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

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Abstract

This paper shows that over the last three decades competitive elections were associated with increased deforestation. Protection of forested areas provides long-term, public goods while their destruction provides short-term, private goods for particular voters. Politicians facing a competitive election offer voters access to forested areas for small-scale farming or commercial use of timber in exchange for electoral support. I test this theory of political deforestation using satellite generated global forest cover data and the results of over 1000 national-level elections between 1982 and 2016. I find that countries which undergo a democratic transition lose an additional .8 percentage points of their forest cover each year, that years with close elections have over 1 percentage point per year higher forest cover loss compared to non-election years, and that as the margin of victory in an election decreases by 10 points the amount of deforestation increases by .7 percentage points per year. These increases are on the order of five to ten times the average rate of forest loss globally. This suggests democratization is associated with under-provision of environmental public goods and contested elections are partially responsible for this under-provision.

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1 Introduction

"If an election were held every year, there would be no forest left."

–High level Kenyan official, December 1998[1]

Leading up to Kenya's first competitive election in 1992, President Moi signed a series of excisions granting key voters access to protected forested areas (Morjaria, 2012). The World Resource Institute noted, "Recent forest loss has resulted from government approved, politically motivated, and dubiously legal excisions of forest land from protected areas, reserves, and plantations" (Seymour and Hutter, 2000). Decades earlier, Bates (1979) wrote "securing the backing of the Mourides became more urgent with the advent of self-government in Senegal... the government of Senegal curried favor with the Marabouts by giving them privileged access to publicly subsidized inputs: fertilizers, mechanical equipment, *land carved out from forest reserves...*" (emphasis added). Deforestation rates increase 8-10% in mayoral election years in Brazil (Pailler, 2016, 2018). How widespread is political deforestation, and what are the common mechanisms that underlie these electoral deforestation cycles? This paper provides the first cross-national, longitudinal study of the link between elections and deforestation using data generated from satellite imagery.

Deforestation is one of the most important environmental issues of our time. When forests are cleared most of the carbon in their biomass is released into the atmosphere, accounting for over one third of all greenhouse gas emissions (Alkama and Cescatti, 2016). Preventing deforestation is one of the most cost-effective climate change mitigation measures (Gibbs et al., 2010). Deforestation is also the leading cause of habitat loss and species extinction and is associated with higher aridity, increased soil erosion, and lower water quality. Globally, only 6.2 million square kilometers of the preindustrial 16 million square kilometers of forest remain (Malhi et al., 2008), nearly 90% of which is on publicly owned land. Recent estimates

[1]The original quote appears in Seymour and Hutter (2000) and later appears in Klopp (2012).

point to a slowing rate of deforestation but continued tropical deforestation remains an important problem (Song et al., 2018). Because nearly 90% of remaining forests are publicly owned, deforestation is a political problem.

A prevailing theme in research on regime type is that democratic governments tend to provide more public goods than autocratic governments, the provision of which improves the lives of those who democracies enfranchise (Lake and Baum, 2001; de Mesquita, 2005). Meanwhile, a small but growing thread of research on competitive elections in weakly institutionalized democracies points out that the electoral mechanism can provide conflicting incentives to politicians causing them to forgo public goods provision and instead target electorally influential people with private goods (for example, Pierskalla and Sacks (2019); Gottlieb and Kosec (2019)). This paper adds nuance to the research on democratic governance and environmental protection (Li and Reuveny, 2006; Buitenzorgy and P. J. Mol, 2011) by considering the effects of competitive elections on preservation of protected forests, an important source of environmental public goods.

I demonstrate that democratic transitions and closely contested elections in weakly institutionalized democracies result in deforestation. I start with a trade-off politicians face: provide short-term, private goods offered by cutting down forests or provide long-term, public goods offered by forest preservation. When a politician faces a more competitive election the short-term electoral advantage they gain from giving key voters access to forested land outweighs the long-term support a politician gains by preserving forests. This results in increased rates of deforestation during competitive elections–as observed in Kenya (Morjaria, 2012) or Brazil (Pailler, 2018).

I test this theory on a global scale using satellite measured data of global land cover from 1982 to 2016 collected and made available by Hansen (2018). I use high quality data derived from satellite imagery which allows me to pinpoint the location and timing of deforestation. I combine this with national level electoral data, and economic and demographic covariates to test whether: (1) a democratic

transition is associated with higher rates of deforestation, (2) a national election year is associated with a higher rate of deforestation, and (3) competitive national elections are associated with higher rates of deforestation than elections in which one side won easily.

I acknowledge that in generalizing across such a wide array of countries over such a long time this paper is limited in its ability to isolate specific causal mechanisms. For example, we know that increased deforestation in an election year can occur as a result of agricultural expansion, logging, mining, infrastructure expansion, and many others. My aim is to show that the decision to allow destruction of forests so that other land uses can occur is one which is most likely to occur in weak democracies in an election year. This type of research is based on and lays the groundwork for close investigations of particular cases and mechanisms.

Across all countries with any forest from 1982-2016, forests in countries which undergo a democratic transition have higher rates of forest loss after the transition than before, controlling for changes in population and economic growth. Election years have higher rates of forest loss than non-election years in weakly institutionalized democracies. A smaller margin of victory is associated with a higher rate of forest cover loss compared to election years with larger margins of victory in these countries. These tests eliminate many alternative mechanisms including economic growth, population changes, time-invariant characteristics of a location (such as topography or agricultural suitability), and year-to-year changes that affect all cells similarly (such as global commodity prices). Together these findings show that forests are a resource politicians can use for political gain, and that electoral competition may lead politicians to prioritize short-term gain at the expense of longer-term environmental public goods provision. This means that competitive elections themselves, a foundational component of democracy, provide perverse incentives to cause long-term environmental damage. This runs counter to the common conception of democracy as protective of natural capital.

2 Democracy and deforestation

It is a stylized fact that democratic governments improve public goods provision resulting in welfare gains for the majority of the population (Lake and Baum, 2001; de Mesquita, 2005), and that the mechanism that drives this relationship is competitive elections (Besley, 2007; Fearon, 1999). This line of reasoning extends into the research on democracy and the environment. Developed democracies tend to have higher levels of environmental protection and lower levels of pollution than non-democracies (Dasgupta and De Cian, 2018) because of their tendencies to provide public goods (Ehrhardt-Martinez, Crenshaw and Jenkins, 2002; Buitenzorgy and P. J. Mol, 2011; Bernauer and Koubi, 2009) and reduce corruption (Wilson and Damania, 2005; Didia, 1997; Gibbs et al., 2010).

Other research clarifies when democracy reduces public goods provision and environmental protection. Often in young or developing democracies an introduction or increase in political competition can decrease the availability of public goods (Gottlieb and Kosec, 2019; Keefer, 2007), increase patronage politics (Pierskalla and Sacks, 2019; Kitschelt, Wilkinson et al., 2007; Driscoll, 2018), and hurt the poor (Ross, 2006; Harding and Stasavage, 2014). Others have found that democracies are associated with worse environmental outcomes (Midlarsky, 1998) and specifically deforestation (Marquart-Pyatt, 2004; Ehrhardt-Martinez, Crenshaw and Jenkins, 2002) though these findings lack theoretical motivation.

Several case studies examine the link between electoral incentives and deforestation. Klopp (2012) argues that the destruction of several forest reserves in Kenya can be attributed to increased demand for patronage in pre-election periods. Also set in Kenya, Morjaria (2012) argues that the introduction of multiparty elections in 1991 led to targeted excisions of protected forested land in areas pivotal for the election and deforestation rates increased thereafter. Pailler (2018) finds that in Brazilian municipalities where mayors run for re-election deforestation rates are 8-10% higher than in non-election years. Burgess et al. (2011) discover "political

logging cycles" in Indonesia, where deforestation rates increase during competitive elections. These studies join brief observations by other authors that in competitive elections, politicians use protected forested areas as a bargaining chip to win the support of key voters (Bates, 1979; Boone, 2003, 2014).

