Supporting Information: Democratization, Elections, and Public Goods: The Evidence from Deforestation

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Contents

1 Heterogeneous Treatment Effects: agriculture and election type

In this section I investigate heterogeneous treatment effects across forest type. In addition, for the tests of democratization I investigate whether the effect is more pronounced for countries with a larger share of agricultural workers or agriculture as a percent of GDP.

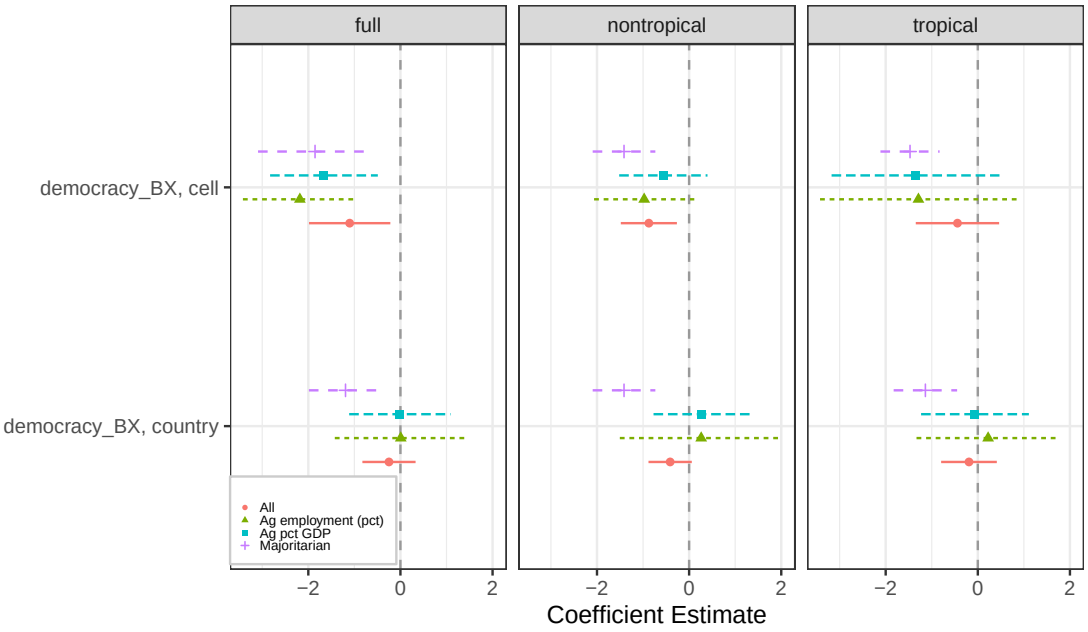

Figure 1: Relationship between democracy regime type and forest cover change across forest types and three moderators: electoral system, agricultural percent of GDP, and agricultural percent of the population. The coefficients shown are for the coefficient on democracy and represents the estimate of the effect with agricultural employment or agricultural percent of GDP set to 0, or in purely majoritarian systems (PR system set to 0).

in Figure 1 I find that the effects uncovered across forest types are not significantly different from the effects in either tropical and subtropical forests nor from the effects in temperate and boreal forests, as classified by **?**. Unconditional on level of aggregation or forest type the transition to a majoritarian democratic system is always significantly associated with higher rates of deforestation–though I should note that the samples for some subgroups are quite small.

Given the theory in the main text it would be easy to infer that countries with a larger share of agricultural employment or economic activity would experience higher rates of deforestation after a regime type change to democracy. The reasoning is that either of these conditions would translate to more political power for that group and thus more incentive for politicians to allow deforestation. However, previous research on the political power of the agricultural sector shows that there is not a monotonic relationship between size of the sector and political power (**?**). **?**

point out that as the size of the agricultural sector grows farmers face a collective action problem as a lobby group, so the power of farmers decreases with the size of the agricultural sector. The tests presented in Figure 1 and Table 1 are consistent with this constraint on agricultural power–the size of the agricultural sector does not strongly moderate the relationship between regime type transition and deforestation rate.

	Model 1	Model 2	Model 3	Model 4
Democracy	-1.10^{*}	-2.18^{***}	-1.66^{**}	-1.85^{**}
	(0.45)	(0.63)	(0.60)	(0.63)
Ag employment		−0.05		
		(0.03)		
Ag emp:Democracy		0.05^{***}		
		(0.01)		
Ag pct GDP			−0.01	
			(0.04)	
Ag pct GDP:Democracy			0.05^{*}	
			(0.02)	
PR				−0.21
				(0.73)
PR:Democracy				1.16
				(0.68)
Forest	-0.77^{***}	-0.78^{***}	-0.78^{***}	-0.77^{***}
	(0.03)	(0.04)	(0.03)	(0.03)
PCGDP	0.08	0.11	0.15^{*}	0.11^{*}
	(0.05)	(0.06)	(0.08)	(0.05)
Δ PCGDP	−7.49	−5.40	−11.91	−1.00
	(20.70)	(21.00)	(21.75)	(25.49)
Pop Growth	−0.12	−0.34	−0.24	0.09
	(0.28)	(0.25)	(0.28)	(0.33)
Num. obs.	136415199	108366127	112334405	116949852
Adj. R^2 (full model)	0.38	0.38	0.38	0.38
Adj. R^2 (proj model)	0.37	0.38	0.37	0.37

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 1: Regressions of forest change on democracy (Model 1) interacted with percent of workforce employed in agriculture (Model 2), Agriculture as a percent of GDP (Model 3), and Electoral system (Model 4). Note that it is possible though rare for nondemocracies to have a "voting system."

Table 1 shows heterogeneous treatment effects by agricultural employment, agriculture share of GDP, and electoral system. In all cases the main effect is negative and significant, but in both of the agricultural interactions the interaction effect is positive and significant, indicating that the effect is strongest in countries which do not have a large agricultural sector. The dynamic here merits further research in future work.

