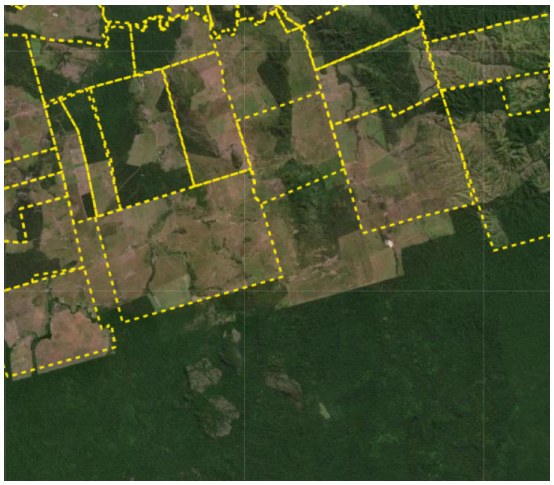
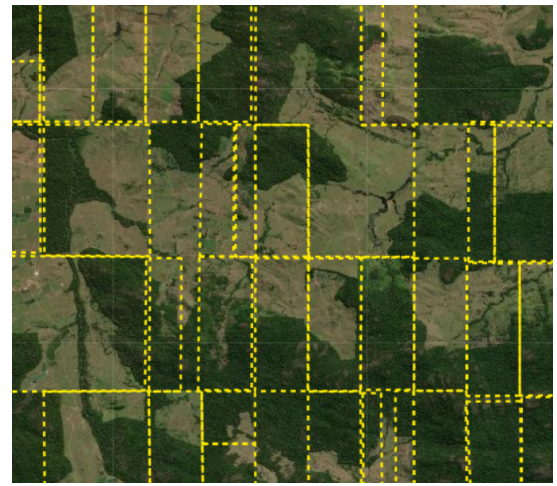
# Agricultural Elites, Special Interest Politics, and Deforestation: Property-Level Evidence from the Amazon

Erik Katovich and Fanny Moffette

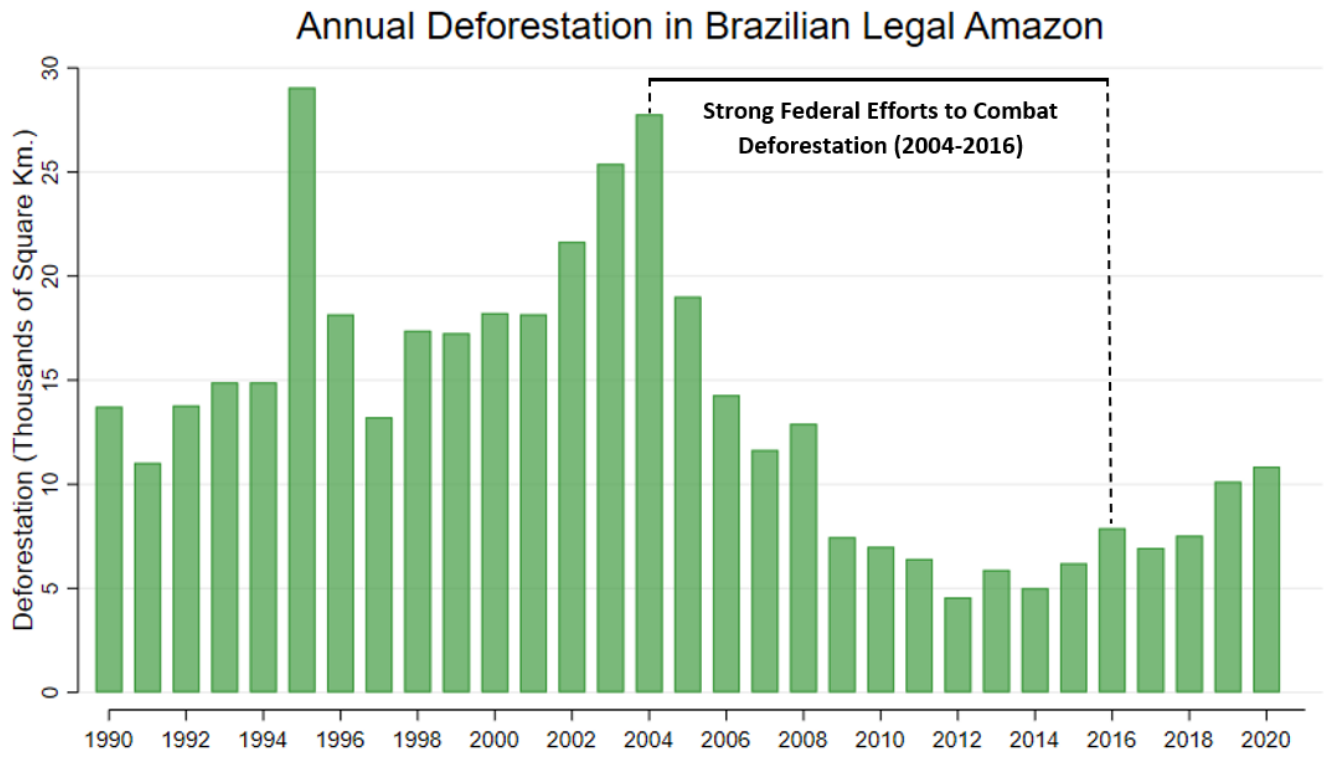
UW-Madison

January 28th, 2022





# Tropical Deforestation Accounts for 20% of Global Greenhouse Gas Emissions, and 70% of Brazil's Emissions (Asner, 2010)




Source: PRODES (2021)

OCTOBER 1, 2021

**In Brazilian Amazon, savannization and climate change will expose 12 million to lethal heat stress**

by Fiocruz Piauí

Article | Open Access | Published: 10 May 2021

**Deforestation reduces rainfall and agricultural revenues in the Brazilian Amazon**

Argemiro Teixeira Leite-Filho, Britaldo Silveira Soares-Filho, Juliana Leroy Davis, Gabriel Medeiros Abrahão & Jan Börner

# Deforestation and Local Politics are Connected in Brazilian Amazon

- Deforestation is driven by **economic incentives**, including **commercial cattle and soy production**
- Economic interest groups may influence local politics through **campaign donations** or **candidate selection**
- Environmental governance mostly set at federal and state levels, but municipal leaders can influence deforestation for electoral motives:
  - **Dahis & Bragança (2021):** Deforestation and agricultural promotion ↑ when self-declared farmer mayors elected during weak enforcement period (2000); no effects in 2004-2012
  - **Pailler (2018):** Deforestation ↑ in election years; self-financed campaign contributions linked to more deforestation
  - **Abman (2014):** Eligibility for reelection reduces deforestation after introduction of municipal blacklist policy

# Research Questions and Preview of Results

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4. **Municipality-Level:** Does election of landholding or landholder financed mayor increase deforestation or change municipal policy?

   Election of landholder-financed mayor associated with increased deforestation, land conversion to ag., and GHG emissions from ag.; municipal spending on agriculture $\uparrow$ and spending on environmental protection $\downarrow$; effects driven by competitive elections

# What Do We Contribute?

- Existing studies:
  - Limited to municipality-level outcomes
  - Rely on self-reported occupation of candidates to identify farmers
  - Don't observe donors' landholdings or occupations, so can't measure behavior on donor properties or effects of landowner donations

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- We contribute to literatures on:
  - Decentralization and environmental federalism
  - Special interest groups and campaign finance
  - Elite capture
  - Political economy of tropical deforestation

# Data I: Building a Property-Level Land Use Database (GLUE Lab)

**Identified land registries:**

- *Cadastro Ambiental Rural* (MT/PA/RO)
- Terra Legal (Legal Amazon)
- SIGEF (subset of SNCR) (Brazil)

**Annual satellite data on land use and tree cover (2000-2020):**

- MapBiomas
- PRODES

CAR property boundaries in Mato Grosso, Pará, and Rondônia

# Data II: Connecting Property Panel with Candidate/Donor Panels

**Candidates:** TSE (2000, 2004, 2008, 2012, 2016): names/IDs, demographic information, declared occupation and property, political affiliations, and vote total for all mayoral and council candidates

**Donations:** TSE (2004, 2008, 2012, 2016): names/IDs, donation value, donation type, and recipient candidate for all donations

**Municipality-Level Outcome Panels**: deforestation, land conversion to agriculture, greenhouse gas emissions (SEEG)

**Municipality-Level Mechanism Panels**: public finances (FINBRA), *Convênios* between federal ministries and municipal governments (PGU)

