Save or *Not Save* Planet Earth?
A Quasi-natural Experiment with the Brazilian Amazon*

Allen N. Berger [a], Cristina Ortega [b], Matias Ossandon Busch [c], Raluca A. Roman [d]

March 2024

Abstract

Despite burgeoning environmental laws, understanding how their enforcement influences banks' consideration of climate risks remains a significant oversight. Using the Brazilian Amazon as a laboratory, we examine the impact of environmental law enforcement on bank credit to deforesting industries. We test whether banks primarily choose short-term profitability gains versus longer-term value gains inclusive of prudential, regulatory, and reputational risks. For identification, we exploit the reduction in environmental police staff in Brazil post-Bolsonaro's 2019 election as an exogenous shock to environmental law enforcement and examine how this shock is transmitted to the banking sector. Findings reveal a concerning trend: after the shock, banks prioritize short-term gains, significantly increasing credit to agribusinesses replacing Brazilian forests, particularly in locations with higher proportions of land available for deforestation and higher political support for Bolsonaro's coalition. Internal capital market reallocation to branches able to grasp profitability benefits emerges as a key channel, while real effects analysis confirms the heightened "brown" credit supply is linked to substantial rise in deforestation. Results cast doubt on the financial sector's stewardship role in addressing environmental challenges.

JEL Classification Codes: D72, G11, G18, G21, Q50, Q54.

Keywords: environmental law enforcement, climate risk, financial institutions, bank credit, Brazilian Amazon, sustainable finance, deforestation, environmental stewardship.

* The views expressed are those of the authors and do not represent the views of the Federal Reserve Bank of Philadelphia or the Federal Reserve System or the Center for Latin American Monetary Studies (CEMLA).

[a]Berger: University of South Carolina. Email: aberger@moore.sc.edu [b] Ortega: University of Malaga. Email: cristinaog@uma.es [c] Ossandon Busch: CEMLA and Halle Institute for Economic Research (IWH). Email: mossandon@cemla.org [d] Roman: Federal Reserve Bank of Philadelphia. Email: raluca.roman@phil.frb.org.

"Enforcing laws and regulations is a necessary element to prevent impunity within society, to ensure the credibility and legitimacy of the institutions […] and to level the playing field among economic actors" (OECD, 2018).
"[…] Despite a 38-fold increase in environmental laws put in place since 1972, failure to fully implement and enforce these laws is one of the greatest challenges to mitigating climate change…" (UN Environmental Programme, 2019).

1. Introduction

In the forefront of global policy debates on climate change, the financial sector holds a pivotal role in helping reallocate capital from sectors significantly harming the environment (e.g., UNCTAD, 2021; BCBS, 2023; NGFS, 2019, 2021, 2023). Despite a surge in environmental laws, the enforcement capacity of countries is often an overlooked dimension.[2] While banks increasingly incorporate carbon-related risks, the impact of environmental law enforcement on their readiness to factor in climate risks remains a significant blind spot.[3] This paper bridges this gap and delves into whether a sudden weakening of environmental law enforcement triggers shifts in banks' credit supply to "brown" deforesting industries in Brazil, probing whether banks' commitment to account for climate-related financial risks is compromised by enforcement vulnerabilities.

To our knowledge, we are the first to study the links between banking and deforestation, the latter being known to significantly exacerbate climate risks. We use Brazil as the ideal laboratory for our study, primarily due to the Brazilian Amazon's status as the world's largest forest, covering 67% of global tropical forests and holding unparalleled biodiversity. The region plays a pivotal role in climate change mitigation, with policies here being crucial for the planet's future. However, rampant deforestation over the past 50 years, driven by infrastructure development and agricultural land clearance, poses significant environmental challenges. Notably, tropical deforestation in this area contributes substantially, estimated to account for one-fifth to

[2] See e.g., UN Environment Programme (2014, 2019); https://www.unep.org/news-and-stories/press-release/dramatic-growth-laws-protect-environment-widespread-failure-enforce
[3] See e.g., Correa, He, Herpfer, and Lel, 2023; Degryse, Goncharenko, Theunisz, and Vadasz, 2023; Fuchs, Nguyen, Nguyen, and Schaeck, 2023; Giannetti, Jasova, Loumioti, and Mendicino, 2023; Ivanov, Kruttli, and Watugala, 2023. Increased attention to climate change is also paid by academics and investors see e.g., Hong, Karolyi, and Scheinkman, 2020; Choi, Gao, and Jiang, 2020; Engle, Giglio, Kelly, Lee, and Stroebel, 2020; Bolton and Kacperczyk, 2021.

one-quarter of the global greenhouse effect, emphasizing the critical importance of our research in understanding and addressing these environmental issues (e.g., Fearnside, 2005, 2019; Pearce and Brown, 2023).

Second, Brazil's evolving environmental laws provide a perfect backdrop for our research, with a notable shift towards environmental protection in the early 21st century. However, the election of Jair Bolsonaro as Brazil's president in 2019 marked a significant reversal in environmental policy, marked by immediate cuts in personnel and resources for agencies like the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA). Leveraging this sudden decline in IBAMA's forest oversight personnel as an exogenous shock to environmental law enforcement, our study examines how the relaxation of environmental policy enforcement influences banks' supply of "brown" agribusiness credit in Brazil. This is particularly crucial given the agribusiness sector (including agriculture and agroindustry) plays a significant role in large-scale deforestation in the Brazilian Amazon (e.g., Peres, Campos-Silva, and Ritter, 2022, 2023).

Specifically, we test whether banks primarily prioritize short-term profitability gains and existing lending relationships (e.g., Degryse, Roukny, and Tielens, 2022; De Haas and Popov, 2023; Giannetti, Jasova, Loumioti, and Mendicino, 2023) over longer-term value gains inclusive of prudential, regulatory, and reputational risks (e.g., Reghezza, Altunbas, Marques-Ibanez, Rodriguez d'Acri, and Spaggiari, 2022; Ehlers, Packer, and De Greiff, 2022; Correa, He, Herpfer, and Lel, 2023; Degryse, Goncharenko, Theunisz, and Vadasz, 2023; Ivanov, Kruttli, and Watugala, 2023). It is unclear *ex-ante* how a weakening in environmental law enforcement would impact brown credit allocation, and our empirical analysis aims to determine which perspective prevails. On the one hand, a weakening in environmental law enforcement might enable banks to expand lending to economic activities that benefit from weaker environmental oversight. These

businesses could have previously faced credit restrictions due to stricter oversight of forests, such as those in the agribusiness sector, or they may be hesitant to cut ties with existing borrowers in this sector (e.g., Giannetti, Jasova, Loumioti, and Mendicino, 2023). On the other hand, banks could incorporate long-term environmental and reputational risks alongside traditional financial risks in the lending decision-making process. This could signal bank's integrity, reliability, and environmental stewardship, potentially leading to increased long-run value gains (e.g., stakeholder view in Freeman (1984)).

Third, in Brazil, financial credit has been identified as a key factor influencing the Amazon Forest, with agribusiness credit strongly associated with increases in deforestation (e.g., Andersen, 1996; Alvarez and Naughton-Treves, 2003; Hargrave and Kis-Katos, 2013; Assunção, Gandour, Rocha, and Rocha, 2020). The banking sector, holding about two-thirds of the country's financial system assets, plays a crucial role in managing risks arising from unsustainable interactions with nature (e.g., Calice, Diaz Kalan, and Miguel, 2021).[4]

Fourth, focusing on Brazil, a major emerging economy (9th in global GDP in 2023 IMF rankings and largest in Latin America), enables us to avoid cross-country confounding differences and better understand policy implications in a singular, complex context. This approach is particularly pertinent for developing countries like Brazil, where weak rule of law implementation, driven by corruption and influential interest groups, often results in a significant gap between regulations and practical enforcement (OECD, 2018). In such environments, poor law enforcement can undermine the effectiveness of environmental regulations (UN Environment Programme, 2014, 2019). Recognizing the crucial role of environmental enforcement, our study emphasizes its

[4] As recognized in Article 2.1(c) of the Paris Agreement, the financial sector could play a central role in shifting capital investments from fossil fuel-intensive industries towards climate-friendly initiatives to achieve a globally sustainable economy. As recognized in the Article 2.1(c) of the Paris Agreement, financial credit is a key tool to reallocate capital to more environmentally conscious alternatives ((e.g., UNFCCC, 2018; NGFS, 2019; Kacperczyk and Peydró, 2022).

importance, highlighting that firms and banks perceive regulatory risks only when substantial consequences for noncompliance are anticipated. This underscores the challenges of investigating how changes in laws impact financial institutions' behavior in developing countries, where the mere existence of laws does not guarantee effective implementation.

Notably, research on effects of environmental law enforcement like ours is very scarce. Examining the consequences of actual changes in environmental law enforcement, rather than laws alone, is particularly crucial for developing nations like Brazil. These countries heavily rely on natural capital for economic development, exposing them to the risk of irreversible environmental degradation, subsequent crises, and social collapses in the absence of adequate environmental governance (e.g., Combes, Delacote, Motel, and Yogo, 2018; Diamond, 2013). Compromised rule of law and governance quality in such nations also contribute to a lack of accountability for environmental violations. In Brazil, the susceptibility of environmental agencies like IBAMA to political interference heightens corruption risks, leading to significant shifts in financial resource management under different political regimes (Yee, Tang, and Lo, 2016; Abreu, Soares, and Silva, 2022). Considering that BRICS nations collectively contribute 40% of global greenhouse gas emissions, exploring the implications of changes in their environmental law enforcement becomes highly relevant (Liu, Zhang, and Bae, 2017).[5]

To identify the effects of a relaxation in the environmental law enforcement on bank allocation of credit to deforesting industries, we exploit sudden cuts in the environmental oversight personnel of the IBAMA across Brazilian federal states after the election of Jair Bolsonaro in 2019. This constitutes an exogenous shock to environmental law enforcement stringency as

[5] Policymakers in BRICS should not underestimate the long-term consequences of unsustainable growth. Choosing not to act could lead to higher costs arising from mitigating the effects of natural disasters, and could hinder economic growth, especially in developing countries (e.g., Hsiang and Jina, 2014; Strobl, 2011; Anttila-Hughes and Hsiang, 2013; Berger, Karakaplan, and Roman, 2023).

demonstrated by the surprise and uncertainty expressed by major press articles (see Appendix A). Such personnel cuts significantly undermined the ability of the environmental agencies to effectively monitor and enforce the environmental laws.

Utilizing comprehensive administrative records from four distinct sources in Brazil, including granular bank branch financial data, and adopting a panel collapsed at the bank branch level into a single observation per branch covering the changes from the pre-shock (2018) to the post-shock (2019) period, akin to Khwaja and Mian (2008) and Schnabl (2012), we investigate the transmission of the environmental law enforcement shock to the banking sector. Specifically, we analyze the impact on each bank branch's allocation of credit to "brown" agribusiness (agricultural and agro-industrial) industries post the environmental law shock. To enhance identification, we conditionally examine this effect based on municipalities' *ex-ante* deforestation potential. Employing a *quasi*-difference-in-difference model with fixed-effects for banks and federal states, controlling for regional credit demand, we simultaneously conduct within-bank estimations using the branch-level credit data. This empirical strategy mitigates concerns related to demand shocks or unobserved bank characteristics influencing credit reallocation to deforestation-intensive industries.

Our analysis reveals a concerning trend. After the sudden relaxation in the environmental law enforcement in Brazil in 2019, banks tend to prioritize short-term gains and existing “brown” relationships, significantly increasing their share of “brown” credit to agribusiness firms (known to replace Amazonian forests), especially in regions with a higher proportion of land suitable for deforestation. Our evidence is robust to a variety of tests, including alternative dependent variable, alternative estimation techniques, alternative sample composition, and when including competing interaction terms with additional municipality characteristics. Placebo tests in which we assume

the shock occurred three, two, or one year before the actual date yield no significant results. Placebo tests in which we replace bank agribusiness credit (linked to large scale deforestation) with credit to other sectors (not linked to large scale deforestation) do not show positive and significant increases in credit after the shock.

