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Young Politicians and Long-Term Policy*

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Abstract

Policies often have costs today but benefits far into the future, especially climate change and environmental policies. A critical dimension in this trade-off is politicians' age, which impacts their life expectancy, career concerns, and what education they receive. We study this trade-off in the case of Brazilian mayors and environmental outcomes, using close elections. We find that when a young politician is elected, there is a reduction in deforestation and greenhouse gas emissions without significant effects on municipal GDP. Our study of mechanisms suggests young mayors matter because they belong to a new cohort, not because of age per se.

JEL: *P18,Q23,Q54*
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1 Introduction

A fundamental difficulty in policy-making, especially regarding climate change and natural resource conservation, is that policies often have costs today but benefits far into the future. It is estimated that greenhouse gas emissions stay in the atmosphere for decades (IPCC, 2021); so actions to reduce emissions today will accrue benefits for the next generations.

A key constraint in whether long-term policy will be adopted may be the age of politicians in office (Stockemer and Sundström, 2022). And, in theory, politicians' age might affect long-term policy in multiple ways (Alesina et al., 2019). First, a young politician is more likely to be alive to experience the benefits of a policy with benefits far into the future. Consequently, younger politicians would be more likely to reduce deforestation today to diminish future adverse impacts of climate change. Second, younger politicians might have more career concerns, prioritizing short-term economic growth over environmental conservation. Third, younger politicians received more information about climate change while in school. Given all these possible channels, the effect of politicians' age on local deforestation is ex-ante ambiguous.

In this paper, we empirically study the effect of politicians' age on long-term policy in the context of Brazil. Specifically, we study the effect of electing a young mayor on deforestation and other outcomes using data from Brazilian municipalities. Brazil is an ideal setting to study the effect of politicians' age on deforestation. Foremost, the country contains 60% of the Amazon rainforest, the largest tropical forest on the planet. In addition, Brazil has thousands of municipalities (analogous to U.S. counties), which provides us with multiple observation units. Although mayors in Brazil are not directly responsible for environmental law enforcement, mayors can affect deforestation when under strong electoral incentives (Bragança and Dahis, 2022) via the agricultural and social programs implemented (Holland, 2016). For example, 118 mayoral candidates were on the

national environmental agency's "watch list" for deforestation, illegal burning, exploiting protected native forests, or providing false information to environmental agencies (MongaBay, 2021). Brazil has also been monitoring deforestation with satellite data since the early 2000s, providing us with data without misreporting concerns. We also use data from municipal elections for the years 2004-2016 from the Superior Electoral Court (TSE).

Our empirical strategy employs a regression discontinuity (RD) design for close elections involving young candidates. The close elections are a natural experiment comparing municipalities that barely elected a young mayor with those where the young candidate barely lost the election. Importantly, young and senior candidates differ in other dimensions besides age. Even though we control for observable characteristics, the estimated effect is not only the effect of a young mayor. The estimated effect is a combined package of the characteristics of having a young mayor in office (Marshall, 2022). We provide the standard RD validity tests to show the absence of manipulation or discontinuities in covariates around the cutoff.

We find that young mayors have better environmental performance without significantly affecting the local economy. Specifically, when a young mayor is in office, there is a 0.56 p.p. reduction in the yearly deforestation rate (as a share of the municipality's forest area in the year 2000). Compared to a mean of 0.76% forest area deforested each year, the effect size amount to a reduction of 74%. We also find that a young candidate also reduces greenhouse emissions. Importantly, electing a young candidate does not have statistically significant effects on municipal gross domestic product.

Turning to mechanisms, we first find that young mayors do not prioritize the primary sector. When a young mayor is in office, there is a reduction in the agricultural sector, as measured by GDP per capita or as a share of total income. We also find a larger share of the municipality's budget for education and a reduction of future liabilities. These results, combined with the positive environmental effects, suggest that the time horizon dominates career concerns when a young mayor is in office.

Lastly, we propose two exercises to test whether our results are capturing (i) *cohort* effects: young mayors are part of a new generation that learned more about climate change in school, or (ii) *age* effects: younger people care more about the future but potentially change as they grow older. First, we show that the effect of electing a young mayor on deforestation is not heterogeneous by any covariate, such as education, political leaning, or incumbency. While for senior mayors, covariates are important. Second, we find no statistically significant results in an alternative specification where we exploit the full variation of age differences between candidates and compare outcomes when the younger candidate wins. These results suggests that cohort effects dominate: young mayors matter because they are part of a new generation, not because they are young per se.

We contribute to three main strands of the literature. First, we contribute to the burgeoning literature that studies the effects of agents' age on government policies. Alesina et al. (2019) and Bertrand et al. (2015) find that younger politicians have more career concerns. To the best of our knowledge, we are the first to study the effects of politicians' age on environmental performance.

Second, we contribute to the literature that studies the political economy of deforestation. At the national level, deforestation can be affected by central government policies (Burgess et al., 2019). At the municipal level, deforestation is higher when the mayor is a farmer (Bragança and Dahis, 2022), when the mayor's campaign was financed by donors (Harding et al., 2021), when municipalities split (Burgess et al., 2012) and when the election was contested (Sanford, 2021; Morjaria, 2018). The effect of electing a donor-funded politician has an effect size of 53-109% compared to the deforestation mean (Harding et al., 2021), comparable to the effect size of 68-90% of electing a young politician.

The environmental justice literature has so far focused on the unequal distribution of environmental damages across income and race (Hsiang et al., 2019). Our work highlights the importance of political representation for younger cohorts, who will be disproportionately impacted by climate change (Thiery et al., 2021).

The reminder of the paper is organized as follows. Section 2 discusses the Brazilian context. Section 3 presents the identification strategy. Section 4 describes the data and summary statistics. Section 5 presents the results and Section 7 concludes.

2 Institutional Background

Brazil contains 60% of the Amazon rainforest, the largest tropical forest on the planet. We focus on the Legal Amazon municipalities,[1] because is where the deforestation data is available. Municipalities are the smallest administrative unit in Brazil, the equivalent of United States counties. There are currently 5,572 municipalities in Brazil, of which 772 are in the Amazon. However, the Amazon municipalities represent about 50% of the country's area.

Municipal governments are managed by a mayor elected using plurality rule in municipalities with less than 200,000 voters and majority rule in municipalities with more than 200,000 voters. Mayors serve a four-year term, and can be re-elected once. The Brazilian municipalities also have a local council. Municipal councilors are elected through an open list proportional representation system. Elected mayors and councilors take office on January 1st next year, after elections in November. We analyze data from elections every four years from 2004 to 2016, covering mayor periods from 2005-2008 to 2017-2019.

The minimum age to be elected mayor is 21 years old, while for councilor it is 18.[2] The median candidate age in all elections in our data is 44 years old, while the median elected candidate age is 48 (see Figure A.1). Other eligibility requirements are being Brazilian, having full electoral rights, having enlisted for the army, living in the relevant geography, and being affiliated to a party.

[1] Is the area of operation of Superintendence for the Development of the Amazon and is delimited by the law. It was established to promote the sustainable development of the region. This area covers almost 59% of the total Brazilian area. (Instituto Brasileiro de Geografia e EstatisticaIBGE, n.d.)

[2] See https://www.tse.jus.br/eleitor/glossario/termos/elegibilidade.

According to the 1988 Constitution municipalities are responsible for providing an array of public goods and services, such as basic education and health. Jurisdiction over environmental conservation is somewhat a gray area. Historically enforcement has been done by the federal government through agencies such as the Brazilian Institute for the Environment and Renewable Resources (*Ibama*), Chico Mendes Institute for Biodiversity Conservation (*ICMBio*), the federal police, and others. Nevertheless, mayors may influence deforestation directly or indirectly, for example, via incentives to developing local agriculture or with infrastructure projects, and with forbearance (Holland, 2016).

3 Empirical Framework

Consider a municipality m where in the election of year t_e the 30 years old candidate won the election against a 60 years old candidate. We would like to compare deforestation when the young mayor is in office ($y_{m,t_e+1,30}$), against deforestation if the senior mayor had won ($y_{m,t_e+1,60}$). Unfortunately we only observe the deforestation when the young one is in office ($y_{m,t_e+1,30} = y_{m,t_e+1}$). Consequently we use two strategies to identify the effect of having a young mayor in office. First, we find other municipalities where the top two candidates have a similar age profile to m and include age profile fixed effects ($\delta_{AP(t_e)}$). Ideally one would have the exact age profile of 30 and 60 years old for the top two candidates. In reality we use age bins of size 10 years. For example we find a municipality m' where a 62 years old candidate won the election against a 28 years old candidate. And compare y_{m,t_e+1} against y_{m',t_e+1}. Second, we only consider close elections, because the winner is quasi-random compared to a case where a candidate won by a landslide victory.

Therefore to study the effect of young mayors on deforestation, we use a Regression Discontinuity Design. This quasi-experimental approach compares municipalities where a young candidate barely won the election versus municipalities where the young candidate lost by a small margin. The first step is to define the age limit to define a candidate

as young. In the main specification we use the following rule:

$$\text{Young}_{mt} = \begin{cases} 1, & \text{if Age}_{mt_e} <= P_{20}(\text{Age}_{mt_e}) \\ 0, & \text{otherwise} \end{cases}$$

where Age_{mt_e} is the age of the mayor at the time of the previous election (t_e), and $P_{20}(Age_{mt_e})$ refers to the 20th percentile of the age of all politicians in the country running for election that year.