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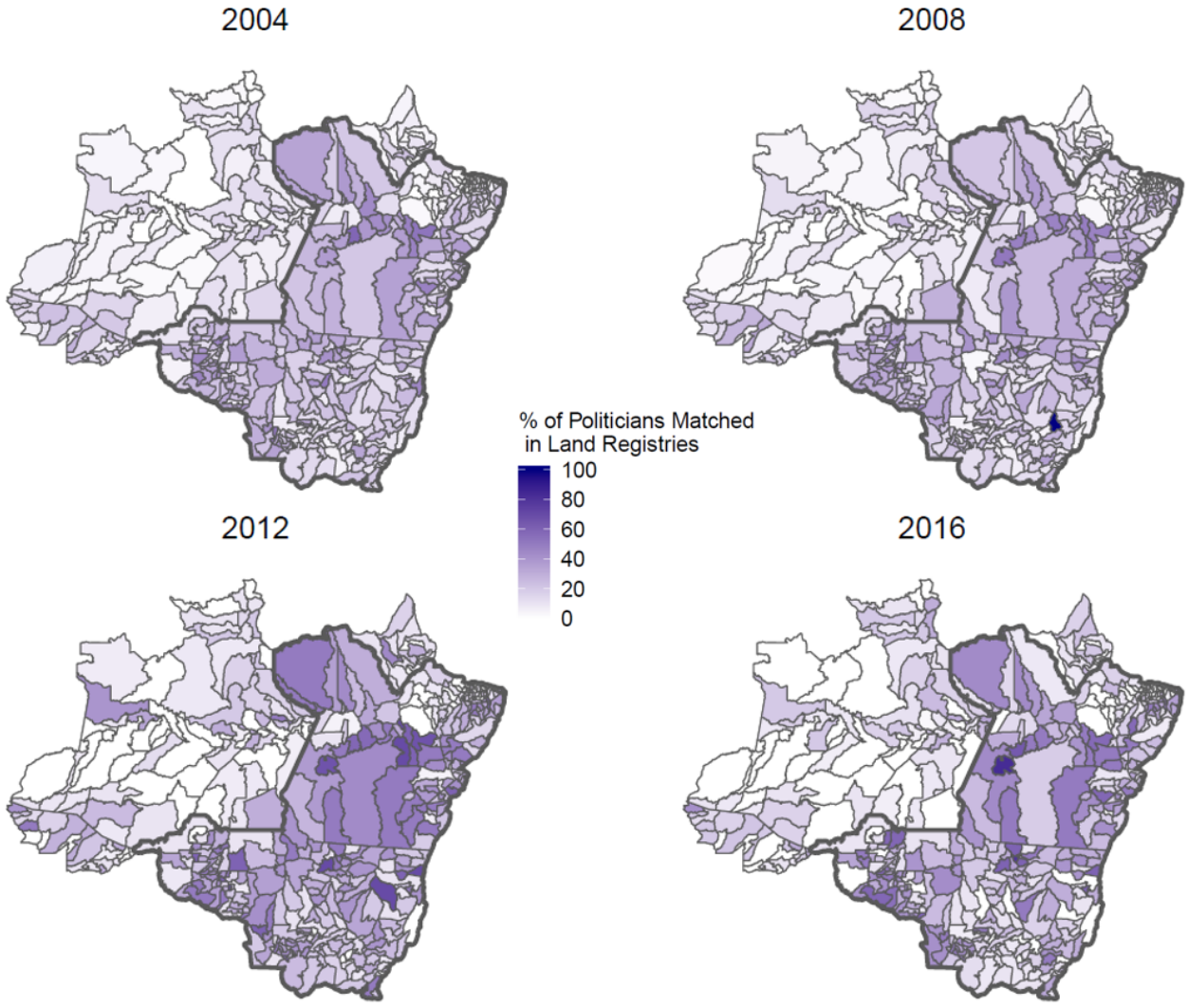


**Potential measurement error:** politicians could own untitled land or title properties in someone else's name

# Descriptive Statistics: Amazon Municipalities

| | Close Elections (10%) | All Elections |
|---|---|---|
| No. Municipalities | 690 | 760 |
| No. Municipality-Elections | 1,404 | 3,041 |
| | | |
| **Descriptives:** | | |
| Size (sq. km.) | 7,517 | 6,667 |
| | (16,557) | (13,857) |
| Dist. from State Capital (km.) | 305.02 | 313.79 |
| | (234.58) | (231.58) |
| % Amazon Biome | 99.68 | 99.78 |
| | (3.17) | (2.62) |
| % Forest Cover Loss (to 2020) | 36.37 | 37.33 |
| | (33.48) | (33.70) |
| Population | 28,468 | 25,805 |
| | (94,575) | (79,947) |
| GDP (Millions of 2010 BRL) | 151.68 | 136.58 |
| | (870.27) | (780.71) |
| Mun. Development Index | 0.45 | 0.46 |
| | (0.09) | (0.09) |
| % of Population Urban | 54.89 | 55.55 |
| | (23.51) | (23.59) |
| % of Population in Poverty | 61.24 | 59.96 |
| | (17.76) | (18.23) |
| % Workers Empl. in Agricult. | 48.75 | 48.49 |
| | (18.29) | (18.07) |
| Value Donations (BRL$) /1000 ppl. | 29,584 | 28,506 |
| | (26,620) | (24,876) |

# Descriptive Statistics: Candidates and Donors

| | MT/PA/RO (2004, 2008, 2012, 2016) | | |
|---|---|---|---|
| | Candidates (Mayor) | Candidates (Council) | Donors (CPF/CNPJ) |
| Number (Total) | 4,134 | 107,059 | 216,469 |
| Number (Landholders) | 1,530 | 15,343 | 26,664 |
| % Landholders | 37.01 | 14.33 | 12.32 |
| % Resource-Linked Occup. | 15.41 | 15.82 | NA |
| | (36) | (36) | |
| Value Donations Received/Given | 87,318 | 2,840 | 3,379 |
| | (353,534) | (39,347) | (32,246) |
| **Among Landholders:** | | | |
| Property Size (ha.) | 2582.68 | 1418.60 | 1969.78 |
| | (7,943) | (10,496) | (11,044) |
| No. Properties | 2.71 | 1.36 | 1.87 |
| | (3.34) | (0.80) | (2.71) |
| % Forest Cover Loss to 2020 | 90.38 | 81.44 | 82.37 |
| | (118.19) | (68.37) | (97.38) |
| Years $\times$ Properties Under Embargo | 5.95 | 0.56 | 2.12 |
| | (28.55) | (3.93) | (18.77) |
| Avg. Cultivated Soy Ha. (2000-2020) | 163.98 | 23.94 | 94.72 |
| | (954.17) | (541.78) | (1,148) |
| % Appearing on Forced Labor List | 1.44 | 0.08 | 0.70 |
| | (13.46) | (3.33) | (9.93) |
| % Resource-Linked Occup. | 27.12 | 43.56 | NA |
| | (0.44) | (0.50) | |
| Value Donations Received/Given | 110,749 | 3,295 | 8,432 |
| | (301,299) | (11,376) | (50,571) |

# Descriptive Statistics: *Successful* Candidates and Donors

| | MT/PA/RO (2004, 2008, 2012, 2016) | | |
|---|---|---|---|
| | Winners (Mayor) | Winners (Council) | Donors (CPF/CNPJ) |
| Number (Total) | 1,353 | 43,506 | 67,781 |
| Number (Landholders) | 629 | 7,921 | 9,786 |
| % Landholders | 46.49 | 18.21 | 14.44 |
| % Resource-Linked Occup. | 16.41 | 18.28 | NA |
| | (0.37) | (0.39) | |
| Value Donations Received/Given | 106,317 | 2,925 | 2,682 |
| | (268,766) | (10,318) | (17,383) |
| Among Landholders: | | | |
| Property Size (ha.) | 3,523 | 1,399 | 2,191 |
| | (9,690) | (9,138) | (11,497) |
| No. Properties | 3.36 | 1.42 | 2.10 |
| | (4.67) | (0.89) | (3.34) |
| % Forest Cover Loss to 2020 | 99.17 | 84.13 | 85.43 |
| | (164.99) | (78.91) | (106.23) |
| YearsxProperties Under IBAMA Embargo | 7.92 | 0.65 | 2.84 |
| | (36.66) | (4.46) | (25.20) |
| Avg. Cultivated Soy Hectares (2000-2020) | 241.29 | 28.41 | 132.35 |
| | (1,142.73) | (594.31) | (1,317.42) |
| % Appearing on Forced Labor List | 2.07 | 0.08 | 0.94 |
| | (0.16) | (0.03) | (0.11) |
| % Resource-Linked Occup. | 26.23 | 42.52 | NA |
| | (0.44) | (0.49) | |
| Value Donations Received/Given | 124,699 | 3,411 | 9,497 |
| | (264,395) | (13,120) | (55,424) |

# Which Empirical Strategy is Best? RDD vs. Diff-in-Diff

**Regression Discontinuity Design:**

- **Pro:** causal interpretation of LATE around close election cutoff
- **Cons:** only makes cross-unit comparisons; how random are close elections really?