Figure 2 shows the results from Figure 4 in the main text broken out across forest types. Several patterns emerge from this analysis. First, in the cell-level tests elections with a margin of victory of less than 10 points are always significantly associated with forest cover loss. In national-level regressions these close elections are almost always associated with forest loss-except for in all electoral systems and all forest cover or tropical and subtropical forests. The mechanisms behind this finding deserve analysis in future work. Second, in Majoritarian electoral systems the relationship between competitive (margin<20) and close (margin<10) elections and forest cover change is always significant and negative with the sole exception in temperate and boreal forests in competitive elections. Despite the fact that each of these categories has relatively few elections

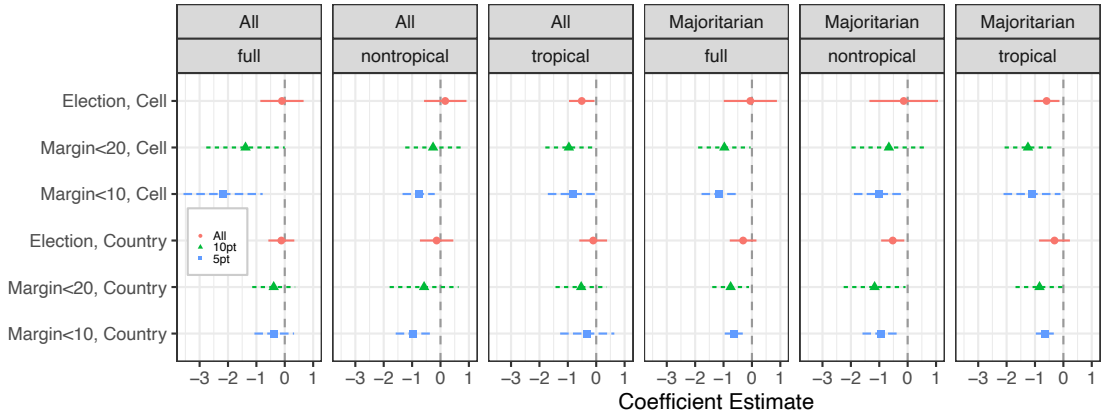

Figure 2: Coefficient plots for forest type–elections

Relationship between elections with varying margins of victory and forest cover change across forest type and electoral system.

there is suprising homogeneity in the results.

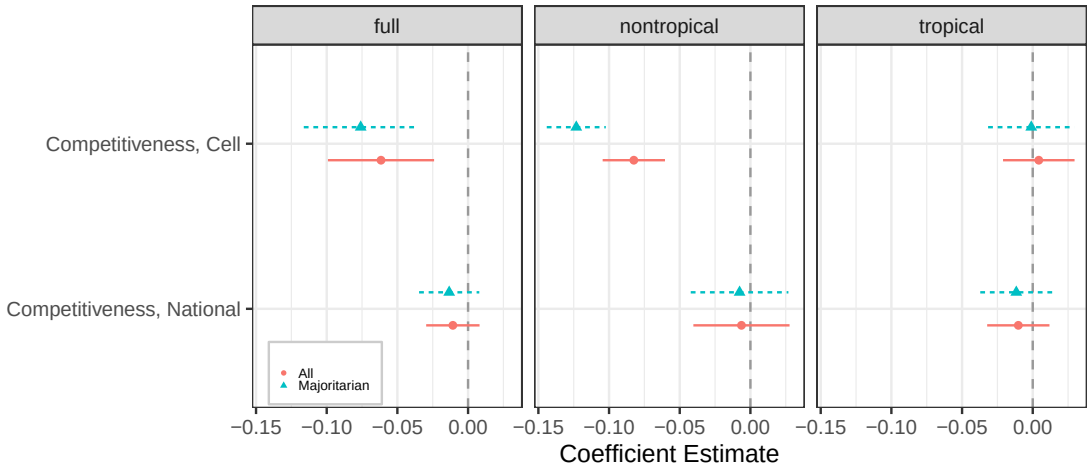

Figure 3: Coefficient plots for forest type–margin

Relationship between margin of victory and forest cover change across forest cover types and electoral systems.

Figure 3 shows results from Figure 5 in the main text broken out along forest types. What clearly stands out is that the relationship is driven by temperate and boreal forests at the cell level and null in tropical and subtropical forests. Future investigations of this effect will need to focus on the deforestation mechanisms associated with different forest types and the years and countries which are driving this effect.

Table 2 shows the results from the main text in Models 1-3 and shows that if I interact electoral system with election year the results are present though smaller (and notably not significant for elections with the smallest margin of victory). This is evidence that regime type is the more important dimension. The results from Figure 4 in the main text further demonstrate that electoral

system does not seem to matter too much, at least in the cell-level regressions.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Election Year	−0.10			−0.20***		
	(0.39)			(0.05)		
Margin < 20		−1.38*			−0.34***	
		(0.71)			(0.10)	
Margin < 10			−2.17**			0.16
			(0.71)			(0.11)
Election:Autocracy	0.14					
	(0.55)					
Margin<20:Autocracy		2.56*				
		(1.25)				
Margin<10:Autocracy			3.95**			
			(1.39)			
Election:Democracy	0.06					
	(0.38)					
Margin<20:Democracy		1.22				
		(0.77)				
Margin<10:Democracy			2.08**			
			(0.66)			
Election:PR				0.35		
				(0.31)		
Margin<20:PR					0.20	
					(0.31)	
Margin<10:PR						−0.49*
						(0.19)
PR				0.14	0.44	0.38
				(0.83)	(0.88)	(0.90)
Democracy	−0.91*	−0.87*	−0.96*			
	(0.38)	(0.36)	(0.38)			
Autocracy	−0.50	−0.54	−0.56			
	(0.61)	(0.64)	(0.65)			
Forest	−0.77***	−0.77***	−0.77***	−0.77***	−0.77***	−0.78***
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.04)
PCGDP	0.07	0.08	0.09	0.12*	0.15**	0.16**
	(0.06)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)
Δ PCGDP	35.20	7.91	13.68	13.99	10.73	16.64
	(38.28)	(30.06)	(32.54)	(28.63)	(26.00)	(29.56)
Pop Growth	−0.14	−0.23	−0.18	0.07	−0.05	−0.01
	(0.28)	(0.27)	(0.27)	(0.37)	(0.38)	(0.40)
Num. obs.	132801614	118463788	110285677	117028441	103133799	95218053
Adj. R^2 (full model)	0.38	0.38	0.38	0.38	0.38	0.39
Adj. R^2 (proj model)	0.37	0.37	0.37	0.37	0.37	0.37

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 2: Models 1-3 show the results across regime type and level of electoral competition from the main paper, Models 4-6 show interactions between electoral system and level of electoral competition (instead of regime type)

Table 3 shows regressions where election years are interacted with agricultural share of employment (Models 1-3) and agricultural share of GDP (figures 4-6). The table shows all null effects–that there are no detectable effects of agricultural strength on whether election years have higher rates of deforestation (without accounting for regime type).