Natural sciences research finds that many factors associated with development increase rates of deforestation. The most common land use transition over the last fifty years has been from forest to agricultural land and pasture (Meiyappan and Jain, 2012). Over the last thirty years, more than 80% of new agricultural land was previously forest (Gibbs et al., 2010). Economic growth causes deforestation through logging as well as infrastructure expansion and mining (Chupezi, 2009; Mertens and Lambin, 1997).

Drawing on theories of electoral competition and public goods provision, case studies, and the natural sciences literature on causes of deforestation, this paper systematically develops and tests a theory of the link between deforestation and elections across countries. It contributes a general theoretical model for when and where electoral deforestation cycles should be strongest. Methodologically and empirically, this study adds higher quality data and panel methods to the debate on democracy and environment, and performs the first cross-national tests of electoral deforestation cycles.

3 Trading the forest for the trees?

Kenya: A motivating case

Figure 1 shows the Mau Forest Reserve, an area of government-owned protected forest, more than half of which has been converted into smallholder farms. The map on the left shows that the formally protected (darker) area falls into three counties: Nakuru, Narok, and Bomet. The satellite image on the right shows (light colored)

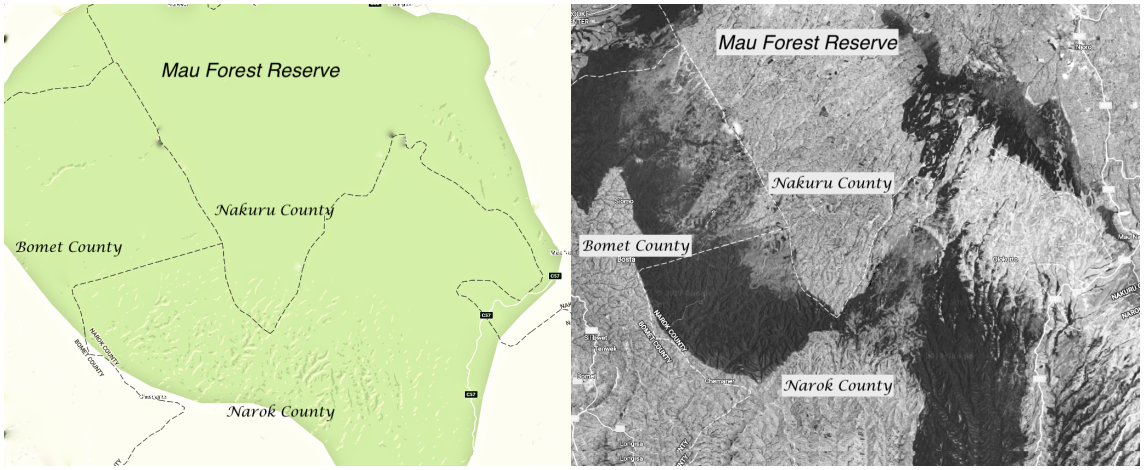

Figure 1: Deforestation in the Mau Forest Reserve

cropland areas and (dark colored) forested areas. Nakuru county is an electorally competitive county with a population of over one million divided among the major Kenyan tribes. Narok county is a primarily Maasai county that consistently voted for the opposition to the incumbent Kenya African National Union (KANU) party by a large margin in the 1990s and early 2000s. Bomet county has consistently voted for KANU by a wide margin. Most of the forest preserve in Nakuru county has been converted from forest to cropland (with the largest losses occurring around elections) while the majority of the preserve in Narok and Bomet county remains standing. In the Mau Forest Reserve the important difference was political: Nakuru was pivotal for control of the national legislature while Narok and Bomet's representatives were all but guaranteed to represent the opposition and incumbent parties respectively. President Moi and the KANU party distributed patronage in the form of explicit and de jure land grants to voters in pivotal counties to maintain political control. Klopp (2012) describes two possible benefits the ruling party obtained through these land-grants: sell the timber to finance re-election campaigns or distribute the land to potential supporters in exchange for their electoral support.

This and other anecdotes describe how deforestation can result from electoral competition at the district level. If this is generally true then years with competitive elections should have higher rates of deforestation at the national level, even if that deforestation is concentrated in competitive districts. I generalize the theoretical

mechanism for how and when politicians exchange trees for votes and then consider the implications on a *cross-national level* using the overall competitiveness of national level elections rather than district-level competitiveness. This allows observation of global patterns across the many countries and years for which sub-national electoral returns are not available.

The value of forests

Protected[2] forests are valuable to voters for several reasons. First, when left undisturbed, forests provide ecosystem services to surrounding areas (Newell, 2016). They host pollinators that are essential to seed production and predators that control pest populations. Additionally, forests reduce air pollution, decreasing respiratory and cardiac illnesses. They act as natural filters that purify water and help to recharge groundwater basins that are important for agriculture. Forests mitigate floods and droughts by preventing large fluctuations in the flow of rivers while preventing erosion and sediment loading that can make water more difficult to consume and shortens the lifespan of dams (Boelee, 2011). Finally, they attract tourists and bring foreign spending. Most of these benefits accrue to populations beyond those that are adjacent to the forest, and fall somewhere on the spectrum of positive externalities (sediment reduction) to pure public goods (CO2 emissions reduction) (Chazdon, 2008). These benefits accrue slowly, for example flood mitigation would not be apparent except in high-runoff events, and the effects of air quality on health can be latent for tens of years. There is growing evidence that negative environmental effects on voters' livelihoods can reduce support for an incumbent politician (Obradovich, 2017). As a result, politicians who protect forests may receive some additional electoral support from those who benefit from the public goods that forests provide.

[2]Protected means government owned and not available for farming or timber harvesting. High levels of protection include national parks and lower levels of protection include government owned land with few or no use permits.

Of remaining forested land, about 86% is government-owned (Gibbs et al., 2010). I define allocation as granting access to publicly owned land, which includes the allocation of informal access, use permits or property rights. The most common types of allocation of forested lands are logging or mining permits (Pailler, 2016; Burgess et al., 2011) and the granting of property rights to farmers (Morjaria, 2012; Klopp, 2012; Pailler, 2018).

Forested land is also valuable through the sale of timber or the potential to use the land for crops or other commercial purposes. The timber itself has value for firms which benefit from decreased protections for forests (Pailler, 2016; Ross, 2001; Burgess et al., 2011). More commonly or in conjunction with the above is commodity driven deforestation where the value of removing forests comes from what replaces the trees (Morjaria, 2012). Forested land is high in nutrients like nitrogen and phosphorous and is extremely productive when converted to agriculture (Rudel, 2013). Rather than providing value over time, the value associated with cutting down forests is immediately realized and clearly attributable to the politician who provided it. Furthermore, the stored value of forested land accrues directly to the firm who is able to log the region or to the people who gain access to agricultural land. This choice over the distribution of value from forests mirrors the choice faced by politicians in electoral business cycles where politicians are more likely to increase spending in competitive districts and on projects for which politicians can easily claim credit (Rogoff, 1987; Drazen, 2000; Mayhew, 2004).

The mechanism of granting access to forests generally takes one of two forms: use permits or property rights. Both of these mechanisms vary in their formality–they range from being transparent and formal to hidden and informal. Use permits grant firms the right to log or mine an area of land, as in Brazil and Indonesia (Pailler, 2016; Burgess et al., 2011). The politician can target a firm, which can provide jobs or economic growth to a particular area, or can contribute additional money to the politician either through higher tax revenue or political donations. Politicians can achieve a similar outcome by reducing protections or even reducing enforcement

of protections for forests; this strategy has lower target-ability but is less visible to the general public. In either situation, continued use is often contingent on the re-election of the politician who provided permits or reduced protection (Albertus, 2013). Property rights grant farmers the ability to clear forests and plant crops or graze livestock with the understanding that those who benefit will vote for the politician who provided those rights. The Kenya case is instructive for how this transaction occurs. Politicians can either target a particular forested with reduced protection, benefiting the people who live nearby and can expand onto the de-protected land or by granting property rights to a group of people whose votes the politician wants to secure. Property rights are also reversible should the incumbent who provided the property lose the subsequent election.