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**Difference-in-Differences:**

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- **Pro:** Leverages within-unit variation
- **Cons:** election outcomes are endogenous, weaker causal interpretation; well-understood problems with TWFE

**Hybrid Approach:** Two-way fixed effects (individual and year) with sample restricted to winners and runner-ups in close municipal elections

- Equivalent to local linear RDD
- Implement Callaway and Sant'Anna *csdid* estimator with not-yet-treated controls

# Property-Level Empirical Strategy: Difference-in-Differences

**Difference-in-differences:**

$$d_{imt} = \beta T_{imt} + \delta_i + \theta_t + \epsilon_{imt}$$

- $d_{imt}$ is annual % loss of baseline tree cover for candidate/donor $i$'s properties in municipality $m$ in year $t$
- $T_{imt}$ is a treatment dummy equal to 1 when candidate is in office
- $\delta_i$ and $\theta_t$ are candidate/donor and year FEs
- SEs clustered at candidate/donor level

**Limit sample to winner and runner-up candidates in close elections** (10% win-margin), where outcomes are "as-if random"; compare to results in full candidate/donor sample

# Property-Level Empirical Strategy: Dynamic Effects

To explore dynamic effects around candidates' entry and exit from office, we estimate an event study specification:

$$d_{ikmt} = \sum_{k=-3}^{+6} \beta_k T_{imt} \mathbb{1}\{s = k\} + \theta_i + \lambda_t + \epsilon_{ikmt}$$

- $k$ is the number of years before or after election year, extending from 3 years prior to election to 2 years after end of mandate
- Outcomes: deforestation, land conversion to soy/pasture, environmental violations

**TWFE Problems:** Already-treated units introduce bias into TWFE estimates. Implement **Callaway and Sant'Anna *csdid* estimator** with not-yet-treated controls

# Candidates: Effect of Being Elected on Deforestation

| | Close Elections (10%) | | All Mayoral Candidates | | All Council Candidates | |
|---|---|---|---|---|---|---|
| | Defor % | Defor (0/1) | Defor % | Defor (0/1) | Defor % | Defor (0/1) |
| **Treatment** | | | | | | |
| *In Office* | -0.756 | 0.008 | -0.545*** | -0.017 | -0.003 | 0.002 |
| | (0.541) | (0.021) | (0.205) | (0.010) | (0.054) | (0.002) |
| Observations | 2,717 | 2,717 | 14,839 | 14,839 | 186,656 | 186,656 |
| Year FE | X | X | X | X | X | X |
| Individual FE | X | X | X | X | X | X |

*Note*: Treatment is defined as dummy variable that switches on when candidate is in office. Sample is 20-year candidate-level panel (2000-2019) for all municipal election candidates in 2000, 2004, 2008, 2012, and 2016 elections in Legal Amazon. Standard errors are clustered at the candidate level and candidate and year FEs are included. Close election columns restrict sample to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Defor % measures % of baseline natural vegetation lost in a year. Defor (0/1) is indicator of whether $>$ 2 ha. of natural vegetation was lost in a year. * p$<$ 0.10, ** p$<$ 0.05, *** p$<$ 0.01.

# Candidates: Effect of Being Elected on Land Conversion to Soy and Pasture

| | Close Elections (10%) | | All Mayoral Candidates | | All Council Candidates | |
|---|---|---|---|---|---|---|
| | Soy % | Past. (%) | Soy % | Past. (%) | Soy % | Past. (%) |
| **Treatment** | | | | | | |
| *In Office* | 0.516* | -0.019 | 0.646** | -0.350 | 0.083 | 0.115 |
| | (0.278) | (0.828) | (0.300) | (0.474) | (0.052) | (0.147) |
| Observations | 2,717 | 2,717 | 14,839 | 14,839 | 186,656 | 186,656 |
| Year FE | X | X | X | X | X | X |
| Candidate FE | X | X | X | X | X | X |

*Note*: Treatment is defined as dummy variable that switches on when candidate is in office. Sample is 20-year candidate-level panel (2000-2019) for all municipal election candidates in 2000, 2004, 2008, 2012, and 2016 elections in Legal Amazon. Standard errors are clustered at the candidate level and candidate and year FEs are included. Close election columns restrict sample to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Soy% measures change in soy cultivation as % of property size. Past. (%) measures change in pasture as % of property size. * p$<$ 0.10, ** p$<$ 0.05, *** p$<$ 0.01.

# Donors: Effect of Supported Candidate Being Elected on Deforestation

| | Close Elections (10%) | | All Mayoral Candidates | | All Council Candidates | |
|---|---|---|---|---|---|---|
| | Defor % | Defor (0/1) | Defor % | Defor (0/1) | Defor % | Defor (0/1) |
| **Treatment** | | | | | | |
| *Supported Candidate In Office* | 0.273** | 0.015** | 0.295 | 0.006 | 0.035 | 0.001 |
| | (0.136) | (0.006) | (0.199) | (0.004) | (0.079) | (0.002) |
| Observations | 29,716 | 29,716 | 75,430 | 75,430 | 171,019 | 171,019 |
| Year FE | X | X | X | X | X | X |
| Donor FE | X | X | X | X | X | X |

*Note*: Treatment is defined as dummy variable that switches on when candidate to whom donor made a campaign contribution is in office. Sample is 20-year donor-level panel (2000-2019) for all donors to municipal election candidates in 2000, 2004, 2008, 2012, and 2016 elections in Legal Amazon. Standard errors are clustered at the donor level and donor and year FEs are included. Close election columns restrict sample to donors who made contributions to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Defor % measures % of baseline natural vegetation lost in a year. Defor (0/1) is indicator of whether $>$ 2 ha. of natural vegetation was lost in a year. * p$<$ 0.10, ** p$<$ 0.05, *** p$<$ 0.01.

# Donors: Effect of Supported Candidate Being Elected on Land Conversion to Soy and Pasture

| | Close Elections (10%) | | All Mayoral Candidates | | All Council Candidates | |
|---|---|---|---|---|---|---|
| | Soy % | Past. (%) | Soy % | Past. (%) | Soy % | Past. (%) |
| **Treatment** | | | | | | |
| *Supported Candidate In Office* | 0.006 | -0.035 | -0.012 | 0.168 | 0.048 | 0.045 |
| | (0.157) | (0.302) | (0.109) | (0.230) | (0.086) | (0.181) |
| Observations | 29,716 | 29,716 | 75,430 | 75,430 | 171,019 | 171,019 |
| Year FE | X | X | X | X | X | X |
| Donor FE | X | X | X | X | X | X |

*Note*: Treatment is defined as dummy variable that switches on when candidate to whom donor made a campaign contribution is in office. Sample is 20-year donor-level panel (2000-2019) for all donors to municipal election candidates in 2000, 2004, 2008, 2012, and 2016 elections in Legal Amazon. Standard errors are clustered at the donor level and donor and year FEs are included. Close election columns restrict sample to donors who made contributions to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Soy% measures change in soy cultivation as % of property size. Past. (%) measures change in pasture as % of property size.
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# Candidates: Effect of Being Elected on Deforestation

# (Heterogeneity Across Enforcement Eras)

| | Close Elections (10%) | | All Mayoral Candidates | | All Council Candidates | |
|---|---|---|---|---|---|---|
| | Defor % | Defor (0/1) | Defor % | Defor (0/1) | Defor % | Defor (0/1) |
| **Treatment** | | | | | | |
| *In Office (2016)* | 0.723 | 0.007 | -0.462 | -0.035 | -0.459** | -0.021* |
| | (2.076) | (0.080) | (0.748) | (0.034) | (0.224) | (0.012) |
| Observations | 1,197 | 1,197 | 9,424 | 9,424 | 102,505 | 102,505 |
| *In Office (2004-2012)* | -0.863** | 0.007 | -0.499** | -0.014 | 0.018 | 0.002 |
| | (0.421) | (0.022) | (0.197) | (0.011) | (0.056) | (0.003) |
| Observations | 2,356 | 2,356 | 13,623 | 13,623 | 181,811 | 181,811 |
| Year FE | X | X | X | X | X | X |
| Individual FE | X | X | X | X | X | X |