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Election Year	0.09			0.06		
	(0.20)			(0.26)		
Margin < 20		−0.42			−0.44	
		(0.29)			(0.37)	
Margin < 10			−0.48			−0.74
			(0.49)			(0.56)
Ag employment	−0.02	−0.02	−0.03			
	(0.03)	(0.03)	(0.03)			
Election:Ag employment	−0.01					
	(0.00)					
Margin<20:Ag employment		0.00				
		(0.01)				
Margin<10:Ag employment			0.00			
			(0.01)			
Ag pct of economy				−0.02	−0.03	−0.03
				(0.05)	(0.05)	(0.05)
Election:Ag pct of economy				0.00		
				(0.01)		
Margin<20 : Ag pct of economy					0.01	
					(0.02)	
Margin<10 : Ag pct of economy						0.03
						(0.03)
Forest	−0.78***	−0.78***	−0.78***	−0.78***	−0.78***	−0.78***
	(0.04)	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
PCGDP	0.09	0.11	0.13	0.16*	0.17*	0.19*
	(0.06)	(0.07)	(0.07)	(0.08)	(0.08)	(0.08)
Δ PCGDP	39.06	26.05	32.46	20.78	10.78	12.04
	(27.72)	(21.26)	(24.79)	(30.26)	(24.61)	(26.96)
Pop Growth	−0.20	−0.21	−0.10	−0.15	−0.17	−0.13
	(0.34)	(0.33)	(0.37)	(0.33)	(0.32)	(0.34)
Num. obs.	107944319	96575335	90622563	112138852	100941895	95368927
Adj. R^2 (full model)	0.38	0.39	0.39	0.38	0.38	0.38
Adj. R^2 (proj model)	0.38	0.37	0.38	0.37	0.36	0.36

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 3: Models 1-3 show interactions between election years of different levels of electoral competition and agricultural share of employment, Models 4-6 show interactions between election years of different levels of electoral competition and agricultural share of GDP.

2 Levels of aggregation

This section presents Tables 3-5 in the main text across different levels of spatial aggregation. The extremes here are Cell and National, with intermediate levels of cells aggregated to one hundred times the native resolution (about 55×55 km near the equator), second level adminstrative units, and first level administrative units. The first two columns are implicitly weighted by forest area–countries which have more forest will be weighted more highly but each cell is weighted equally. The third to the fifth tests are weighted by adminstrative unit–for example each state or province receives equal weight regardless of the amount of forest. This implicitly downweights the result of cells which are in adminstrative units with many other forested cells. For example, the relationship uncovered in Liechtenstein is weighted equally to the relationship uncovered in Brazil. I include smaller administrative units because I think of those as possibly the "true" level of treatment–as the Kenya example shows, in many cases it is the electoral competitiveness at the district or county level which determines whether deforestation occurs or not.

Table 4: Election results across levels of spatial aggregation

	Dependent variable:														
	forest cover change														
	Full			Aggregated 100			L2			L1			National		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Election	−0.099			−0.123			−0.616*			−0.224			−0.121		
	(0.389)			(0.369)			(0.339)			(0.159)			(0.233)		
Margin < 20		−1.383**			−1.301*			−0.796			−0.377			−0.390	
		(0.706)			(0.683)			(0.602)			(0.407)			(0.386)	
Margin < 10			−2.173***			−2.106***			−1.673			−0.429			−0.371
			(0.711)			(0.687)			(1.019)			(0.468)			(0.356)
Election:Democracy	0.057			0.070			0.137			0.035			0.071		
	(0.378)			(0.353)			(0.306)			(0.194)			(0.220)		
Margin < 20:Democracy		1.221			1.132			0.352			0.159			0.188	
		(0.771)			(0.745)			(0.601)			(0.495)			(0.425)	
Margin < 10:Democracy			2.080***			2.009***			1.062			0.134			0.155
			(0.664)			(0.643)			(0.922)			(0.537)			(0.422)
Autocracy	−0.500	−0.543	−0.557	−0.449	−0.481	−0.491	0.056	0.101	−0.027	0.465	0.502	0.474	0.112	0.214	0.213
	(0.610)	(0.638)	(0.648)	(0.549)	(0.578)	(0.587)	(0.812)	(0.798)	(0.789)	(0.412)	(0.434)	(0.427)	(0.387)	(0.384)	(0.377)
Democracy	−0.911**	−0.874**	−0.958**	−0.854**	−0.812**	−0.895**	−0.552	−0.793	−0.820	−0.108	−0.260	−0.241	−0.332	−0.384	−0.355
	(0.378)	(0.358)	(0.379)	(0.357)	(0.342)	(0.363)	(0.519)	(0.576)	(0.627)	(0.241)	(0.262)	(0.272)	(0.233)	(0.239)	(0.251)
Forest	−0.769***	−0.771***	−0.774***	−0.703***	−0.706***	−0.709***	−0.627***	−0.635***	−0.634***	−0.577***	−0.584***	−0.586***	−0.552***	−0.562***	−0.565***
	(0.034)	(0.034)	(0.035)	(0.039)	(0.038)	(0.039)	(0.043)	(0.043)	(0.045)	(0.050)	(0.052)	(0.052)	(0.060)	(0.060)	(0.060)
PCGDP	0.066	0.078	0.089*	0.057	0.069	0.079*	0.079	0.076	0.107*	0.103**	0.099**	0.117***	0.106***	0.107***	0.112***
	(0.056)	(0.055)	(0.052)	(0.051)	(0.050)	(0.047)	(0.051)	(0.051)	(0.058)	(0.041)	(0.042)	(0.042)	(0.032)	(0.032)	(0.033)
Δ PCGDP	35.199	7.915	13.676	33.511	7.897	13.631	−6.887	−8.778	−12.726	−4.569	−4.331	−4.572	−1.482	1.934	3.144
	(38.281)	(30.057)	(32.538)	(35.626)	(27.687)	(30.070)	(21.864)	(18.875)	(19.706)	(10.037)	(9.096)	(9.737)	(10.230)	(10.332)	(10.457)
Pop growth	−0.137	−0.229	−0.176	−0.138	−0.223	−0.174	0.082	0.107	0.047	−0.127	−0.116	−0.137	−0.061	−0.077	−0.072
	(0.276)	(0.267)	(0.274)	(0.244)	(0.236)	(0.242)	(0.249)	(0.236)	(0.212)	(0.099)	(0.083)	(0.095)	(0.073)	(0.063)	(0.066)
Observations	132,801,614	118,463,788	110,285,677	34,388,275	30,650,003	28,514,778	1,259,194	1,136,341	1,055,911	75,545	67,751	63,947	4,081	3,701	3,517
R^2	0.397	0.403	0.410	0.370	0.379	0.387	0.356	0.363	0.369	0.345	0.351	0.354	0.370	0.378	0.384
Adjusted R^2	0.375	0.379	0.385	0.348	0.354	0.360	0.334	0.339	0.343	0.322	0.325	0.327	0.341	0.347	0.352
Residual Std. Error	7.340	7.365	7.348	5.605	5.626	5.608	5.500	5.522	5.513	3.731	3.746	3.741	2.851	2.881	2.880

