2 can become entrenched. Entrenchment leads to higher production of the political service output for the loyal politician ($S^{entr} > S$) and also decreases his ability-productivity ($a_2^{entr} < a_2$). The entrenchment is captured by a parameter $\delta > 0$:

Bureaucrats in office can become entrenched with probability π. We assume for simplicity that only a_2 type can get entrenched. Relative to a non-entrenched bureaucrat, an entrenched bureaucrat produces lower public good output ($a_2^{entr} < a_2$), and produces a larger political service output only when he is a loyalist ($s_{loyalist}^{entr} > s_{loyalist}$).

$s^{entr} = S + \delta > S$ and $a_2^{entr} = a_2 - \delta < a_2$

hence we have $s_j^{entr} = \begin{Bmatrix} S^{entr} & \texttt{if j= challenger} \\ 0 & \texttt{if j= incumbent} \end{Bmatrix}$

We assume that an entrenched bureaucrat produces lower public good than the expected public good from a newly-hired bureaucrat:

Assumption 3: $a_2 - \delta < E[a]$

Politicians & Society The politician values both outputs, while society only values the public good. Let $\gamma_t(a_i, j)$ be the share of bureaucrats in period t with attributes (a_i, j). Given a distribution of bureaucrats in $t = 0$, the politician chooses to retain or replace them to maximize bureaucrats' total output in period $t = 1$:

Society's welfare:

$$\sum_{i=1,2,3} \sum_{j=incumbent}^{challenger} a_i \times \gamma_1(a_i; j) + \sum_{j=incumbent}^{challenger} -\delta \times \gamma_1(a_2; j) \times \pi$$

Politician's Objective function:

$$\sum_{i=1,2,3} \sum_{j=incumbent}^{challenger} (s_j + a_i) \times \gamma_1(a_i; j) + \sum_{j=incumbent}^{challenger} [(s_j^{entr} + a_2^{entr}) - (s_j + a_2)] \times \gamma_1(a_2; j) \times \pi$$

To match our empirical setting, we investigate the case where there was an

incumbent in charge in period $t = -1$, and we contrast the decision of a challenger in charge in period $t = 0$ against the decision that would have occurred if the incumbent party had continued in office.

Proposition 1: Upon arrival a challenger (that follows an incumbent administration) will face the following distribution of bureaucrat in the bureaucracy at t=0:

$\gamma_0(a_1; challenger) = 0$
$\gamma_0(a_2; challenger) = 0$
$\gamma_0(a_2^{entr}; challenger) = 0$
$\gamma_0(a_3; challenger) > 0$
$\gamma_0(a_1; incumbent) > 0$
$\gamma_0(a_2; incumbent) > 0$
$\gamma_0(a_2^{entr}; incumbent) > 0$
$\gamma_0(a_3; incumbent) > 0$

In words: the former administration (incumbent party) has replaced all low-level ability bureaucrats and has retained all high-level ability bureaucrats, both regardless of loyalty status. The former administration has also replaced mid-level ability non-loyalists, while retaining mid-level ability loyalists. Note that despite that all the low-ability bureaucrats were fired at $t = -1$, at $t = 0$ there are still some low-ability bureaucrats (i.e., $\gamma_0(a_1; incumbent) > 0$) due to the bad draw in the process of hiring new loyalists.

Proposition 2: A challenger replaces an additional share of bureaucrats relative to the continued incumbent, precisely $\gamma_0(a_2; incumbent) + \gamma_0(a_2^{entr}; incumbent)$.

A challenger makes the following decision regarding bureaucrats' allocation (considering the types with positive mass at time 0 according to proposition 1):

- *Replace* (a_1, a_2, a_2^{entr}; incumbent). This is due to *assumption 1* since the expected total output of a newly-hired loyalist (i.e., loyalist to the challenger) will be higher: $S + E[a] > a_2 + 0 > a_2^{entr} + 0 > a_1 + 0$. Hence a total of: $\gamma_0(a_1; incumbent) + \gamma_0(a_2; incumbent) + \gamma_0(a_2^{entr}; challenger)$ will be replaced.
- *Retain* (a_3; incumbent) and (a_3; challenger). This is due to *assumption 2* since the expected total output of a newly-hired loyalist will be lower: $S + a_3 > a_3 + 0 > S + E[a]$