Forests differ from other classes of goods governments provide such as roads, clinics, and schools (Harding, 2011; Harding and Stasavage, 2014). Forests take decades to regenerate and are thus a one-off opportunity in a political lifetime. Additionally the allocation of forested areas does not require government spending that trades off with other projects. The exploitation of forests in the present only trades off with either their future exploitation or the future public goods that they could provide. Even if the government absolutely discounted the diffuse public goods that forested areas provide, it might choose to preserve some forested areas for future use and smooth its consumption of forested areas (Ostrom et al., 1999). The implication is that even if officials place little or no value on the public goods forests provide, they should tend to preserve forested areas until the present need for the goods exploitation of forests provides is greater than the expected future need for those goods. In other words, politicians should only grant access when they need to provide short-term benefits to an important group of constituents or when they are afraid they might lose the ability to grant access.

Political incentives

Facing re-election, politicians possess two strategies with respect to forested areas: one is to allocate some access to publicly owned forests to the constituents they believe to be pivotal in an election. The other is to protect forests and rely on the public goods protected forests provide to convince constituents that they will be better off if they are elected. A politician must distribute benefits in such a way that they generate enough support to be re-elected.

How will a politician use limited forest resources to maximize their chances of staying in power? Most research focuses on how politicians supply goods to potential supporters. In an autocracy where a politician must please a small winning coalition, providing private goods tends to be more efficient than providing public goods (de Mesquita, 2005), and we expect politicians to allocate more access to public forests (Li and Reuveny, 2006; Didia, 1997; Buitenzorgy and P. J. Mol, 2011). In a democracy where the winning coalition is large, providing public goods is more efficient at generating support, and politicians can be expected to preserve forest at a higher rate (Olson, 1965; Lake and Baum, 2001; Deacon, 2009).

However, there are two demand-side reasons deforestation rates increase when a country transitions from autocracy to democracy: the relative political empowerment of farmers who demand land and the shortened political time horizons that come with regular elections. In a new democracy the selectorate includes recently enfranchised small-holder farmers (or others who may benefit from deforestation) for whom forested land is an extremely valuable resource (Boone, 2003; Morjaria, 2012). In an autocracy, the selectorate tends to consist of a small wealthy group of industrialists who do not have incentives to quickly deforest[3] (Anderson, 2010; Swinnen, 2010;

[3]This is for two reasons. The value for industrialists tends to come from selling timber products rather than planting crops meaning that they would smooth their consumption of forest over time. Second, as the number of plausible consumers of forest increases, the incentive to deforest now becomes stronger (Ostrom et al., 1999)

De Gorter and Swinnen, 2002; Bates and Block, 2013; Kasara, 2007). Note that this can occur in countries where agriculture plays a small role in the economy–all that is required is the combination of newly enfranchised forest consumers. When a democratic transition occurs, the political value of removing protections for forested land increases. Democracy may also lead to higher rates of allocation of forested land because politicians in democracies face regular electoral challenges that shorten their time horizons and make short-term increases in support more valuable than the slow, long-term accrual of support.

Keefer and Vlaicu (2008) have shown that new or weakly institutionalized democracies tend to rely on clientelism because parties are weaker and their promises are less credible in the mind of voters. The introduction of additional electoral competition can exacerbate clientelism (Pierskalla and Sacks, 2019) by increasing the stakes of clientelist relationships or by increasing the demand for clientelist goods (Driscoll, 2018). Similarly, Gottlieb and Kosec (2019) find that in places with weak parties and low transparency political competition reduces the amount of public goods provision. Thus, after democratic transitions and during close elections targeted forest allocation should be more likely, especially in weakly institutionalized democracies.

I focus first on countries which experience a democratic transition. This allows me to isolate the relationship between political incentives and deforestation rates in the two different systems while holding other conditions relatively constant. Based on the empowerment of farmers who demand cropland and the introduction of elections which emphasize short-term political gains, I hypothesize that:

Hypothesis 1: *Countries which transition regime type have higher rates of deforestation under democratic government.*

There are further observable implications for election and non-election years. Politicians have a shortened time horizon ahead of a competitive election because they may not be reelected. Short horizons reduce the value of the long-run goods

forests provide and make the short-run benefits of granting access to the land more appealing. Should the politician lose re-election, the long-term goods protected forests provide are worthless to them, rendering the immediate increase in political support from immediate allocation even more valuable in comparison. Additionally, if the politician is able to identify pivotal voters, the efficiency of granting access those voters likely exceeds the efficiency of providing public goods. However, this comes at the expense of the increase in support generated by protecting forested lands until they are allocated at some point in the future and the benefit the politician might get in a future election by allocating those goods. Because of this, a politician should generally only choose to allocate forested land when they feel truly threatened, and only if institutions are weak enough that the politician will face minimal backlash for these allocations. Given that autocracies rarely, if ever, have competitive and meaningful elections and institutionalized democracies have mechanisms to punish politicians for clientelist behavior, the following two hypotheses apply primarily to weakly institutionalized democracies. The higher value of tropical forested land means they should often be a part of politicians' electoral strategies, and the increased trade-off with public goods should make those forests particularly vulnerable in election years.

Hypothesis 2: *Election years will have higher rates of deforestation than non-election years.*

Hypothesis 3: *Years with competitive elections will have higher rates of deforestation than years with non-competitive elections.*

Finally, all of the hypotheses should be strongest in places where politicians can observe and target key constituents. In a single-district proportional representation system policies which by their nature target certain geographic areas are less likely to be useful than in majoritarian systems with low district magnitude (like Kenya) where politicians can identify pivotal districts (Rogowski, 1987; Park and Jensen, 2007).

Hypothesis 4: *Majoritarian systems will amplify the effects of democratic transi-*

tions and elections on deforestation compared to non-majoritarian systems.

4 Empirical Strategies

Data

The dependent variable for this study is the percentage point change in primary forest cover in a $.05^\circ \times .05^\circ$ cell of land in one year. The total area of a cell is $30.25km^2$ near the equator, but as small as $8.90km^2$ near the poles. Forest is characterized by the presence of vegetation with a canopy over 5 meters tall. The data used to construct this measure is from Hansen (2018) which uses data from Advanced Very High Resolution Radiometer instruments to measure vegetation cover over the globe on an annual basis. This type of data is remarkable for a few reasons: the coverage is global, the method is accurate, and the data are not susceptible to interference from parties that seek to conceal or misrepresent information. I use data from 1982 to 2016, the full extent of the available data Song et al. (2018).