Note: *p<0.1; **p<0.05; ***p<0.01

Table 5: Democracy results across levels of spatial aggregation

	Dependent variable:				
	forest cover change				
	Full	Aggregated 100	L2	L1	National
	(1)	(2)	(3)	(4)	(5)
Democracy	-1.102^{**}	-1.070^{**}	-0.850	-0.344	-0.249
	(0.450)	(0.430)	(0.586)	(0.350)	(0.295)
Forest	-0.770^{***}	-0.705^{***}	-0.631^{***}	-0.581^{***}	-0.556^{***}
	(0.032)	(0.037)	(0.042)	(0.050)	(0.059)
PCGDP	0.080^{*}	0.071^{*}	0.086^{*}	0.120^{***}	0.110^{***}
	(0.047)	(0.043)	(0.046)	(0.040)	(0.033)
Δ PCGDP	-7.493	-6.522	-18.498	-9.438	-9.164
	(20.696)	(18.548)	(17.850)	(9.119)	(10.576)
Pop Growth	-0.125	-0.129	0.056	-0.152	-0.078
	(0.278)	(0.243)	(0.245)	(0.096)	(0.080)
Observations	136,415,199	35,316,175	1,280,001	78,024	4,345
R^2	0.398	0.374	0.356	0.344	0.364
Adjusted R^2	0.377	0.352	0.334	0.322	0.336
Residual Std. Error	7.374	5.640	5.513	3.775	2.923
Note:					*p<0.1; **p<0.05; ***p<0.01

Table 6: Competitiveness results across levels of spatial aggregation

	Dependent variable:				
	forest cover change				
	Full	Aggregated 100	L2	L1	National
	(1)	(2)	(3)	(4)	(5)
Competitiveness	-0.062^{***}	-0.058^{***}	-0.014	-0.013	-0.011
	(0.019)	(0.018)	(0.017)	(0.010)	(0.010)
Democracy	-4.534^{*}	-4.222^{*}	0.782	0.420	0.163
	(2.522)	(2.352)	(2.240)	(1.399)	(0.962)
Comp:Democracy	0.059^{*}	0.056^{**}	-0.001	0.002	0.002
	(0.031)	(0.028)	(0.028)	(0.019)	(0.013)
Forest	-0.713^{***}	-0.639^{***}	-0.578^{***}	-0.476^{***}	-0.426^{***}
	(0.030)	(0.034)	(0.045)	(0.042)	(0.066)
PCGDP	0.067	0.057	0.183^{***}	0.192^{***}	0.143^{***}
	(0.089)	(0.083)	(0.032)	(0.051)	(0.051)
Δ PCGDP	43.019	43.959^{*}	94.106^{**}	52.083	12.294
	(28.596)	(26.692)	(41.830)	(33.202)	(35.220)
Pop growth	-0.035	-0.096	-1.141^{*}	-0.460^{*}	-0.343
	(0.469)	(0.434)	(0.601)	(0.269)	(0.259)
Observations	35,346,878	9,170,979	341,318	17,227	864
R^2	0.430	0.398	0.399	0.355	0.341
Adjusted R^2	0.352	0.316	0.318	0.250	0.217
Residual Std. Error	7.377	5.638	5.475	3.893	2.999
Note:					*p<0.1; **p<0.05; ***p<0.01

3 Geographically weighted regressions

Geographically weighted regressions are a way of examining spatial heterogeneity in the results of this analysis. In each GWR below every point corresponds to the coefficient of interest from a regression which includes only cells within two decimal degrees from that point. Additionally, cells within the two decimal degree radius are weighted by their inverse distance to the cell. The goal is to visually investigate heterogeneities in the relationship tested by the regression.