After identifying young candidates, we identify mayoral elections where a young candidate won or obtained second place. Then we estimate the effect of electing a young mayor on deforestation using the following equation:

$$y_{mt} = \beta \times \text{YoungWon}_{mt_e} + f^{+}(Margin^{+}_{mt_e}) + f^{-}(Margin^{-}_{mt_e}) + \delta_{AP(t_e)} + \lambda_t + \gamma \times Z_{mt} + \varepsilon_{mt} \tag{1}$$

where y_{mt} is the percentage of the forest area deforested in municipality m on year t. The forest area for each municipality is the forest standing in the year 2000. YoungWon_{mt_e} is a dummy equal to one if a young candidate won the previous election (t_e), and consequently is in office at time t. $f^{+}(Margin^{+}_{mt_e})$ and $f^{-}(Margin^{-}_{mt_e})$ are local polynomials of the margin of victory ($+$) or defeat ($-$) of the young candidate in the previous election. $\delta_{AP(t_e)}$ are the age profile fixed effects. λ_t are time-fixed effects to control for different yearly shocks, like the weather and national policies. Z_{mt} are municipality time-variant controls such as the logarithm of population and mayor controls such as sex, second-term, right-wing, married status and college attendance. Finally, we use Hinkley (HC1) errors (ε_{mt}) in the main specification, but present robustness to other error types.

In the main specification, we compare young mayors against any mayor that is not classified as young. On average the young mayor is 17.8 years younger than the rival candidate. Still, there is a concern that the strategy sometimes compares a candidate that

is 35 years old against a candidate that is 36 years old. Therefore we also present results using only elections with a young and a senior candidate compete for first place. We define a senior candidate as one that is above the 80th percentile of the age distribution, which is approximately 55 years. However, there are not many elections where the top two candidates are young and senior.

If the main difference between a young and an older candidate was just the age, one could think of an empirical design with a dummy of *YoungerWon* instead of *YoungWon*. For example the effect of a 50 year old candidate beating a 60 year old candidate, would be similar to that of a 30 year old beating a 40 year old candidate. The difference in each case is 10 years, so the effect on long term discounting would be similar. We will use this design in the mechanisms section. The regression is similar to equation (1), but using the *YoungerWon* dummy.

Following the literature, we restrict the use of polynomial order to those of low order (Gelman and Imbens, 2019). We use a linear local polynomial in our main specification. In the case of the bandwidth selection, we use the data-driven approach proposed by Calonico et al. (2014). We employ in the main specification a triangular kernel for weighting observations as recommended by Cattaneo et al. (2019). We present robustness to polynomial degree, bandwidth and kernel in the Appendix.

In addition, to understand the mechanism driving the results, we estimate the same equation with different dependent variables – such as economic variables and expenditure type. We also add interactions to compute potential heterogeneous effects of having a young mayor in office.

4 Data and Summary Statistics

4.1 Data sources

Deforestation.

The area deforested each year is provided by the National Institute for Space Research (INPE) through the Measurement of Deforestation by Remote Sensing program (PRODES). INPE computes deforestation by analyzing satellite images covering only the Legal Amazon, with a resolution in a range of 20-30 meters pixels. An area is categorized as deforested if there is a "suppression of areas of primary forest physiognomy due to anthropic actions" (de Almeida et al., 2021, p.3) and the deforested polygon is larger than 6.25 hectares (625 square meters). The data is yearly using the "PRODES year", which begins on August 1st and ends on July 31st of the following year. For example, deforestation in 2006 in the data is forest clearing that occurred between August 1st 2005 and July 31st of 2006. The reason for using this time interval is to take as reference the date with most clear images in terms of clouds, that is, closest to the dry season (de Almeida et al., 2021) and where largest extent of the forest can be detected by the satellite..

Election results and candidates information.

We have elections' results from 2004 to 2016 from the Superior Electoral Court (TSE), preprocessed by the Data Basis project (Dahis et al., 2022). The dataset contains information on the elections of each municipality and information about the candidates, such as age, education, sex, marital status or college attendance. In addition, from the political party information, we establish whether the candidate is left or right-wing. Figure A.1 shows the age distribution of candidates during the whole study period. Figure A.2 shows the map of the Brazilian Amazon with the distribution of municipalities that enter the regression discontinuity sample by year. While Table B.1 reports the number of municipalities by year that enter the RD sample.

Emissions.

We use the emissions data from System for Estimating Greenhouse Gas Emissions and Removals (SEEG) (Sistema de Estimativa de Emissões e Remoções de Gases de Efeito Estufa, Observatório do ClimaSEEG, n.d.).[3] SEEG classifies emissions in different levels depending on the activity that produced the emissions. Emissions are measured in tons of carbon dioxide equivalent (CO_2e), so that different gases are comparable based on their global warming potential. We add this data to proxy environmental behavior by municipality and economic activity.

We also use other databases such as SICONFI for municipal expenditures, Municipal Agricultural Research, and Agricultural Census. All data is pre-processed by the Data Basis project Dahis et al. (2022) and is available on their website.[4]

4.2 Summary statistics

Table 1 presents summary statistics of the data we have. Columns 1-4 present the mean and standard deviation for four different groups of municipalities: (1) all Brazilian municipalities except those in the Legal Amazon and the main sample; (2) municipalities in the Legal Amazon that do not enter the regression discontinuity design; (3) Amazon municipalities where a young candidate closely won the last election; (4) Amazon municipalities where a young candidate barely lost the last election (the "control" group). Columns 5 presents the difference between the group of municipalities where the Young won (3) versus the group where the Not young won (4). Column 6 asses if there is a discontinuity in the characteristics at the close election cutoff. Panel A presents characteristics of the municipality, while Panel B characteristics of the mayors.

Panel A shows that around 15% of elections in Brazil have a young candidate in the top two, and the percentage is similar in Amazon municipalities. By construction, all the

[3]For more information about methodology used see De Azevedo et al. (2018).
[4]See `https://basedosdados.org`

elections in the regression discontinuity sample (columns 3 and 4) have a young candidate in the top two. Municipalities have on average 30,000 inhabitants in all groups, but Amazon municipalities are around ten times as large in terms of area. As stated before, the deforestation data is only available for Amazon municipalities. These municipalities had on average 4,500 km^2 of forest in the year 2000 and deforest each year 0.7% of the forest. These variables are similar in treatment and control groups columns 5 and 6 show.

Panel B of Table 1 presents summary statistics of the mayor characteristics. Only 10% of the mayors are female and 12% are in their second term. 43% of young mayors went to college, while only 27% of not young mayors went to college. As expected, young mayors are less likely to be married. Interestingly young mayors are equally likely to be from a right wing party. As we have statistically significant differences between Young and Not young mayors, we control by college, marital status, sex, second-term, and right-wing, in the regressions. Table A.1 presents additional summary statistics.

5 Results

We first study the effect of having a young mayor in office on deforestation. Then the effect of a young mayor in other outcomes and finally we explore mechanisms.

5.1 Effect of having a young mayor in office on deforestation

Table 2 presents the results of estimating Equation (1). Column 1 presents the results without controlling for characteristics of the mayor, while Column 2 includes controls. For each regression in these first two columns, we recalculate the optimal bandwidth for the given data. In the last two columns, we fix the bandwidth to that of the main specification (column 2, Panel A) so that we compare results with the same margin of victory. Panel A compares young candidates to any other not young candidate. Panel B compares

young candidates against senior candidates. Recall that we define a senior candidate as being above the 80^{th} percentile of the candidates' age distribution in the election, approximately 55 years. Finally, panel C compares senior candidates against any other candidate. Column 1 in Panel A shows that when a young mayor is in office, there is a reduction in deforestation of 0.48 percentage points compared to municipalities where the young mayor barely lost the election. Compared to the mean of 0.73% of the forest area deforested each year, this is a reduction of almost 66% in deforestation. The reduction is of similar magnitude (74%) when we control by mayor characteristics (column 2). Figure A.3 shows the Regression Discontinuity plot for the main specification.

The effect is larger when we restrict the control group to elections with a senior candidate (Column 1, Panel B). But we obtain a similar coefficient once we include mayor controls. This is explained by the fact that young and senior candidates differ in other dimensions beyond age. Panel C shows a slight increase in deforestation comparing municipalities with senior mayors with the rest of the municipalities, but statistically we cannot reject the effect is null. Note that we do not include a Panel comparing Senior vs Young candidates, because the results are symmetric to Panel B.

Robustness.

Figure A.4 presents the results of the sensitivity analysis to the bandwidth in the main specification (column 2 of Panel A in Table 2). We vary the bandwith between half and twice the optimal bandwith. Table A.2 presents the results when we vary the age limit to define a candidate as young. We still observe a reduction when we use 25th and 10th percentiles of age. The main results are even larger, when we apply a quadratic polynomial in the margin of victory (see Table A.3). The main results are also robust to different error estimations (see Table A.4). We use a triangular kernel in main specification following Cattaneo et al. (2019), but we also present robustness to Epanechnikov and Uniform kernels (Table A.5). The coefficient using a Uniform kernel with the optimal bandwidth of the main regression (column 8 in Table A.5) was reduced to an effect size of 50% and a p-

value of 0.108. Furthermore, the optimal bandwidth of this kernel specification (column 6) is almost twice the optimal bandwidth of main specification, which explain the change of the results. Table A.6 presents results for a placebo exercise, assigning deforestation four years ago as dependent variable. There are no statistical significant effects of the young mayor on previous deforestation, as expected.

Figure A.5 shows the results of the main specification when dropping different observations of the closest elections to avoid the results being just driven by a few observations with higher weights. Figure A.6 presents results when we apply different threshold to drop potential outliers on deforestation and in forest area. The coefficients are smaller when we drop the areas with more deforestation (Figure A.6a) as expected because the mean will also be reduced. Table B.2 shows the results excluding the second-term mandates.

5.2 Other outcomes

We now study what happens in economic variables and other environmental measures when a young mayor is in office. Table 3 varies the dependent variable to study the effect of electing a young mayor on numerous variables, some as potential mechanisms. Columns 1 and 2 show the results for GDP by economic sector. We find a reduction in the agricultural sector share when electing a young mayor measured as percentage of the total GDP of the municipality. While we do not find an increase in the agricultural share for senior mayors (Panel B), Columns 3 and 4 show an increase in agricultural planting area and livestock, measured as the number of bovines.