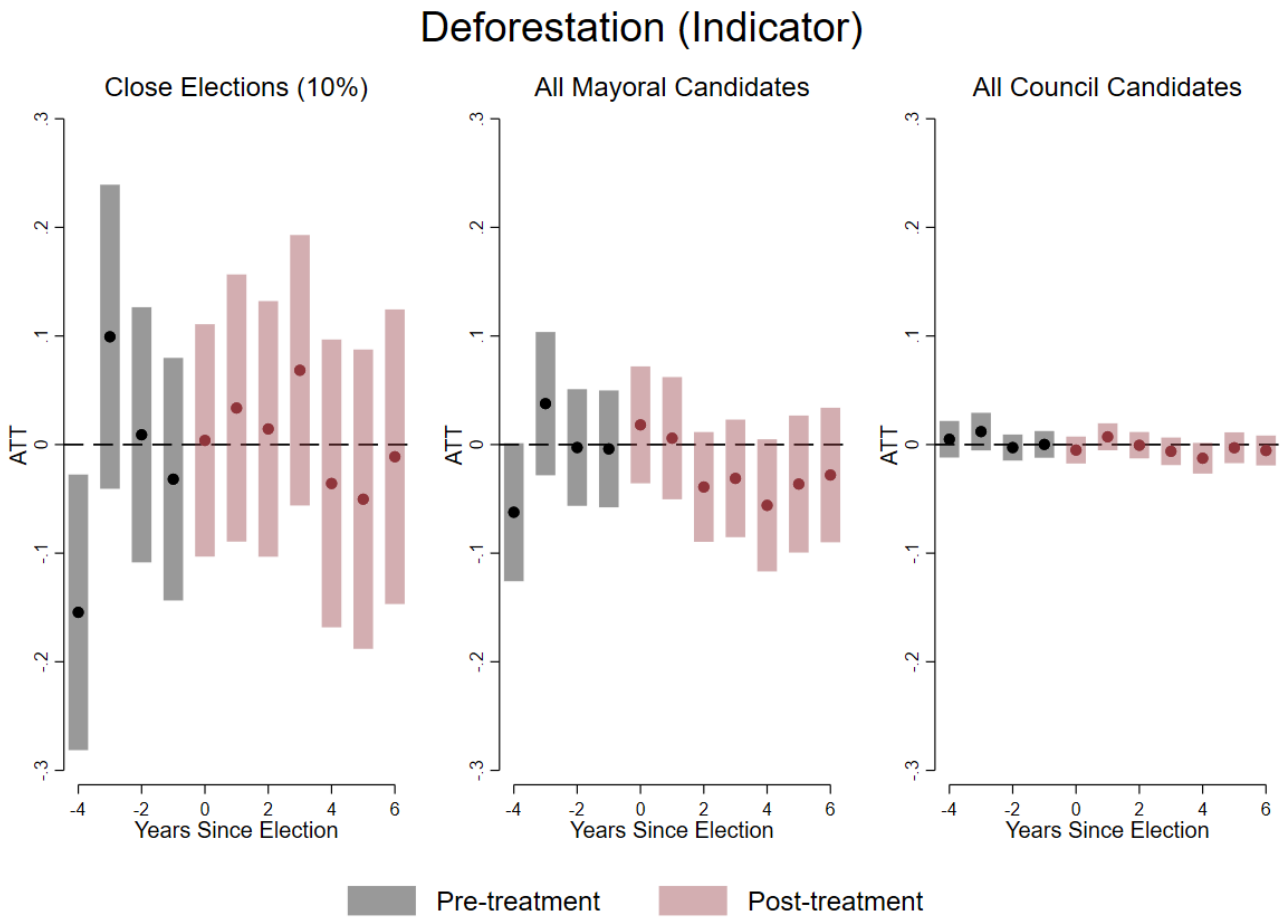
*Note*: Treatment is defined as dummy variable that switches on when candidate is in office. Sample in top panel is 20-year candidate-level panel (2000-2019) for all municipal election candidates in 2000, 2004, 2008, 2012, and 2016 in Legal Amazon who were first treated in 2016 or who were never treated. Sample in bottom panel is similarly defined, but for candidates who were treated in 2004, 2008, or 2012, or never treated. Standard errors are clustered at the candidate level and donor and year FEs are included. Close election columns restrict sample to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Defor % measures % of baseline natural vegetation lost in a year. Defor (0/1) is indicator of whether $>$ 2 ha. of natural vegetation was lost in a year. * p$<$ 0.10, ** p$<$ 0.05, *** p$<$ 0.01.

# Donors: Effect of Supported Candidate Being Elected on Deforestation (Heterogeneity Across Enforcement Eras)

| | Close Elections (10%) | | All Mayoral Candidates | | All Council Candidates | |
|---|---|---|---|---|---|---|
| | Defor % | Defor (0/1) | Defor % | Defor (0/1) | Defor % | Defor (0/1) |
| **Treatment** | | | | | | |
| *Supported Candidate In Office (2016)* | 0.658* | 0.031 | -0.141 | 0.020* | 0.315 | 0.001 |
| | (0.393) | (0.020) | (0.270) | (0.011) | (0.307) | (0.008) |
| Observations | 12,502 | 12,502 | 37,658 | 37,658 | 79,914 | 79,914 |
| *Supported Candidate In Office (2004-2012)* | 0.189 | 0.011 | 0.338 | 0.004 | -0.001 | -0.000 |
| | (0.145) | (0.007) | (0.233) | (0.004) | (0.084) | (0.002) |
| Observations | 25,840 | 25,840 | 64,163 | 64,163 | 158,327 | 158,327 |
| Year FE | X | X | X | X | X | X |
| Candidate FE | X | X | X | X | X | X |

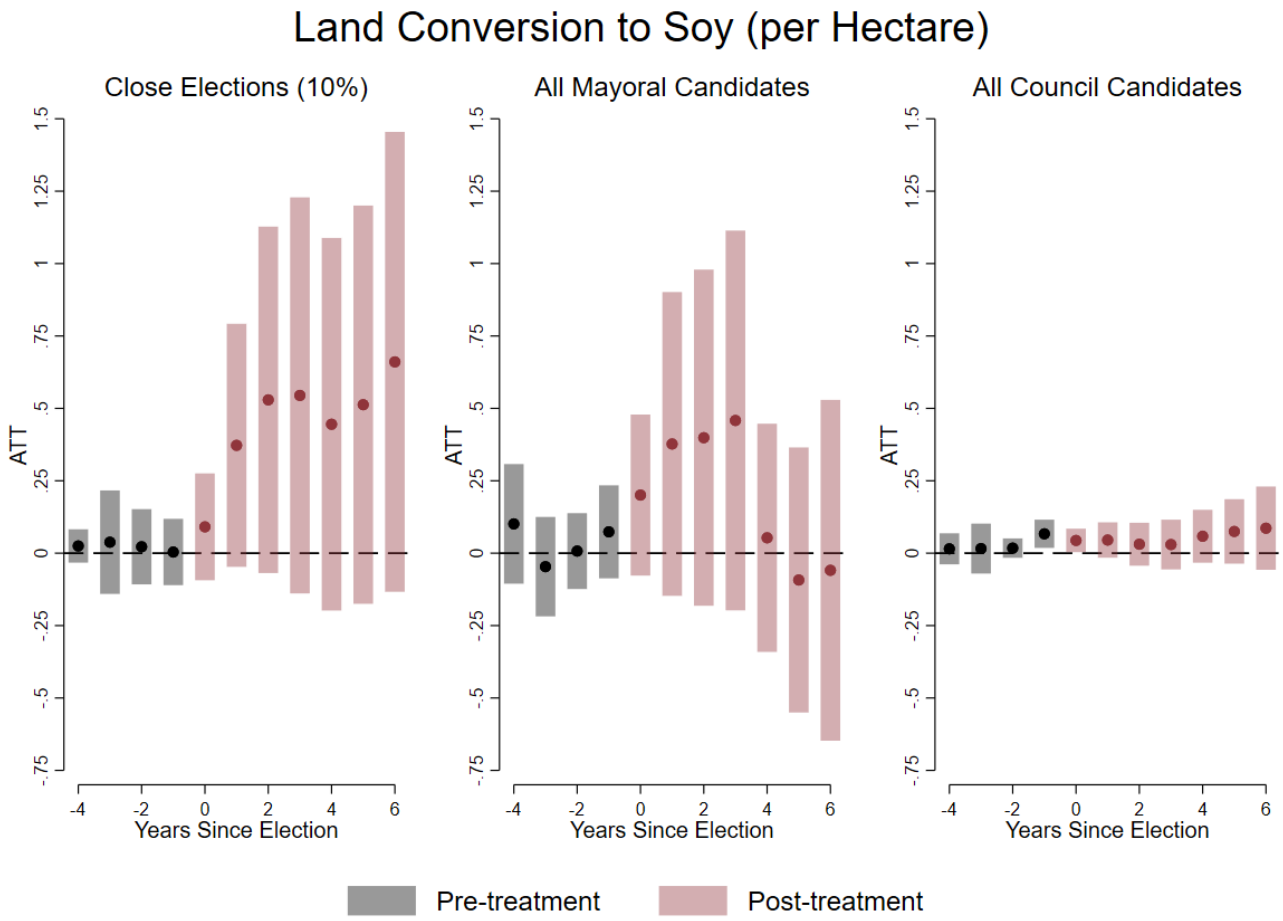
*Note*: Treatment is defined as dummy variable that switches on when candidate to whom donor made a campaign contribution is in office. Sample in top panel is 20-year donor-level panel (2000-2019) for all donors to municipal election candidates in 2000, 2004, 2008, 2012, and 2016 in Legal Amazon who were first treated in 2016 or who were never treated. Sample in bottom panel is similarly defined, but for donors who were treated in 2004, 2008, or 2012, or never treated. Standard errors are clustered at the donor level and donor and year FEs are included. Close election columns restrict sample to donors who made contributions to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Defor % measures % of baseline natural vegetation lost in a year. Defor (0/1) is indicator of whether $>$ 2 ha. of natural vegetation was lost in a year. * p$<$ 0.10, ** p$<$ 0.05, *** p$<$ 0.01.