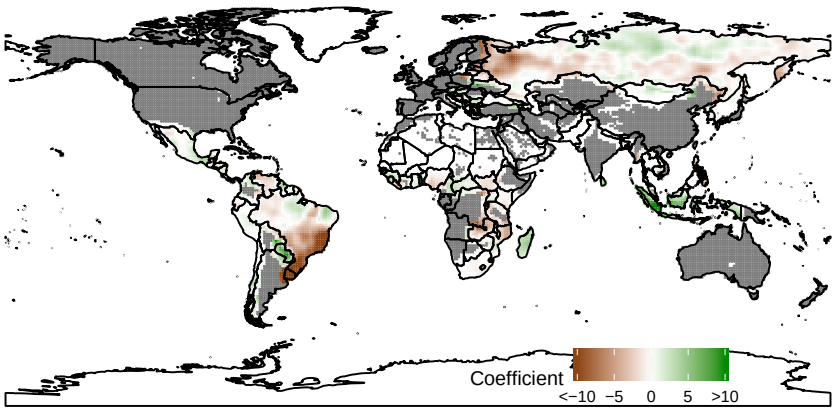

Figure 4: Geographically Weighted Regression: Coefficient on Democracy

The color of a cell corresponds to the relationship between democracy and forest cover change for the cells within two decimal degrees of that cell. cells included in the regression are weighted by their inverse distance to the target cell. White cells are areas where there was no change, including places in which there was never forest present. Grey cells indicate areas for which the coefficient of interest is not estimable because there were no cells which had variation in regime type.

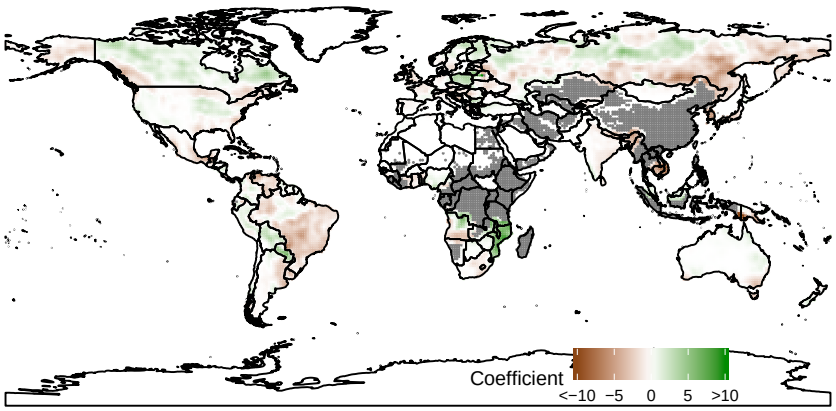

Figure 5: Geographically Weighted Regression: Coefficient on $<$ 20% Margin

The color of a cell corresponds to the relationship between election years with a margin of victory of less than 20% and forest cover change for the cells within two decimal degrees of that cell. cells included in the regression are weighted by their inverse distance to the target cell. White cells are areas where there was no change, including places in which there was never forest present. Grey cells indicate areas for which the regression failed, mainly due to no variation in whether there were any elections.

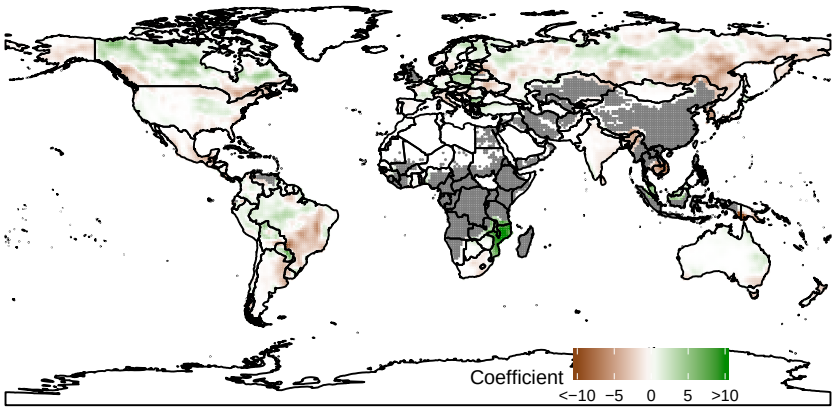

Figure 6: Geographically Weighted Regression: Coefficient on $< 10\%$ Margin

The color of a cell corresponds to the relationship between election years with a margin of victory of less than 20% and forest cover change for the cells within two decimal degrees of that cell. cells included in the regression are weighted by their inverse distance to the target cell. White cells are areas where there was no change, including places in which there was never forest present. Grey cells indicate areas for which the regression failed, mainly due to no variation in whether there were any elections.

4 Measures of competitiveness

This section explores the results of Tables 3 and 4 in the main text but with two other measures of electoral competition. The first is the difference between the incumbent coalition's vote share and 50 which measures how close that coalition was to winning/losing an election. This measure does not capture the seat-vote elasticity discussed in **?** and only roughly captures the notion of incumbent victory or loss, see for example the US election in 2016. It is pre electoral system so a small margin of victory in the popular vote might not mean a close election in terms of seats or control of the executive branch. It is useful for single district PR systems, but those are places where geographic targeting already makes the expected effect small. Tables 3 and 4 are replicated in Tables 4 and 9.

The second is the difference between the incumbent coalition's seat share and 50 which implicitly includes seat-vote elasticities, but fails to capture what **?** say is a better measure of competitiveness, which is which party holds the prime minister position or the presidency. Tables 3 and 4 are replicated in Tables 4 and 4.

Both measures have the expected sign and magnitude at the National level of aggregation but null or opposite results at the cell level. Future work should investigate how electoral systems interact with measures of competitiveness to help resolve this issue. Subnational measures of competitiveness would also provide additional clarity.

