

Water Pollution Progress at Borders: The Role of Changes in China's Political Promotion Incentives

By Matthew E. Kahn, Pei Li, Daxuan Zhao

Online Appendix

Table A1.
COD Discharges and Its Determinants with Station Fixed Effects

Independent variables	(1)	(2)	(3)	(4)	(5)
<i>Boundary</i> × <i>Post2005</i>	-2.138** (0.923)	-2.012** (0.898)			
<i>Boundary</i> × <i>Time_Trend</i>			-0.543*** (0.209)		
<i>Proximity to Boundary</i> × <i>Post2005</i>				-0.129*** (0.044)	
<i>Proximity to Boundary</i> × <i>Time_Trend</i>					-0.052*** (0.011)
Station dummy	Yes	Yes	Yes	Yes	Yes
Year dummy	Yes	Yes	Yes	Yes	Yes
Temperature	Yes	Yes	Yes	Yes	Yes
Economic controls		Yes	Yes	Yes	Yes
R ²	0.730	0.731	0.732	0.731	0.732
No. of observations	3,377	3,377	3,377	3,377	3,377

Notes: (1)***, **, * indicate statistical significance at the 0.01, 0.05, and 0.1 levels respectively. (2) Standard errors are clustered spatially and temporally using methods reported in Conley (1999, 2008). The standard errors are reported in parenthesis. The distance cutoff is 50km. The time lag cutoff is one period. (3) The omitted category is a non-boundary monitoring station. (4) *Boundary* is a dummy variable to indicate whether the station is at the provincial border. *Proximity to Boundary* is defined as 50 minus the distance to the province boundary for each station. Distance is measured in ten kilometers units.

Table A2. Water Pollutants and their Determinants

Independent variables	COD	BOD	NH	Petroleum	Mercury	Phenol
Panel A						
<i>Boundary</i> × <i>Year_Dummy2005</i>	-1.609 (1.672)	0.463 (1.246)	0.268 (0.364)	2.874 (3.817)	1.285 (0.935)	0.315 (0.437)
<i>Boundary</i> × <i>Year_Dummy2006</i>	-2.737 (1.718)	-1.114 (1.197)	-0.355 (0.306)	0.040 (2.946)	0.777 (1.082)	0.409 (0.412)
<i>Boundary</i> × <i>Year_Dummy2007</i>	-1.958 (1.658)	0.451 (1.217)	0.149 (0.332)	2.028 (3.646)	0.225 (0.919)	0.513 (0.359)
<i>Boundary</i> × <i>Year_Dummy2008</i>	-2.358 (1.636)	0.835 (1.137)	-0.310 (0.299)	2.974 (3.209)	1.050 (0.898)	1.212* (0.693)
<i>Boundary</i> × <i>Year_Dummy2009</i>	-3.218* (1.836)	0.024 (1.278)	-0.130 (0.338)	1.389 (3.292)	0.731 (0.858)	0.173 (0.420)
<i>Boundary</i> × <i>Year_Dummy2010</i>	-3.942** (1.818)	-0.903 (1.303)	-0.444 (0.379)	-2.137 (3.401)	0.834 (0.883)	0.101 (0.443)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Station dummies	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	2.52**	1.75	1.40	1.24	0.71	0.98
R-squared	0.732	0.715	0.882	0.588	0.399	0.469
No. of observations	3,377	3,377	3,377	3,377	3,377	3377
Panel B						
<i>Proximity to Boundary</i> × <i>Year_Dummy2005</i>	-0.011 (0.077)	-0.064 (0.071)	-0.016 (0.022)	0.099 (0.292)	0.041 (0.094)	-0.003 (0.020)
<i>Proximity to Boundary</i> × <i>Year_Dummy2006</i>	-0.004 (0.084)	-0.054 (0.073)	-0.037* (0.019)	-0.009 (0.259)	-0.085 (0.124)	0.015 (0.018)
<i>Proximity to Boundary</i> × <i>Year_Dummy2007</i>	-0.072 (0.073)	-0.089 (0.069)	-0.010 (0.020)	0.001 (0.284)	-0.060 (0.099)	0.022 (0.014)
<i>Proximity to Boundary</i> × <i>Year_Dummy2008</i>	-0.160** (0.077)	-0.188*** (0.071)	-0.032* (0.019)	0.213 (0.289)	-0.005 (0.094)	0.054** (0.027)
<i>Proximity to Boundary</i> × <i>Year_Dummy2009</i>	-0.214** (0.092)	-0.265*** (0.080)	-0.037* (0.021)	0.096 (0.311)	-0.011 (0.091)	0.009 (0.018)
<i>Proximity to Boundary</i> × <i>Year_Dummy2010</i>	-0.241*** (0.088)	-0.292*** (0.080)	-0.051** (0.023)	-0.071 (0.279)	0.016 (0.090)	0.008 (0.017)
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
Station dummies	Yes	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
F-statistics	6.91***	6.78***	2.62**	0.74	0.49	1.05
R-squared	0.732	0.716	0.882	0.587	0.400	0.467
No. of observations	3,377	3,377	3,377	3,377	3,377	3377