Moreover, our main effects are more pronounced in regions characterized by a significant pre-existing concentration of agro-industrial activities, suggesting a potential shift in perceived returns for agribusiness firms in areas with weakened environmental oversight. This implies a possible change in the anticipated profitability for agribusiness enterprises operating in regions with diminished environmental supervision. We also show that results are more pronounced for banks with a stronger *ex-ante* risk appetite, which are more prone to engage in "brown" loan supply following the weaking of IBAMA enforcement capacities. These results may signal an unexplored tendency among financial institutions to prioritize short-term gains and profitability and overlook long-term transition risks when the climate policy stringency is weakened.

Our findings point to an internal capital markets channel: we conjecture that banks may use internal capital markets to channel resources and support credit supply in regions affected by relaxed enforcement. This aligns with prior research by Houston, James, and Marcus (1997), Bustos, Caprettini, and Ponticelli (2016), Ben-David, Palvia, Spatt (2017), Coleman, Correa, Feler, and Goldrosen (2017), and Becker, Busch, and Tonzer (2021), indicating that Brazilian banks strategically employ internal capital markets to navigate external shocks or policy changes. Using proxies for changes of internal funds from the bank to its branches and branch profitability as dependent variables, our analysis shows that banks engaged in an internal reallocation of capital towards branches of the same bank located in regions with greater availability of forested areas. Thus, internal capital market reallocation to branches able to grasp profitability benefits emerges

as a key channel for our results. The analysis underscores the crucial role of internal capital markets in understanding the observed increase in "brown" agribusiness credit following the reduction in environmental law enforcement.

Another important channel to test is the role of political connections, which prior research including for Brazil finds to be especially rewarding for those firms and areas that provide financial support for the winning officials (e.g., Fisman, 2001; Faccio, Masulis, and McConnell, 2006; Faccio and Parsley, 2009; Leuz and Oberholzer-Gee, 2006; Claessens, Feijen, and Laeven, 2008). Using granular data on political contributions for Brazil we construct measures depicting the campaign contributions for Bolsonaro's party or coalition, we uncover that our main higher "brown" credit results are more pronounced for regions with higher political support for Bolsonaro's party and coalition. Such results suggest that "brown" agrobusiness firms may derive significant benefits from political connections to Bolsonaro's party and coalition after Bolsonaro's election. Thus, we can infer that political connections made through campaign contributions pay off in terms of improved supply of credit to "brown" borrowers.

Finally, several prior studies (mentioned above) find that agribusiness credit is significantly linked to deforestation in Brazil. To address skepticism that such a link may not be present during our sample period, we also conduct a real effects analysis. For this, we use a municipality-level sample (level at which deforestation data is available) as we collapse all data at the municipality-level panel into a single observation per municipality, in the spirit to Khwaja and Mian (2008) as above and use the change in natural forest area from before to after the shock as dependent variable. Using two different methodologies, we confirm that the change in the bank branch share of "brown" agribusiness credit after the shock and/or the weakening of environmental law enforcement are linked to substantial rise in deforestation.

Our study makes several contributions to literature. First, our study adds a distinctive and important perspective to the evolving literature on climate risk, policy, and financial institutions. Previous research (e.g., Correa, He, Herpfer, and Lel, 2023; Degryse, Goncharenko, Theunisz, and Vadasz, 2023; Fuchs, Nguyen, Nguyen, and Schaeck, 2023; Ivanov, Kruttli, and Watugala, 2023) has demonstrated how banks adjust lending decisions in response to environmental considerations, whether through altering loan spreads, probabilities of default, or reallocating credit away from high carbon firms. Similarly, studies like those by Beyene, De Greiff, Delis, and Ongena (2021), Benincasa, Kabas, and Ongena (2022), Degryse, Roukny, and Tielens (2022), Kacperczyk and Peydro (2022), De Haas and Popov (2023), and Giannetti, Jasova, Loumioti, and Mendicino (2023) shed light on various aspects, from the impact of climate policies on banks' effectiveness to cross-border lending practices and the reluctance of banks to alter lending policies due to potential negative effects on existing relationships. In contrast, our work stands out as the first, to our knowledge, to examine the immediate effects of a sudden shift in the enforcement of environmental laws on banks' "brown" credit allocation in Brazil, home to the world's largest tropical forest. Our novel approach fills a crucial gap, offering insights distinct from previous studies that focused on post-regulation adjustments or long-term policy effects. Our examination of the real-time response to environmental law enforcement provides valuable perspectives on the dynamics of banks' “brown” credit allocation in a rapidly changing climate regulatory landscape. Furthermore, our even greater contribution lies in the focus on deforestation, a critical determinant of climate change, previously overlooked in scholarly inquiries

Second, our study contributes to the extensive body of research on law and finance, which highlights the critical role of legal frameworks in shaping economic and financial outcomes. Building on seminal works by La Porta, Lopez-de-Silanes, Shleifer, and Vishny (1997, 1998),

Levine (1999, 2005), Malmendier (2009) and others, we further explore the nexus between law and financial dynamics. Previous studies, such as Bae and Goyal (2009), Haselmann, Pistor, and Vig (2010), Rodano, Serrano-Velarde, and Tarantino (2016), and Ponticelli and Alencar (2016), Schiantarelli, Stacchini, and Strahan, (2020), Heitz and Narayanamoorthy (2021), and Fonseca and Van Doornik (2022) have delved into the impact of legal enforceability on loan structures, bankruptcy laws, and court congestion, respectively. Extending this line of inquiry, our research focuses on repercussions of the changes in enforcement of environmental law (rather than other laws) which is rarely considered, and bank "brown" credit and tangible deforestation outcomes, offering a fresh perspective on the interplay between legal factors and financial and environmental consequences in an emerging economy which is critical for global climate change.

Third, our study significantly enhances the exploration of financial sector and real economy dynamics in Brazil, seamlessly integrating insights from influential works such as Claessens, Feijen, and Laeven (2008), Behr, Norden, and de Freitas Oliveira (2020), Martins, Schiozer, and de Menezes Linardi (2023), and Norden, Mesquita, and Wang (2021), Colonnelli, Lagaras, Ponticelli, Prem, and Tsoutsoura, (2022), and Martins, Schiozer, and de Menezes Linardi (2023). Behr, Norden, and de Freitas Oliveira (2020) highlight the positive correlation between bank credit relationships and employment and wages in Brazilian firms, emphasizing the economic impact of bank credit availability. Martins, Schiozer, and de Menezes Linardi (2023) stress the importance of same-bank lending in supply chain dynamics. Claessens, Feijen, and Laeven (2008) uncover the influence of political connections on Brazilian firms, revealing higher stock returns and increased bank financing for those contributing to elected federal deputies. Colonnelli, Lagaras, Ponticelli, Prem, and Tsoutsoura, (2022) explore the impact of revealing corrupt practices on firms engaged in illegal dealings with the government, and find adaptive responses in firms' growth

strategies, capital investment, and borrowing. Our unique contribution extends this research by investigating how changes in environmental law enforcement in Brazil shape bank credit allocation to deforesting industries and subsequent deforestation outcomes. It adds valuable insights to the understanding of the intricate relationships between financial dynamics and environmental policies in the Brazilian business landscape.

Finally, our study also adds to the literature on political connections and financial outcomes which used cross-country and country-specific political connections and finds that political connections increase firm value for the connected firms, including through preferential access to financing (e.g., Fisman, 2001; Johnson and Mitton, 2003; Ferguson and Voth, 2008; Faccio and Parsley, 2006; Leuz and Oberholzer-Gee, 2006; Claessens, Feijen, and Laeven, 2008) or have real economic outcomes, increasing job creation (e.g., Bertrand, Kramarz, Schoar, and Thesmar, 2004). We complement and add to this research by providing some evidence of the influence of political connections on "brown" credit supply in the Brazilian Amazon. Our political economy analysis underscores the enduring significance of political connections in influencing bank credit provision, even within the context of deforesting industries.

Overall, results of this study have important policy implications and cast doubt on the ability of the financial sector to play a stewardship role in addressing environmental challenges.

The remainder of the paper is organized as follows. Section 2 shows our hypothesis development. Section 3 offers an overview of the environmental law in Brazil and changes in the enforcement that took place over our sample period. Section 4 describes our dataset and identification strategy. Then, Section 5 explains our empirical results. Finally, Section 6 draws conclusions and provides policy implications.

2. Hypothesis development

It is unclear *ex-ante* how a weakening in environmental law enforcement would impact "brown" credit allocation. Our empirical analysis tests which of the following views empirically dominates. On the one hand, according to **Hypothesis 1 (Short-Term Profitability Gains)**, a reduction in the staff responsible for deforestation control might result in an increased share of "brown" agribusiness credit allocated by banks. On the other hand, according to **Hypothesis 2 (Long-Term Value Gains)**, weakened environmental law enforcement may not significantly alter or decrease banks' "brown" credit allocation patterns. The effect of a lowering in environmental law enforcement on banks' credit composition would vary depending on the trade-off banks face between the short-term profitability gains derived from the exploitation of credit opportunities to new agribusinesses and the preservation and/or enhancement of existing lending relationships with "brown" borrowers versus the longer-term value gains inclusive of prudential, regulatory, and reputational risks.

To expand, **Hypothesis 1 (Short-Term Profitability Gains)** suggests that a weakening in environmental law enforcement may increase bank "brown" credit to deforesting firms due to lower compliance costs and higher perceived short-term profitability. Thus, weakening environmental laws could reduce the compliance costs for firms engaged in deforestation and with fewer restrictions, these companies may find it more cost-effective to operate, potentially leading to higher profit margins. Some may also argue that industries linked to deforestation, when unhindered by strict environmental regulations, may experience growth, leading to job creation and overall economic development. This positive economic outlook could make these industries more attractive to investors and creditors. Thus, banks may see an opportunity to extend credit to these firms, anticipating better financial gains from improved relationships with these firms.

Investors and banks focused on short-term gains might be attracted to deforesting industries if they expect a rapid increase in profits due to reduced regulatory burdens. This perception of quick returns could lead to increased credit availability for deforesting firms as financial institutions seek to capitalize on what appears to be a lucrative opportunity.

Conversely, **Hypothesis 2 (Long-Term Value Gains)** suggests that a weakening in environmental law enforcement can also decrease bank "brown" credit to deforesting firms due to increased perceived reputational risks and other long-term economic and prudential risks for banks. Weakening environmental laws in support of deforestation could expose banks to significant reputational risks. As public awareness of environmental issues grows, there is an increasing demand for ethical and sustainable business practices and banks associated with deforesting-intensive industries may face backlash from environmentally conscious depositors, investors, and borrowers leading them to reconsider providing credit to such firms. In addition, banks must consider also long-term economic sustainability and regulatory risks. Weakening environmental laws may contribute to long-term environmental degradation, climate change, and legal challenges. Banks assessing the long-term viability of their investments may hesitate to provide credit to industries that could face increased regulations or legal consequences related to climate risk in the future. Moreover, banks that incorporate long-term environmental and reputational risks alongside traditional financial risks in the lending decision-making process may enhance stakeholder's view of bank's integrity, reliability, and environmental stewardship, potentially leading to increased value gains in the long run. It is important to emphasize that sustainable practices and ethical considerations are now becoming integral components of decision-making for many financial institutions around the world.

3. Environmental law and its enforcement in Brazil

The foundation of the Brazilian environmental law system is the **Brazilian Forest Code (Lei 12.651/2012)**, governing landowners' responsibilities related to forest conservation, legal reserves, and environmental licensing. The initial effort to combat deforestation emerged in 1989 with the "Nossa Natureza (Our Nature)" program. Subsequently, the 2004 initiative, "Action Plan for the Prevention and Control of Deforestation in the Legal Amazon (PPCDAm)," introduced additional legal procedures for the management and control of the Brazilian Amazon Forest. Its intended objective was to promote the sustainable use of the land for economic and infrastructure development; and dictated the legal procedures regarding monitoring and control of deforestation; environmental licensing and fining, and on-the-ground law enforcement. However, in 2012, the PPCDAm dictated a revision of the Brazilian Forest Code to grant amnesty for all illegal deforestation before 2008 (West and Fearnside, 2021). This clearly exemplifies the ease with which environmental laws can be dramatically altered depending on the influence of the Brazilian political regime, consequently contributing to the likely increased perception of impunity among land grabbers. [6] Nonetheless, in December 2015, Brazil signed the Paris Agreement at COP 21 of the UNFCCC under which the country committed to achieving zero illegal deforestation in the Amazon by 2030.[7]

One of the main strategies adopted in Brazil to combat illegal deforestation has been the use of punitive power of the state and the imposition of administrative fines (Mendes, 2021). This

[6] As stated by Fearnside (2023): "Brazil is probably the only country in the world where one can invade government land, deforest, and expect to obtain a land title…Making illegal deforestation legal may fulfil Brazil's promise to end illegal deforestation by 2028".