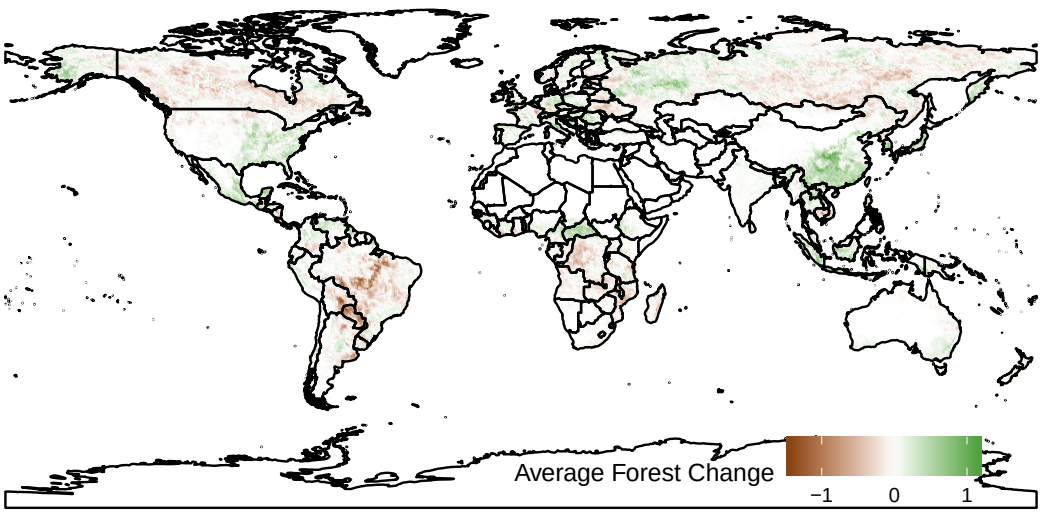

Figure 2: Average Forest Change, 1982-2016

The color of each cell represents the average change in forest cover in that location from 1982-2016

I extract the percent land-cover of forest of each cell in each year, resulting in

34 years of global forest cover data, and calculate the year-on-year differences for the dependent variable. The dependent variable exhibits a unit root in levels, which suggests taking a first difference will produce more consistent results than including a lagged dependent variable. Alternately, the dependent variable of interest is the rate of forest cover change rather than the level of forest cover. Formally, $\Delta\text{forest}_{i,t} = \text{forest}_{i,t} - \text{forest}_{i,t-1}$. A value of -1 for a cell indicates a one percentage point loss meaning an average loss of about $0.3km^2$ of forest per cell.

I merge national boundaries with this data, so each observation contains a unit level measure of forest cover and a set of national-level independent variables. I exclude all observations that never have forest cover from 1982-2016 because such places are never eligible to lose forest. Many areas gain forest, particularly in China, Russia, and Canada where large scale tree planting or climatic changes have resulted in more forests. Forest increases are included in the data but are difficult to link to a political event because the different growth rates of various species of trees mean that new trees may take many years to appear in the data. However, a slower than normal rate of gain in a particular year could indicate forest loss in some parts of the cell.

Right-hand side variables come from several sources and are merged with forest cover data by country-year. This analysis uses a dichotomous indicator of democracy from Boix, Miller and Rosato (2013) for the democratic transition test. They define a minimum threshold for both contestation and participation to determine whether a country is a democracy or not in a given year. Data on election years and votes come from the Database of Political Institutions (DPI) (Beck et al., 2001) and the V-Dem project (Coppedge et al., 2020). The variable **election year** takes a value of 1 if a national-level legislative election occurred in that country in a given year and 0 otherwise.[4]

Kayser and Lindstädt (2015) note that ideally researchers should use past

[4]I use the V-Dem measure in the paper but the results are robust to DPI

vote swings and seats-votes elasticities to calculate electoral risk, but even this is complicated by implicit assumptions about how effort maps to votes (Cox, Fiva and Smith, 2020). This is further complicated by two features of this study: seat-vote elasticities are not available for most of the countries considered, and using previous vote swings requires 6 previous elections with relatively stable parties. Because the focus of this paper is young democracies, previous elections both are not available and do not provide good information on which to base an expectation of the competitiveness of the current election. Instead, in the spirit of Kayser and Lindstädt (2015) I use the percent seat difference between the two largest parties. This most clearly captures the margin by which the largest party holds the prime minister position in a parliamentary system or the presidency in a two-party democracy as measured by Coppedge et al. (2020). Alternately, I use two measures derived from Beck et al. (2001): the difference between the incumbent coalition's vote proportion and 0.5; and the difference between the incumbent coalition's seat proportion and 0.5. For interpretability I transform these variables so a value of 100 represents a tie election and a value of 0 represents one party garnering 100% of the vote or seats[5]. I use the Polity IV data to divide countries into "autocracies" (polityIV $<$ -5), "anocracies" (polityIV $\leq$ 5 and $\geq$ 5) and "democracies" (polityIV $>$ 5) Marshall (2019). Anocracies are the weakly institutionalized democracies for which I expect electoral deforestation cycles to be most pronounced.

I create a variable which is 1 if proportional representation is used in national legislative elections and 0 otherwise Beck et al. (2001). This allows a test of Hypothesis 4 by isolating majoritarian systems where geographic targeting is more feasible.

In each regression I include the following controls from the World Bank World Development Indicators: per capita GDP (thousands of US Dollars), change in per

[5]Formally: margin $= 100 - |\%\ \text{votes}_i - \%\ \text{votes}_j|$ where i and j are the two parties with the most seats, or margin $= |50 - \%\ \text{votes or seats}_i| \times 2$ where i is the incumbent coalition.

capita GDP (% change), and change in population (% change) (WDI, 2017). Each is lagged by one year to prevent the inclusion of post-treatment controls. This means a variable such as per capita GDP is included from time $t-1$ and change in per capita GDP is included as the change from time $t-2$ to time $t-1$. I also include a control for the amount of forest remaining in a cell at the start of the year because I expect deforestation rates might be higher in places that are partially forested than places that have 100% forest cover. Appendix specifications control for the percent of the population employed in agriculture and agriculture as a percent of the GDP.

I include unit and year fixed effects. The unit fixed effect absorbs any time-invariant characteristics at the unit level, including location, country, elevation, average climate, soil type, etc. It also de-means the forest cover loss variable, considering only deviations from the average forest cover loss in each cell. Year fixed-effects absorb global-level changes specific to a single year, like food, lumber or fuel prices. The remaining variation is composed of deviations from each observation's average forest cover loss that are also deviations from the global average forest cover loss in that year. Because election shocks should appear only in cell-years that experience an election, this specification should control for most variables that are associated with both election years and deforestation. It should also control for most of the non-political drivers of deforestation including economic and population growth. Simply, the variation I explain is: changes in forest cover that are not associated with development, economic growth, population growth, size of the agricultural sector, growth in the agricultural sector, and changes idiosyncratic to a particular location or year.

I cluster standard errors at the country and year level to account for correlation in residuals between cells in the same country, possibly over many years, and to account for correlation in residuals between distant cells in the same year. This reduces the effective number of observations to a number much closer to the number of country-years (thousands) instead of cell-years (tens of millions) (Table 1). A second set of regressions reported below aggregates forested cells to the country

level, generating a dependent variable which is the average change in forest cover among forested cells in a country in a year. Appendix 1 aggregates to cells which are 100 times larger than those described above, and level 1 and 2 sub-national units. There are two strong reasons to prefer the cell-level specifications. The unit fixed effects are much less effective at accounting for environmental characteristics when the unit is an entire country. With standard errors clustered at the country and year levels I can be confident that the confidence intervals are valid. Additionally, for climate and ecosystem outcomes the unit of focus is the land area rather than the country. This means that the results from the regressions are interpretable in the context of the forested area of earth rather than an average of country-level results.

Summary Statistics

Number of forested cell-years	157,586,802
Number of forested cells	4,397,228
Number of countries with forested area	136
Number of country-Years	6,692
Number of elections	1,146

Table 1: Observations in different levels of aggregation

Regime Type	System	Elections	Margin <20	Margin <10
Anocracy	PR	92	24	5
Anocracy	Majoritarian	105	15	17
Autocracy	PR	28	2	2
Autocracy	Majoritarian	67	12	5
Democracy	PR	144	64	36
Democracy	Majoritarian	544	340	220

Table 2: Elections by Regime and Electoral type

There are approximately 4.4 million cells which ever have forest, 136 countries which have some forest and appear in them sample, and 1,146 elections. Those elections predominantly occur in strong democracies, but 197 of them are in anocracies and 95 in autocracies. Only 22 elections in anocracies have a margin of victory of less than 10 percentage points.