# Candidates: Dynamic Effects Around Time in Office (Deforestation Indicator)




Note: Figures show dynamic event study ATT estimates and 95% confidence intervals from Callaway and Sant'Anna (2021) csdid estimator. ATTs are aggregated from pairwise candidate-year comparisons. Standard errors are clustered at the candidate-level. Sample is 20-year candidate-level panel (2000-2019) for all municipal election candidates in 2000, 2004, 2008, 2012, and 2016 elections in Legal Amazon. Close Elections figure restricts sample to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Outcome is indicator of whether $>$2 ha. of natural vegetation was lost in a year.

# Candidates: Dynamic Effects Around Time in Office (Land Conversion to Soy)

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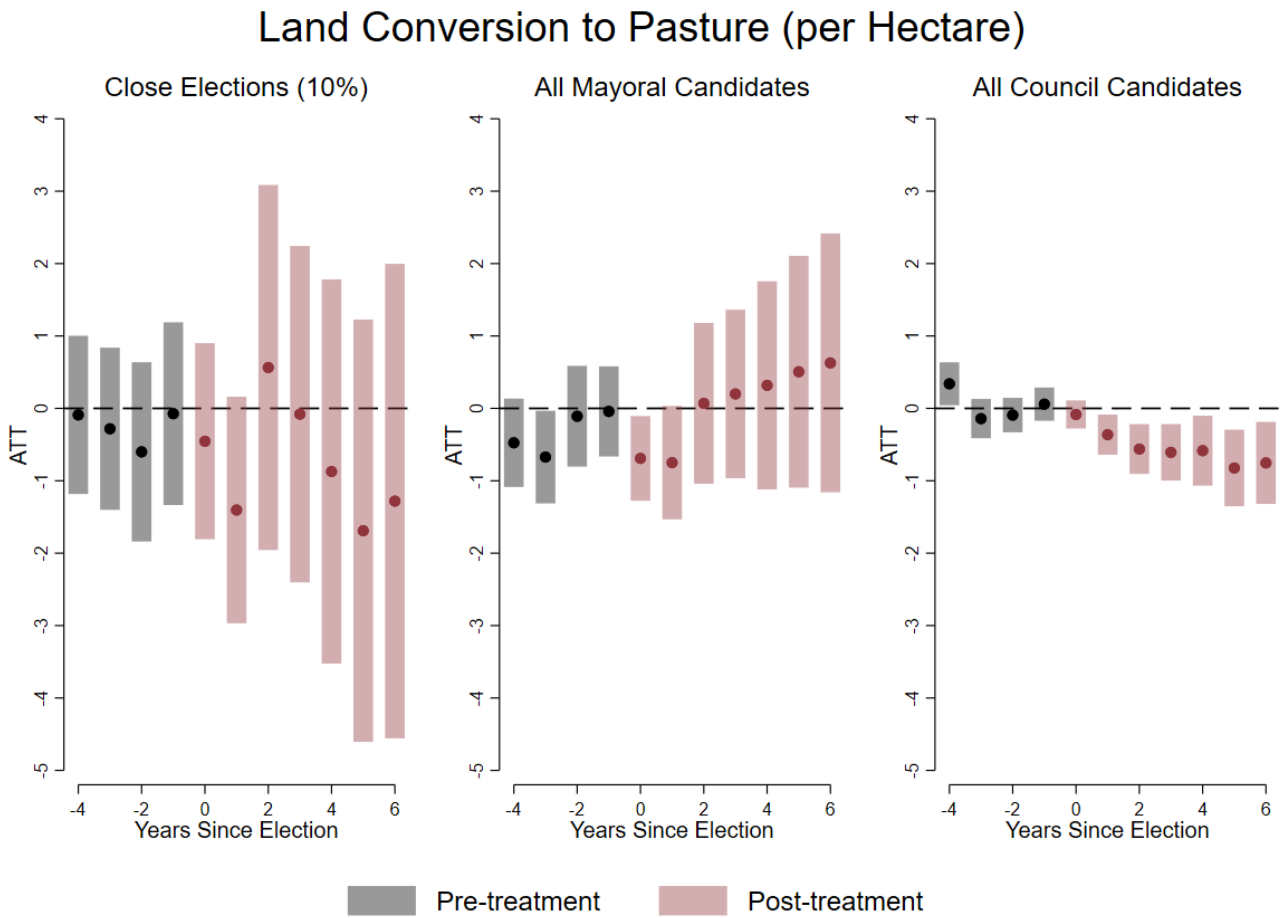
# Candidates: Dynamic Effects Around Time in Office (Land Conversion to Pasture)

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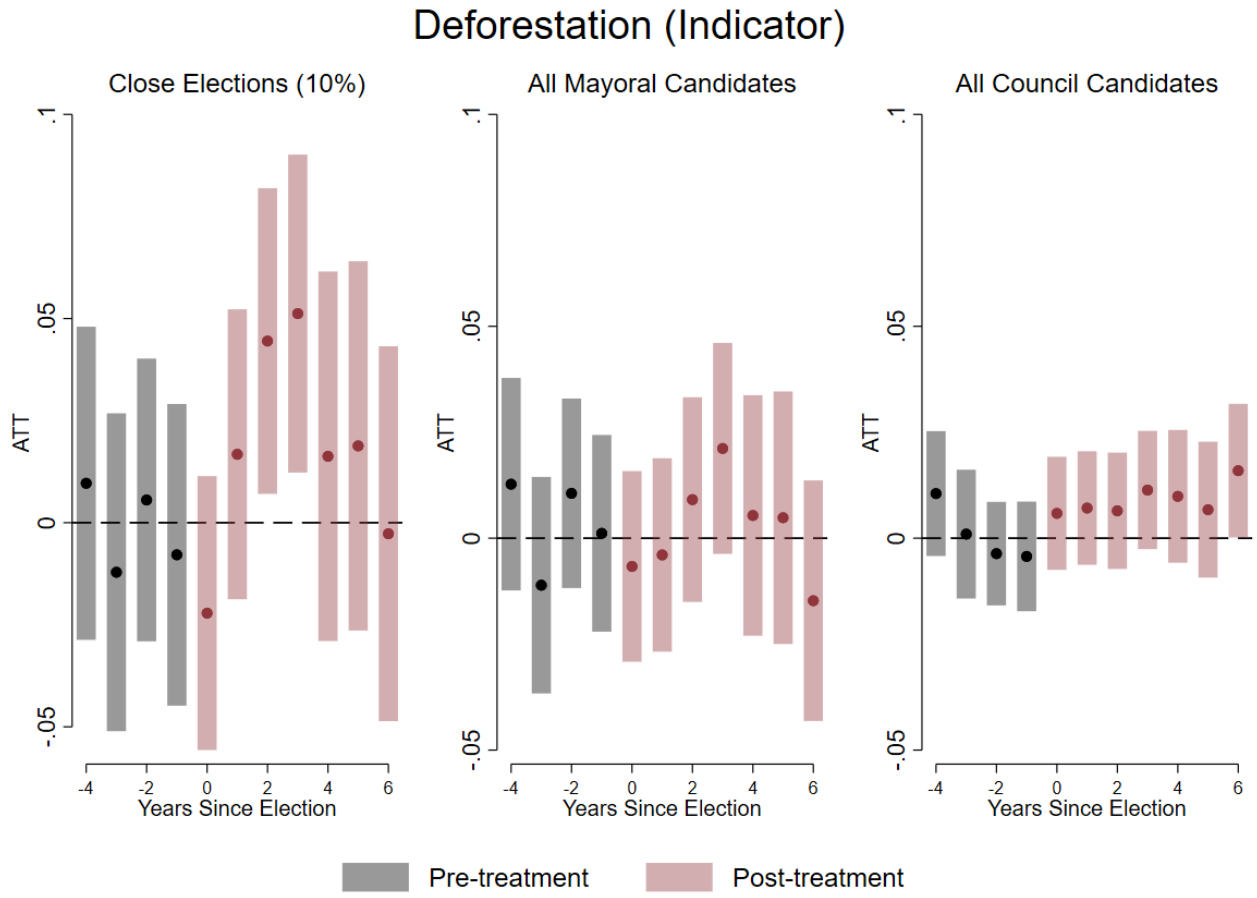
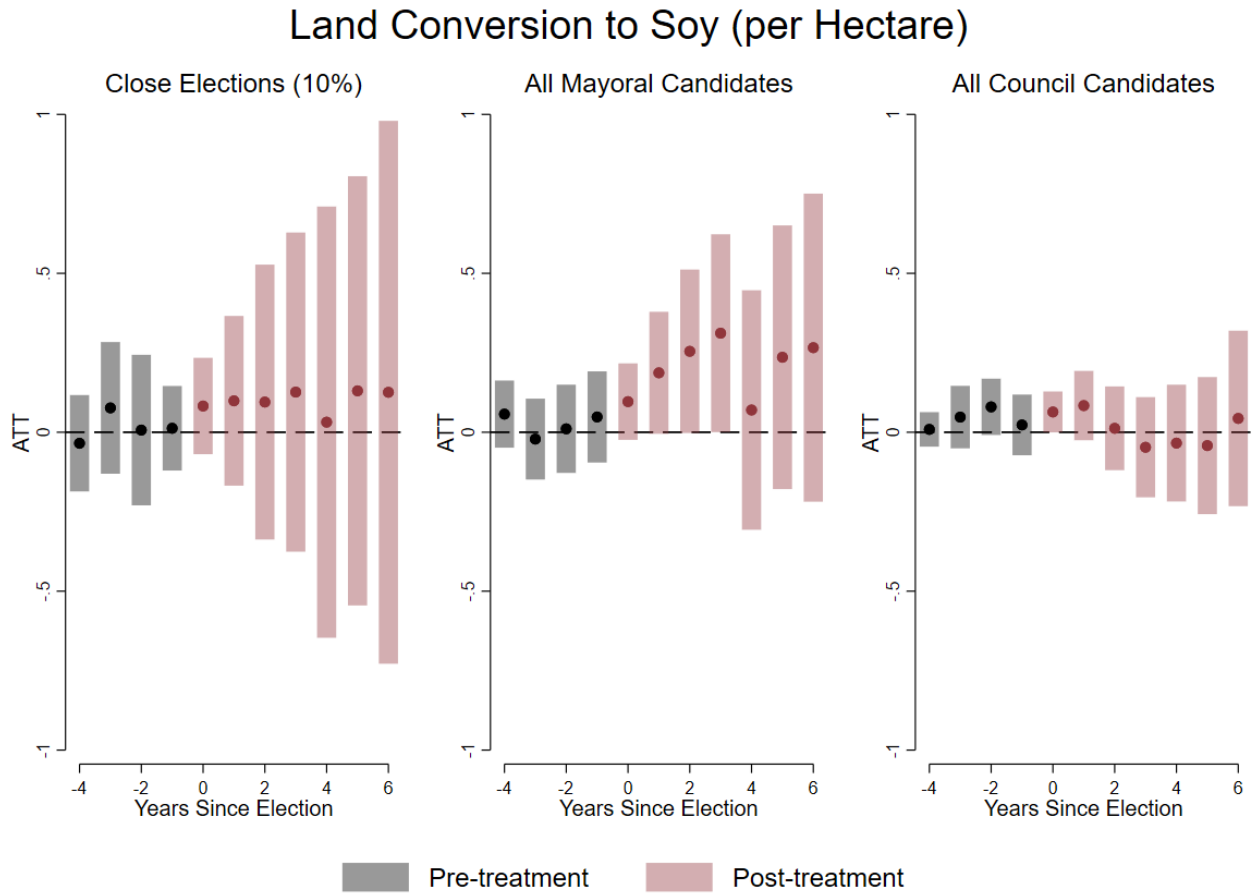
# Donors: Dynamic Effects Around Supported Candidate's Time in Office (Deforestation Indicator)