	Dependent variable:					
	forest cover change					
	Cell			National		
	(1)	(2)	(3)	(4)	(5)	(6)
Election	−0.099			−0.121		
	(0.389)			(0.233)		
Margin < 20		−0.511			−0.766**	
		(0.752)			(0.341)	
Margin < 10			0.825**			−1.416**
			(0.396)			(0.597)
Election:Democracy	0.057			0.071		
	(0.378)			(0.220)		
Margin < 20:Democracy		0.598			0.612	
		(0.700)			(0.377)	
Margin < 10:Democracy			−0.509			1.419**
			(0.333)			(0.638)
Autocracy	−0.500	−0.537	−0.477	0.112	0.165	0.172
	(0.610)	(0.611)	(0.600)	(0.387)	(0.367)	(0.369)
Democracy	−0.911**	−0.900**	−0.844**	−0.332	−0.325	−0.343
	(0.378)	(0.397)	(0.388)	(0.233)	(0.226)	(0.232)
Forest	−0.769***	−0.769***	−0.769***	−0.552***	−0.553***	−0.554***
	(0.034)	(0.036)	(0.036)	(0.060)	(0.061)	(0.062)
PCGDP	0.066	0.068	0.075	0.106***	0.101***	0.103***
	(0.056)	(0.054)	(0.054)	(0.032)	(0.033)	(0.033)
Δ PCGDP	35.199	5.031	−3.217	−1.482	−1.208	−0.809
	(38.281)	(34.696)	(31.597)	(10.230)	(11.436)	(11.082)
Pop growth	−0.137	−0.143	−0.189	−0.061	−0.057	−0.055
	(0.276)	(0.248)	(0.227)	(0.073)	(0.068)	(0.070)
Observations	132,801,614	124,713,884	119,285,168	4,081	3,816	3,697
R^2	0.397	0.400	0.402	0.370	0.376	0.376
Adjusted R^2	0.375	0.377	0.378	0.341	0.346	0.345
Residual Std. Error	7.340	7.285	7.277	2.851	2.833	2.834
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 7: Election year and forest change across levels of competition. Here competition is measured as the difference between the incumbent coalition's vote share and 0.5, intended to capture the margin of victory of the incumbents.

	Dependent variable:					
	forest cover change					
	Cell			National		
	(1)	(2)	(3)	(4)	(5)	(6)
Election	−0.099			−0.121		
	(0.389)			(0.233)		
Margin < 20		0.174			−0.940***	
		(0.677)			(0.316)	
Margin < 10			0.708			−0.309
			(0.536)			(0.280)
Election:Democracy	0.057			0.071		
	(0.378)			(0.220)		
Margin < 20:Democracy		−0.221			0.789**	
		(0.658)			(0.348)	
Margin < 10:Democracy			−0.593			0.129
			(0.515)			(0.400)
Autocracy	−0.500	−0.547	−0.485	0.112	0.133	0.159
	(0.610)	(0.620)	(0.616)	(0.387)	(0.388)	(0.389)
Democracy	−0.911**	−0.844**	−0.871**	−0.332	−0.374	−0.371
	(0.378)	(0.408)	(0.404)	(0.233)	(0.240)	(0.244)
Forest	−0.769***	−0.773***	−0.776***	−0.552***	−0.565***	−0.571***
	(0.034)	(0.036)	(0.034)	(0.060)	(0.060)	(0.060)
PCGDP	0.066	0.074	0.067	0.106***	0.109***	0.110***
	(0.056)	(0.058)	(0.050)	(0.032)	(0.036)	(0.037)
Δ PCGDP	35.199	9.839	8.235	−1.482	−2.073	0.652
	(38.281)	(32.020)	(30.257)	(10.230)	(11.030)	(9.667)
Pop growth	−0.137	−0.155	−0.265	−0.061	−0.059	−0.056
	(0.276)	(0.258)	(0.221)	(0.073)	(0.074)	(0.069)
Observations	132,801,614	118,136,134	110,261,053	4,081	3,572	3,410
R^2	0.397	0.403	0.407	0.370	0.383	0.385
Adjusted R^2	0.375	0.379	0.382	0.341	0.351	0.352
Residual Std. Error	7.340	7.317	7.297	2.851	2.877	2.880
Note:						*p<0.1; **p<0.05; ***p<0.01

Table 8: Election year and forest change across levels of competition. Here competition is measured as the difference between the incumbent coalition's seat share and 0.5, intended to capture the margin of victory of the incumbents.

Table 9:

	Dependent variable:	
	forest cover change	
	(1)	(2)
Competitiveness	−0.030	−0.003
	(0.022)	(0.009)
Democracy	−4.191*	0.661
	(2.303)	(1.862)
Competitiveness:Democracy	0.034	−0.001
	(0.021)	(0.019)
Forest	−0.701***	−0.472***
	(0.032)	(0.075)
PCGDP	0.072	0.116**
	(0.051)	(0.046)
Δ PCGDP	168.918**	31.611
	(73.345)	(36.265)
Pop growth	0.339	−0.326
	(0.534)	(0.407)
Observations	27,696,215	600
R^2	0.434	0.378
Adjusted R^2	0.332	0.205
Residual Std. Error	7.654 (df = 23460344)	3.244 (df = 469)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 10: Election year and forest change across margin of victory. Here competition is measured as the difference between the incumbent coalition's vote share and 0.5, intended to capture the margin of victory of the incumbents.

	Dependent variable:	
	forest cover change	
	(1)	(2)
Competitiveness	0.016	−0.007
	(0.019)	(0.010)
Democracy	−0.036	−0.369
	(0.976)	(0.842)
Competitiveness:Democracy	−0.016	0.010
	(0.014)	(0.011)
Forest	−0.695***	−0.447***
	(0.035)	(0.062)
PCGDP	0.088	0.121***
	(0.067)	(0.044)
Δ PCGDP	125.596	21.302
	(69.672)	(27.820)
Pop growth	−0.021	−0.352*
	(0.424)	(0.204)
Observations	34,499,480	907
R^2	0.418	0.334
Adjusted R^2	0.336	0.211
Residual Std. Error	7.566 (df = 30216247)	2.994 (df = 765)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 11: Election year and forest change across margin of victory. Here competition is measured as the difference between the incumbent coalition's vote share and 0.5, intended to capture the margin of victory of the incumbents.

5 Margin of victory

In this section I explore differences across elections where the incumbent won vs elections where they lost. In elections where the incumbent won there is a consistent positive and linear relationship between margin of victory and forest cover change. This section uses a different measure of competitiveness than the main text–rather than using the percent seat difference between the two largest parties (data is not available for which party is incumbent) I use the difference between the incumbent coalition's vote proportion. This allows me to differentiate between incumbent victory and loss.