Columns 5 to 8 of Table Table 3 study what happens to the greenhouse gas emissions intensity of GDP. Column 5 shows a large reduction in the emissions intensity of aggregate GDP when a young mayor is in office. Part of this reduction is caused by a reduction in emissions associated with the agricultural sector. There is a reduction in emissions

generated by the transport sector. The results for young mayors are aligned with the results in Panel B for senior mayors. Panel B shows a statistically significant increase in emissions intensity of the agricultural sector and energy sector when a senior mayor is in office. Furthermore, there is a significant and positive effect on the total emissions.

Column 9 shows the effect of having a young mayor on the number of environmental fines. As there is less deforestation with young mayors, there are also less environmental fines. Table B.4 presents the results disaggregating by type of environmental fine. Table B.5 presents results with the optimal bandwidth for each specification.

Table B.6 studies the effect of electing a young mayor on agricultural sector variables. Column 1 shows a reduction in the production value in Panel A and Panel B, but the effect is not statistically significant. Also, we do not find significant effects on productivity (column 2). Regarding the livestock sector, we find a reduction in the number of cows in municipalities with a young mayor and an increase in municipalities with an senior mayor. [5]

5.3 Mayors' Actions

Lastly, columns 10 to 13 of Table 3 studies whether mayors are spending their municipal budget differently and how much they are impacting local governments' liabilities. Column 10 of Panel A shows that young mayors do not affect the share of the budget allocated to the environmental sector, while senior mayors (Panel B) reduce it by 0.43 percentage points. This reduction is 100% of the mean. There is evidence of more investment by young mayors in long-term policy, such as education (column 11). In the analysis of municipality liabilities (column 13), young mayors borrow less, and this reduction is totally driven by the decrease in the amount of long-term liabilities (column 7 of Table B.3).

[5]The results are not statistically significant in column 4 (as they were in column 4 of Table 3) because there are few observations, given that the Census does not happen yearly. Nonetheless, the sign is consistent in the two columns.

It means that young mayors commit fewer resources in the long run. While senior mayors spend more today. Finally, there is an increase in the budget allocated in the agricultural sector. However, the weight of this sector in the total budget is less than 1%. Table B.7 presents results the analogous to Table 3, selecting the optimal bandwidth for each regression. The conclusions are similar.

6 Distinguishing Age and Cohort Effects

The results in the previous Section show that when a younger mayor is in office there are less environmental damages in the municipality. This better environmental performance could be due to the longer time horizon of younger mayors or cohort differences, for example what they learned in school. To explore this competing explanation, in this Section we study heterogeneous effects of the main results and a new specification looking at the effect of age.

First, Table 4 presents heterogeneous effects of estimating Equation (1). Column 2 studies the heterogeneous effects of having a college degree. College is important to have lower deforestation for senior mayors, but not for young mayors. This is probably because in recent years environmental education is more widespread in high school. Column 3 shows that a young female mayor reduces deforestation even more than a male young mayor. Although, only 12% of young mayors are female (see bottom row with the mean of the interaction variable). Column 4 shows that right-wing mayors are less effective at reducing deforestation. For senior mayors the differential effect is statistically significant, but for young mayors is not. Column 5 studies whether young married mayors have a different effect on deforestation. One could expect that married mayors might have kids and therefore more inclined to protect the environment. Although the coefficient shows a negative sign, as expected, it is not statistically significant in the case of young mayor but it has a positive sign and significant for senior mayors. Column 5 presents the effect

of being a young mayor in his second-term mandate. Column 6 studies whether young farmer mayors have a differential effect on deforestation. The sign is positive, although the effect is not statistically significant. This result is in line with (Bragança and Dahis, 2022).

Next, our main effects could be explained by pure cohort effects, if for instance young mayors are part of a new generation which learned more about climate change in school, or by pure age effects, if for instance younger people care more about the future but potentially change as they grow older. Table 5 tests that idea, studying whether the effect of young mayors is similar to that of younger mayors. Panel A column 1 repeats the main specification. Column 2 interacts with the age difference, and column 3 interacts with bins of age group.

Panel B changes the treatment dummy from *YoungWon* to *YoungerWon*. That is, besides looking at a case where a mayor under 35 won, we look at every close election where the younger mayor won, exploiting all variation in age differences between candidates. We find no statistically significant effects of a younger mayor winning the election on our outcomes of interest. This is consistent with cohort effects being the dominant force behind our results.

7 Conclusion

In this paper, we study how politicians of different age groups affect environmental conservation and investment in various long-term policies. We find evidence that electing young mayors in Brazil causes a reduction in deforestation and GDP emissions intensity. We find roughly opposite effects when electing a senior mayor. We also find an increase in the share of the budget allocated for education when electing a young mayor. These results support that young mayors' longer time horizon affects their policy decisions.

Our work highlights the importance of political renovation for environmental conser-

vation. With climate change mainly affecting young generations, these results provide motivation for affirmative action based on age for elected bodies. Our work also leaves various paths of research open. For example, whether voters incorporate the candidates' age tradeoffs in voting decisions; or whether the Brazil result generalizes to other contexts where emissions are not driven mainly by deforestation but by energy and industrial production.

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8 Tables and Figures

Table 1: Summary statistics

Variable	Brazil	Legal Amazon	Young	Not young	Young (3) vs Not Young (4)	
					Difference	RD
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Municipality						
% elections with young top2	14.70	11.85	100.00	100.00	0.00	0.00
	(35.41)	(32.33)	(0.00)	(0.00)	(0.00)	(0.00)
Population (thousands)	35.72	32.82	20.70	20.64	0.06	-13.79*
	(219.89)	(105.68)	(19.74)	(19.09)	(2.99)	(7.45)
Municipality Area (Km2)	723.33	6,531.59	7,006.31	6,079.71	926.60	408.77
	(1498.43)	(13,700.45)	(13,102.11)	(10,849.24)	(1,843.05)	(1346.44)
Forest area in 2000 (km2)	-	4,503.42	5,159.07	4,108.31	1050.76	920.13
	(-)	(13,054.62)	(11,817.92)	(10,291.88)	(1,700.67)	(1148.51)
Deforestation as % forest	-	0.68	0.85	0.74	0.10	-0.24
	(-)	(1.21)	(1.08)	(1.24)	(0.18)	(0.16)
N	19,176	2,915	79	90		
Panel B: Mayor						
College	0.48	0.39	0.43	0.27	0.16**	0.26*
	(0.50)	(0.49)	(0.50)	(0.44)	(0.07)	(0.14)
Male	0.91	0.88	0.87	0.87	0.00	0.07
	(0.29)	(0.33)	(0.33)	(0.34)	(0.05)	(0.10)
Right	0.77	0.76	0.72	0.72	0.00	-0.21
	(0.42)	(0.43)	(0.45)	(0.45)	(0.07)	(0.13)
Married	0.78	0.72	0.57	0.71	-0.14*	-0.17
	(0.41)	(0.45)	(0.50)	(0.46)	(0.07)	(0.12)
Second term	0.27	0.25	0.10	0.14	-0.04	0.01
	(0.44)	(0.43)	(0.30)	(0.35)	(0.05)	(0.10)
N	19,176	2,915	79	90		

Notes: Mean and standard deviation (in parenthesis) of the municipality and mayor attributes disaggregated by groups. Column 1 includes municipalities that are neither in our main specification sample nor in the Legal Amazon. Column 2 contains all municipalities belonging to Legal Amazon that are not in our main sample. Columns 3 and 4 municipalities of our main regression sample disaggregated by Young and Not Young groups. Columns 5 and 6 show the results for differences testing between Young (Column 3) and Not young (Column 4). Column 5 uses a t-test, and Column 6 uses a Regression Discontinuity with year fixed-effects and controlling by the logarithm of the population. Panel A contains information with variation across municipalities and electoral terms in the case of deforestation from PRODES and population and just by municipalities in the rest of the variables. Panel B provides information about the candidates and elections of the sample. *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table 2: Electing a young mayor reduces deforestation

Dependent variable:	Deforestation as % forest 2000			
	(1)	(2)	(3)	(4)
Panel A:	Margin: Young vs Not young			
Young won	-0.48**	-0.56***	-0.53***	-0.56***
	(0.20)	(0.19)	(0.20)	(0.19)
Mean Dep. Variable Control	0.73	0.76	0.76	0.76
Age Diff.	17.63	17.78	17.78	17.78
Bandwidth	11.64	9.95	9.95	9.95
N	732	637	644	637
Panel B:	Margin: Young vs Senior			
Young won	-0.95**	-0.34	-0.77**	-0.33
	(0.40)	(0.32)	(0.39)	(0.32)
Mean Dep. Variable Control	0.94	0.94	0.91	0.91
Age Diff.	26.62	27.27	27.59	27.59
Bandwidth	7.94	8.96	9.95	9.95
N	150	169	181	177
Panel C:	Margin: Senior vs Not senior			
Senior won	0.07	0.10	0.11	0.11
	(0.14)	(0.15)	(0.15)	(0.16)
Mean Dep. Variable Control	0.79	0.76	0.77	0.77
Age Diff.	16.70	16.73	16.68	16.68
Bandwidth	11.51	10.54	9.95	9.95
N	1782	1637	1606	1567
Mayor Controls	No	Yes	No	Yes

Notes: This table presents the effect of having a young mayor or senior mayor on deforestation. Coefficients are estimated using Equation (1). Columns (1) and (2) use the optimal bandwidth of each regression. Columns (3) and (4) are restricted to the optimal bandwidth of Column 2 in Panel A. Columns (2) and (4) control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. Panel A uses the sample of all municipalities with one young candidate among the top two candidates. Panel B restrict the sample to municipalities with exactly one young and one senior candidate in the two top places. In Panel C, the sample contains all elections in which a senior candidate was between the top two candidates. Age Diff. is the average difference in age between the top two candidates. All regressions include year and age profile fixed-effects, and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table 3: Other outcomes