Note: Figures show dynamic event study ATT estimates and 95% confidence intervals from Callaway and Sant'Anna (2021) csdid estimator. ATTs are aggregated from pairwise donor-year comparisons. Standard errors are clustered at the donor-level. Sample is 20-year donor-level panel (2000-2019) for all donors to municipal election candidates in 2000, 2004, 2008, 2012, and 2016 elections in Legal Amazon. Close Elections figure restricts sample to donors to winner and runner-up mayors in elections with $\leq$ 10% win margin (e.g., 45% to 55%). Outcome is indicator of whether >2 ha. of natural vegetation was lost in a year.

# Donors: Dynamic Effects Around Supported Candidate's Time in Office (Land Conversion to Soy)

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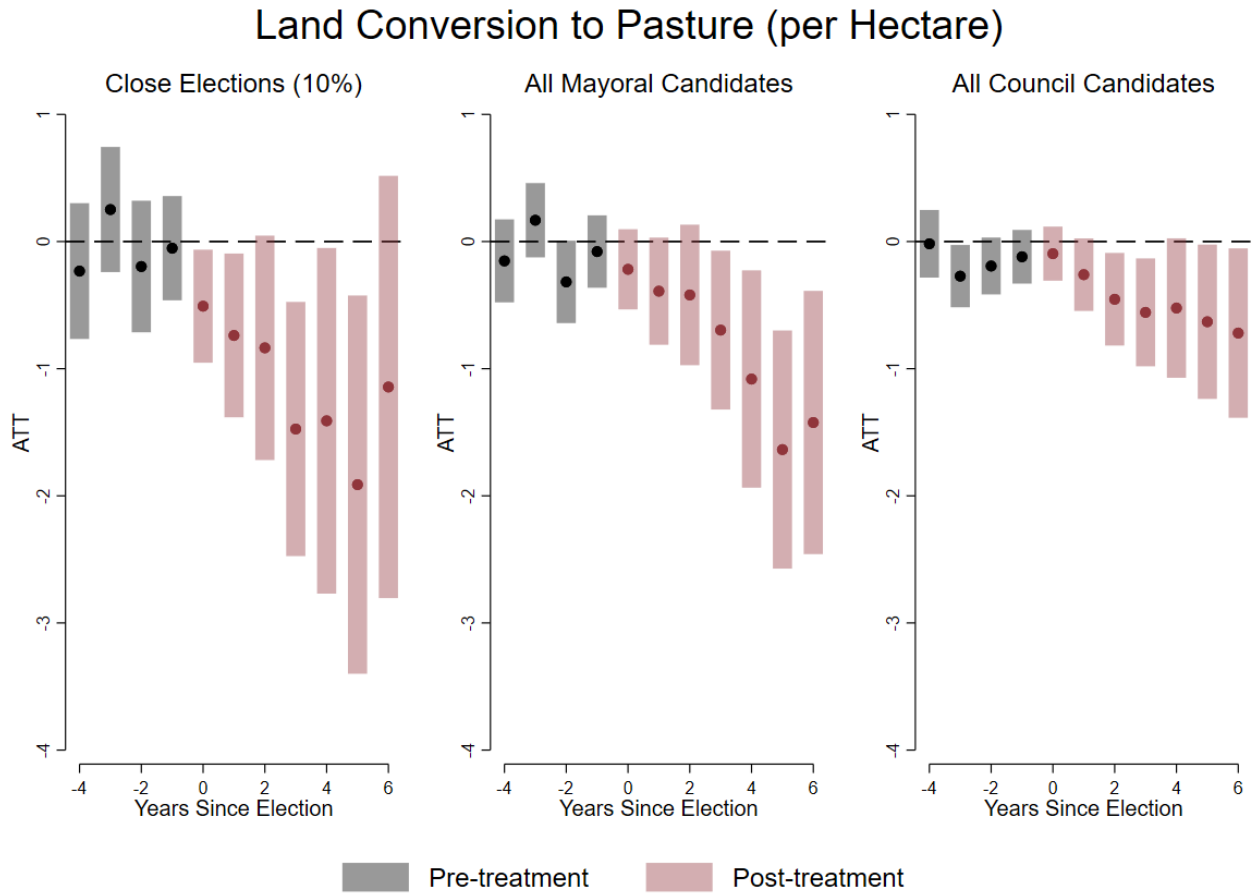
# Donors: Dynamic Effects Around Supported Candidate's Time in Office (Land Conversion to Pasture)

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# Municipality-Level Difference-in-Differences