Test 1: Democratic Transitions

First, I test whether cells in democratic countries that experience regime type transitions transitions have higher rates of deforestation than cells in non-democratic countries which experience such a transition. The main independent variable is whether a country is a democracy, where democracies are coded 1 and non-democracies coded 0. The dependent variable is percentage point change in forest cover for a cell in a year. The main specification uses unit and year fixed effects which project out time-invariant characteristics of each cell (and thus country):

$$\text{ForestChange}_{i,c,t} = \alpha_i + \gamma_t + \beta_1 * \text{Democracy}_{c,t} + \lambda * X_{c,t} + \delta * X_{i,t} + u_{i,c,t} \quad (1)$$

β_1 represents the within-country difference between years when a country was a democracy (according to Boix, Miller and Rosato (2013)) and years when that country was not. α and γ are cell and year fixed effects, $X_{c,t}$ is a vector of country-level controls, $X_{i,t}$ is a vector of cell-level controls, and $u_{i,c,t}$ is the unexplained variation, clustered at the country and year level.

This regression targets whether a patch of forest was more likely to lose forest under a democratic or non-democratic regime. It gives each equal-sized area the same weight, focusing on the total amount of deforestation. I focus on these cell-level regressions, however, I also present the country-level results in Figure 3 and in the Appendix.

Hypothesis 1 is countries which transition regime type have higher rates of deforestation under democratic government.

Table 3 shows that among countries that experience at least some years as a democracy and a non-democracy, forested areas have about 1 percentage point greater forest cover loss during democratic years compared to the nondemocratic years. Columns 2 and 4 show that without including fixed effects this relationship is not detectable because it compares deforestation rates *between* fundamentally

	Cell	Cell	National	National
Democracy	-1.10^{*}	-0.34	-0.25	0.04
	(0.45)	(0.39)	(0.29)	(0.10)
Forest	-0.77^{***}	-0.05^{***}	-0.56^{***}	-0.01
	(0.03)	(0.01)	(0.06)	(0.01)
PCGDP	0.08	0.00	0.11^{***}	0.00
	(0.05)	(0.01)	(0.03)	(0.01)
Δ PCGDP	-7.49	10.17	-9.16	26.59
	(20.70)	(28.40)	(10.58)	(16.77)
Pop Growth	-0.12	-0.01	-0.08	-0.06
	(0.28)	(0.13)	(0.08)	(0.06)
Constant		1.78^{***}		0.45
		(0.31)		(0.27)
FE	cell + year	none	country + year	none
Num. obs.	136415199	136415199	4345	4345
Adj. R^2	0.38	0.02	0.34	0.01
Num. groups: Country	143	143	143	143
Num. groups: year	33	33	33	33

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

Table 3: Regressions of forest change on regime type. A total of 61 countries experienced a regime-type transition.

different countries rather than within a single country. This change in forest cover is estimated to be negative at a $\alpha = 0.05$ confidence level in the cell-level specification. The rate of forest cover loss associated with democracy is higher than the global average has been in any year since 1982. Democratization is responsible for approximately nine million square kilometers of forest loss, or an area roughly the size of Brazil. This represents approximately 9% of the total forest cover as measured in 1982 lost in countries which have experienced years as a democracy and non-democracy. Furthermore, this estimate is *after* the main structural economic and demographic drivers of forest cover loss have been taken into account.

Hypothesis 4 posits that the effect of democratization will be stronger in majoritarian systems. To test this, I run the following regression:

$$\begin{aligned}\text{ForestChange}_{i,c,t} = \alpha_i + \gamma_t + \beta_1 * \text{Democracy}_{c,t} + \beta_2 * PR_{c,t} + \\ \beta_3 * (\text{Democracy}_{c,t} * \text{PR}_{c,t}) + \lambda * X_{c,t} + \delta * X_{i,t} + u_{i,c,t} \quad (2)\end{aligned}$$

The β_1 coefficient can be interpreted as the the relationship between a democratic transition and forest cover change for majoritarian systems. Figure 3 shows the democracy coefficient from the original specification and the coefficient from this specification. When a country transitions to a majoritarian system the forest cover loss associated with this transition is consistently large, negative and significant across aggregation levels.

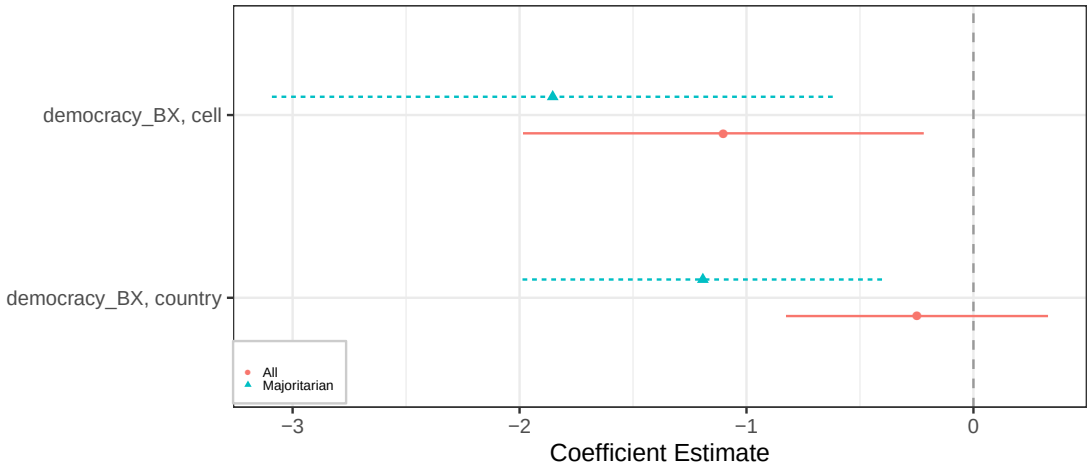

Figure 3: Forest cover change across electoral systems

The top row red circles correspond to the estimates presented in the Table 3. The second row corresponds to regressions with data aggregated to the country level. The blue triangles are the same regressions but in electoral systems without proportional representation.

When the data are aggregated to a national level the effect size is smaller and not statistically distinguishable from 0. This points to the possibility that the effect is more pronounced in countries with more forested cells or that the effects are localized to hot-spots which carry little weight in the national-level regressions. To further investigate I run geographically weighted regressions and regressions at different levels of spatial aggregation, including aggregating cells to 55km $\times$ 55km, and aggregating to first and second level sub-national units. As Lee and Rogers (2019) point out, identifying the 'correct' unit of analysis can be difficult and lead to different results, so results from various levels of aggregation can be found in the Appendix. When focusing on majoritarian systems the effect of a regime type transition is larger and significant for all levels of aggregation, suggesting that

geographic targeting is for the political and ecological versions of this question.

Where previous results attempt to answer the question of whether democracies deforest more than non-democracies, this paper poses a more tractable question: how do rates of forest cover loss change when a country switches between being a non-democracy to being a democracy? This refrains from comparisons between vastly different countries and instead relies on variation within countries over time. Second, by including data at the cell area it allows me to ask a modified version of the question–for an area of forested land, what is the likely result of having the country in which it is located change regime types. This focuses on an effect which is substantively important: in the large countries where most of the remaining forest in the world resides, what were the consequences of democratic transitions? The evidence shown here is that democratic transitions are associated with higher rates of deforestation, especially when the transition is to an electoral system with geographic targeting.