Notes: (1)***, **, * indicate statistical significance at the 0.01, 0.05, and 0.1 levels, respectively. (2) Standard errors are clustered spatially and temporally using methods reported in Conley (1999, 2008). The standard errors are reported in parenthesis. The distance cutoff is 50km. The time lag cutoff is one period. (3) The H0 hypothesis of F-statistics is that the coefficients on the interacted terms between *Boundary/ Proximity to Boundary* and 2006-2010 year dummies are jointly equal to 0. (4) *Boundary* is a dummy variable to indicate whether the station is at the provincial border; *Proximity to*

Boundary is defined as 50 minus each station's distance to the closest province boundary. Distance is measured in ten kilometers units. (5) The baseline is the pollution level of each station in 2004.

Table A3. Career Concerns and Water Pollution

VARIABLES	(1)	(2)	(3)
Panel A			
<i>Boundary</i> × <i>Time_Trend</i>	-1.273 (1.234)	-4.199** (1.978)	-4.988** (1.957)
<i>Secretary Age</i> × <i>Boundary</i> × <i>Time_Trend</i>	0.012 (0.021)		0.012 (0.021)
<i>Secretary Age</i>	-0.047 (0.046)		-0.052 (0.047)
<i>Governor Age</i> × <i>Boundary</i> × <i>Time_Trend</i>		0.063* (0.033)	0.065* (0.034)
<i>Governor Age</i>		-0.008 (0.034)	-0.004 (0.035)
Control Variables	Yes	Yes	Yes
Station dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Observations	3,377	3,377	3,377
R-squared	0.732	0.732	0.732
Panel B			
<i>Proximity to Boundary</i> × <i>Time_Trend</i>	-0.097*** (0.027)	-0.155*** (0.028)	-0.203*** (0.040)
<i>Secretary Age</i> × <i>Proximity to Boundary</i> × <i>Time_Trend</i>	0.001** (0.000)		0.001* (0.000)
<i>Secretary Age</i>	-0.117* (0.069)		-0.138* (0.073)
<i>Governor Age</i> × <i>Proximity to Boundary</i> × <i>Time_Trend</i>		0.002*** (0.000)	0.002*** (0.000)
<i>Governor Age</i>		-0.162*** (0.059)	-0.140** (0.061)
Control Variables			
Station dummies			
Year dummies			
Observations	3,377	3,377	3,377
R-squared	0.733	0.734	0.735

Notes: (1)***, **, * indicate statistical significance at the 0.01, 0.05, and 0.1 levels, respectively. (2) Standard errors are clustered spatially and temporally using methods reported in Conley (1999, 2008). Standard errors are reported in parenthesis. The distance cutoff is 50 km. The time lag cutoff is one period. (3) *Boundary* is a dummy variable to indicate whether the station is at the provincial border; *Proximity to Boundary* is defined as 50 minus each station's distance to the closest province boundary. Distance is measured in ten kilometers units.