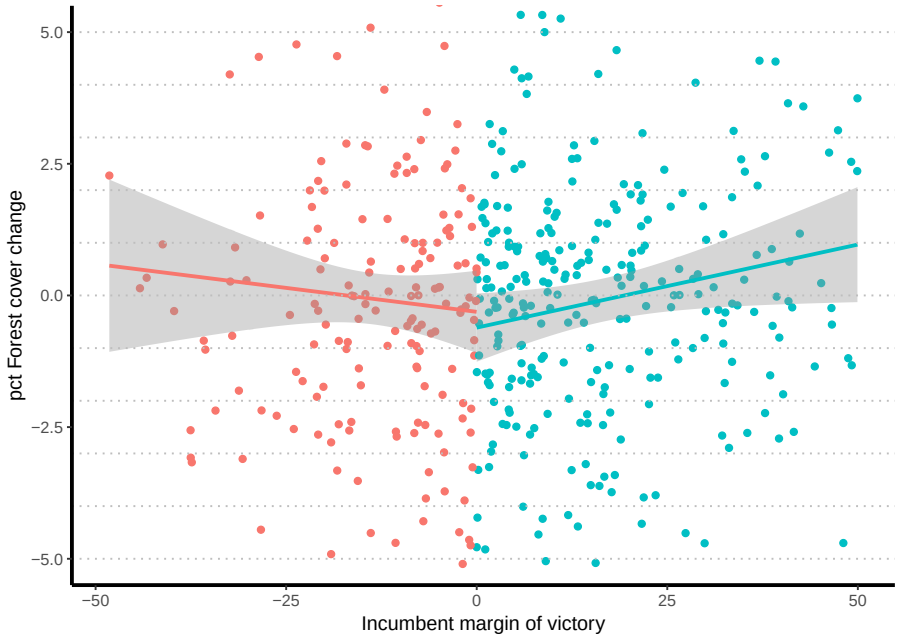

Figure 7: Incumbent margin of victory and forest cover loss, linear fit

This suggests that the difference between close elections and non-close elections is driven by years in which the incumbent was victorious rather than years in which the incumbent lost. Note however that there is neither enough power to distinguish the rate of forest cover loss at the break in the running variable, nor is there enough power to confirm that the slope of the fit is positive in elections in which the incumbent won.

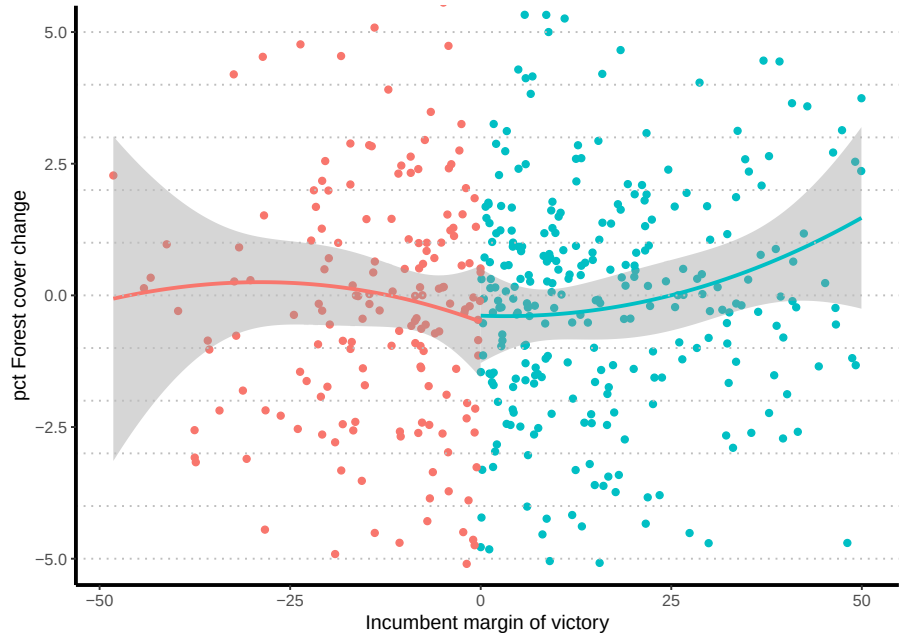

Figure 8: Incumbent margin of victory and forest cover loss, loess by win/loss

A loess fit confirms the general pattern observed in the linear fit above, but is unable to provide statistical evidence that a close victory is distinct from a close loss, nor that close incumbent victories are different from non-close incumbent victories.

6 Neighboring forest and lagged forest

In this section I explore what happens when a spatial lag of forest cover is included. In theory the forest cover of neighboring cells should predict whether a cell will lose forest cover. cells on the edge of a forest are more likely to be deforested than those surrounded by forest. However, in practice there is an almost perfect correlation between forest in a cell and forest in its neighbors. The following plots explore the bivariate relationships between forest in a cell, forest in neighboring cells, and change in forest. Including both does not change the results of the regressions, the correlation coefficient of the forest in a cell and its average neighboring cells forest is over 0.99.

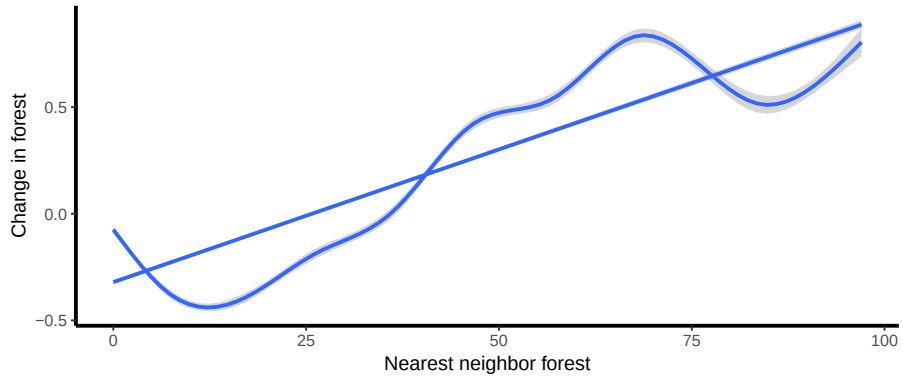

Figure 9: Linear and nonlinear bivariate fit of forest cover in neighboring cells and forest loss in target cell

A clear relationship appears between amount of forest in neighboring cells and expected change in forest cover. This is before any controls or fixed effects are taken into account.