Test 2: Election years

Competitive elections create a unique set of incentives for politicians to allocate more forested land to voters than they do in non-election years. I expect this to be strongest in weakly institutionalized democracies and weak in both autocracies (where leaders' positions of power are not contingent on elections) and strong democracies (where institutions can prevent clientelism). A blunt test of Hypothesis 2 considers forest cover loss in all national-level election years across the government-type trichotomy and compares it to forest cover loss in non-election years. Because business cycles are known to be connected with elections and could drive deforestation, I control for change in per capita GDP from $t-2$ to $t-1$. While this estimation strategy cannot rule out the possibility of some unobserved confounder, such a confounder would have to cause elections and increase forest loss in many countries over the course of multiple elections. Unit and year fixed effects prevent unit, country, or year-specific

characteristics from confounding the estimates:

$$\text{ForestChange}_{i,c,t} = \alpha_i + \gamma_t + \beta_1 * \text{Election}_{c,t} + \beta_2 * \text{GovType}_{c,t} + \beta_3(\text{Election}_{c,t} * \text{GovType}_{c,t}) + \lambda * X_{c,t} + \delta * X_{i,t} + u_{i,c,t} \quad (3)$$

β_1 represents the within-country difference between election years and non-election years for anocracies. β_2 represents the within-country difference between regime types. β_3 represents the difference between election-year effects for anocracies versus democracies or autocracies. The second and third panels only include elections within the specified margin of victory. α and γ are unit and year fixed effects, $X_{c,t}$ is a vector of country-level controls, $X_{i,t}$ is a vector of cell-level controls, and $u_{i,c,t}$ is the unexplained variation, clustered at the country and year level. The goal is to isolate deviations from each cell or country's average rate of deforestation that cannot be explained by economic or demographic characteristics, and test whether those deviations align with election years and close elections.

In an average election there is no more deforestation than usual. However, as the competitiveness of the election increases so does the expected rate of deforestation, culminating in a two percentage point increase in the rate of deforestation (Over ten times the average rate of forest loss in the Brazilian Amazon). Columns 1-3 of Table 4 show results at the cell level. Election years themselves are not significantly associated with forest change, but elections with less than a 20 point and less than a 10 point margin of victory are increasingly associated with deforestation. Columns 4-6 show that when aggregated to a national level these results at not significant. At the cell level the rows 4-6 show that in democracies the effect of elections are counteracted, but row 7 supports the above conclusion that being in a democracy is a net negative for forest cover.

Figure 4 shows this relationship across levels of aggregation and electoral system

	Cell	Cell	Cell	National	National	National
Election Year	−0.10			−0.12		
	(0.39)			(0.23)		
Margin < 20		−1.38*			−0.39	
		(0.71)			(0.39)	
Margin < 10			−2.17**			−0.37
			(0.71)			(0.36)
Election:Democracy	0.06			0.07		
	(0.38)			(0.22)		
Margin<20:Democracy		1.22			0.19	
		(0.77)			(0.43)	
Margin<10:Democracy			2.08**			0.16
			(0.66)			(0.42)
Democracy	−0.91*	−0.87*	−0.96*	−0.33	−0.38	−0.35
	(0.38)	(0.36)	(0.38)	(0.23)	(0.24)	(0.25)
Autocracy	−0.50	−0.54	−0.56	0.11	0.21	0.21
	(0.61)	(0.64)	(0.65)	(0.39)	(0.38)	(0.38)
Forest	−0.77***	−0.77***	−0.77***	−0.55***	−0.56***	−0.56***
	(0.03)	(0.03)	(0.03)	(0.06)	(0.06)	(0.06)
PCGDP	0.07	0.08	0.09	0.11***	0.11**	0.11***
	(0.06)	(0.06)	(0.05)	(0.03)	(0.03)	(0.03)
Δ PCGDP	35.20	7.91	13.68	−1.48	1.93	3.14
	(38.28)	(30.06)	(32.54)	(10.23)	(10.33)	(10.46)
Pop Growth	−0.14	−0.23	−0.18	−0.06	−0.08	−0.07
	(0.28)	(0.27)	(0.27)	(0.07)	(0.06)	(0.07)
Country + Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Num. obs.	132801614	118463788	110285677	4081	3701	3517
Adj. R^2	0.38	0.38	0.38	0.34	0.35	0.35
Num. groups: Country	136	136	136	136	136	136
Num. groups: year	33	33	33	33	33	33

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

Table 4: Regressions of forest change on election year. Election years are subset by how competitive they were: columns 1 is all election years, 2 is years with a margin of victory less than 20 points, 3 is years with a margin of victory less than 10 points. Election year is interacted with regime type with anocracy as the base case.

types. Refer to Table 1 for the number of elections in each category. The top of Figure 4 shows the coefficients from the first three rows of Table 4. The bottom half of the figure shows the results from the electoral system regressions–at the cell level the point estimates are smaller but still significant. At the national level focusing on majoritarian systems increases the precision of the estimates where competitive and close elections both have higher rates of deforestation than non-election years. When aggregated over elections in anocracies I find that close elections are responsible for around *additional* 500,000 square kilometers of deforestation, or larger than the size of the state of California.

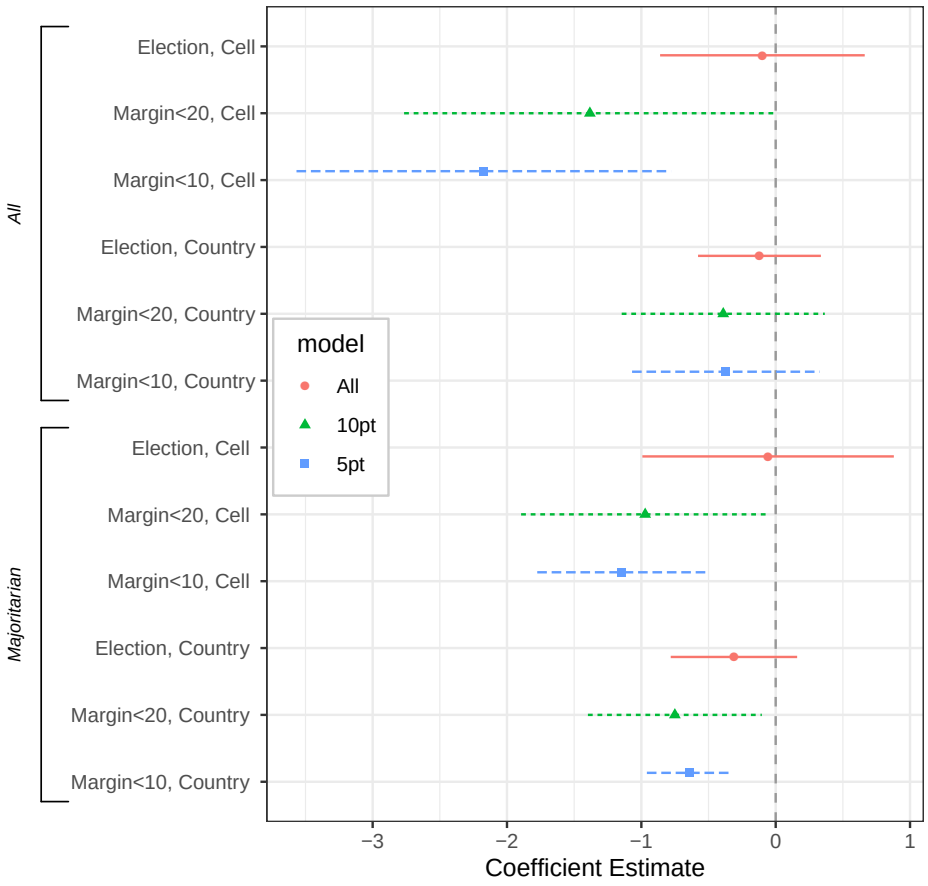

Figure 4: Forest cover change across levels of electoral competitiveness, regime type and electoral system

In many countries we should expect sub-national variation in effect sizes due to variation in importance or competitiveness across districts. This or specific locations of key constituencies should lead us to expect only some parts of countries to exhibit higher rates of deforestation in election years. This should bias against finding results because it averages across areas where no change in forest cover should be expected.

Figure 5 shows the spatial heterogeneity in the relationship between elections and forest change. Appendix 2 has figures for elections with margin of victory less than 20% and less than 10%. Notably, the sub-equatorial region which has experienced the most intense deforestation in the last 40 years also has the strongest relationship between elections and forest cover loss, stretching across Brazil, Argentina,

Uruguay, DRC, Congo, Angola, Indonesia and up into South Asia. This analysis also shows heterogeneity within countries–something which merits further analysis in future work.