If, however, it is a continuing incumbent party, the continuing incumbent will:

- *Replace* (a_1; incumbent). This is because the expected output of a newly-hired loyalist is higher than the total output of lowest ability loyalist $S + E[a] > S + a_1$.
- *Retain* (a_3, a_2, a_2^{entr}; incumbent) and (a_3; challenger). This is because the total output of a mid-ability loyalist (or a high-ability non-loyalist) is higher

than the expected output of a newly-hired loyalist: $a_2 + S > E[a] + S$ and $a_3+S > a_3+0 > E[a]+S$. Since from the perspective of the incumbent, total output of a mid-ability bureaucrat is the same regardless of entrenchment, the inequality also holds for entrenched bureaucrats: $a_2^{entr}+S^{entr} = a_2+S > E[a] + S$

Proposition 3 A challenger replaces an additional share of bureaucrats (i.e., "politically motivated replacements") relative to the continued incumbent. Public good output might be smaller or larger depending on π:

if $\pi = 1$ (i.e. all a_2 gets entrenched) $\rightarrow$ bureaucrats' public goods output is larger under the challenger administration. Since $a_2-\delta < E[a]$ due to assumption 3.

if $\pi = 0$ (i.e. no a_2 gets entrenched) $\rightarrow$ bureaucrats' public goods output is smaller under challenger administration. Since $a_2 > E[a]$ due to assumption 1.

$0 < \pi < 1$ can lead to either a larger or smaller output, it will depend on the parameter values.

No Entrechment (π). We discuss in greater detail the case of $\pi = 0$ as it better matches our empirical finding that political turnover leads to adverse consequences for public education.

Note that the average ability of employed bureaucrats may also increase when the challenger chooses to replace low-ability bureaucrats. However, this same set of low-ability bureaucrats would also have been replaced by the continuing incumbent, thereby increasing the average ability level in their bureaucracy.

$E_{t=-1}[a|\texttt{incumbent admin. at t=-1}] < E_{t=0}[a|\texttt{incumbent admin. at t=0}]$

However, the challenger also replaces an additional number of bureaucrats. This decision leads to a lower ability of employed bureaucrats (relative to what one would observe if a continuing incumbent had continued):

$$E_{t=0}[a|\texttt{challenger admin. at t=0}] << E_{t=0}[a|\texttt{incumbent admin. at t=0}] \quad \text{(E1)}$$

And, under certain parameter values, also leads to a decrease in average quality over time

$$E_{t=0}[a|\texttt{challenger ruling at t=0}] < E_{t=-1}[a|\texttt{incumbent ruling at t=-1}] \quad \text{(E2)}$$

The required condition for statement (E2) to hold is the following:

$$\underbrace{(E[a]-a_1)\times\gamma_0(a_1,incumbent)}_{\texttt{benefit of firing low-level ability}} < \underbrace{(a_2-E[a])\times\gamma_0(a_2,incumbent)}_{\texttt{cost of firing mid-level ability}}$$

Therefore, even in the absence of entrenchment the model does not predict public good output would decrease overtime. The consequence for society's welfare of a challenger taking office (relative to welfare in time $t-1$) is given by:

$$\Delta\ \texttt{Society's Welfare:}$$
$$\underbrace{(E[a]-a_1)}_{>0}\times\gamma_0(a_1,incumbent)+\underbrace{(E[a]-a_2)}_{<0}\times\gamma_0(a_2,incumbent)$$

While, society's welfare of a challenger taking office (relative to the case when the incumbent continues in office)

$$\Delta\ \texttt{Society's Welfare:}\ (E[a]-a_2)\times\gamma_0(a_2,incumbent)<0$$

Hence, when there is no entrenchment ($\pi=0$) political transitions leads to lower public good output.