[7] Regarding the Brazilian environmental laws that have directly affected the financial system, since 2008 Brazil has implemented some voluntary (e.g., the Green Protocol) and other mandatory guidelines for banks to deal with social and environmental risks. The Green Protocol fosters the provision of financial credit to promote the population's quality of life and sustainable use of the environment; and commit participating banks to consider the impacts and environmental costs in managing assets (Oyegunle and Weber, 2015). Moreover, the Central Bank of Brazil, under resolution N.4.327, requires banks to establish procedures for identification, classification, monitoring, and mitigation of socio-environmental risks.

strategy has been supported by a solid environmental enforcement structure, largely overseen by the **Brazilian Institute of Environment and Renewable Natural Resources (IBAMA)**. Established in 1989, IBAMA is a federal agency responsible for enforcing environmental policies and regulations. It operates under the Ministry of the Environment and plays a crucial role in monitoring, licensing, and combating illegal activities that threaten the Amazon rainforest. The institute employs a combination of field agents, inspectors, and technical experts to carry out its mission. On-the-ground enforcement is carried out by armed IBAMA staff that physically oversee the Amazon land.

Prior to 2019, there was a significant emphasis on environmental protection and law enforcement in Brazil. However, Following Jair Bolsonaro's election as president of Brazil in 2019, there were significant shifts in environmental policy with direct implications for environmental law enforcement. There were significant reductions in staff and resources allocated to environmental agencies, including IBAMA (Peres, Campos-Silva, and Ritter, 2022). Moreover, this new administration openly questioned Brazil's commitment to the Paris Agreement and expressed a desire to expand regional infrastructure, agricultural activities, and mining operations with limited consideration for indigenous rights and existing environmental regulations (e.g., Escobar, 2018; Tollefson, 2018). This shift triggered international attention and raised questions about Brazil's commitment to combating deforestation and addressing climate change. In summary, the changes in climate law enforcement in 2019 had severe consequences for the Brazilian Amazon Forest, leading to increased deforestation, threats to indigenous communities, and a negative impact on global climate efforts. Our study points to important consequences from the banking sector perspective.

4. Data and empirical approach

4.1 Data and sample

We build an empirical setting aimed at identifying the effect of a weakened enforcement of environmental laws – as proxied by the sudden reduction in IBAMA's staff following the inauguration of the Bolsonaro administration in January 2019 – on the share of "brown" agribusiness credit supplied by bank branches at the municipal level in Brazil.

The empirical setting is based on the combination of four different sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008) and Schnabl (2012). We collapse observations for each bank branch over the two periods of pre (2018) and post the environmental law shock from the Bolsonaro's presidential inauguration (January 2019) and use the change between periods in bank share of "brown" agribusiness credit and environmental oversight personnel as key variables for the analysis. We provide more details on our data approach below.

First, as mentioned, our analysis is based on measuring changes in branches' credit exposure to the agriculture sector between 2018 and 2019, considering the inauguration of the Bolsonaro administration in January 2019 as our event of interest. As of 2018, Brazil had 5,570 municipalities, out of which 3,364 reported hosting at least one bank branch. These branches operate in all 27 federal states across Brazil. We collected data on the universe of Brazilian bank

branches at the municipal level from the ESTBAN (Estadistica Bancaria Mensal por Municipio) database published by the Central Bank of Brazil (BCB). Since we cannot distinguish between different offices of a given bank within a municipality, the definition of a bank branch should be considered as the consolidated assets and liabilities held by a bank within a municipality. This source has been previously used, for instance, to explore questions about the transmission of domestic and foreign liquidity shocks to Brazilian municipalities in different settings (e.g., Coleman and Feler, 2015; Bustos et al., 2016; Noth and Ossandon Busch, 2021). We combined this data with information on banks' call reports containing balance sheet and income statements at the bank group level.

We manually construct an identifier to connect each branch to its corresponding bank. While 208 banks reported being active in Brazil as of 2018, most of them were concentrated in the investment banking sector, lacking a network of regional branches which are our main unit of interests. For example, only 56 banks reported more than one active branch as of 2018. We begin with a sample of 9,806 branches active as of 2018 and introduce three sample restrictions to align the sample with the identification strategy. First, we restrict the sample to 9,361 branches active throughout 2018 and 2019, avoiding the results being influenced by branches entering or exiting the market. Second, we restrict the sample to 5,048 branches that reported active outstanding credit balances in the agricultural sector as of 2018. Finally, we drop the metropolitan areas of Sao Paolo and Rio de Janeiro from the sample, as these regions represent financial centers with little exposure to agriculture activity. Moreover, most banks are headquartered in these regions. With this restriction, the final sample consists of 3,909 branches operating in 2,093 municipalities and belonging to 20 banking conglomerates. Each bank reports branches operating, on average, in 179 municipalities.

We next merge the branch-level data with an administrative record of the staff employed by IBAMA, the Brazilian Institute of the Environment and Renewable Natural Resources, in each Federal State. These data are collected from yearly reports published by the Brazilian Ministry of Finance. The cut in IBAMA's budget and personnel during the Bolsonaro administration became a matter of heated public debate in Brazil. The agency was assigned in 2019 with a budget that was nominally 28 percent shorter than in 2007, the year when it got assigned its largest historical budget. Its staff went from 11,971 as of 2007 to only 8,704 in 2019, completing a decrease of 27 percent.

While IBAMA's approved budget for 2019 slightly increased compared to the electoral year of 2018, the main impact of the newly elected government came through a drastic cut in the budget's execution, which only in its payroll decreased from 91 percent in 2018 to 56 percent in 2019 (see Figure 1). In 2019, the budget assigned to new investments in enforcement capacities had an execution of only 4 percent. Mirroring this figure, IBAMA's staff decreased by 6.8 percent on a yearly basis in 2019, mainly affecting large federal states exposed to deforestation. For instance, the staff decreased by 20 percent in the state of Amazonia and by 15 percent in the states of Mato Grosso do Sul and Tocantins. Official records suggest that this cut in budget and personnel had material consequences for IBAMA's enforcement capacities. For instance, the number of sanctioning processes due to environmental law violations decreased by 50.6 percent between 2018 and 2019, while only 16 percent of the budget assigned to on-site inspections and fire-control measures was executed (Werneck, Angelo, and Araujo, 2022). The local and international press presented this scenario as a dismantling of environmental law enforcement capacities, raising concerns about the consequences for the preservation of the Amazon ecosystems (see, e.g., The Economist, 2019). Against this backdrop, the deforestation in the Amazon region increased by 49

percent only during the first year of the Bolsonaro administration compared to 2018, while the number of fires recorded in the Amazon – associated with deforestation practices - increased by 52 percent (INPE, 2023).

For our identification strategy, we rely on information on IBAMA's staff at the federal state level. Figure 2 illustrates the percentage change in IBAMA's staff in each of the 27 federal states in Brazil. Between 2018 and 2019, 20 federal states reported a decrease in IBAMA's staff, with an average decrease across affected regions of 6.2 percent. Out of the five more affected federal states, four were within the so-called Legal Amazon, a region of nine federal states in the northwest of Brazil. These regions reported an average decrease in IBAMA's staff of 14 percent on a yearly basis.

Finally, we complete our data with an administrative record of each municipality's geographical area reported being used for agriculture, forestry, or kept as natural rainforest environment. This record is obtained from the Brazilian Annual Land Use and Land Cover Mapping Project (Mapbiomas). This source provides information on the yearly shares of land use per municipality for the years 1985 through 2021. We use this information to compute the share of natural environment to total area per municipality as of 2018. As explained below, we use this variable to assess the municipal area available to be deforested per municipality, proxying for the extent to which the decrease in IBAMA's staff may have had an impact on firms' incentives to increase the areas intended for agriculture and related activities.

4.2 Identification strategy

In Eq. (1), we estimate the effect of the change in IBAMA's staff within federal states on the change in branches' share of outstanding "brown" (agribusiness) credit to total credit by branch *i* in municipality *j*, from 2018 to 2019:

$$\Delta\, AG\ Credit_{i,j,(18-19)} = \beta_1\left(\Delta\, IBAMA_{j,(18-19)} \times Av\ Forest_{\ j,\,2017}\right) + \mu_{uf} + \delta_i + \epsilon_{i,j} \qquad (1)$$

Our key dependent variable is the change in the share of agribusiness credit (Δ*AGCredit*) (loans to agriculture and agro-industrial activities linked to large-scale deforestation) from 2018 to 2019. β_1 is our coefficient of interest and measures the effect of the interaction between our key independent variables: *Av Forest*, which measures the percentage of available forest (forest area in km^2/total area km^2) in municipality (*j*) in 2017 and $\Delta\ IBAMA$, which is the growth rate in IBAMA's staff in each federal state from 2018 to 2019. We expect $\beta 1$ to be negative, which would suggest that a higher percentage of forest availability, combined with the sudden decrease in IBAMA staff, might have incentivized banks to provide more credit to "brown" (agro-industrial) activities. The *IBAMA* variable is only available at the federal state level. Thus, we add the share of forestry area per municipality to narrow-down the estimation at the municipality-level. Furthermore, we collapse the sample between the pre/post periods to avoid concerns of serial correlation biases (and cluster standard errors at the bank level). This means that bank FE are *quasi*-bank-time FE, allowing for a within-bank estimation. Therefore, we may find that the same bank could increase more its credit in certain regions, depending on the IBAMA staff levels. Additionally, the interaction with "*Av Forest*" serves two purposes: it allows narrowing-down the estimation at the municipal level, and it sheds light on the mechanism in place (banks may take advantage of a weaker law enforcement mostly in regions where there is more available area to deforest). Moreover, μ_{uf}, federal-state FE, allows controlling for demand effects; given the collapsed panel, they resemble region-time FE; and δ_i control for bank fixed effects. While $\varepsilon_{i,t}$ represents a white-noise error term.

We use the identification strategy outlined above to estimate the change in branches' share of outstanding credit to the agricultural sector between 2018 and 2019, as a function of the change (in percent) of the IBAMA staff allocated in each federal state. Thus, we conjecture that a weakening in environmental law enforcement stringency – as proxied by the reduction in IBAMA staff– may have induced banks to expand credit supply in sectors that could benefit from a weakened enforcement capacity. The intuition is that banks could price in growth possibilities in the agribusiness sector, particularly if firms benefit from the acquisition of land in regions with larger available areas to be deforested.

Eq. (1) illustrates our baseline estimation. We focus our analysis on an interaction term between the change in IBAMA staff (measured at the federal-state level) and the share of a municipalities' area covered by forest as of 2017 (measured at the municipality level) to account for the fact that the growth opportunities derived from the lack of law enforcement could be better grasped in the presence of large areas available for deforestation. A negative coefficient $\beta 1$ would therefore imply that for municipalities with large available forest areas, the decrease in IBAMA staff may represent a stronger signal for growth possibilities in the agribusiness sector, leading to an increase in banks' exposure to agribusiness firms after 2019.

A concern when estimating Eq. (1) is that the change in IBAMA's staff can be a function of regional characteristics. For instance, the government may decide to reduce law enforcement capacities in regions that are politically aligned, or where economic growth through forest exploitation is already a trend. Moreover, the potential increase in branches' exposure to the agribusiness sector could reflect banks' own business models or trends in local credit demand, that happen to be spuriously correlated with the change in IBAMA's staff.

Our approach to addressing these endogeneity concerns is threefold. First, we exploit the fact that the change in IBAMA's staff was triggered by Bolsonaro's inauguration in January 2019, an electoral result that is arguably exogeneous from each individual municipality's perspective. The sizable decrease in IBAMA's capacities was also not chosen at the municipality level, since IBAMA had only a few regional offices mostly concentrated in the federal states' capitals.