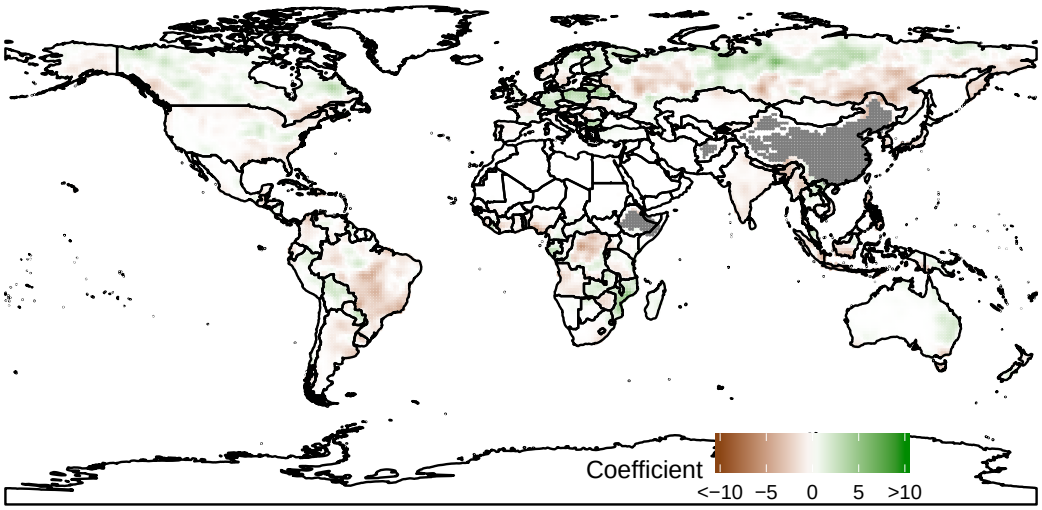

Figure 5: Geographically Weighted Regression: Coefficient on Election Year
The color of a cell corresponds to the relationship between election years and forest cover change for the cells within two decimal degrees of that cell. For each cell a separate regression is run including only cells within two decimal degrees, weighted by their inverse distance to that 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.

Test 3: Competitiveness

In this section the sample is restricted to years in which elections occurred, and close elections (in which the margin of victory is low) are compared to elections where one party got a preponderance of the votes. The independent variable measures the competitiveness of an election where 100 corresponds to a tie vote between the two largest parties, 0 corresponds to an election in which one party got 100% of the votes cast. This simplifies the interpretation of the coefficient–as elections get more competitive rates of forest cover loss increase. Once again the main independent variable is interacted with the trichotomized polity variable to isolate the effects in

weakly institutionalized democracies. The main test includes unit fixed effects[6], and the same controls:

$$\text{ForestChange}_{i,c,t} = \alpha_i + \beta_1 * \text{Competition}_{c,t} + \beta_2 * \text{GovType}_{c,t} + \beta_3(\text{Competition}_{c,t} * \text{GovType}_{c,t}) + \lambda * X_{c,t} + \delta * X_{i,t} + u_{i,c,t} \quad (4)$$

β_1 represents the within-country difference between election years and non-election years for anocracies. β_2 represents the differences between rates of deforestation in election years across regime type estimated at a competitiveness of 0. β_3 represents the difference between margin-of-victory effects for anocracies versus democracies or autocracies. α is unit fixed effects, $X_{c,t}$ is a vector of country-level controls, $X_{i,t}$ is a vector of cell-level controls, and $u_{i,c,t}$ is the unexplained variation, clustered at the country and year level.

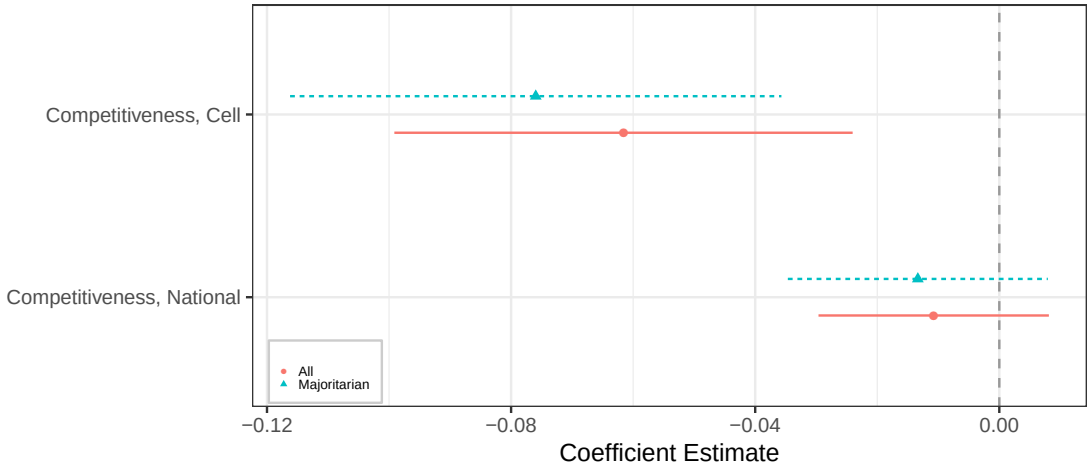

Figure 6: Forest cover change across electoral competitiveness, regime type, and electoral system

At the cell level a one percentage point increase in competitiveness is associated with a 0.06 percentage point decrease in forest cover among election years in anocracies. While the previous set of regressions compared election years to non-election years

[6]but not year FE because demeaning forest cover change only in cells which have an election by year doesn't make sense and loses several years in which there was only one election

	Cell	National
Competitiveness	-0.06^{**}	-0.01
	(0.02)	(0.01)
Comp:Democracy	0.06	0.00
	(0.03)	(0.01)
Democracy	-4.53	0.16
	(2.52)	(0.96)
Forest	-0.71^{***}	-0.43^{***}
	(0.03)	(0.07)
PCGDP	0.07	0.14^{**}
	(0.09)	(0.05)
Δ PCGDP	43.02	12.29
	(28.60)	(35.22)
Pop Growth	-0.03	-0.34
	(0.47)	(0.26)
FE	cell	country
Num. obs.	35346878	864
Adj. R^2	0.35	0.22
Num. groups: Country	128	128

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

Table 5: Regressions of forest change on electoral competitiveness. Competitiveness is interacted with government type with Anocracy as the base case.

this regression compares competitive to uncompetitive elections. However, the results are consistent with a ten percentage point increase in competitiveness linked to a .6 percentage point decrease in forest cover, or the difference between a 20 point margin and a ten point margin. While the coefficient on the interaction between democracy and competitiveness is not significant, it exactly cancels out the size of the anocracy competitiveness coefficient, suggesting that the relationship between electoral competitiveness and deforestation is mitigated there. At the national level the effect is not distinguishable from zero, likely for the same reasons cited above–that elections in countries with large forested areas are driving the effect.

Figure 6 shows this relationship across cell and national levels of aggregation, and across electoral systems. Here like above subsetting to majoritarian countries only marginally changes the estimate of the effect size, and the two estimates are not significantly different. This test demonstrates that the degree of competitiveness can

have a large effect on the deforestation rate. Brazil's average rate of deforestation between 1982 and 2016 was -0.13 percentage points per year which means going from a tied election to a 55-45 split would be expected to increase the deforestation rate by 50%.

A variety of other mechanism and robustness tests can be found in the Supporting Information: Tests of heterogeneous treatment effects by forest type and agricultural influence in Section 1, different levels of spatial aggregation results (Section 2), Geographically weighted regressions for the other tests (Section 3), Different measures of electoral competitiveness (Section 4), Margin of victory and incumbent victory vs loss (section 5), including neighboring and lagged forest as controls (section 6), and examining the timing of deforestation with respect to elections (section 7).