Implications and Predictions

This simple model generates predictions that we can test in our empirical setting. The model predicts that when a challenger takes office (relative to the case when incumbent continues):

Prediction 1. A challenger replaces an additional share of bureaucrats relative to the continued incumbent. Public good output might be smaller or larger depending on entrenchment (π). A challenger will fire an additional $\gamma_0(a_2;incumbent)+\gamma_0(a_2^{entr};incumbent)$ fraction of bureaucrats. As a result total bureaucrats' output might be smaller or larger depending on the extent of entrenchment (π).
Prediction 2. Assuming no entrenchment (i.e., $\pi=0$), bureaucrats' output under the challenger will be lower than under the continued incumbent. This difference can be attributed to the lower average quality of bureaucrats that results from replacements.
Prediction 3. Assuming no entrenchment (i.e., $\pi=0$), in choosing to replace a bureaucrat, the challenger trades off a bureaucrat who produces a larger public good output and little political services against another bureaucrat who produces a smaller expected public good output but also produces a higher political service. Replacement patterns should reflect this trade-off.

Proofs

Prediction 1. (this is demonstrated by Proposition 1) A bureaucrat will be replaced if he produces a total output smaller than the expected total output of a newly hired bureaucrat:

$$s_j + a_i < S + E(a)$$

So, following Assumptions 1 and 3 ($S + E[a] > a_2 > E[a]$ and $a_2 - \delta < E[a]$), bureaucrats of types a_2 and a_2^{entr} aligned with the incumbent will be fired only by the challenger:

$$\begin{aligned} a_2: \quad & \text{Incumbent's payoff} > S + E[a] > \text{Challenger's payoff} \\ & S + a_2 - \pi\delta > S + E[a] > a_2 - \pi\delta \\ a_2^{entr}: \quad & \text{Incumbent's payoff} > S + E[a] > \text{Challenger's payoff} \\ & (S + \delta) + (a_2 - \delta) > S + E[a] > a_2 - \delta \\ & S + a_2 > S + E[a] > a_2 - \delta \end{aligned}$$

For types a_1 and a_3 the decision to fire or not is the same for incumbents or challengers, no matter the alignment of the bureaucrat:

$$\begin{aligned} a_1: \quad & S + E[a] > S + a_1 > a_1 \longrightarrow \text{always fired} \\ a_3: \quad & S + a_3 > a_3 > S + E[a] \longrightarrow \text{never fired} \end{aligned}$$

The challenger replaces a share of bureaucrats (i.e., $\gamma_0(a_1; incumbent) + \gamma_0(a_2; incumbent) + \gamma_0(a_2^{entr}; incumbent)$), while the incumbent replaces only $\gamma_0(a_1; incumbent)$ share of bureaucrats.

As fired bureaucrats will be replaced by a loyal bureaucrat with expected ability $E[a]$, this excess firing will lead to a difference in bureaucratic output of:

$$\gamma_0(a_2; incumbent)(E[a] - (a_2 - \pi\delta)) + \gamma_0(a_2^{entr}; incumbent)(E[a] - (a_2 - \delta))$$

This difference can be positive or negative depending on the extent of entrenchment (π). Below we abbreviate "incumbent" as "inc.".

$$\gamma_0(a_2; inc.)(E[a] - (a_2 - \pi\delta)) + \gamma_0(a_2^{entr}; inc.)(E[a] - (a_2 - \delta)) > 0$$
$$(\gamma_0(a_2; inc.) + \gamma_0(a_2^{entr}; inc.))(E[a] - a_2) + \gamma_0(a_2^{entr}; inc.) \times \delta + \gamma_0(a_2; inc.) \times \pi\delta > 0$$
$$\gamma_0(a_2^{entr}; inc.) \times \delta + \gamma_0(a_2; inc.) \times \pi\delta > (\gamma_0(a_2; inc.) + \gamma_0(a_2^{entr}; inc.))(a_2 - E[a])$$
$$\frac{\gamma_0(a_2^{entr}; inc.)}{\gamma_0(a_2; inc.) + \gamma_0(a_2^{entr}; inc.)} \times \delta + \frac{\gamma_0(a_2; inc.)}{\gamma_0(a_2; inc.) + \gamma_0(a_2^{entr}; inc.)} \times \pi\delta > a_2 - E[a]$$
$$\frac{\gamma_0(a_2^{entr}; inc.)}{\gamma_0(a_2; inc.) + \gamma_0(a_2^{entr}; inc.)} + \frac{\gamma_0(a_2; inc.)}{\gamma_0(a_2; inc.) + \gamma_0(a_2^{entr}; inc.)} \times \pi > \frac{a_2 - E[a]}{\delta}$$
$$\pi + (1 - \pi) \times \pi > \frac{a_2 - E[a]}{\delta}$$
$$-\pi^2 + 2\pi > \frac{a_2 - E[a]}{\delta}$$