Second, and as it is conventional in other *quasi*-experimental settings in the empirical banking literature (see, e.g., Khwaja and Mian, 2008; Schnabl, 2012), we use this exogeneous change in enforcement capacity to estimate a *quasi*-difference-in-difference model in which we collapse the branch-level panel into a single observation per branch. We adopt this procedure to avoid concerns of biased standard errors due to autocorrelation (Bertrand, Duflo, and Mullainathan, 2004). Moreover, this approach facilitates the interpretation of Eq. (1) since aggregated time trends and banks' unobserved time-invariant characteristics do not affect the results after having first differentiated the main variables of interest. We account for the fact that the standard errors can still be correlated across branches of the same bank by clustering standard errors at the bank level. While the control variables mentioned below are computed as 2017 averages from the underlying monthly data, the change in the share of agricultural credit and the percent change in IBAMA's staff are computed from 2018 and 2019 monthly averages.

Third, we are further tightening the identification by saturating the *quasi*-difference-in-difference model with federal state and bank fixed effects. By introducing the interaction term with municipalities' share of forest area in Eq. (1), we do not only shed light on an underlying plausible mechanism linking weak law enforcement and agricultural credit but also allow for the use of federal state fixed effect that capture unobserved variation across branches that could be attributed to varying credit demand trends between 2018 and 2019. That is, we interpret $\beta 1$ as a supply-

driven effect of changes in environmental law enforcement on credit. Still, a further concern is that unobserved changes in banks' business models could affect the estimation, as banks more prone to expand in the agribusiness sector could also be more active in regions that face a stronger reduction in law enforcement. The introduction of bank fixed effects in Eq. (1) reduces this omitted variable concern. In fact, we estimate Eq. (1) as a within bank estimation, in which we compare branches of the same bank that share the same characteristics of their banking conglomerate including, for instance, changes in a bank's business model that are contemporaneous to Bolsonaro's election.

Finally, we also add a vector of control variables capturing branches' characteristics. While bank characteristics are subsumed within the bank fixed effects, branch characteristics such as their size, deposit base, or profitability, may further explain an expansion of credit to agribusiness firms. We add branches' size (log assets), liquidity (liquid-to-total assets ratio), profitability (return on assets), and deposit ratio (the ratio of deposits to total liabilities) as controls across all specifications. These variables are computed as 2017 averages from the monthly underlying data. Table 1 reports the variables' description and the summary statistics on means, standard deviations, minimum and maximum values, and number of observations on all the regression variables.

We address more specific identification concerns in a series of robustness tests reported below. For instance, we estimate placebo tests with alternative event time windows, and we test the validity of the findings when introducing competing interaction terms in Eq. (1) between the change in IBAMA's staff and other regional characteristics including, for instance, the political alignment between federal states and the Bolsonaro administration.

4.3 Parallel Trends Analysis

As it is conventional in difference-in-difference applications, we test the validity of the parallel-trends assumption. Figure 1 plots the evolution over time of the simple average change in the share of agribusiness loan growth *(*Δ *AGCredit*) that we use in our baseline analysis for branches located in regions with a large vs. small "*deforestable*" area (affected and not-affected, respectively) over 2018 to 2020. Figure 1 shows that prior to 2019 before the shock in environmental law enforcement, bank branches provided on average lower agribusiness credit or shows a roughly similar trend in credit growth to large vs small "*deforestable*" areas, but this reverses after the law enforcement shock. The aggregate movements in bank agribusiness credit growth for large vs. small "*deforestable*" area provide some preliminary evidence consistent with the empirical domination of a short-term profitability shift of banks that we alluded to above. The figure also suggests that the parallel trends assumptions are not violated for agribusiness loan growth. Of course, these aggregate trends are only mildly suggestive, can only show simple differences and neither show individual bank branch behavior nor include control variables. In the next section, we investigate our question more rigorously in our *quasi*-difference-in-difference model, controlling for different demand and supply factors and addressing identification concerns.

5. Empirical results

5.1 Baseline results

Our main evidence is presented in Table 2. The baseline specification (in column 2) shows a negative coefficient for the interaction term ($\Delta IBAMA_{j,(18-19)} \times Av\ Forest_{j,2017}$). The sign, and the economic and statistical significance remains stable when controlling for different fixed effects and adding branch controls. This result confirms our hypothesis, suggesting that a decrease

on the IBAMA staff, right after the election of Jair Bolsonaro as president in 2019, incentivized banks to increase the share of "brown" agribusiness credit.

Figure 2 presents the marginal effects at a 95th percent confidence level of changes in the number of IBAMA's staff on the proportion of agro-industrial credit across the distribution of municipalities' share of forestry available area. These estimates are derived from our baseline model specified in Eq (1) and suggest that a one-standard deviation decrease in IBAMA's personnel growth rate (5 percentage points) is associated with a 35 basis points increase in the share of agribusiness credit for branches located in municipalities with approximately 70% of *ex-ante* available area to be deforested. This effect represents approximately 35% of the average change in branches' share of agribusiness credit, which is economically meaningful.

5.2 Agricultural versus agro-industrial credit

We also study the effects of the sudden change in IBAMA staff affect the agribusiness credit, looking separately at its two key components: agricultural credit and agro-industrial credit. The agricultural credit represents the ratio of loans to finance crop cultivation to total loans; while the agro-industrial credit represents the share of loans to enterprises involved in processing, manufacturing, and value addition within the agricultural sector, to total loans. It primarily encompasses activities that convert raw agricultural products into food products related to agriculture. This distinction is made to identify whether a particular agribusiness explains the increase in total agribusiness credit after the weakening in the environmental law enforcement.

Table 3 reports the estimates for a sudden relaxation in environmental law enforcement (Δ IBAMA) in both agricultural and agro-industrial credit. Columns (1) and (2) report the estimation results for the change in the share of agricultural credit. Columns (3) and (4) report the estimation results for the change in the share of agro-industrial credit. These results suggest that agricultural

credit is the driving force behind the increase in agribusiness credit following the relaxation of environmental law enforcement. This indicates that the effects are concentrated in the agriculture sector (farming and crop cultivation) which directly involves deforestation during the growth process. In contrast, the effect of the drop in IBAMA staff is not significant for the agro-industry credit. These results provide supporting evidence for our main hypothesis, suggesting that a reduction in the staff responsible for forest oversight is fostering increased credit for activities with a higher deforestation impact.

5.3 Ex-ante agro-industrial importance

Additionally, we conduct a heterogeneity analysis to assess to which extent the effects of a weakening in the environmental law enforcement differ across municipalities with large versus small shares of agricultural land. Table 4 compares our baseline estimation results to those from different sample splits. Columns (2) and (3) show estimation results for the sample split depending on the *ex-ante* agricultural physical area extension (larger vs. lower than the median). Columns (4) and (5) report the results for an *ex-ante* agricultural specialization split sample. We compare then entities located in municipalities with a level of higher versus lower than median *ex-ante* agricultural production (Column (4)). We find that after the decrease in IBAMA's staff which significantly weakened climate law enforcement in Brazil (after the presidential election in 2019) led banks to increase their share of "brown" (agro-industrial) credit particularly in regions with larger "*deforestable*" areas. The effect is higher in regions with a strong *ex-ante* intensity of agro-industrial importance, both in amount of agricultural area and in agricultural output level.

5.4 Bank and branch traits

We expand our baseline model (Eq. 1) by introducing an additional factor related to bank branch characteristics (*Bank Trait*) into our main interaction term, resulting in a triple interaction model

($\Delta IBAMA_{j,(18-19)} \times Av\ Forest_{j,2017} \times Bank\ Trait$). The considered branch traits are size (log assets), deposit to asset ratio, liquidity to asset ratio and profit to assets ratio in 2017. The outcomes of this extended model are detailed in Table 5. Our estimates suggest that larger entities and those with higher risk appetite experience a higher increase in agribusiness credit following the weaking of the environmental enforcement capacities.

This reaction is also reflected in an internal reallocation of capital towards branches of the same bank in regions with more areas of forest available, as shown in Table 6. This table shows the results of estimating Eq. (1) for different dependent variables defined as the change in the share of internal liabilities to assets (vis-à-vis the branch's bank) using a narrow and an extended definition. The narrow definition considers only intra-bank credits, whereas the extended definition adds intra-bank deposits.

5.5 Internal capital markets reallocation analysis

Our main result suggests that within a bank, those branches located in regions where IBAMA's enforcement capacities decreased the most increase their exposure to agriculture to a larger extent. This finding can reflect a change in the expected returns – as perceived by banks – of agribusiness firms that can now expand their operations in previously protected areas. Thus, a plausible conjecture is that banks may channel liquidity through internal capital markets to support the supply of credit by branches that are geographically closer to agribusiness firms in weakly-enforced areas. This hypothesis builds on the notion that branches are restricted from raising deposits – their main source of funding – within the municipalities where they operate. Given this friction, exploiting a sudden shift in the expected return of loans to agribusiness firms will arguably require mobilizing resources from other branches affiliated to the same banking conglomerate.

The possibility that banks in Brazil may seize the opportunity of productivity shocks by shifting liquidity across regions has been previously discussed in related literature. Bustos, Caprettini, and Ponticelli (2016) shows, for instance, that productivity gains in the soy-beans industry led by technological changes created incentives for banks to reallocate financial resources to agriculture-intensive regions. Moreover, Coleman, Correa, Feler, and Goldrosen (2017), and Becker, Busch, and Tonzer (2021) show that Brazilian banks actively use internal capital markets within the country to adjust to foreign financial shocks or domestic changes in the stance of macroprudential policies, respectively. In our setting, finding traces of shifts in internal capital markets because of the reduction in IBAMA's law enforcement capacities would further corroborate that banks' reaction to this changing policy is driving our results.

To shed light on the dynamics in internal capital markets following the decrease in IBAMA's law enforcement capacities, we adjust Eq. 1 by replacing the dependent variable by the log change in the average monthly balances of internal liabilities between 2018 and 2019. In this exercise, we use two definitions of internal liabilities. First, a narrow definition that considers only interbank liabilities vis-à-vis the same banking conglomerate to which a branch belongs; and second, a broad definition equal to the sum of interbank deposits plus the former variable. While for the case of interbank deposits we cannot distinguish whether their origin lies inside the same banking conglomerate of a given branch, we would expect a sizable share of those deposits to be internal considering that bank branches outside the financial centers of Rio de Janeiro and Sao Paulo arguably lack operational independence to conduct interbank business operations.

Table 6 reports the results of this estimation. The results confirm that internal capital markets reacted to the decrease in IBAMA's environmental enforcement capacities, with liquidity flowing into branches that were in a better position to grasp the benefits of an expansion in the

agribusiness sector. Columns 1 and 2 on Table 6 illustrate the results for the narrow definition of internal liabilities. Following a decrease in the growth rate of IBAMA's personnel by 8 percentage points (a one standard deviation shift), branches located in municipalities at the 75th percentile of the distribution of natural forest area reported a 0.4 percentage points larger growth rate of internal liabilities compared to other branches of the same bank. This differential effect corresponds to 12 percent of a standard deviation in the growth rate of internal liabilities between 2018 and 2019. The results are robust to our alternative broad definition of internal liabilities, in which case the effect reports a similar order of magnitude (columns 3 and 4). We thus conclude that the documented increase in agribusiness credit following weaker environmental law enforcement policies was fueled by a sizable shift of liquidity through internal capital markets across Brazil. The fact that banks react by activating internal liquidity channels is reassuring about the interpretation of the main results as driven by a reallocation of bank activities across regions following weaker law-enforcement policies.

5.6 Political economy analysis

Previous research has shown that firms contributing to electoral campaigns can disproportionally benefit from policies implemented by newly elected governments as discussed in Introduction. For the case of Brazil, Claessens Feijen, and Laeven (2008) provide evidence on how firms contributing to winning political candidates report larger stock returns and expand their access to bank finance by more than other firms. This indication of rent-seeking in the market for campaign donations can matter for our results. Even if the effect of a weaker environmental law enforcement holds, the way this relaxation in law affects firms may depend on local authorities' decision to reallocate the fewer law enforcement resources out of regions in which politically aligned firms

operate. We next explore this question by examining whether the baseline effect remains in place in regions that differ in terms of their political alignment with the Bolsonaro administration.