	% GDP		Agro		GDP emission intensity (kgCO2/R$)				N Fines	% of municipal expenditure			Liabilities
Dependent variable:	Agro	Industry	Area (Ha)	N Bovine	Total	Agro	Transport	Energy	Total	Environment	Education	Agro	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel A:	Margin: Young vs Not young												
Young won	-6.79***	3.90**	-55.03	-31.99	-11.74***	-1.24***	-0.01**	-0.01	-0.75	0.01	2.99**	0.29*	-9.18**
	(2.26)	(1.81)	(230.64)	(37.80)	(2.07)	(0.27)	(0.00)	(0.01)	(3.02)	(0.20)	(1.18)	(0.17)	(4.32)
Mean Dep. Var. Control	27.10	8.86	955.60	142.99	5.10	2.01	0.04	0.08	11.54	0.33	19.50	0.56	12.01
Bandwidth	9.95	9.95	9.95	9.95	9.95	9.95	9.95	9.95	9.95	9.95	9.95	9.95	9.95
N	637	637	637	637	598	598	598	598	637	267	267	267	245
Panel B:	Margin: Senior vs Not senior												
Senior won	-0.11	1.04	689.99***	103.32***	5.68**	0.45**	0.00	0.04**	5.78**	-0.43***	-3.00***	0.26***	5.73**
	(1.40)	(1.28)	(218.18)	(21.62)	(2.51)	(0.19)	(0.00)	(0.02)	(2.37)	(0.11)	(0.80)	(0.09)	(2.51)
Mean Dep. Var. Control	25.53	9.86	780.82	107.83	2.81	1.85	0.04	0.10	10.10	0.38	19.57	0.54	12.15
Bandwidth	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54	10.54
N	1637	1637	1633	1637	1526	1526	1526	1526	1637	716	716	716	651

Notes: Testing of the different mechanisms. Coefficients are estimated by using Equation (1) but changing the variable of interest. The bandwidth used in this Table is the same as Column 2 of Table 2 but can be smaller given that not all variables have observations in all years used in main sample. Columns 1 and 2 present the results in GDP disaggregated by sector share. This share is calculated by dividing the added value of the Agro and Industry sectors respectively by the total nominal GDP of each year. Columns 3 and 4 are computed using data from Municipal Agricultural Research (Pesquisa Agrícola Municipal). Columns 5 to 8 are computed by dividing the CO2 emissions in kg by the GDP of each year. All emissions data are provided by (Sistema de Estimativa de Emissões e Remoções de Gases de Efeito Estufa, Observatório do ClimaSEEG, n.d.). Data are available until 2018. Column 9 uses the number of fines provided by IBAMA. Columns 10 to 12 are computed by dividing the expenditure per budget by the municipality's total budget. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which a senior candidate was between the top two candidates. Column 13 presents results on municipality liabilities. Liabilities amounts are deflated using IPCA. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table 4: Heterogeneous effects

Dependent variable:	Deforestation as % forest 2000						
		Interaction variables (columns)					
		College	**Male**	**Right**	**Married**	**2nd term**	**Farmer**
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A:		Margin: Young vs Not young					
Treat	-0.56***	-0.66***	-1.62***	-0.85***	-0.52**	-0.60***	-0.59***
	(0.20)	(0.25)	(0.56)	(0.31)	(0.23)	(0.21)	(0.20)
Treat X Interaction		0.33	1.18**	0.40	-0.05	0.35	0.21
		(0.26)	(0.53)	(0.27)	(0.21)	(0.25)	(0.35)
Mean dep. var. Control	0.75	0.75	0.75	0.75	0.75	0.75	0.75
Mean interact.	-	0.42	0.88	0.73	0.56	0.10	0.09
N	637	637	637	637	637	637	637
Panel B:		Margin: Senior vs Not senior					
Treat	0.10	0.30*	0.06	-0.38*	-0.33*	0.13	0.07
	(0.15)	(0.17)	(0.21)	(0.22)	(0.18)	(0.15)	(0.15)
Treat X Interaction		-0.53***	0.05	0.67***	0.60***	-0.24	0.24
		(0.16)	(0.20)	(0.20)	(0.15)	(0.16)	(0.18)
Mean dep. var. Control	0.77	0.77	0.77	0.77	0.77	0.77	0.77
Mean interact.	-	0.36	0.87	0.79	0.74	0.23	0.20
N	1637	1637	1637	1637	1637	1637	1637

Notes: Heterogeneous effect of having a young or senior mayor on deforestation. Coefficients are estimated by using Equation (1) but adding an interaction term between the treatment dummy and the variable of interest. The sample of this Table is the same as Column (2) of Table 2. Column (1) presents the results of the main specification with mayor controls. Columns 2 to 7 present the treatment interacted with mayor related variables. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which a senior candidate was between the top two candidates. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table 5: Heterogeneity using Younger as treatment

Dependent variable:	Deforestation as % forest 2000		
	(1)	(2)	(3)
Panel A:	Margin: Young vs Not young		
Treat	-0.56***	-0.88***	
	(0.20)	(0.23)	
Treat X Age Dif		0.02**	
		(0.01)	
Treat X 0-9			-0.67**
			(0.30)
Treat X 10-19			-0.72***
			(0.25)
Treat X 20-29			-0.36*
			(0.21)
Treat X more 30			-0.41
			(0.28)
Mean dep. var.	0.75	0.75	0.75
N. Obs	637	637	637
R^2	0.20	0.21	0.21
Panel B:	Margin: Younger vs Not younger		
Treat	0.03	-0.09	
	(0.10)	(0.10)	
Treat X Age Dif		0.01*	
		(0.01)	
Treat X 0-9			0.04
			(0.10)
Treat X 10-19			-0.05
			(0.12)
Treat X 20-29			0.24
			(0.19)
Treat X more 30			-0.03
			(0.20)
Mean dep. var.	0.67	0.67	0.67
N. Obs	3,766	3,766	3,766
R^2	0.11	0.11	0.11

Notes: Effect of having a younger mayor in the mayor office dissagregated by age intervals. Coefficients of Column 2 are estimated by using Equation (1) but adding an interaction term between the treatment dummy and the variable of interest, while Column (3) is computed by spiting the coefficient. Panel A shows the results using the main specification. Panel B displays results using younger between the two most voted candidates as treatment. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

A Appendix

Table A.1: Additional Summary statistics

Variable	Mean	Std Dev	Min	Max	N
	(1)	(2)	(3)	(4)	(5)
Panel A: Municipality term					
Margin young vs not young	-0.52	5.48	-9.77	9.68	169
Margin young vs senior	-0.69	5.18	-8.79	8.55	44
Margin senior vs not senior	0.06	5.89	-10.51	10.53	437
Panel B: Other variables					
% Environmental expenditure	0.36	0.65	0.00	4.42	367
% Education expenditure	19.87	5.68	0.00	34.04	295
% Health expenditure	10.62	2.53	0.00	16.52	254
% Agro expenditure	0.59	0.63	0.00	3.12	261
GDP (R$ Current prices) per cap.	13365.62	14,888.36	1,440.19	180,941.36	717
Agro as % GDP	26.44	15.48	0.78	72.73	854

Notes: Summary statistics (mean, standard deviation, minimum, maximum, and number of observations) of variables we use. Panel A contains information with variation across the municipality-election term, so there is one observation per municipality for four years. Panel B provides information about variables measured by municipality-year; nonetheless, the sample is restricted due to data availability. Exchange rate: 1R$ $\sim$ 0.2 USD$. The Energy Emissions intensity from Brazil was 0.5 for 1 (kgCO2/R$) in the United States in 2019.

Table A.2: Robustness to treatment definition

Dependent variable:	Deforestation as % forest 2000						
	p25		p20		p15		LEI No 11.692
	By-election	All sample	By-election	All sample	By-election	All sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A:	Margin: Young vs Not young						
Young won	-0.37**	-0.07	-0.54***	-0.36**	-0.83***	-0.65**	-0.02
	(0.16)	(0.21)	(0.19)	(0.18)	(0.28)	(0.26)	(0.49)
Mean Dep. Variable Control	0.75	0.93	0.76	0.80	0.91	0.86	0.99
Bandwidth	9.95	9.95	9.95	9.95	9.95	9.95	9.95
N	899	979	637	729	425	481	166
Panel B:	Margin: Young vs Not young						
Young won	-0.25*	-0.10	-0.52***	-0.28	-0.60**	-0.35	-0.30
	(0.14)	(0.16)	(0.19)	(0.18)	(0.28)	(0.23)	(0.47)
Mean Dep. Variable Control	0.72	0.85	0.76	0.75	0.81	0.77	0.62
Optimal bandwidth	17.59	12.94	10.20	12.14	13.78	16.86	9.36
N	1400	1233	668	867	525	690	154
Panel C:	Margin: Senior vs Not senior						
Senior won	-0.03	-0.02	0.10	-0.14	0.14	0.07	0.48*
	(0.14)	(0.13)	(0.15)	(0.14)	(0.15)	(0.15)	(0.27)
Mean Dep. Variable Control	0.75	0.66	0.76	0.67	0.66	0.58	0.54
Bandwidth	10.54	10.54	10.54	10.54	10.54	10.54	10.54
N	1803	1671	1637	1453	1310	1130	355
Panel D:	Margin: Senior vs Not senior						
Senior won	-0.06	-0.08	0.10	-0.30*	0.36**	-0.16	0.65**
	(0.13)	(0.14)	(0.15)	(0.16)	(0.18)	(0.18)	(0.28)
Mean Dep. Variable Control	0.77	0.67	0.76	0.70	0.70	0.54	0.61
Optimal bandwidth	12.70	9.07	10.54	7.91	7.19	7.06	8.98
N	2066	1464	1637	1129	919	784	297

Notes: This table presents the results when we vary the definition of young and senior to other percentiles. Coefficients are estimated by using Equation (1). Columns 1 to 6 use different thresholds for defining Young based on percentiles. Column 7 uses the definition of young displayed in LEI No 11.692 "Programa Nacional de Inclusão de Jovens" where young is all people up to 29 years and we set old as the retirement age –65 years old–. Odd columns compute percentiles using the percentile by electoral term in the same form as main specification, while even columns compute the percentile using the whole sample of candidates. Panels A and B take as sample all municipalities with at least one young candidate among the two first candidates. In Panels C and D, the sample contains all elections in which almost a senior candidate was between the two first candidates. Panels A and C use bandwidth restricted to optimal bandwidth of the main regression. Panels B and D use the optimal bandwidth for each regression. All regressions have year and age profile fixed-effects and control by population, gender, second-term, right-wing, and married. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table A.3: Robustness to the order of the polynomial