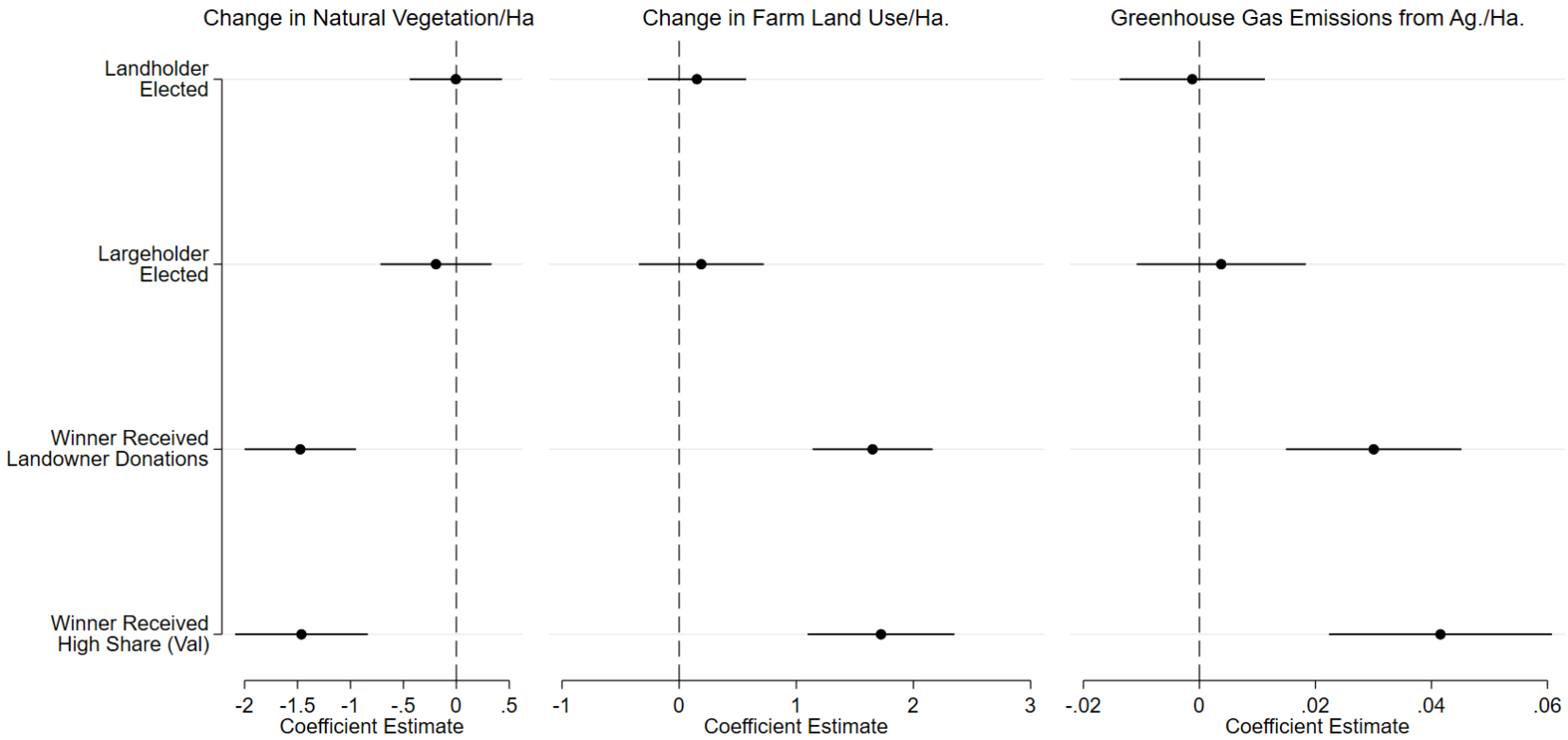
For 4-year period $e$ following an election in municipality $m$, estimate:

$$d_{me} = \beta T_{me} + \mu X'_{ime} + \delta_m + \theta_e + \epsilon_{me}$$

- $d_{me}$ are municipality-level outcomes over four years following mayor's election
- $T_{me}$ is treatment indicator = 1 if elected mayor is (i) landowner, (ii) large landowner, (iii) received landowner donations, or (iv) received >50% donations from landowners
- $X_{ime}$ is vector of winner $i$ covariates (sex and education)
- $\delta_m$ and $\theta_e$ are municipality and election-period FEs
- Standard errors are clustered at municipality-level

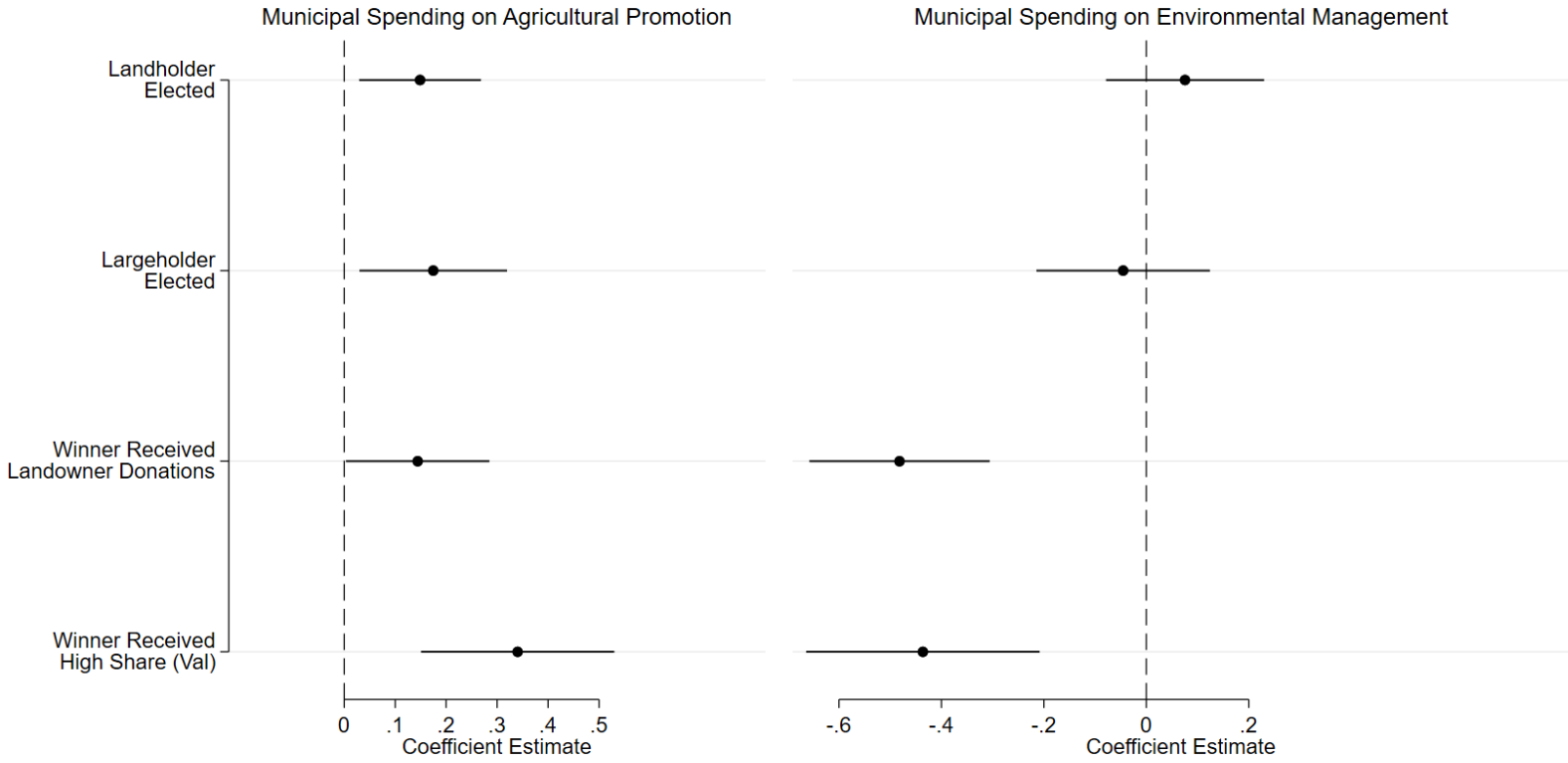
**Estimate with TWFE and Callaway and Sant'Anna *csdid* estimator**