We use donation-level data for Brazil's federal election of 2018 to construct measures of regions' political alignment with the Bolsonaro administration. Using administrative records available at the Brazilian High Electoral Court (Tribunal Superior Electoral), we identify firms and individuals that in the run-up to the 2018 election donated funds to candidates from the Social Liberal Party (PSL), Bolsonaro's party of affiliation. Alternatively, we also identify firms and individuals donating to any of the parties that formed Bolsonaro's coalition. Armed with these data, we compute the share of total electoral contributions within a federal state that went to the PSL party or to any of Bolsonaro's allied parties in each region. We then split the sample of federal states according to the median of the share of Bolsonaro-supporting contributions and estimate Eq. 1 separately for regions in which the financial support to the candidate's coalition was large vs. small. We conjecture that the pass-through of lower resources for environmental law enforcement to credit may have benefited politically-aligned regions the most, in which rent-seeking firms expect a retribution to their political support.

Table 7 shows our results. When considering the share of donations channeled to the PSL party, we find that the results hold only for the subsample of federal states reporting large contributions to Bolsonaro's party (column 1), whereas federal states reporting relatively little financial support to Bolsonaro's campaign do not report a statistically significant increase in credit following the reduction in IBAMA's staff. Interestingly, we observe a significant increase in the size of the estimated coefficient $\beta 1$ in column 1 compared to our baseline specification. This result is in line with the notion that the reduction in law enforcement did not benefit all regions equally,

likely reflecting a complex political economy dynamic in which contributing firms grasp the benefits of a weaker enforcement capacity to a larger extent.

5.7 Robustness tests

To mitigate identification concerns, we undertake several additional robustness checks. First, in Table 8 we show the estimates of our baseline model employing different specifications. In columns (2) and (3), the dependent variable is the log change in agribusiness credit from 2018 to 2019. In column (4) of Table 8 we drop the metropolitan regions, including all capital municipalities per state, to check that our results are not driven by those. In column (5) we replace the federal state fixed effects with micro-region fixed effects. These level of region aggregation group statistical units of approximately 3.5 municipalities on average with similar economic characteristics. All these specifications corroborate our main results.

Then, we perform placebo experiments to address concerns about the potential influence of alternative factors other than the sudden weakening of the environmental enforcement capacities that may explain the increase in agro-industrial credit. Table 9 shows the placebo results in which we estimate our main specification for different time periods. Therefore, this empirical evidence confirms that of our main results are not driven by spurious explanations.

Lastly, we undertake a comprehensive horse-race test to assess the extent to which the observed increments in agribusiness credit can be attributed to factors beyond the scope of agribusiness. Specifically, our objective is to discern whether macroeconomic or bank business-related characteristics may contribute to increases in agribusiness credit. We introduce a competing interaction term between the change in IBAMA and various municipality characteristics. These include key factors such as the log of the municipal GDP, population, total bank assets, GDP per capita, and the proportion of agroindustrial activities relative to the total GDP. Results are

presented in Table 10 and suggest that none of the afore-mentioned municipality characteristics explain the increases in “brown” agribusiness credit.

6. Conclusions

Our study offers a unique empirical exploration into the intricate dynamics between environmental law enforcement and the allocation of “brown” credit by banks, using Brazil as a laboratory. Positioned as a significant emerging economy and housing the largest forest globally, Brazil serves as a focal point for climate change mitigation, making our investigation into the interplay between environmental policies and bank credit allocation especially pertinent. By concentrating on one pivotal country, we circumvent the potential distortions introduced by cross-country variations, providing a more focused and nuanced analysis. Our unique identification strategy leverages an exogenous shock – a substantial reduction in environmental police staff at IBAMA post-Bolsonaro's 2019 election – to unveil the impact of altered environmental law enforcement on bank credit to agribusinesses involved in deforestation in the Brazilian Amazon.

Using comprehensive data on bank branches and deforestation in Brazil and a *quasi*-difference-in-difference methodology, our study delves into the banks’ trade-off decisions between short-term profitability gains and the consideration of longer-term value, encompassing prudential, regulatory, and reputational risks. The results illuminate a concerning trend: a relaxation in environmental law enforcement, exemplified by a sudden decrease in IBAMA staff after the 2019 presidential election, corresponds to a notable surge in banks' allocation of "brown" (agribusiness) credit, especially in regions conducive to deforestation. Notably, banks displaying a higher pre-existing risk appetite are more inclined to lend to deforesting-intensive industries. These findings underscore a potential prioritization of short-term gains over long-term value and regulatory considerations by banks, contributing to the persistence of deforestation and its associated

environmental and social ramifications. The influence of political connections on “brown” credit supply is accentuated in areas with stronger political support for Bolsonaro’s coalition, highlighting the role of political connections in “brown” credit supply. Additionally, our analysis identifies internal capital market reallocation to branches able to grasp profitability benefits as a pivotal channel, with real effects confirming the consequential link between increased “brown” credit supply and substantial deforestation.

The findings of our study carry crucial policy implications, shedding light on the intricate interplay between environmental law enforcement, banking decisions, and deforestation in the Brazilian Amazon. Despite the existence of environmental laws, our research underscores the need for a more nuanced understanding of their impact on banks' consideration of climate risks. The observed trend, where banks prioritize short-term gains by significantly increasing credit to agribusinesses involved in deforestation, is a cause for concern. This suggests a potential misalignment between financial incentives and the broader societal goals of environmental conservation. Policymakers may take note of the importance of robust and consistently enforced environmental regulations, considering the broader implications of weak enforcement on deforestation, climate risks, and the financial sector's role in sustainable development. Addressing these issues requires a careful balancing act, ensuring that financial institutions are incentivized to consider the longer-term value gains, including prudential, regulatory, and reputational risks, in their credit allocation decisions. Furthermore, understanding the implications of climate policy stringency on credit is of paramount importance, particularly in the context of developing countries like the BRICS countries. While politicians in these countries may be tempted to prioritize short-term economic growth regardless of environmental implications, it could be more costly to later confront the long-term consequences of climate change and repay the growth achieved by dealing

with more frequent and higher in magnitude natural disasters. Thus, the implications of this research extend to global efforts to understand effects of and combat climate change.

References

Alvarez, N. L., and Naughton-Treves, L., 2003. Linking national agrarian policy to deforestation in the Peruvian Amazon: A case study of Tambopata, 1986–1997. *AMBIO*: *A Journal of the Human Environment* 32(4), 269-274.

Andersen, L.E., 1996. The causes of deforestation in the Brazilian Amazon. *Journal of Environment and Development* 5, 309-328.

Anttila-Hughes, J. K., Hsiang, S. M., 2013. Destruction, disinvestment, and death: economic and human losses following environmental disaster. Working Paper.

Assunção, J., Gandour, C., Rocha, R., and Rocha, R. (2020). The effect of rural credit on deforestation: evidence from the Brazilian Amazon. *The Economic Journal* 130, 290-330.

Bae, K.H. and Goyal, V.K., 2009. Creditor rights, enforcement, and bank loans. *Journal of Finance* 64, 823-860.

BCBS, 2023. Disclosure of climate-related financial risks. November 2023. At: https://www.bis.org/bcbs/publ/d560.htm#:~:text=The%20Basel%20Committee%20on%20Banking,to%20the%20global%20banking%20system.

Becker, C., Busch, M.O. and Tonzer, L., 2021. Macroprudential policy and intra-group dynamics: The effects of reserve requirements in Brazil. *Journal of Corporate Finance* 71, 102096.

Behr, P., Norden, L. and de Freitas Oliveira, R., 2022. Labor and finance: the effect of bank relationships. *Journal of Financial and Quantitative Analysis*, 1-24, forthcoming.

Ben-David, I., Palvia, A. and Spatt, C., 2017. Banks' internal capital markets and deposit rates. *Journal of Financial and Quantitative Analysis* 52, 1797-1826.

Benincasa, E., Kabas, G., and Ongena, S., 2022. There is no planet B, but for banks there are countries B to Z: Domestic climate policy and cross-border lending. Working Paper.

Berger, A. N., Karakaplan, M. U., & Roman, R. A., 2023. *The economic and financial impacts of the COVID-19 crisis around the world: Expect the unexpected*. 1st Edition. Academic Press.

Bertrand, M., Duflo , E., and Mullainathan, S., 2004. How much should we trust differences-in-differences estimates?, *Quarterly Journal of Economics* 119, 249-275.

Bertrand, M., Kramarz, F., Schoar, A., and Thesmar, D., 2004. Politically connected CEOs and corporate outcomes: Evidence from France. Working Paper.

Beyene, W., De Greiff, K., Delis, M. D., and Ongena, S., 2021. Too-big-to-strand? Bond versus bank financing in the transition to a low-carbon economy. Working Paper.

Bolton, P. and Kacperczyk, M., 2021. Do investors care about carbon risk?. *Journal of Financial Economics* 142, 517-549.

Bustos, P., Caprettini, B. and Ponticelli, J., 2016. Agricultural productivity and structural transformation: Evidence from Brazil. *American Economic Review* 106, 1320-1365.

Calice, P., Diaz Kalan, F., and Miguel, F., 2021. Nature-related financial risks in Brazil. World Bank Group. Policy Research Working Paper 9759.

Choi, D., Gao, Z. and Jiang, W., 2020. Attention to global warming. *Review of Financial Studies* 33, 1112-1145.

Claessens, S., Feijen, E. and Laeven, L., 2008. Political connections and preferential access to finance: The role of campaign contributions. *Journal of Financial Economics* 88, 554-580.

Coleman, N., Correa, R., Feler, L. and Goldrosen, J., 2017. Internal liquidity management and local credit provision. FRB International Finance Discussion Paper 1204.
Coleman, N., Feler, L. (2015). Bank ownership, lending, and local economic performance during the 2008-2009 financial crisis. *Journal of Monetary Economics* 71, 50–66.
Colonnelli, E., Lagaras, S., Ponticelli, J., Prem, M. and Tsoutsoura, M., 2022. Revealing corruption: Firm and worker level evidence from Brazil. *Journal of Financial Economics* 143, 1097-1119.
Combes, J. L., Delacote, P., Motel, P. C., and Yogo, T. U., 2018. Public spending, credit and natural capital: Does access to capital foster deforestation?. *Economic Modelling* 73, 306-316.
Correa, R., He, A., Herpfer, C. and Lel, U., 2023. The rising tide lifts some interest rates: Climate change, natural disasters and loan pricing. Working Paper.
De Haas, R. and Popov, A.A., 2023. Finance and carbon emissions. *The Economic Journal* 133, 637-668.
Degryse, H., Goncharenko, R., Theunisz, C. and Vadasz, T., 2023. When green meets green. *Journal of Corporate Finance* 78, 102355.
Degryse, H., Roukny, T. and Tielens, J., 2022. Asset overhang and technological change. Working Paper.
Diamond, J., 2013. Collapse: *How Societies Choose to Fail or Survive*. Penguin UK.
Ehlers, T., Packer, F. and De Greiff, K., 2022. The pricing of carbon risk in syndicated loans: Which risks are priced and why?. *Journal of Banking and Finance* 136, 106180.
Engle, R.F., Giglio, S., Kelly, B., Lee, H. and Stroebel, J., 2020. Hedging climate change news. *Review of Financial Studies* 33, 1184-1216.
Escobar, H., 2018. Scientists, environmentalists brace for Brazil's right turn. *Science* 362, 273–274.
Faccio, M. and Parsley, D.C., 2009. Sudden deaths: Taking stock of geographic ties. *Journal of Financial and Quantitative Analysis* 44, 683-718.
Faccio, M., Masulis, R.W. and McConnell, J.J., 2006. Political connections and corporate bailouts. *Journal of Finance* 61, 2597-2635.
Fearnside, P. M., 2005. Deforestation in Brazilian Amazonia: History, rates, and consequences. *Conservation Biology* 19, 680-688.
Fearnside, P. M., 2019. Greenhouse gas emissions from land-use change in Brazil's Amazon region. *In Global climate change and tropical ecosystems* (231-249). CRC Press.
Fearnside, P. M., 2023. The outlook for Brazil's new presidential administration. *Trends in Ecology and Evolution*.
Ferguson, T., and Voth, H.J., 2008. Betting on Hitler—the value of political connections in Nazi Germany. *Quarterly Journal of Economics* 123, 101-137.
Fisman, R., 2001. Estimating the value of political connections. *American Economic Review* 91, 1095-1102.
Fonseca, J. and Van Doornik, B., 2022. Financial development and labor market outcomes: Evidence from Brazil. *Journal of Financial Economics* 143, 550-568.
Freeman, R. E.: 1984. *Strategic Management: A Stakeholder Approach* (Pittman, Marsheld, MA).
Fuchs, L., Nguyen, H., Nguyen, T. and Schaeck, K., 2023. Climate Stress Test, Bank Lending, and the Transition to the Carbon-Neutral Economy. Working Paper.
Giannetti, M., Jasova, M., Loumioti, M. and Mendicino, C., 2023. "Glossy Green" Banks: The Disconnect Between Environmental Disclosures and Lending Activities. Working Paper.
Hargrave, J., and Kis-Katos, K., 2013. Economic causes of deforestation in the Brazilian Amazon:

a panel data analysis for the 2000s. *Environmental and Resource Economics* 54, 471-494.
Haselmann, R., Pistor, K. and Vig, V., 2010. How law affects lending. *Review of Financial Studies* 23, 549-580.
Heitz, A.R. and Narayanamoorthy, G., 2021. Creditor rights and bank loan losses. *Journal of Financial and Quantitative Analysis* 56, 2800-2842.
Hong, H., Karolyi, G.A. and Scheinkman, J.A., 2020. Climate finance. *Review of Financial Studies* 33, 1011-1023.
Houston, J., James, C. and Marcus, D., 1997. Capital market frictions and the role of internal capital markets in banking. *Journal of Financial Economics* 46, 135-164.
Hsiang, S.M., Jina, A.S., 2014. The causal effect of environmental catastrophe on long-run economic growth: Evidence from 6,700 cyclones. Working Paper.
INPE, 2023. Instituto Nacional de Pesquisas Espaciais. At: www.terrabrasilis.dpi.inpe.br
Ivanov, I., Kruttli, M.S. and Watugala, S.W., 2023. Banking on carbon: Corporate lending and cap-and-trade policy. Review of Financial Studies. Forthcoming.
Johnson, S., and Mitton, T., 2003. Cronyism and capital controls: Evidence from Malaysia. *Journal of Financial Economics* 67, 351-382.
Kacperczyk, M. T., and Peydró, J. L., 2022. Carbon emissions and the bank-lending channel. Working Paper.
Khwaja, A. I., and Mian, A., 2008. Tracing the impact of bank liquidity shocks: Evidence from an emerging market. *American Economic Review* 98, 1413-1442.
Leuz, C. and Oberholzer-Gee, F., 2006. Political relationships, global financing, and corporate transparency: Evidence from Indonesia. *Journal of Financial Economics* 81, 411-439.
La Porta, R., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R.W., 1997. Legal Determinants of External Finance. *Journal of Finance* 52, 1131-1150.
La Porta, R.L., Lopez-de-Silanes, F., Shleifer, A. and Vishny, R.W., 1998. Law and finance. *Journal of Political Economy* 106, 1113-1155.
Levine, R., 1999. Law, finance, and economic growth. *Journal of Financial Intermediation* 8, 8-35.
Levine, R., 2005. Law, endowments and property rights. *Journal of Economic Perspectives* 19, 61-88.
Liu X., Zhang S., and Bae, J., 2017. The nexus of renewable energy agriculture-environment in BRICS. *Applied Energy* 204:489–496.
Malmendier, U., 2009. Law and Finance "at the Origin." J*ournal of Economic Literature* 47, 1076-1108.
Mendes, D. F. D. S., 2021. Arrecadação de multas e a política sancionadora do Ibama contra o desmatamento ilegal em Rondônia: uma análise a partir da criminologia verde. Working Paper.
NGFS, 2019. NGFS First comprehensive report — A call for action: Climate change as a source of financial risk. Network for Greening the Financial System, April 2019. At: https://www.ngfs.net/sites/default/files/medias/documents/ngfs_first_comprehensive_report_-_17042019_0.pdf
NGFS, 2021. Guide on climate-related disclosure for central banks December 2021. At: https://www.ngfs.net/sites/default/files/medias/documents/guide_on_climate-related_disclosure_for_central_banks.pdf
NGFS, 2023. Report on micro-prudential supervision of climate-related litigation risks. September 2023. At: https://www.ngfs.net/sites/default/files/medias/documents/ngfs_report-on-microprudential-supervision-of-climate-related-litigation-risks.pdf

Norden, L., Mesquita, D. and Wang, W., 2021. COVID-19, policy interventions and credit: The Brazilian experience. *Journal of Financial Intermediation* 48, 100933.
Martins, T.C., Schiozer, R. and de Menezes Linardi, F., 2023. The information content from lending relationships across the supply chain. *Journal of Financial Intermediation* 56, 101057.
Noth, F., and Ossandon Busch, M., 2021. Banking globalization, local lending, and labor market effects: Micro-level evidence from Brazil. *Journal of Financial Stability* 56.
OECD, 2018. Integrity for Good Governance in Latin America and the Caribbean: From Commitments to Action, OECD Publishing. At: https://doi.org/10.1787/9789264201866-en
Oyegunle, A., and Weber, O., 2015. Development of sustainability and green banking regulations: existing codes and practices. Working Paper.
Pearce, D., and Brown, K., 2023. Saving the world's tropical forests. In *The causes of tropical deforestation* (2-26). Routledge.
Peres, C. A., Campos-Silva, J., and Ritter, C. D., 2022. Environmental policy at a critical junction in the Brazilian Amazon. *Trends in Ecology and Evolution*.
Ponticelli, J. and Alencar, L.S., 2016. Court enforcement, bank loans, and firm investment: evidence from a bankruptcy reform in Brazil. *Quarterly Journal of Economics* 131, 1365-1413.
Reghezza, A., Altunbas, Y., Marques-Ibanez, D., d'Acri, C.R. and Spaggiari, M., 2022. Do banks fuel climate change?. *Journal of Financial Stability* 62, p.101049.
Rodano, G., Serrano-Velarde, N. and Tarantino, E., 2016. Bankruptcy law and bank financing. *Journal of Financial Economics* 120, 363-382.
Schiantarelli, F., Stacchini, M. and Strahan, P.E., 2020. Bank quality, judicial efficiency, and loan repayment delays in Italy. *Journal of Finance* 75, 2139-2178.
Schnabl, P., 2012. The international transmission of bank liquidity shocks: Evidence from an emerging market. Journal of Finance 67, 897-932.
Strobl, E., 2011. The economic growth impact of hurricanes: evidence from US coastal counties. *Review of Economics and Statistics* 93, 575–89.
Tollefson, J., 2018. Brazil's lawmakers renew push to weaken environmental rules. *Nature* 557, 17.
UN Environment Programme, 2014. Annual Report. At: https://www.unep.org/resources/annual-report/unep-2014-annual-report
UN Environment Programme, 2019. Annual Report. At:
https://www.unep.org/resources/assessment/environmental-rule-law-first-global-report;
https://www.unep.org/resources/unep-annual-report-2019
UNCTAD, 2021. Trade and Development Report. The role of central banks in supporting green structural transformation in the least developed countries. United Nations Conference on Trade and Development. At: https://unctad.org/publication/trade-and-development-report-2021; https://unctad.org/system/files/official-document/ldc2023_ch4_en.pdf
Werneck, F., Angelo, C., and Araújo, S. , 2022. A conta chegou. Observatorio do Clima. Technical Report.
West, T. A., and Fearnside, P. M., 2021. Brazil's conservation reform and the reduction of deforestation in Amazonia. *Land Use Policy* 100, 105072.
Yee, W. H., Tang, S. Y., and Lo, C. W. H., 2016. Regulatory compliance when the rule of law is weak: Evidence from China's environmental reform. *Journal of Public Administration Research and Theory* 26, 95-112.

FIGURE 1:
Geographical Area Distribution of Amazonia in Brazil, Largest Rainforest in the World

This figure presents the geographic area distribution of Amazonia in Brazil, the area that comprises largest tropical rainforest in the world (covering 67% of the world's tropical forests) in dark green, while the rest of Brazil is shown in light green. Amazonia is an area of over five million square kilometers in Brazil, home to 28 million people, that includes several federal states: Amazonas (AM), Acre (AC), Amapá (AP), Maranhão (MA), MatoGrosso (MT), MatoGrosso do Sul (MS), Pará (PA), Rondônia (RO), Roraima (RR), and Tocantins (TO).

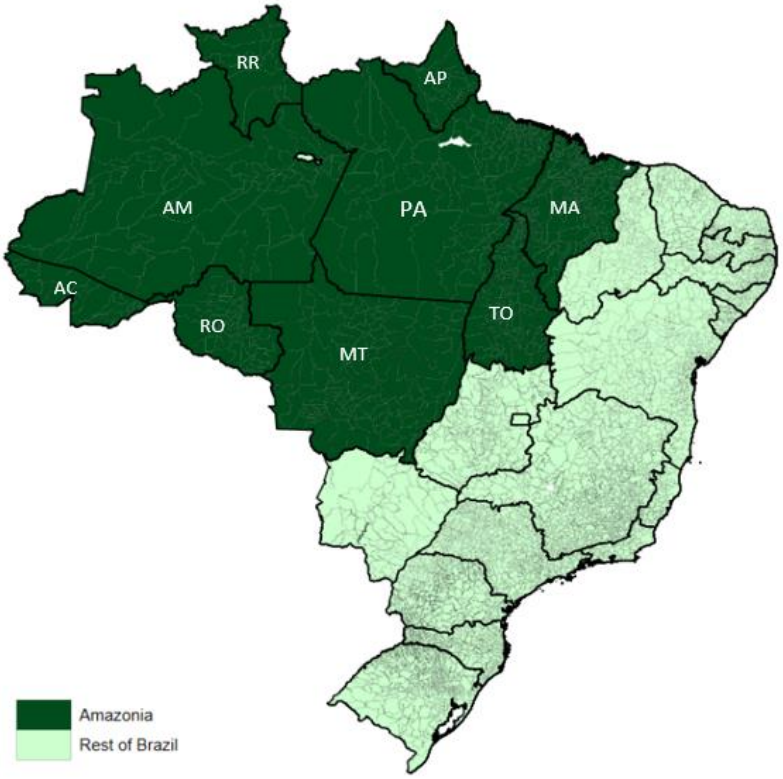
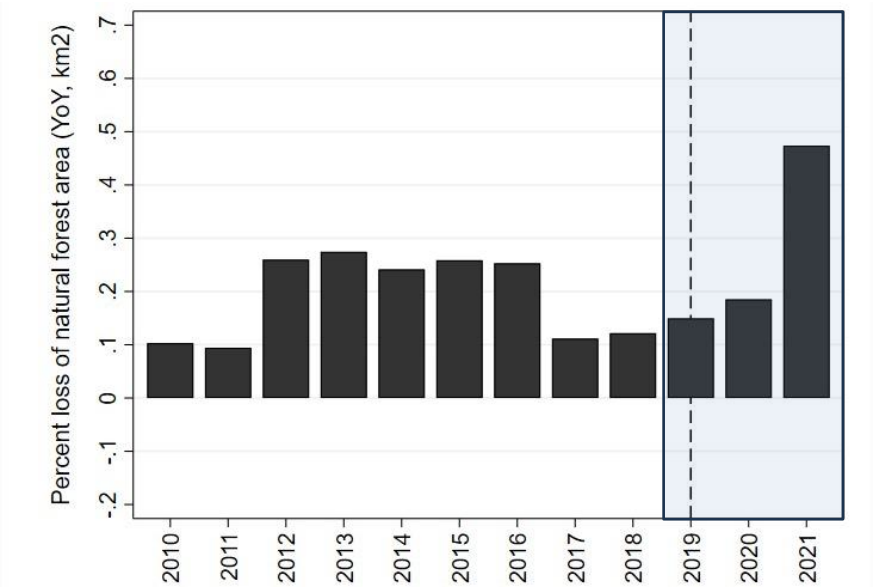


FIGURE 2:
Percentage Loss of Natural Forest Area (Δ *Loss Natural Forest Area)*
for Brazil and Brazilian Amazonia

This figure shows the year-over-year percentage loss in natural forest area in km² for Brazil as a whole in Panel A and for the Brazilian Amazonia only in Panel B between 2010 and 2021. This figure draws data from TerraBrasilis, developed by the Brazilian Institute INPE (Instituto Nacional de Pesquisas Espaciais).