Dependent variable:	Deforestation as % forest 2000							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:	Margin: Young vs Not young							
Young won	-0.75***	-0.78***	-1.05***	-1.01***	-0.88***	-0.85***	-1.34***	-1.21***
	(0.23)	(0.22)	(0.28)	(0.26)	(0.26)	(0.26)	(0.45)	(0.40)
Mean Dep. Variable Control	0.69	0.69	0.76	0.76	0.71	0.71	0.76	0.76
Major Controls	No	Yes	No	Yes	No	Yes	No	Yes
Poly Order	2	2	2	2	3	3	3	3
Bandwidth	14.86	13.69	9.95	9.95	19.84	18.91	9.95	9.95
N	881	819	644	637	1070	1018	644	637
Panel B:	Margin: Senior vs Not senior							
Senior won	0.24	0.27	0.39*	0.44*	0.37	0.41	0.67*	0.75*
	(0.19)	(0.20)	(0.22)	(0.23)	(0.23)	(0.25)	(0.31)	(0.32)
Mean Dep. Variable Control	0.79	0.78	0.76	0.76	0.77	0.78	0.76	0.76
Major Controls	No	Yes	No	Yes	No	Yes	No	Yes
Poly Order	2	2	2	2	3	3	3	3
Bandwidth	14.99	13.97	10.54	10.54	17.76	17.17	10.54	10.54
N	2172	2028	1679	1637	2376	2280	1679	1637

Notes: This table presents results using a second-order polynomial. Columns 1 and 2 are computed considering the optimal bandwidth using the second-order polynomial. Columns 3 and 4 are restricted to the optimal bandwidth of the main specification of Table 2 (Column 2). Columns 2 and 4 control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which almost a senior candidate was between the two first candidates. All regressions include year and age profile fixed-effects and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table A.4: Robustness to the error estimation

Dependent variable:	Deforestation as % forest 2000			
	(1)	(2)	(3)	(4)
Panel A:	Margin: Young vs Not young			
Young won	-0.47**	-0.56***	-0.53***	-0.56***
HC0	(0.20)	(0.19)	(0.20)	(0.19)
HC1	(0.20)	(0.19)	(0.20)	(0.19)
HC2	(0.20)	(0.19)	(0.20)	(0.19)
HC3	(0.20)	(0.19)	(0.20)	(0.19)
Mean Dep. Variable Control	0.74	0.76	0.76	0.76
Major Controls	No	Yes	No	Yes
Bandwidth hc0	11.61	9.93	9.95	9.95
Bandwidth hc1	11.64	9.95	9.95	9.95
Bandwidth hc2	11.66	9.96	9.95	9.95
Bandwidth hc3	11.71	9.99	9.95	9.95
N	724	637	644	637
Panel B:	Margin: Senior vs Not senior			
Senior won	0.07	0.09	0.09	0.10
HC0	(0.14)	(0.15)	(0.15)	(0.15)
HC1	(0.14)	(0.15)	(0.15)	(0.15)
HC2	(0.14)	(0.15)	(0.15)	(0.15)
HC3	(0.14)	(0.15)	(0.15)	(0.15)
Mean Dep. Variable Control	0.79	0.76	0.76	0.76
Major Controls	No	Yes	No	Yes
Bandwidth hc0	11.49	10.52	10.54	10.54
Bandwidth hc1	11.51	10.54	10.54	10.54
Bandwidth hc2	11.53	10.56	10.54	10.54
Bandwidth hc3	11.58	10.61	10.54	10.54
N	1782	1634	1679	1637

Notes: This table presents the estimation result varying the kind of error correction used. Optimal bandwidths differ slightly from the main regressions due to different biases and weighting. Columns 1 and 2 are computed considering the optimal bandwidth for each regression. Columns 3 and 4 are restricted to the optimal bandwidth of column 2 in Table 2. Columns 2 and 4 control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which almost a senior candidate was between the two first candidates. All regressions have year age profile fixed-effects and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table A.5: Kernel robustness

Dependent variable:	Deforestation as % forest 2000							
Kernel:	Epanechnikov				Uniform			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A:	Margin: Young vs Not young							
Young won	-0.28	-0.48**	-0.47**	-0.50**	-0.50**	-0.20	-0.30	-0.37
	(0.17)	(0.20)	(0.21)	(0.20)	(0.22)	(0.17)	(0.23)	(0.23)
Mean Dep. Variable Control	0.68	0.74	0.76	0.76	0.67	0.68	0.76	0.76
Major Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bandwidth	17.46	10.84	9.95	9.95	8.96	15.50	9.95	9.95
N	978	698	644	637	585	900	644	637
Panel B:	Margin: Senior vs Not senior							
Senior won	0.06	0.08	0.05	0.05	0.03	-0.00	-0.00	-0.01
	(0.15)	(0.15)	(0.14)	(0.15)	(0.13)	(0.15)	(0.13)	(0.13)
Mean Dep. Variable Control	0.77	0.79	0.76	0.76	0.76	0.78	0.76	0.76
Major Controls	No	Yes	No	Yes	No	Yes	No	Yes
Bandwidth	10.29	9.41	10.54	10.54	10.40	8.93	10.54	10.54
N	1640	1494	1679	1637	1665	1422	1679	1637

Notes: This table presents results of Table 2 using different kernels. Columns 1 to 4 use Epanechnikov kernel, while Columns 5 to 8 use a Uniform kernel. Columns 1 and 2, and 5-6 are computed considering the optimal bandwidth using their respective kernels. Columns 3 and 4, and 7-8 are restricted to the optimal bandwidth of the main specification of Table 2 (Column 2). Even columns control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which almost a senior candidate was between the two first candidates. All regressions include year and age profile fixed-effects and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table A.6: Placebo results

Dependent variable:	Deforestation as % forest 2000			
	(1)	(2)	(3)	(4)
Panel A:	Margin: Young vs Not young			
Young won future election	-0.32	-0.40	-0.24	-0.37
	(0.31)	(0.35)	(0.52)	(0.51)
Mean Dep. Variable Control	1.21	1.19	1.36	1.36
Major Controls	No	Yes	No	Yes
Bandwidth	22.03	18.32	9.95	9.95
N	1059	945	605	598
Panel B: Margin	Margin: Senior vs Not senior			
Senior won future election	0.10	0.21	0.20	0.30
	(0.48)	(0.51)	(0.53)	(0.55)
Mean Dep. Variable Control	1.28	1.28	1.31	1.30
Major Controls	No	Yes	No	Yes
Bandwidth	12.93	12.20	10.54	10.54
N	1804	1683	1552	1514

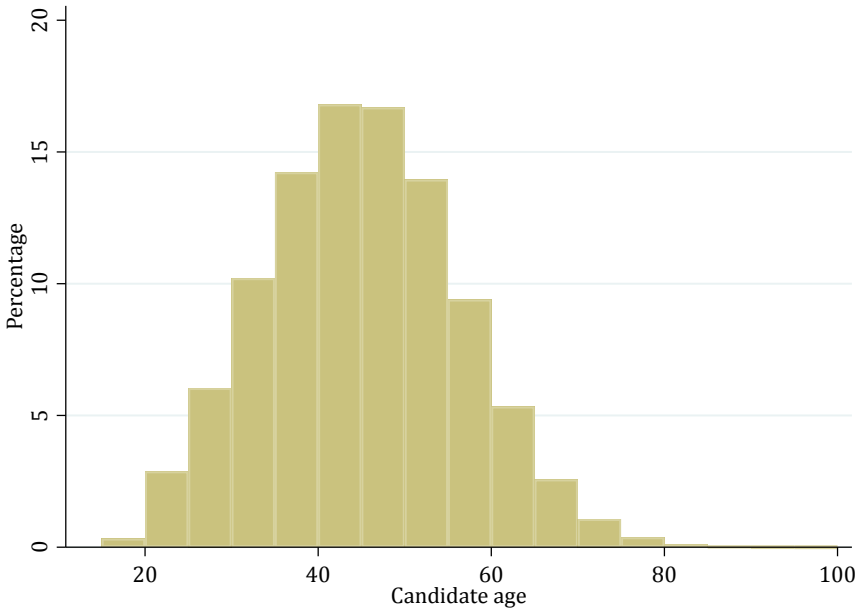
Notes: This table presents the placebo analysis. Coefficients are estimated using Equation Equation 1, but dependent variable is deforestation of the same municipality four years ago. Columns 1 and 2 are computed considering the optimal bandwidth. Columns 3 and 4 are restricted to the optimal bandwidth of the main regression (Column 2 of Table 2). Columns 2 and 4 control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which almost a senior candidate was between the two first candidates. All regressions have year and age profile fixed-effects, and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table A.7: Results using Younger as treatment

Dependent variable:	Deforestation as % forest 2000			
	(1)	(2)	(3)	(4)
Panel A:	Margin: Younger vs Not younger			
Younger won	0.02	0.03	0.03	0.04
	(0.09)	(0.09)	(0.09)	(0.09)
Mean Dep. Variable Control	0.67	0.67	0.67	0.67
Age Diff.	11.21	11.17	11.08	11.08
Bandwidth	9.72	9.66	9.95	9.95
N	3851	3766	3952	3882

Notes: This table presents the effect of having a younger mayor on deforestation. Younger is a dummy that takes the value of one when, comparing two most voted candidates, the younger won. Coefficients are estimated using Equation (1). Columns (1) and (2) use the optimal bandwidth of each regression. Columns (3) and (4) are restricted to the optimal bandwidth of column 2 in Panel A. Columns (2) and (4) control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. All regressions include year and age profile fixed-effects and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Figure A.1: Candidates' age distribution



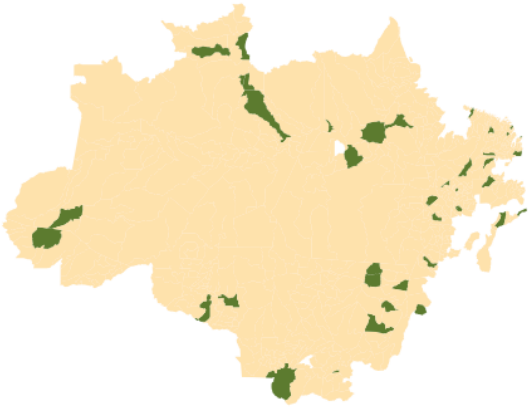
Notes: This histogram presents the age distribution of all candidates in ordinary municipal elections in Brazil during the elections included in the study period: 2004 to 2016.