Since $\frac{a_2 - E[a]}{\delta} < 1$ due to assumptions 2 and 1. Then, there will be $\pi^* \in (0, 1)$ where:
If $\pi > \pi^*$, $-\pi^2 + 2\pi > \frac{a_2 - E[a]}{\delta} \rightarrow$ Public good output will be larger under the challenger
If $0 < \pi < \pi^*$, $-\pi^2 + 2\pi < \frac{a_2 - E[a]}{\delta} \rightarrow$ Public good output will be smaller under the challenger

Prediction 2. Following the proof on prediction one, if there is no entrenchment ($\pi = 0$), bureaucratic output will be smaller if the challenger takes office. The difference in bureaucrat's output when a challenger takes office (relative to an incumbent) will be:

$$\gamma_0(a_2; incumbent)(E[a] - a_2)$$

As $a_2 > E[a]$ from Assumption 1, this will be negative and bureaucratic output will be lower if a challenger takes office.

The average ability of the employed bureaucrats will also decrease. As a_1 bureaucrats will always be fired and a_3 are always retained, the changes in average abilities will be:

Incumbent takes office : $\gamma_0(a_1; incumbent)(E[a] - a_1)$
Challenger takes office : $\gamma_0(a_1; incumbent)(E[a] - a_1) + \gamma_0(a_2; incumbent)(E[a] - (a_2 + \pi\delta)$

So the difference in average ability will also be $\gamma_0(a_2; incumbent)(E[a] - (a_2 + \pi\delta))$ and will decrease when a challenger takes office compared when the incumbent does so.

Prediction 3. We discuss empirically two examples consistent with the politi-

cian trading off.

Example 1: The excess replacement rate that occurs when a challenger takes office is lower for the highest ability bureaucrat relative to the excess replacement among those of lower ability.

$$P(Replaced|a_3 \text{ , Challenger admin.}) - P(Replaced|a_3, \text{ Incumbent admin.})$$
$$<$$
$$P(Replaced|a_1 \text{ or } a_2, \text{ Challenger admin.}) -$$
$$P(Replaced|a_1 \text{ or } a_2, \text{Incumbent admin.})$$

To see this we compare the likelihood that bureaucrats with varying abilities will be replaced under the challenger administration and the continuing incumbent administration. Note that we assume no entrenchment, and there will be no type a_2^{entr}.

The decisions of the challenger and the incumbent will differ only with respect to the bureaucrats that are loyal to the incumbent. Bureaucrats that are loyal to the challenger will be replaced at the same rate under a continuing incumbent administration and a challenger administration. Under the challenger, there will be the following distribution of bureaucrats that are loyal to the incumbent:

$\gamma_0(a_3; incumbent) = 1$
$\gamma_0(a_2; incumbent) = 0$
$\gamma_0(a_1; incumbent) = 0$

Under the continuing incumbent, there will be the following distribution of bureaucrats that are loyal to the incumbent:

$\gamma_0(a_3; incumbent) = 1$
$\gamma_0(a_2; incumbent) = 1$
$\gamma_0(a_1; incumbent) = 0$

From this we can see that:
$P(Replaced|a_3 \text{ , Challenger admin.}) - P(Replaced|a_3, \text{ Incumbent admin.}) = 0 - 0 = 0$

While
$P(Replaced|a_1 \text{ or } a_2, \text{ Challenger admin.}) = 1 > P(Replaced|a_1 \text{ or } a_2, \text{Incumbent admin.})$

Example 2: The second example is more straightforward and driven by how we interpret an ideology transition. Political turnover that is accompanied by ideology transition leads to a challenger who faces a much larger number of bureaucrats that are loyal to the incumbent. In the model, the excess replacement rate that occurs when a challenger takes office is higher when the number of bureaucrats that are loyal to the incumbent is higher. Since the additional bureaucrats that are replaced are the mid-ability non-loyalists. If the number of non-loyalists across all ability-levels is larger, there will be higher number of mid-ability non-loyalist to replace. Hence, the prediction that political turnover accompanied with political transition result in a higher replacement rate of bureaucrats.