Panel A: Percentage Loss in Natural Forest Area for Brazil as a Whole



Panel B: Percentage Loss in Natural Forest Area for Brazilian Amazonia, the Largest Rainforest in the World

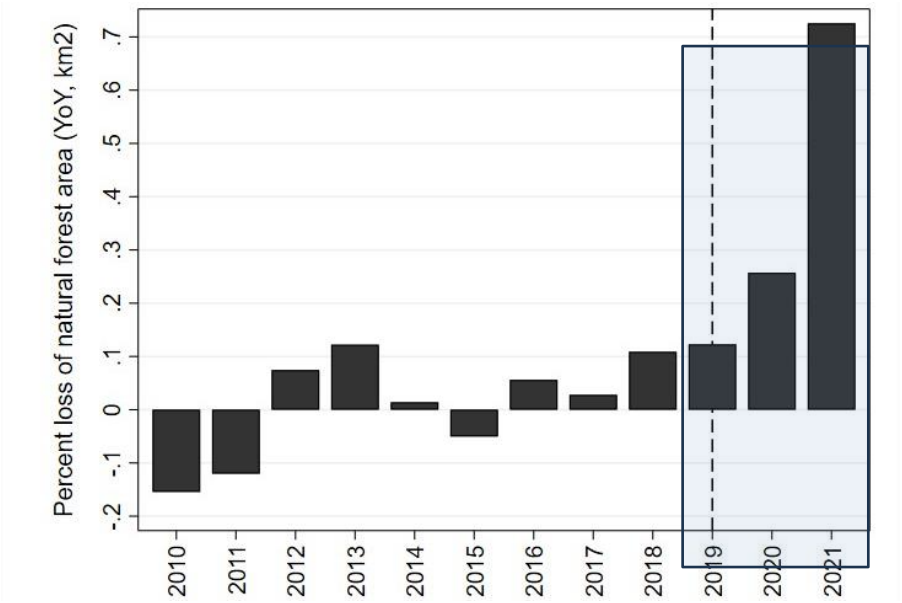


FIGURE 3:
Percentage Change in IBAMA Oversight Personnel (Δ *IBAMA)* from 2018 to 2019 across Brazil Federal States

This figure presents the percentage change in IBAMA oversight personnel from 2018 to 2019 across individual Brazil federal states which are shown with abbreviated letters and we show states in descending order from the states with the highest to those with the lowest decline in IBAMA oversight personnel. We pay special attention to federal states in Amazonia, the area that comprises largest tropical rainforest in the world (covering 67% of the world's tropical forests) which are: Amazonas (AM), Acre (AC), Amapá (AP), Maranhão (MA), MatoGrosso (MT), MatoGrosso do Sul (MS), Pará (PA), Rondônia (RO), Roraima (RR), and Tocantins (TO).

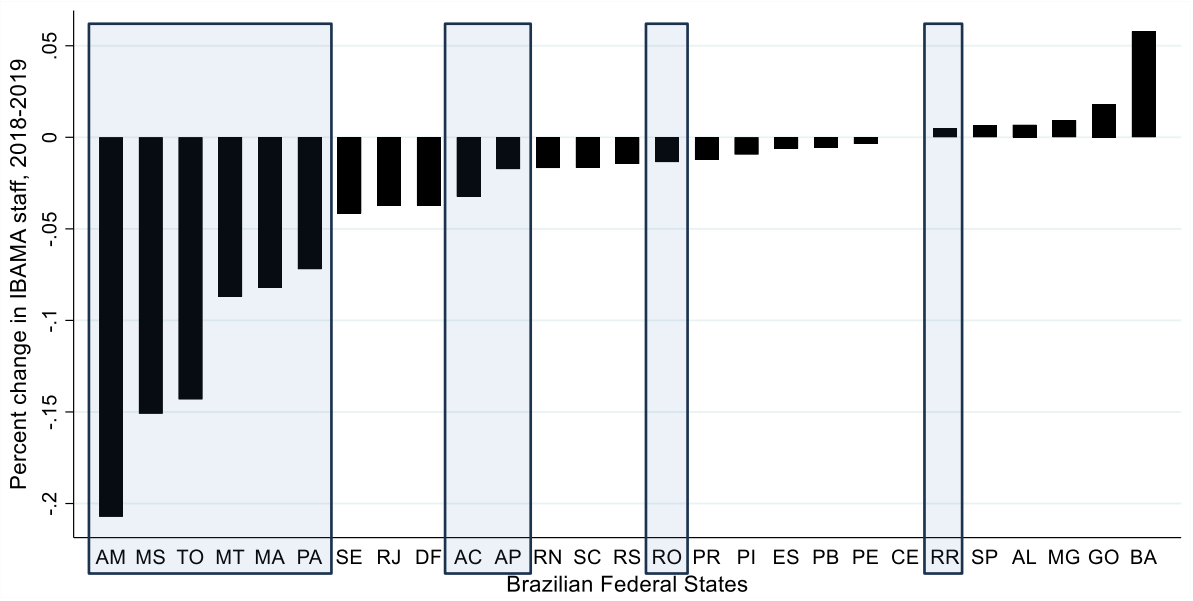


FIGURE 3:
Overall Percentage Budget Execution by IBAMA over 2015 to 2019

This figure presents the percentage change in Brazil IBAMA budget execution from 2015 to 2019.

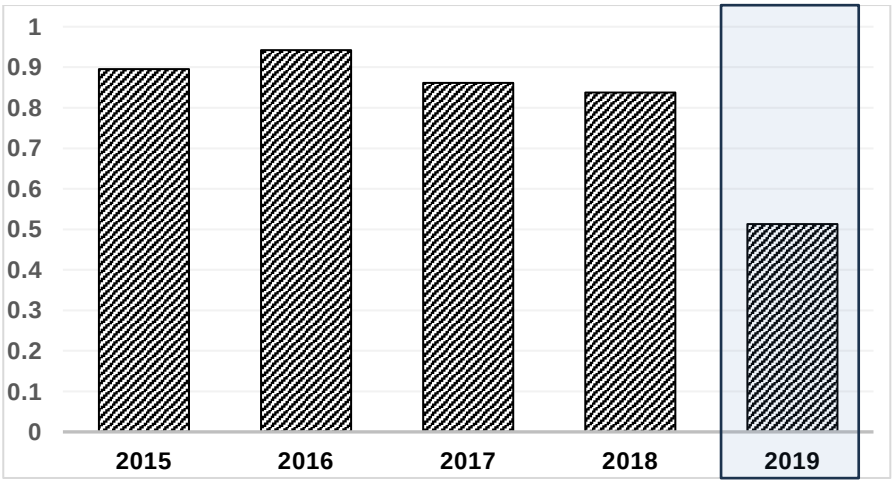


FIGURE 4:
Identification Strategy

This figure presents a schematic of our identification strategy, using as an example the federal state of Amazonas (AM). We *ask*: Does the share of bank "brown" agrobusiness credit (linked to large-scale deforestation) by Bank A in Municipality A increase by more than in Municipality B following a decrease in IBAMA's enforcement strength in the Federal State of Amazonia? Importantly, in our empirical approach we control for bank and federal-state fixed effects, absorbing unobserved heterogeneity across banks A and B (i.e., credit demand).

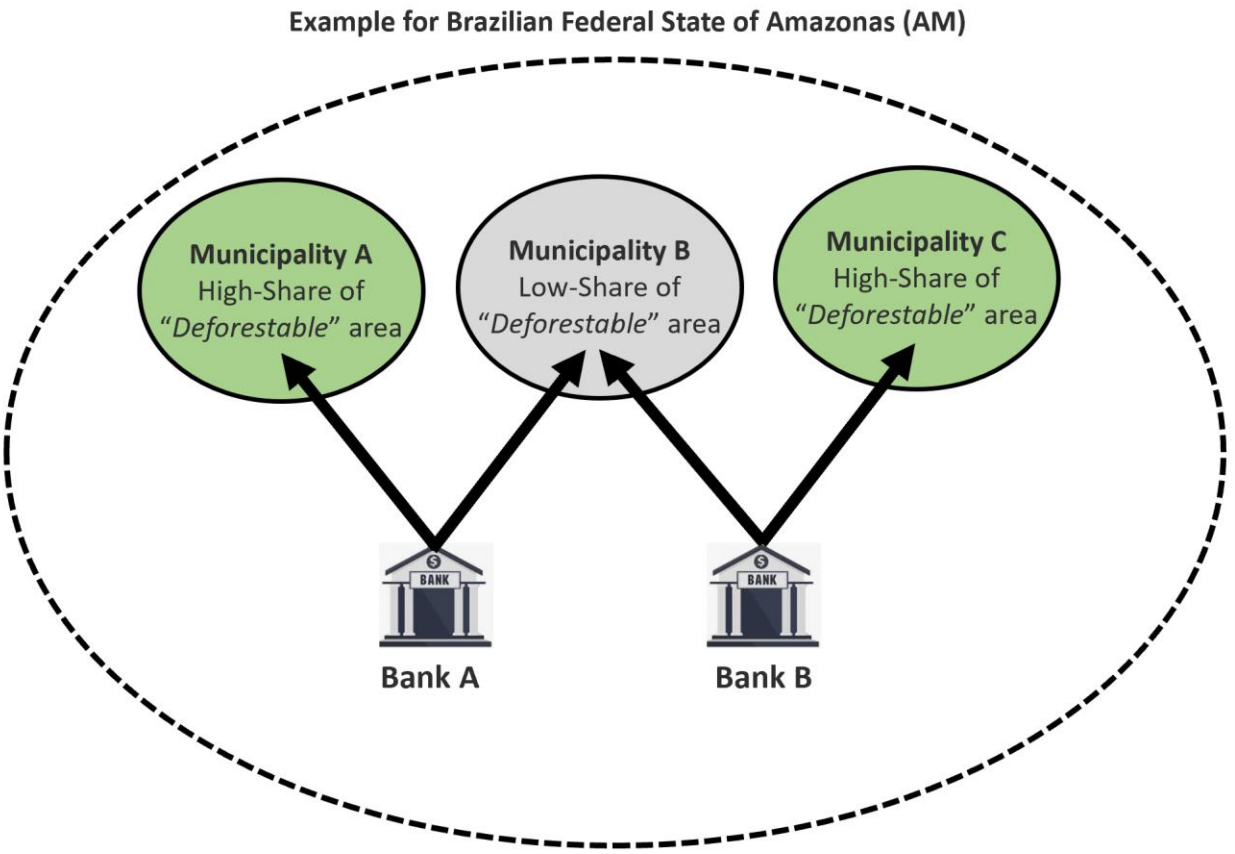


FIGURE 5:
Agribusiness Credit Growth *(Δ AGCredit)* in Large vs. Small "*Deforestable*" Areas

This figure presents the average change in the share of agribusiness loan growth (Δ *AGCredit*) for branches located in regions with a large vs. small "*deforestable"* area (affected and not-affected, respectively) over 2018:M1-2020:M1.

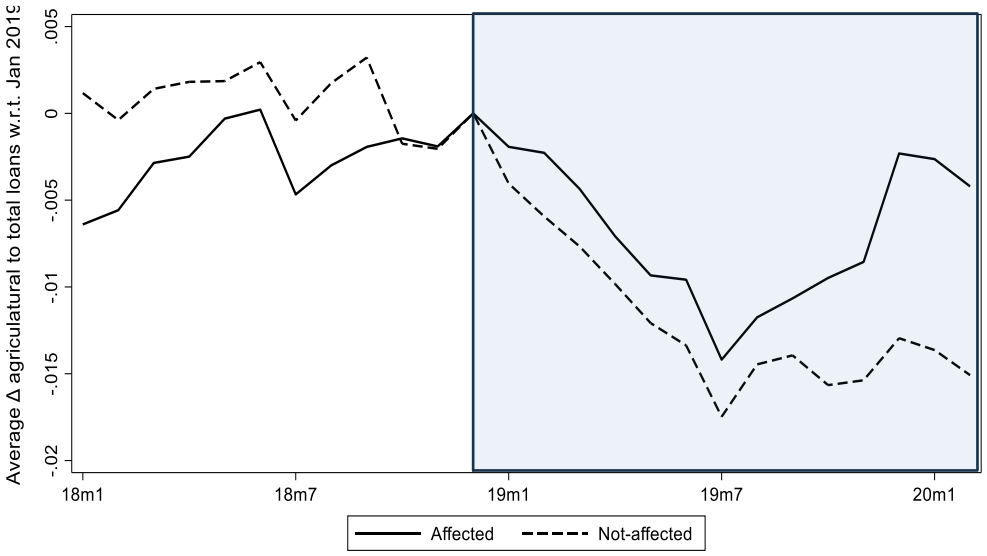


FIGURE 6:
Marginal Effects of Change in IBAMA Personnel (Δ *IBAMA)* on Agribusiness Credit Growth *(Δ AGCredit*) across the Distribution of "*Deforestable*" Area

This figure illustrates the estimated marginal effects at a 95 percent confidence level of changes in IBAMA's personnel (Δ *IBAMA)* on the share of agribusiness credit *(*Δ *AGCredit*) across the distribution of municipalities' share of *deforestable* area (forestry area, *x*-axis). The estimation is based on the preferred estimation in Eq. (1).