Figure A.2: Municipalities sample by election year

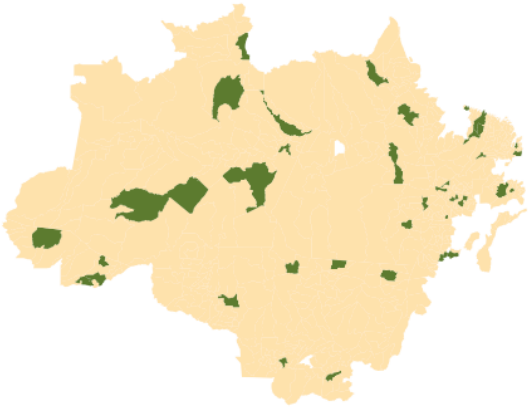
(a) Sample in 2004 elections

(b) Sample in 2008 elections

(c) Sample in 2012 elections

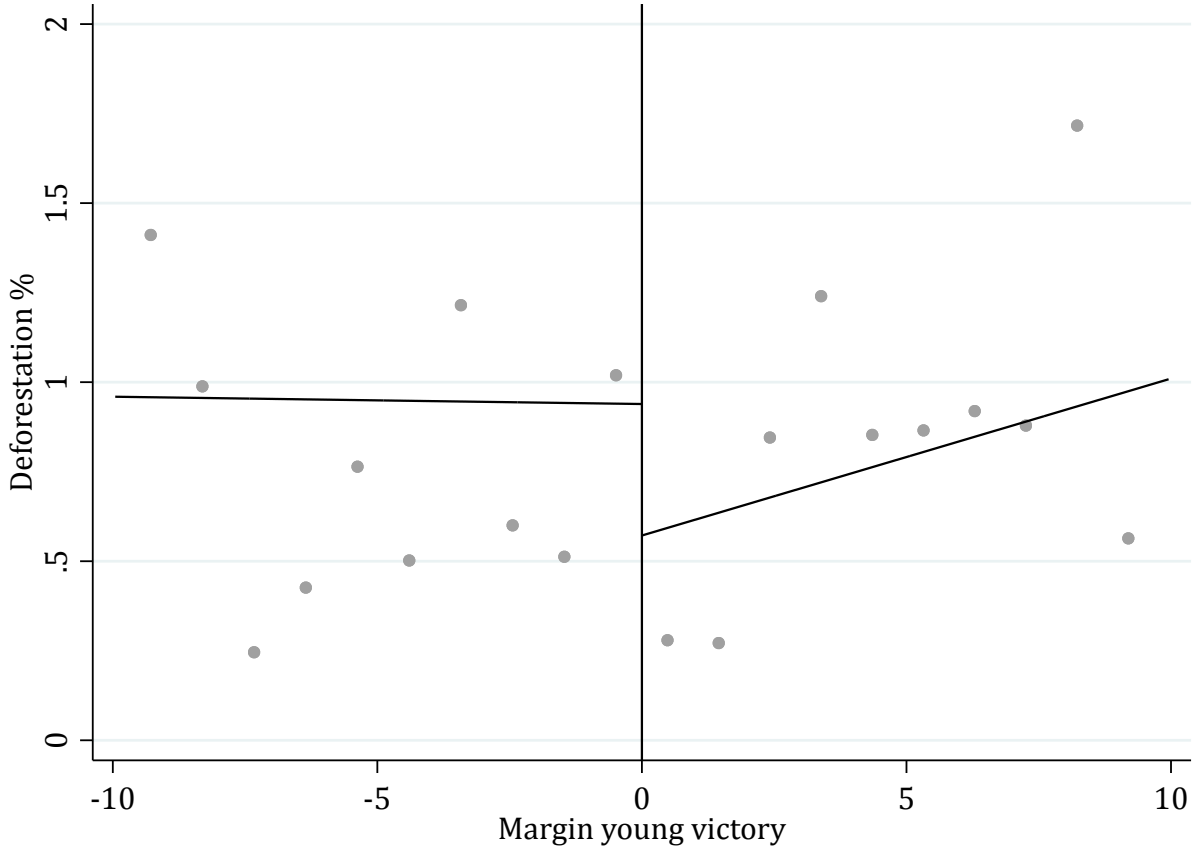


(d) Sample in 2016 elections



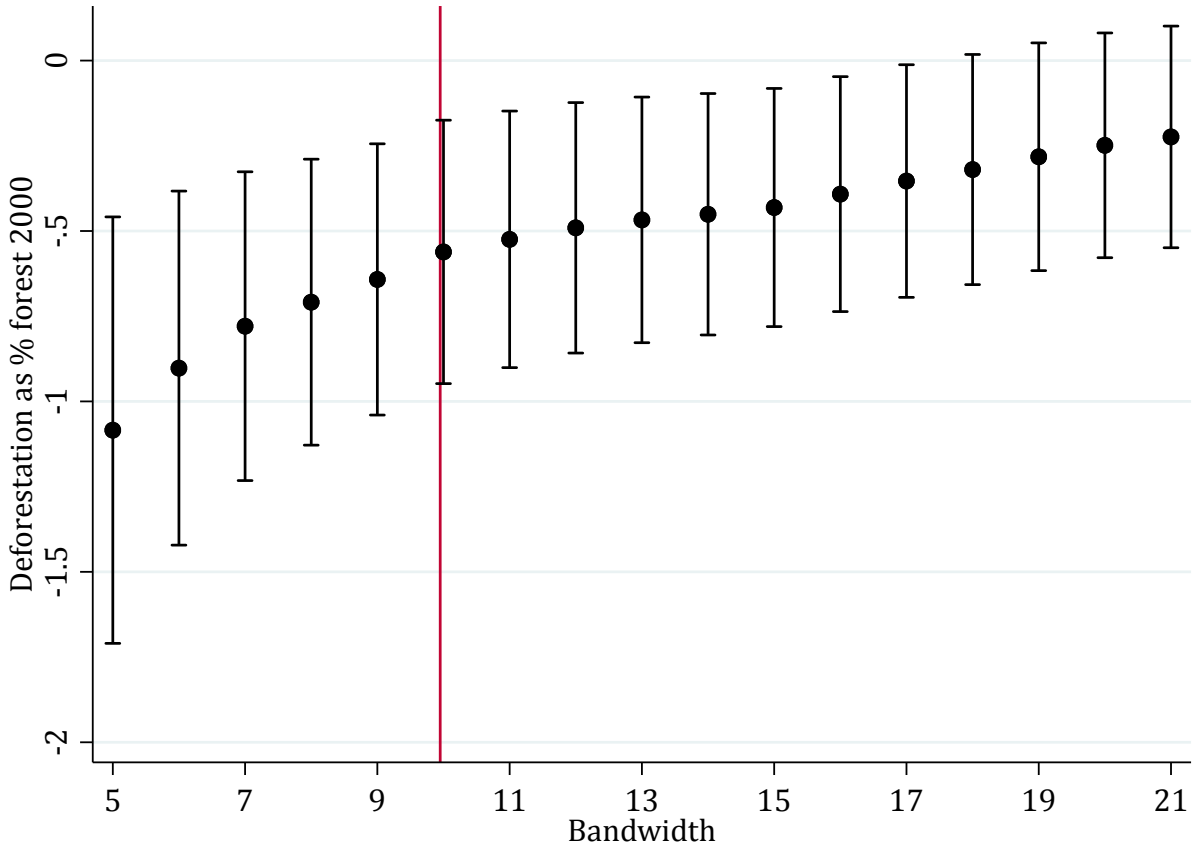
Notes: This figure presents the geographical distribution of municipalities belonging to the regression discontinuity sample of the main regression.