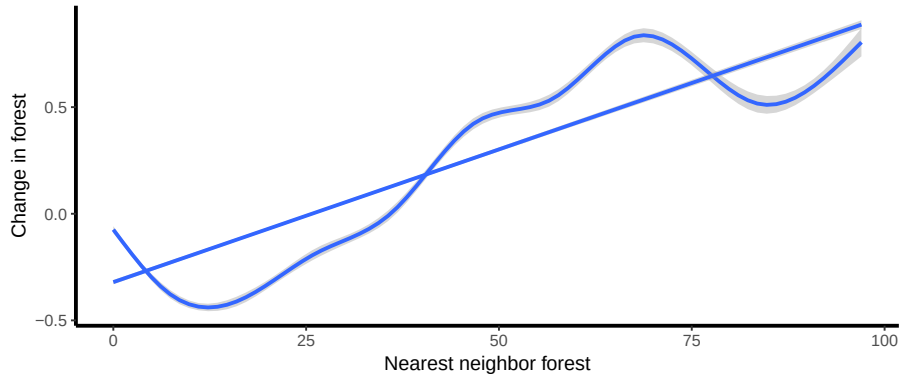

Figure 10: Linear and nonlinear bivariate fit of forest cover and forest loss in target cell

A clear relationship appears between amount of forest in a cell and expected change in forest cover in that cell. This is before any controls or fixed effects are taken into account.

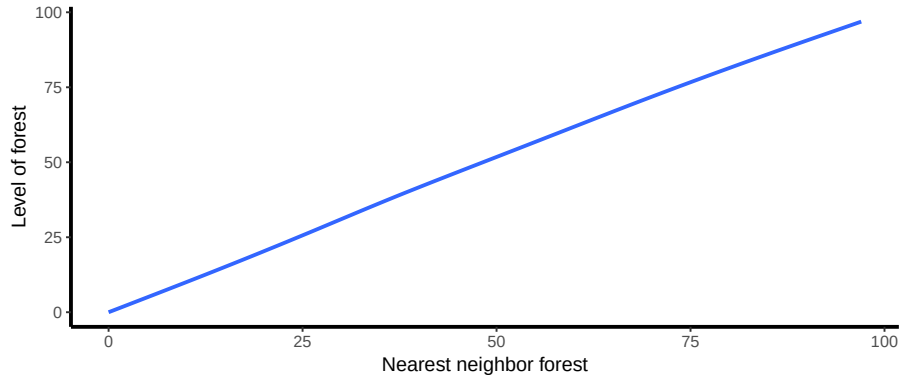

Figure 11: Nonlinear bivariate fit of forest cover and nearest neighbor forest cover

7 Timing of Deforestation

The final test presented here explores the timing of the forest loss with respect to an election. I expect deforestation rates to be highest in the time surrounding an election. The rate at which

politicians will choose to allocate forested land will peak just before the election takes place for two reasons: the ability of a politician to efficiently allocate resources increases as the election approaches, and voters exhibit recency bias. First, as an election approaches a politician's expected probability of winning that election becomes more precise, so they can choose how much land to allocate to ensure victory without wasting too much of the resource. Second, voters tend to exhibit some myopia and give more weight to recent events than less-recent events. Simply, a politician wants the benefit a voter received from that politician to be in the front of his mind when he goes to the ballot box (**??**).

While one might expect deforestation to be a slow process and thus expect higher rates of deforestation for several years after an election, I expect deforestation associated with elections to happen quickly for two reasons: opportunity costs of waiting and political uncertainty. Consider the two mechanisms highlighted above: smallholder farmers converting forest to cropland and logging firms extracting timber. Smallholder farmers have an incentive to clear forests quickly so they can plant crops during the next growing season. Failure to do so would be to sacrifice a year's worth of additional income. Furthermore, if farmers have to relocate to obtain this additional land like they did in the case of the Mau forest reserve in Kenya, their main priority is to clear the land and start growing crops. Alternatively, logging firms have different incentives to exploit forested resources quickly: their access might be contingent on the incumbent winning the upcoming election. Should a challenger win it would make sense for the challenger to revoke access to a firm that supported their opponent. Knowing this, logging firms should extract as much as possible quickly.

I test this by creating a lead and a lag of the **competitive election** variable ($t-1$ to $t+1$) to identify the timing of deforestation. Table 4 shows that the year of an election with less than a 10% margin of victory in an anocracy has significantly higher rates of deforestation than other years while the years before and after an election are not impacted to a degree which is statistically significant. This relationship is strong across levels of aggregation.

	Dependent variable:	
	Forest Change	
	(Cell)	(National)
	(1)	(2)
Election	-1.458^{***}	-0.626^{***}
	(0.301)	(0.231)
Election lag	1.733	-0.211
	(1.078)	(0.319)
Election lead	-0.241	0.053
	(0.978)	(0.343)
Democracy	-0.765^{*}	-0.440
	(0.392)	(0.330)
Election:Democracy	0.937^{**}	0.388
	(0.423)	(0.251)
Election lag:Democracy	-1.159	0.101
	(1.167)	(0.426)
Election lead:Democracy	0.714	0.219
	(1.137)	(0.448)
forest cover	-0.771^{***}	-0.551^{***}
	(0.041)	(0.062)
PCGDP	0.081	0.089^{**}
	(0.059)	(0.038)
Δ PCGDP	-20.008	6.118
	(25.600)	(14.242)
Population Growth	-0.240	-0.072
	(0.245)	(0.108)
Observations	103,241,073	2,695
R^2	0.412	0.389
Residual Std. Error	7.280 (df = 98676042)	2.867 (df = 2513)
Note:		*p<0.1; **p<0.05; ***p<0.01

Table 12: Timing of deforestation with respect to election years

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