5 Limitations and Implications

The finding that politicians allocate forest resources in exchange for electoral support has two broader implications: first, natural resources do not fit the familiar dynamic between democratic government and increased public goods provision; second, ecosystem services and other public goods supplied by the preservation of natural resources can change how states address common pool resource problems. However, before discussing those implications I first lay out scope conditions and limitations of the study.

Limitations

While providing evidence of a general relationship between deforestation and both democratic transitions and elections, a few limitations exist for the finding. These include the vast heterogeneity among countries and years in the sample, the spatial and temporal resolution of the data, the reliance on selection on observables and fixed effects, and potential measurement issues for independent variables across

such a heterogeneous sample. These limitations generate possibilities for future work including testing the hypotheses here with higher resolution data, exploiting surprise elections, and examining the factors that might mediate the effect including political institutions, the demand for forested land, and the type of forest. The results for democracy only apply to countries which switch regime type, not stable democracies. I think that the transition itself is important, as discussed below. The other effects are often estimated based on relatively few elections and as a result are more likely to be idiosyncratic to the sample, but this is a fundamental limitation of the data and our political history.

Reverse causality could be a problem, especially because the theory is that politicians can gain an advantage in elections by increasing the deforestation rate. This directly suggests reverse causality, that deforestation influences the outcome of elections. However, deforestation is one item on a long menu of strategies available to politicians in the lead-up to an election. A few of the other strategies available include vote-buying (Stokes et al., 2013; Boone, 2014), constructing roads and clinics (Burgess et al., 2013; Harding, 2011), and agricultural taxation and subsidation (Kasara, 2007). In fact, Posner and Kramon (2011) points out that politicians choose among a set of many strategies. This means that the rate of deforestation likely only explains a very small part of the variation in electoral competitiveness, limiting the size of the potential reverse causality bias. Future work will take advantage of pre-election polling results where they are available and the amount of deforestation leading up to an election to try to directly measure the effect that deforestation has on voting behavior (Morjaria (2012) uses a similar strategy).

This paper is limited in how it can address specific mechanisms. Using national election returns means that I cannot assess whether politicians target core or swing voters, or whether the effect is driven by particular sectors. It also means that deforestation as a result of electoral business cycles is observationally equivalent to targeted allocation of protected forested land. I also cannot rule out the possibility that firms try to extract timber faster when there is political uncertainty. While I

expect these effects to be relatively small compared to agriculturally and pastorally driven electoral deforestation cycles, they are potentially important mechanisms.

Implications

A number of influential papers argue that democratic governments are more likely to provide public goods than non-democratic governments. Lake and Baum (2001) and Olson (1993) argue that more contestable political markets decrease the monopoly rents the state can extract from its provision of public goods, implying that the more competitive the election, the more public goods politicians are likely to provide. This paper demonstrates that in young or weakly institutionalized democracies this relationship does not hold; rather than politicians choosing between state rents and public goods, politicians choose between strategies that maximize their chances of victory, sacrificing long-term provision of public goods for short-term transfers of private goods. As a result we should not expect political competiton to increase state production of *environmental public goods*. Instead, political competiton may fuel exploitation of natural resources in a way that is more consistent with Ostrom (1990)'s description of common pool resources. Keefer and Vlaicu (2008) and Keefer (2007) argue that young democracies are more prone to clientelism and corruption, which reinforces the effect observed in this paper.

Deacon (2009) and de Mesquita (2005) argue that because democratic politicians rely on the support of a larger subset of the population to stay in power, providing public goods is a more efficient way to generate public support than providing private goods. My findings run contrary to Deacon's and Mesquita's theses. There are two main reasons for this disagreement. First, Deacon and Bueno de Mesquita's argument does not consider differences in demand for different types of goods across different selectorates. The transition to democracy empowers a larger portion of the population, but also increases demand for agricultural land. Because politicians have to choose between highly demanded private goods and less demanded public goods,

it is not always efficient to provide public goods even if politicians aim to satisfy a large constituency. When the newly enfranchised population is largely agrarian, politicians may choose to distribute private goods with a higher marginal utility to that population rather than providing public goods. Ross (2006)'s argument that the public goods democracies provide benefit the middle class is in line with this argument–that the demand for different kinds of public goods drives which goods are provided.

Second, selectorate models do not incorporate changes in the marginal utility of providing private or public goods leading up to an election. As the time of an election grows nearer, the subset of the voters who might be pivotal comes into focus for a politician seeking re-election. With knowledge of who these constituents are and where they are located, politicians might be able to exercise a price-discriminating strategy where they distribute just enough goods to secure the vote of each member of the winning coalition. When a politician can do this, the efficiency of providing public goods decreases (because it essentially offers a single price for the vote of a selectorate member) and politicians will choose to offer private goods to low-price members of the winning coalition. This means offering pivotal voters access to protected forested areas even though doing so reduces the well-being of other constituents. This effect may be amplified in places where the distribution of private goods is highly attributable but the utility provided by ecosystem services is not easily attributable. In places without a strong rule of law or low freedom of the press, voters might not know a politician is giving away public land in a way that will hurt the voters in the long run. In fact, Klopp (2012) notes that as the attributability of environmental destruction increased in Kenya, forest for votes exchanges became less common.

In addition to the question of democratic provision of public goods, the findings have implications for how we categorize the goods natural systems like forests provide when they are preserved. The default framework for natural resources in political science work is Common Pool Resources (CPRs) as in Ostrom (1990).

These resources are notoriously hard to preserve because consumers face an n-player prisoners dilemma game where defection from preservation is a strictly dominant strategy for each player (Hardin, 1968; Ostrom et al., 1999). This paper characterizes forests differently: rather than only considering the value forests provide when they are cut down or "consumed," it evaluates the value these forests provide when they are preserved. The ecosystem services outlined above are public goods (non-rival, non-excludable), which changes the way we might think about their preservation. In non-election years, government control of the resources produces an efficient outcome (contrary to what one might expect with a CPR). However, in election years CPR problems begin to crop up. Perhaps forested areas are a class of goods that are best described as "public goods with common pool resource problems."

With this categorization, the CPR literature can offer some insight into why election years have such an effect on forest change. Ostrom (1990) argues that rapid changes in the value of a common pool resource can reduce the ability of any governance system to prevent overuse, but does not consider when political systems themselves might induce this change. As elections approach the value protected forests provide politicians (through the political support they help to generate) undergoes rapid changes. The value to a politician of removing protections and granting access increases relative to the value of preserving that resource, triggering a situation where the governance system (democratic governance) fails.

6 Conclusion

To summarize, I argue that democratic transitions are associated with higher rates of deforestation, competitive election years have higher rates of deforestation than non-election years, and the more competitive an election the higher the rate of forest loss. Politicians choose to allow, induce, or even subsidize deforestation to garner political support when they fear they might not be re-elected. Doing this is costly for the politicians–they give up both the additional support the public goods

provided by forests might provide them as well as the ability to allocate that land in the future.

These findings are a first step towards demonstrating that natural resources might not fit neatly into the democracy and public goods provision literature. This is in part because natural resources differ from the "normal" public or private goods politicians offer their constituents in exchange for political support. However, this is also because an electoral mechanism leads to changes in demand for particular types of goods, leading politicians to take actions that do not seem efficient if one only considers the supply of public and private goods. Finally, it shows natural resources that provide environmental services might not fit neatly into a CPR framework, opening possibilities for new lines of research into environmental preservation.

The policy implications of this work are twofold. First, international institutions should note that democratic transitions and especially closely contested elections during a transition pose a threat to forests. Preventing forest cover loss is one of the most cost-effective methods to combat global warming, and politically motivated deforestation is something a process that international environmental institutions might be uniquely suited to address. Second, this research illuminates behavior by politicians that is inefficient in the long-term as a contributor to deforestation. Recognizing the situations in which democratic elections do not promote public goods provision but rather the provision of goods to a small politically important subset of the population is an important first step towards understanding when democracy fails to live up to its promise.

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