Figure A.3: Visual Regression Discontinuity Design



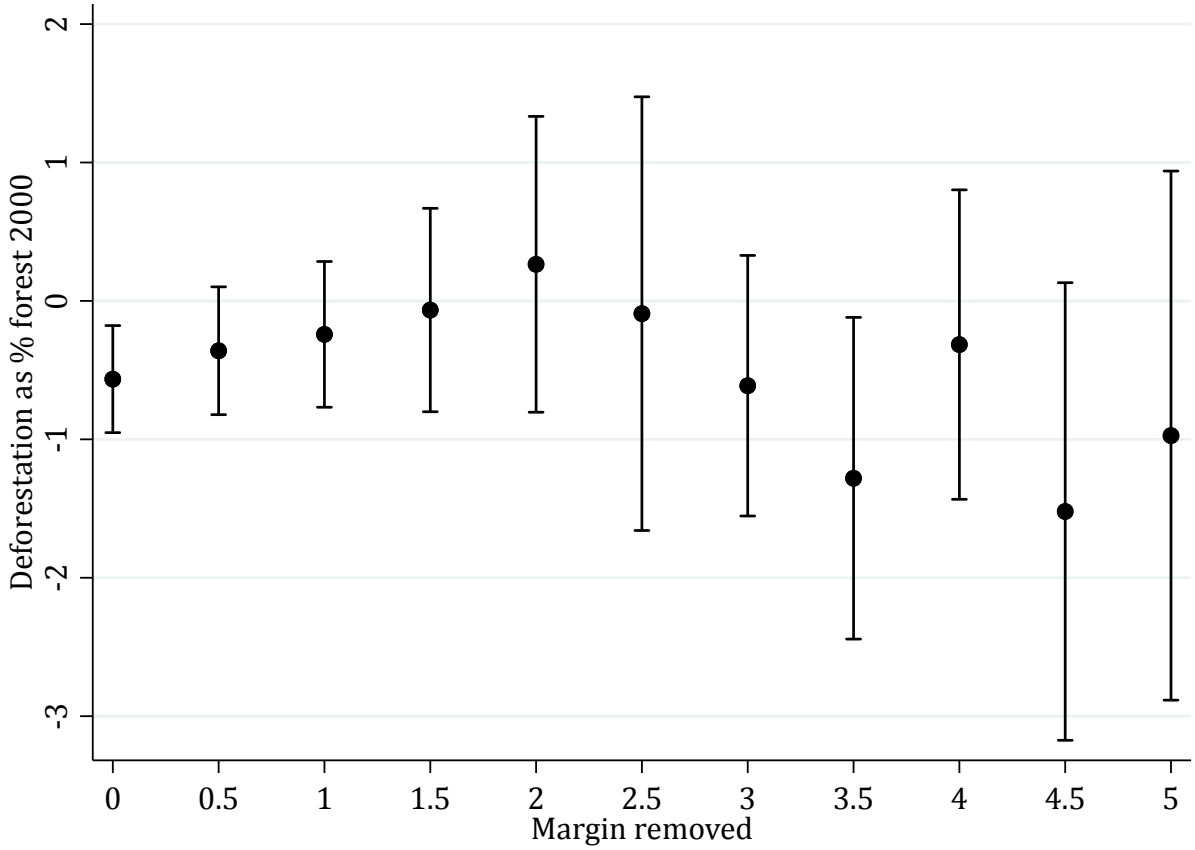
Notes: Regression Discontinuity plot of the main specification (Column 2 of Panel A in Table 2). Observations are grouped in 10 bins at each side of the winning cutoff. The regression controls for population, gender, left/right leaning of the mayor's party, second-term, married status, college attendance, and it also includes year and age profile fixed effects.

Figure A.4: Sensitivity analysis to bandwidth



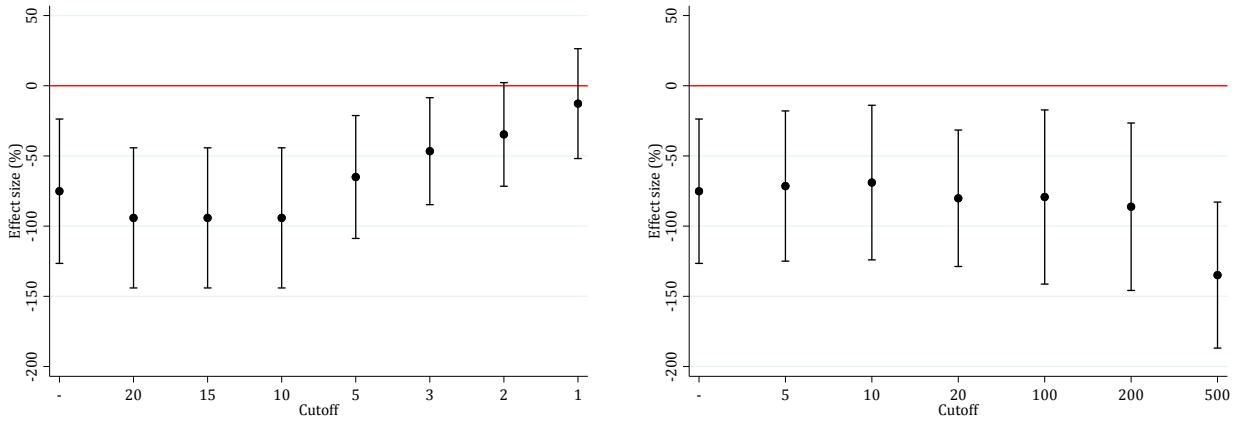
Notes: Sensitivity analysis of the main specification (Column 2 of Panel A in Table 2) varying the bandwidth between half and twice the optimal bandwidth. The red line represents the optimal bandwidth. Regressions were estimated using Equation Equation 1. They have year and age profile fixed-effects, and control by population, gender, left or right-wing of the mayor's party, second-term, married status and college attendance. 95% confidence intervals are shown.

Figure A.5: Sensitivity analysis observations close to the cutoff



Notes: Sensitivity analysis of the main regression (column 2 of Panel A in Table 2) dropping observations close to the margin of victory cutoff, leaving a "doughnuts hole". All regressions are estimated using Equation Equation 1. They have year fixed-effects and control by population, gender, left or right-wing of the mayor's party, second-term, and married status. 95% confidence intervals are shown.

Figure A.6: Sensitivity analysis to outliers

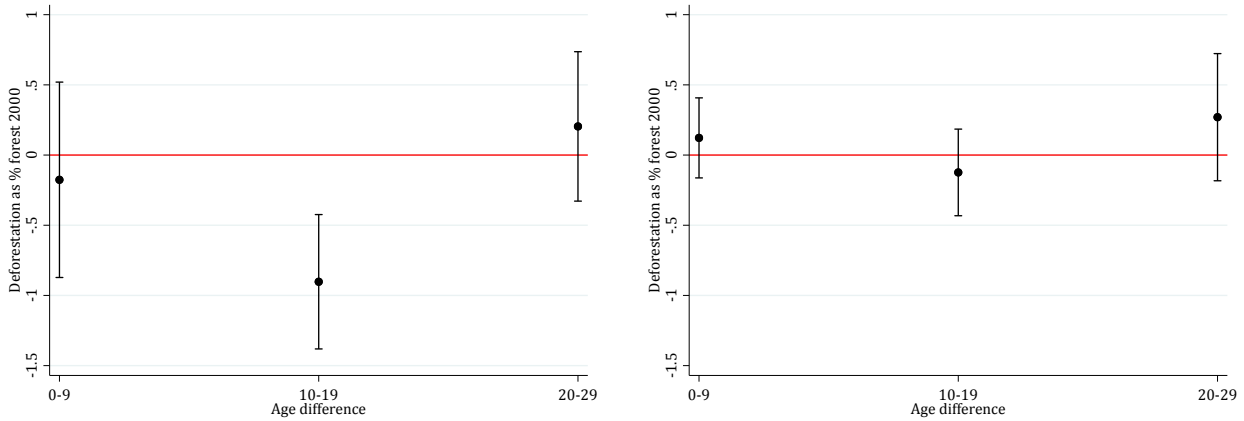


(a) Excluding deforestation outliers

(b) Excluding forest area outliers

Notes: Results for the main regression (Column 2 of Panel A in Table 2) excluding outliers. Deforestation outliers (Figure A.6a) are those with a deforestation rate above the cutoff indicated. For forest area outliers (Figure A.6b) are municipalities with forest area below the cutoff indicated.

Figure A.7: Treatment effect by age diff.



(a) Young (Panel A)

(b) YoungerWon (Panel A)

Notes: This figure shows the coefficient of the treatment when the main sample is reduced to the intervals displayed in x-axis. Figure A.7a shows results for main specification and Figure A.7b when we use younger as treatment as in Table A.7.

B Online Appendix

Table B.1: Observations by year

Year:	Young vs Not young	Young vs Senior	Senior vs Not senior
	(1)	(2)	(3)
2005	39	10	123
2006	39	10	123
2007	39	10	123
2008	39	10	123
2009	50	14	98
2010	50	14	98
2011	50	14	98
2012	50	14	98
2013	41	13	105
2014	41	13	105
2015	41	13	105
2016	41	13	105
2017	39	7	111
2018	39	7	111
2019	39	7	111
Total	637	169	1637

Notes: Number of municipalities by year used in Column 2 of Table 2. Column 1 corresponds to Panel A sample, columns 2 and 3 refers to Panel B and C respectively.

Table B.2: Results without second term

Dependent variable:	Deforestation as % forest 2000			
	(1)	(2)	(3)	(4)
Panel A:	Margin: Young vs Not young			
Young won	-0.56**	-0.67***	-0.59***	-0.67***
	(0.22)	(0.21)	(0.23)	(0.21)
Mean Dep. Variable Control	0.66	0.66	0.66	0.66
Age Diff.	17.62	17.71	17.71	17.71
Bandwidth	11.29	9.95	9.95	9.95
N	636	557	564	557
Panel B:	Margin: Senior vs Not senior			
Senior won	0.11	0.17	0.15	0.19
	(0.16)	(0.17)	(0.17)	(0.18)
Mean Dep. Variable Control	0.77	0.77	0.79	0.79
Age Diff.	17.16	17.07	17.08	17.08
Bandwidth	11.04	10.40	9.95	9.95
N	1348	1251	1250	1211

Notes: This table presents the effect of having a young or senior mayor on deforestation excluding of the sample the second-term mandates. Coefficients are estimated by using Equation (1). Columns 1 and 2 use the optimal bandwidth of each regression. Columns 3 and 4 are restricted to the optimal bandwidth of Column 2 in Panel A of Table 2. Columns 2 and 4 control by gender, left or right-wing of the mayor's party, second-term, married status and college attendance. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which almost a senior candidate was between the two first candidates. All regressions include year and age profile fixed-effects, and control by population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table B.3: Results on other municipality outcomes

	as PIB per capita			% of muni. expenditure		Liabilities	
Dependent variable:	Total	Agro	Industry	Health	Capital	Short-term	Long-term
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A:	Margin: Young vs Not young						
Young won	1304.47	-2133.90	2554.33**	-0.75	1.02	-0.94	-8.24*
	(3015.40)	(1455.85)	(1009.97)	(0.54)	(1.20)	(0.83)	(4.22)
Mean Dep. Var. Control	14,157.56	4,262.70	1,334.60	10.70	8.44	4.34	7.67
Bandwidth	9.95	9.95	9.95	9.95	9.95	9.95	9.95
N	637	637	637	267	267	245	245
Panel B:	Margin: Senior vs Not senior						
Senior won	6330.47***	1538.25**	1640.76	0.88**	0.23	-0.11	5.85**
	(2271.75)	(682.41)	(1513.22)	(0.40)	(0.71)	(0.63)	(2.41)
Mean Dep. Var. Control	13,412.59	3,339.27	2,292.55	11.23	7.94	4.25	7.90
Bandwidth	10.54	10.54	10.54	10.54	10.54	10.54	10.54
N	1637	1637	1637	716	716	651	651