# Municipality-Level: Effects of Landowning Candidate or Donors on Land Use



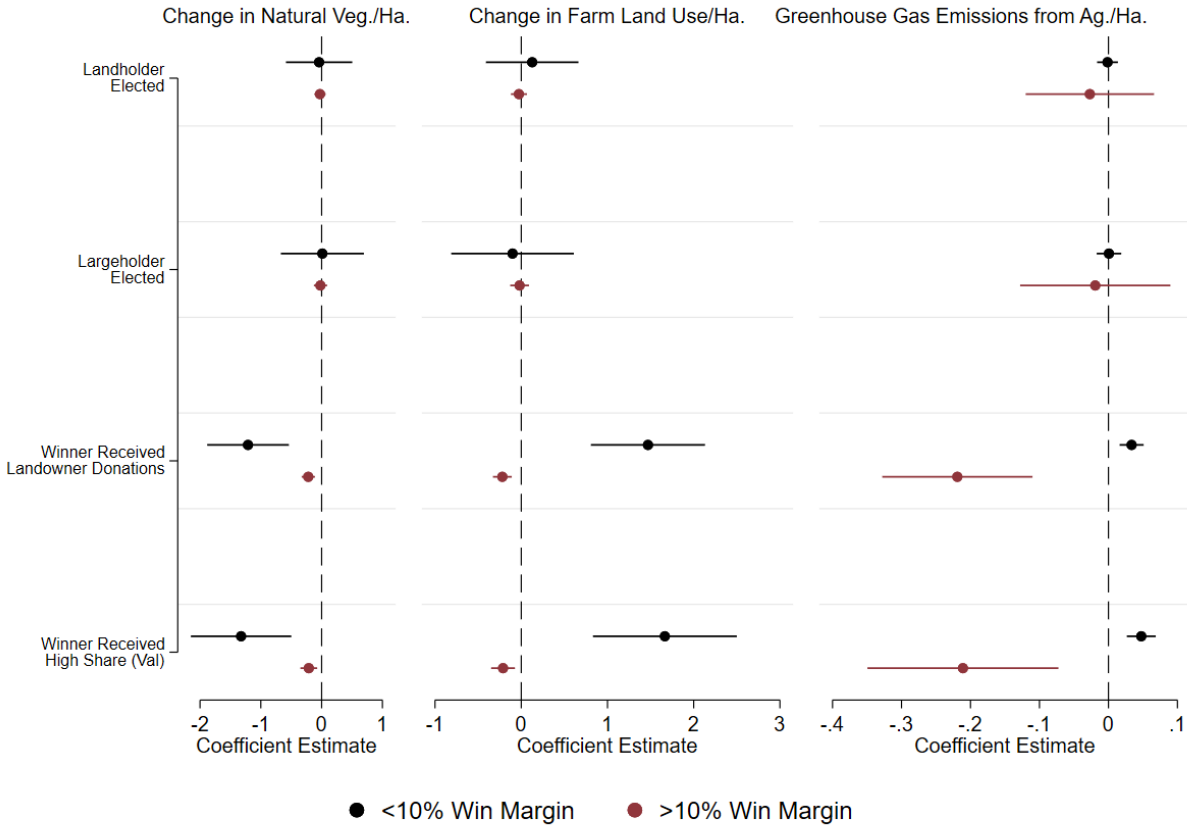

Note: Figures report coefficient estimates and 95% confidence intervals from regression of outcome on municipality-election level treatment dummies (landowner in office, large landowner ($>$ 500 ha.) in office, mayor who received landowner donations in office, and winner who received more than 50% of donation value from landowners in office). Specifications include municipality and election FEs and cluster standard errors at municipality level. Left figure reports effects on change in natural vegetation as a share of municipality area, such that a negative effect indicates deforestation. The central figure reports effects on change in farm area as a share of municipality area. The rightmost figure reports effects on greenhouse gas emissions from agriculture per hectare of municipality area.

# Municipality-Level: Public Finance Mechanism




Note: Figures report coefficient estimates and 95% confidence intervals from regression on municipality-election level treatment dummies (landowner in office, large landowner ($>$ 500 ha.) in office, mayor who received landowner donations in office, and mayor who received more than 50% of donation value from landowners in office). Specifications include municipality and election FEs and cluster standard errors at municipality-level. Left figure reports effects on municipal spending on agricultural promotion (Agriculture, Colonization, Agro-livestock Defense and Sanitation, Rural Extension, Irrigation, Agrarian Organization, Agro-Livestock Promotion, Land Reform, and Other Agricultural Subfunctions); right figure reports effects on municipal spending on environmental management (Environmental Control, Management, Preservation and Conservation, Recuperation of Degraded Areas, and Other Environmental Subfunctions). Monetary values are deflated to constant 2010 $BRL.

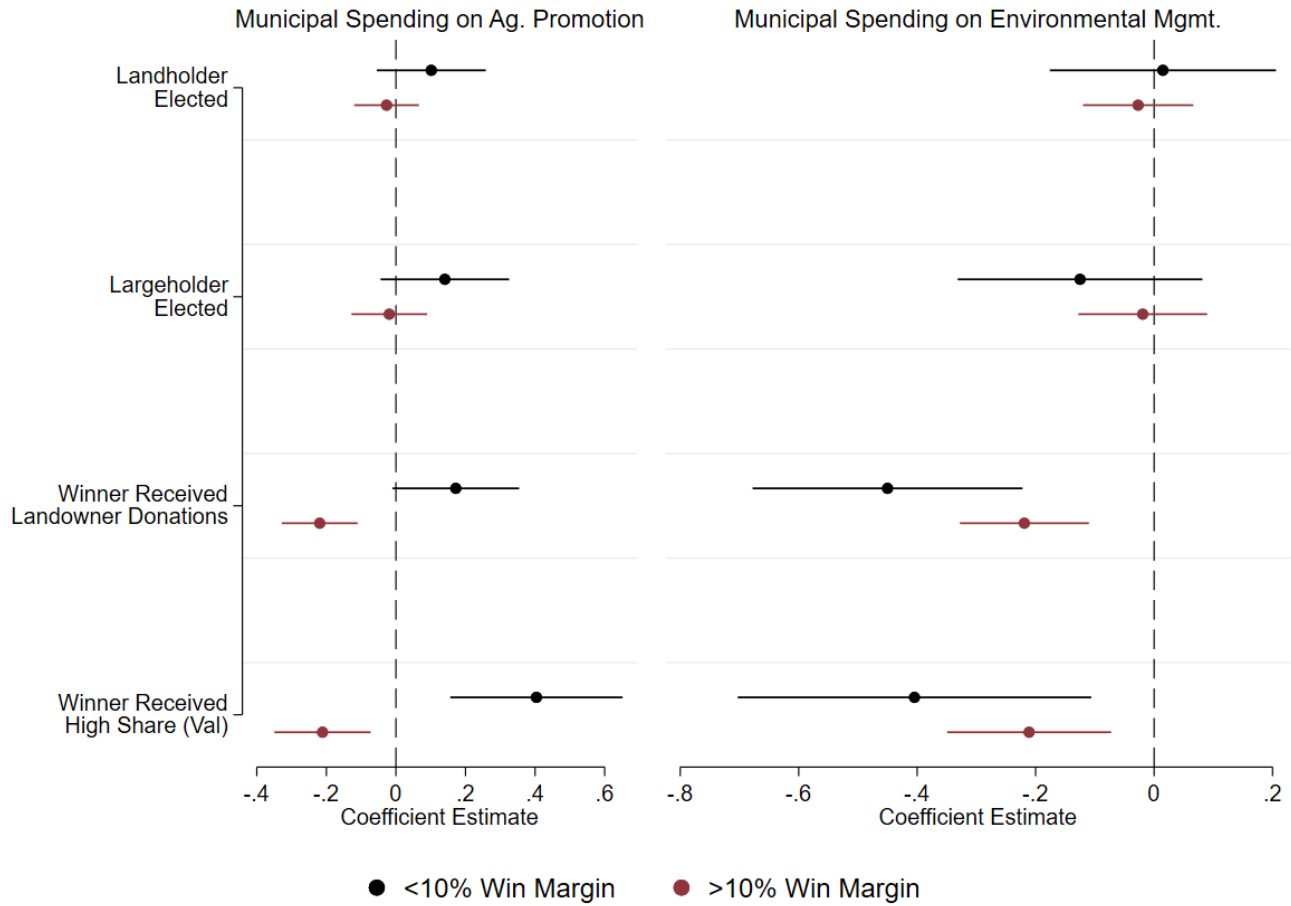
# Municipality-Level: Effects of Landowning Candidate or Donors on Land Use (Heterogeneity Across Electoral Competition)




Note: Figures report coefficient estimates and 95% confidence intervals from regression of outcome on municipality-election level treatment dummies (landowner in office, large landowner ($>$ 500 ha.) in office, mayor who received landowner donations in office, and winner who received more than 50% of donation value from landowners in office). Specifications include municipality and election FEs and cluster standard errors at municipality level, and are estimated separately for close elections and non-competitive elections. Left figure reports effects on change in natural vegetation as a share of municipality area. Central figure reports effects on change in farm area as a share of municipality area. Right figure reports effects on greenhouse gas emissions from agriculture per hectare of municipality area.

# Municipality-Level: Public Finance Mechanism

# (Heterogeneity Across Electoral Competition)




Note: Figures report coefficient estimates and 95% confidence intervals from regression of outcome on municipality-election level treatment dummies (landowner in office, large landowner ($>$ 500 ha.) in office, mayor who received landowner donations in office, and winner who received more than 50% of donation value from landowners in office). Specifications include municipality and election FEs and cluster standard errors at municipality level, and are estimated separately for close elections and non-competitive elections. Figures report effects on municipal spending on agricultural promotion and environmental management, respectively.

## Robustness Checks and Next Steps

**Robustness:**

- Re-estimate with 5% close election cutoff (more credibly "as-if random", but less statistical power)
- Limit to MT/PA/RO (more complete land registries, less statistical power)

**Next steps:**

- Document/test pre-trends more thoroughly
- Callaway and Sant'Anna with on-off treatment (in-office) rather than on-forever treatment
- Add *Convênios* mechanism (data request pending)