Table A4
Career Concerns and Different Measures of Water Pollution with Conley Standard Errors

Independent Variable	COD	BOD	NH	Petroleum	Mercury	Phenol
<i>Boundary × Time_Trend</i>	-4.988** (1.957)	2.652 (1.995)	-1.991** (0.929)	17.278** (7.283)	-0.730 (1.158)	1.337 (2.483)
<i>Secretary Age × Boundary × Time_Trend</i>	0.012 (0.021)	-0.001 (0.021)	0.013 (0.009)	-0.156*** (0.060)	-0.007 (0.014)	-0.005 (0.008)
<i>Secretary Age</i>	-0.052 (0.047)	0.054 (0.048)	0.001 (0.007)	0.337*** (0.110)	0.092* (0.054)	0.012 (0.010)
<i>Governor Age × Boundary × Time_Trend</i>	0.065* (0.034)	-0.048 (0.030)	0.019* (0.011)	-0.143* (0.085)	0.021 (0.013)	-0.018 (0.044)
<i>Governor Age</i>	-0.004 (0.035)	0.202*** (0.069)	0.010 (0.015)	-0.183 (0.156)	-0.094*** (0.034)	-0.024* (0.013)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Station Dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-Statistics	4.68***	1.14	2.88**	2.43**	1.09	0.50
Observations	3,377	3,377	3,377	3,377	3,377	3,377
R-squared	0.732	0.716	0.883	0.590	0.401	0.468

Notes: (1)***, **, * indicate statistical significance at the 0.01, 0.05, and 0.1 levels, respectively. (2) Standard errors are clustered spatially and temporally using methods reported in Conley (1999, 2008). The standard errors are reported in parenthesis. The distance cutoff is 50 km. The time lag cutoff is one period. (3) The H0 hypothesis of F-statistics is that the coefficients on *Boundary × Time_Trend*, *Secretary Age × Boundary × Time_Trend* and *Governor Age × Boundary × Time_Trend* are jointly equal to 0. (4) *Boundary* is a dummy variable to indicate whether the station is at the provincial border.

Table A5
Career Concerns and Different Measures of Water Pollution with Conley Standard Errors and a Continuous Distance to Boundary Measure

VARIABLES	COD	BOD	NH	Petroleum	Mercury	Phenol
<i>Proximity to Boundary</i> × <i>Time_Trend</i>	-0.203*** (0.040)	-0.187*** (0.048)	-0.022** (0.010)	-0.175* (0.100)	0.035 (0.044)	-0.004 (0.014)
<i>Secretary Age</i> × <i>Proximity to Boundary</i> × <i>Time_Trend</i>	0.001* (0.000)	-0.000 (0.001)	0.000 (0.000)	-0.001 (0.001)	-0.001 (0.001)	-0.000 (0.000)
<i>Secretary Age</i>	-0.138* (0.073)	0.064 (0.071)	0.005 (0.014)	0.323** (0.135)	0.180 (0.110)	0.018 (0.020)
<i>Governor Age</i> × <i>Proximity to Boundary</i> × <i>Time_Trend</i>	0.002*** (0.000)	0.002*** (0.001)	0.000* (0.000)	0.004*** (0.001)	0.000 (0.000)	0.000* (0.000)
<i>Governor Age</i>	-0.140** (0.061)	-0.067 (0.078)	-0.003 (0.019)	-0.758*** (0.212)	-0.158** (0.062)	-0.068*** (0.024)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Station dummies	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
F-Statistics	16.78***	16.03***	3.68**	4.28***	2.76**	3.52**
Observations	3,377	3,377	3,377	3,377	3,377	3,377
R-squared	0.735	0.719	0.882	0.590	0.402	0.468

Notes: (1)***, **, * indicate statistical significance at the 0.01, 0.05, and 0.1 levels, respectively. (2) Standard errors are clustered spatially and temporally using methods reported in Conley (1999, 2008). Standard errors are reported in parenthesis. The distance cutoff is 50 km. The time lag cutoff is one period. (3) The H0 hypothesis of F-statistics is that the coefficients on *Proximity to Boundary* × *Time_Trend*, *Secretary Age* × *Proximity to Boundary* × *Time_Trend* and *Governor Age* × *Proximity to Boundary* × *Time_Trend* are jointly equal to 0. (4) *Proximity to Boundary* is defined as 50 minus each station's distance to the closest province boundary. Distance is measured in ten kilometers units.