Notes: Testing of the results on different outcomes. Coefficients are estimated by using Equation (1) but changing the variable of interest. The bandwidth used in this Table is the same as Column 2 of Table 2 but can be smaller given that not all variables have observations in all years used in main sample. Columns 1 to 3 present the results in GDP disaggregated by sector measured in per capita terms. This share is calculated by dividing the nominal GDP or the value added by each sector by the population in 2004. Columns 4 and 5 are computed by dividing the expenditure per budget by the municipality's total budget. Columns 6 and 7 show results disaggreating by the type of liability. Liabilities amounts are deflated using IPCA. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which a senior candidate was between the top two candidates. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table B.4: Effect on fines

Dependent variable:	**Fines for crime in**			**Fines divided by previous defo**			
	Non flora	Flora	Deforestation	Total	Non flora	Flora	Deforestation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Margin	**Young vs not young**						
Young won	-1.11*	0.00	-1.14	-6.01***	-1.58*	-4.43**	-1.85
	(0.60)	(2.73)	(1.82)	(2.07)	(0.82)	(1.84)	(1.54)
Mean Dep. Variable Control	2.71	8.83	4.97	3.23	1.18	2.04	1.79
Bandwidth	9.95	9.95	9.95	9.95	9.95	9.95	9.95
N	637	637	637	532	532	532	532
Margin	**Senior vs Not senior**						
Senior won	1.82***	3.96**	1.01	1.54	0.02	1.53*	0.24
	(0.67)	(1.99)	(1.01)	(1.32)	(0.71)	(0.91)	(0.55)
Mean Dep. Variable Control	3.21	6.88	3.62	4.17	1.95	2.22	1.40
Bandwidth	10.54	10.54	10.54	10.54	10.54	10.54	10.54
N	1637	1637	1637	1360	1360	1360	1360

Notes: This table displays the effect of having a young or senior mayor on fines restricted to the main specification. These data are provided by IBAMA. Columns 1 to 2 present the number of fines disaggregated by crimes against flora and the rest. Column (3) shows results for fines imposed by deforestation crimes. Columns 4 to 7 present results by dividing the number of fines by deforestation in the previous year measured in hectares. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table B.5: Effect on fines using optimal bandwidth

Dependent variable:	**Fines for crime in**			**Fines divided by previous defo**			
	Non flora	Flora	Deforestation	Total	Non flora	Flora	Deforestation
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Margin	**Young vs not young**						
Young won	-0.98*	-0.60	-0.99	-3.47*	-1.88**	-3.57**	-2.03
	(0.53)	(1.93)	(1.36)	(1.79)	(0.84)	(1.76)	(1.29)
Mean Dep. Variable Control	2.41	7.75	4.13	2.62	1.20	1.73	1.47
Optimal band	13.30	17.15	15.77	18.51	9.04	13.29	15.53
N	808	967	907	863	496	687	756
Margin	**Senior vs Not senior**						
Senior won	1.90***	4.25**	1.19	1.63	-0.13	1.49	-0.03
	(0.64)	(1.84)	(0.96)	(1.31)	(0.72)	(0.91)	(0.59)
Mean Dep. Variable Control	3.30	7.28	4.02	4.22	1.89	2.20	1.54
Optimal band	13.29	13.24	8.33	10.37	11.12	10.76	8.08
N	1957	1954	1344	1341	1416	1396	1091

Notes: This table displays the effect of having a young or senior mayor on fines computing the optimal bandwidth for each regression. These data are provided by IBAMA. Columns 1 to 2 present the number of fines disaggregated by crimes against flora and the rest. Column (3) shows results for fines imposed by deforestation crimes. Columns 4 to 7 present results by dividing the number of fines by deforestation in the previous year measured in hectares. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table B.6: Effect on agricultural variables

Dependent variable:	Agriculture		Livestock
	Production Value (R$)	Productivity (R$ per Ha.)	N Bovine (Census)
	(1)	(2)	(3)
Panel A:	Margin: Young vs Not young		
Young won	-2992.21	-0.82	-12.76
	(2199.95)	(0.74)	(32.70)
Mean Dep. Variable Control	5962.35	7.25	69.26
Bandwidth	9.95	9.95	9.95
N	637	596	78
Panel B:	Margin: Senior vs Not senior		
Senior won	-1617.52	0.22	12.30
	(2607.07)	(0.57)	(19.32)
Mean Dep. Variable Control	6134.98	6.91	42.39
Bandwidth	10.54	10.54	10.54
N	1633	1505	234

Notes: This table shows the effect of having a young or senior mayor on Agro variables using the sample restricted to main specification. Coefficients are estimated using Equation (1) but changing the dependent variable. Column (1) is computed using data from Municipal Agricultural Research (Pesquisa Agrícola Municipal). Column (2) is computed by dividing Column (3) of Table 3 by Column (1) of this table. Column (3) uses Agricultural Census (Censo Agropecuário). Census data is provided every ten years, so we only can use 2006 and 2017 data. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which almost a senior candidate was between the two first candidates. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance, and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table B.7: Results on other outcomes using their optimal bandwidth

	% GDP		Agro		GDP emission intensity (kgCO2/R$)				N Fines	% of municipal expenditure			Liabilities
Dependent variable:	Agro	Industry	Area (Ha)	N Bovine	Total	Agro	Transport	Energy	Total	Environment	Education	Agro	Total
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Panel A:	Margin: Young vs Not young												
Young won	-5.35***	3.69**	-155.86	-42.47	-12.60***	-1.12***	-0.01*	-0.02	-1.42	-0.13	2.97***	0.32*	-5.77*
	(1.90)	(1.70)	(230.97)	(26.10)	(2.34)	(0.26)	(0.01)	(0.01)	(2.15)	(0.16)	(1.15)	(0.17)	(3.12)
Mean Dep. Var. Control	27.30	9.56	939.76	131.10	5.99	1.98	0.04	0.08	10.03	0.33	19.57	0.54	11.30
Optimal band	14.31	12.40	11.86	17.12	8.69	11.24	8.03	9.59	17.76	13.32	10.49	9.40	17.10
N	854	766	736	964	534	674	490	578	986	367	295	261	406
Panel B:	Margin: Senior vs Not senior												
Senior won	-0.11	0.44	685.58***	122.25***	6.67***	0.71***	0.01**	0.06**	5.90***	-0.38***	-3.25***	0.24***	6.31**
	(1.38)	(1.19)	(217.55)	(22.99)	(2.58)	(0.21)	(0.00)	(0.02)	(2.29)	(0.09)	(0.82)	(0.09)	(2.68)
Mean Dep. Var. Control	25.52	9.39	783.49	109.15	1.92	1.55	0.04	0.09	10.01	0.34	19.60	0.53	12.30
Optimal band	10.79	12.89	10.48	8.54	9.84	6.99	6.85	8.25	11.95	14.68	9.80	11.38	9.02
N	1683	1901	1627	1370	1450	1050	1022	1246	1793	895	682	759	565

Notes: Testing of the different mechanisms. Coefficients are estimated by using Equation (1) but changing the variable of interest. The bandwidth used in this Table is the optimal one for each regression. Columns 1 and 2 present the results in GDP disaggregated by sector share. This share is calculated by dividing the added value of the Agro and Industry sectors respectively by the total nominal GDP of each year. Columns 3 and 4 are computed using data from Municipal Agricultural Research (Pesquisa Agrícola Municipal). Columns 5 to 8 are computed by dividing the CO2 emissions in kg by the GDP of each year. All emissions data are provided by (Sistema de Estimativa de Emissões e Remoções de Gases de Efeito Estufa, Observatório do ClimaSEEG, n.d.). Data are available until 2018. Column 9 uses the number of fines provided by IBAMA. Columns 10 to 12 are computed by dividing the expenditure per budget by the municipality's total budget. Panel A takes as sample all municipalities with at least one young candidate among the two first candidates. In Panel B, the sample contains all elections in which a senior candidate was between the top two candidates. Column 13 presents results on municipality liabilities. Liabilities amounts are deflated using IPCA. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.

Table B.8: Effect by occupation

Dependent variable: Deforestation as % forest 2000		
	(1)	(2)
Panel A: Margin: Young vs Not young		
Treat	-0.56***	
	(0.20)	
Treat X Pro-Agriculture		-0.38
		(0.34)
Treat X Politician		-0.57***
		(0.20)
Treat X Bureaucrat		-0.57**
		(0.27)
Treat X Education		-0.90***
		(0.26)
Treat X Health		-0.77***
		(0.26)
Treat X Business		-0.56
		(0.53)
Treat X Others		-0.51**
		(0.22)
Mean dep. var. Control	0.75	0.75
Panel B: Margin: Senior vs Not senior		
Treat	0.10	
	(0.15)	
Treat X Pro-Agriculture		0.31
		(0.21)
Treat X Politician		0.07
		(0.18)
Treat X Bureaucrat		-0.44***
		(0.17)
Treat X Education		-0.38*
		(0.21)
Treat X Health		-0.05
		(0.23)
Treat X Business		0.38*
		(0.20)
Treat X Others		-0.10
		(0.18)
Mean dep. var. Control	0.77	0.77

Notes: Heterogeneous effect of having a young or senior mayor on deforestation using self-reported occupation. Coefficients are estimated by using Equation (1) but adding an interaction term between the treatment dummy and the variable of interest. All regressions have year and age profile fixed-effects, and control by mayor gender, left or right-wing of the mayor's party, second-term, married status, college attendance, and population. Significance level: *$p < 0.10$, ** $p < 0.05$, ***$p < 0.01$.