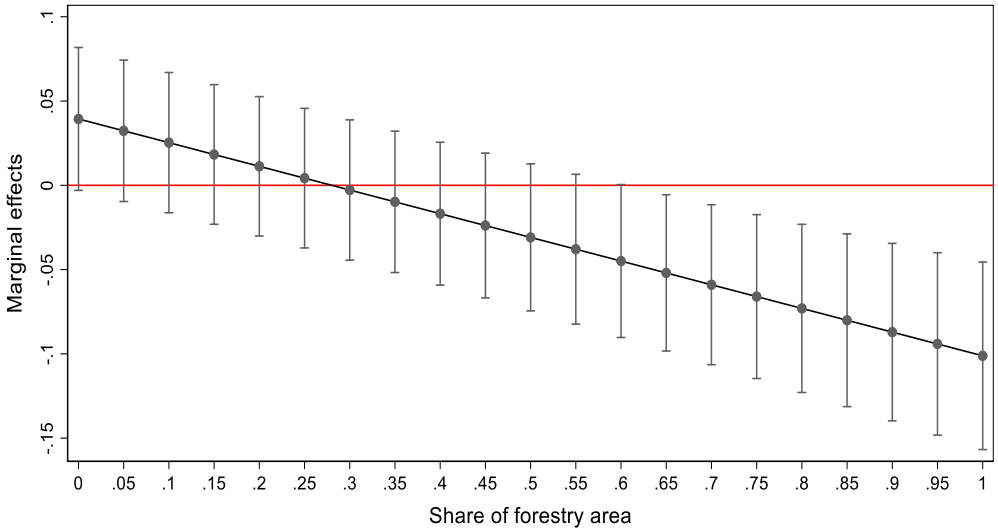


TABLE 1
Variable Definitions and Summary Statistics

This table provides definitions for the variables used in our analyses in Panel A, and summary statistics (mean, median, standard deviation (SD), as well as minimum and maximum) for each variable in Panel B We use combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities.

Panel A: Variable Definitions

Variable	Definition	Source
Key Dependent Variable		
Agricultural Credit	The branch's share of agricultural credit (loans to finance mainly crop cultivation) to total loans. Agricultural businesses are those involved in activities related to farming or agricultural production.	Authors' calculation based on Estatistica Bancaria Mensal por Municipio (ESTEBAN) database by the Central Bank of Brazil
Agro-Industrial Credit	The branch's share of agro-industrial credit (loans to finance processing, manufacturing, and distribution of processed agricultural products). Agro-industrial businesses are involved in activities that transform raw agricultural products into processed goods.	
Δ AG Credit	Change in the branch's share of agribusiness credit from 2018 to 2019.	
Δ Agricultural Credit	Change in the branch's share of agricultural credit from 2018 to 2019.	
Δ Agro-Industrial Credit	Change in the branch's share of agro-industrial credit from 2018 to 2019.	
Main Independent Variables		
Δ IBAMA	Change in (%) in IBAMA's staff in each Federal State from 2018 to 2019.	Brazilian Ministry of Finance
Av Forest	Percentage of forest available (forest area in km2/total area km2) in municipality (j) in 2017.	Brazilian Annual Land Use and Land Cover Mapping Project (Mapbiomas)
Control Variables		
Branch Size	The branch's natural log of total loans in 2017.	Authors' calculation based on Estatistica Bancaria Mensal por Municipio (ESTEBAN) database by the Central Bank of Brazil
Branch Liquidity Ratio	The branch's liquid-to-total assets ratio in 2017.	
Branch ROA	The branch's return on assets in 2017.	
Branch Deposit Ratio	The branch's ratio of deposits to total liabilities in 2017.	
Branch Share in Bank Assets	The ratio of branch assets to total bank assets in 2017.	Authors' calculation based on ESTEBAN database and Bank Call Reports by the Central Bank of Brazil
Bank Size	The bank's natural log of total assets in 2017.	Authors' calculation based on Bank Call Reports by the Central Bank of Brazil
Bank High Risk Credit Ratio	The bank's ratio of high-risk loans to total loans in 2017.	
Bank Capital Ratio	The bank's ratio of total equity capital to total assets in 2017.	
Bank Government Owned	Indicator for whether a bank is government owned (50% or more) or not.	

Panel B: Summary Statistics

Variable	Mean	Median	SD	Min	Max
Key Dependent Variable					
Agribusiness Credit	0.387	0.357	0.313	0.000	0.924
Δ AG Credit	-0.010	-0.005	0.055	-0.189	0.149
Agricultural Credit	0.206	0.019	0.288	0.000	0.989
Δ Agri Credit	-0.006	0.000	0.056	-0.888	0.916
Agro-Industrial Credit	0.001	0.000	0.004	0.000	0.222
Δ Agro-Industrial Credit	0.001	0.000	0.003	-0.119	0.153
Main Independent Variables					
Δ IBAMA	-0.016	-0.012	0.046	-0.151	0.058
Av Forest	0.321	0.254	0.223	0.027	0.921
Control Variables					
Branch Size	18.94	18.65	1.442	16.44	23.87
Branch Liquidity Ratio	0.013	0.008	0.014	0.000	0.067
Branch ROA	0.005	0.004	0.003	-0.001	0.015
Branch Deposit Ratio	0.330	0.310	0.191	0.011	0.768
Branch Share in Bank Assets	0.002	0.000	0.029	0.000	0.015
Bank Size	29.28	29.64	1.209	24.43	29.91
Banks Non-A Credit Ratio	0.557	0.520	0.090	0.446	0.937
Bank Capital Ratio	0.012	0.012	0.005	0.004	0.033

TABLE 2
Impact of Climate Law Enforcement Change on Bank Agribusiness Credit – Main Evidence

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model (Eq. (1)) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil following Bolsonaro's presidential election in 2019 and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation). Column (1) presents a model without any controls or fixed effects; Column (2) includes federal state fixed effects; Column (3) includes both federal state and bank fixed effects; and Column (4) shows a model with federal state and bank fixed effects as well as controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio).

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects (unless noted otherwise). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Independent Variables				
Av Forest	0.006	0.002	0.001	0.002
	(0.008)	(0.006)	(0.007)	(0.007)
Δ IBAMA × Av Forest	-0.111***	-0.199***	-0.209***	-0.207***
	(0.029)	(0.047)	(0.045)	(0.051)
Branch size				0.001
				(0.002)
Branch liquidity				-0.166**
				(0.045)
Branch profitability				0.368
				(0.864)
Branch deposit ratio				0.011
				(0.012)
FEs	No	Federal	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.002	0.014	0.031	0.033
Controls	No	No	No	Yes

TABLE 3
Decomposition of Bank Agribusiness Credit into Subcomponents

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), when decomposing agribusiness credit into agricultural credit (loans to finance crop cultivation) in Columns (1)-(2) and agro-industrial credit (loans to enterprises that convert raw agricultural products into food products related to agriculture, being involved in processing, manufacturing, and value addition within the agricultural sector) in Columns (3)-(4). Columns (1) and (3) present models with federal state and bank fixed effects only, while Columns (2) and (4) present models that additionally include controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio).

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variables are *Δ Agricultural Credit* and *Δ Agro-Industrial Credit*, the change in the bank branch share of credit to agricultural and agro-industrial firms, respectively, from 2018 to 2019, which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects. Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
Dependent Variable	Δ Agricultural Credit	Δ Agricultural Credit	Δ Agro-Industrial Credit	Δ Agro-Industrial Credit
Independent Variable				
Av Forest	-0.168***	-0.154**	0.001	0.000
	(0.049)	(0.067)	(0.000)	(0.000)
Δ IBAMA × Av Forest	-0.027*	-0.055**	0.002**	0.003
	(0.015)	(0.024)	(0.001)	(0.002)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.032	0.073	0.021	0.041
Controls	No	Yes	No	Yes

TABLE 4
Impact of Climate Law Enforcement Change on Bank Agribusiness Credit – Splits by *Ex-Ante* Agro-Industrial Importance

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), and reports results for sample splits according to the median of municipalities' share of *ex-ante* agro-industrial importance proxied two ways. Column (1) repeats our baseline specification for convenience of comparison. Columns (2) and (3) show estimation results for sample splits using the *ex-ante* agricultural physical area extension (larger vs. lower than the median). Columns (4) and (5) show estimation results for sample splits using the *ex-ante* agricultural production/output (larger vs. lower than the median).

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1) Baseline Full Sample (*repeated for convenience*)	(2) *High Ex-Ante* Agricultural Physical Area Extension	(3) *Low Ex-Ante* Agricultural Physical Area Extension	(4) *High Ex-Ante* Agricultural Production	(5) *Low Ex-Ante* Agricultural Production
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Av Forest	0.002	-0.003	0.007	-0.003	0.004
	(0.007)	(0.006)	(0.010)	(0.008)	(0.008)
Δ IBAMA × Av Forest	-0.207***	-0.314**	-0.0730	-0.458**	-0.0546
	(0.051)	(0.120)	(0.138)	(0.164)	(0.166)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	2,727	1,176	2,139	1,769
R-squared	0.033	0.045	0.041	0.036	0.053
Controls	Yes	Yes	Yes	Yes	Yes

TABLE 5
Impact of Climate Law Enforcement Change on Bank Agribusiness Credit – Heterogeneity by *Branch* and *Bank* Traits

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), when conducting interactions with key branch traits in Panel A and bank traits in Panel B. Panel A reports results when conducting interactions with four different bank branch traits (*Branch Trait*), all as of 2017 (Columns 1-4): branch size (the natural log of branch total assets), branch deposit ratio (branch deposits to total liabilities ratio), branch liquidity (branch liquid assets to total assets ratio), and branch profitability (branch return on assets). Panel B reports results when conducting interactions with four different bank traits (*Bank Trait*), all as of 2017 (Columns 1-4): bank size (the natural log of bank total assets), high risk credit ratio (bank high risk credit to total credit ratio), capital (bank equity capital to total assets ratio), and government ownership (indicator for whether the bank is government owned); bank trait by themselves are absorbed due to inclusion of bank fixed effects.

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA* × *Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Panel A: Interactions with *Branch* Traits

	(1)	(2)	(3)	(4)
Branch Trait	*Branch* Size	*Branch* Deposit Ratio	*Branch* Liquidity Ratio	*Branch* ROA
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Independent Variables				
Av Forest	0.007	-0.012	-0.005	0.003
	(0.012)	(0.008)	(0.007)	(0.012)
Branch Trait	0.004	-0.017***	-0.008	0.005
	(0.003)	(0.002)	(0.007)	(0.009)
Δ IBAMA × *Av Forest*	-0.112	-0.336***	-0.171*	-0.119
	(0.104)	(0.071)	(0.082)	(0.206)
Δ IBAMA × *Branch Trait*	0.111	-0.097*	-0.026	0.030
	(0.093)	(0.052)	(0.073)	(0.087)
Av Forest × *Branch Trait*	-0.012	0.025	0.015	-0.001
	(0.012)	(0.015)	(0.014)	(0.007)
Δ IBAMA × *Av Forest* × *Branch Trait*	-0.209**	0.190***	-0.051	-0.127
	(0.083)	(0.038)	(0.152)	(0.273)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.034	0.037	0.035	0.034
Controls	Yes	Yes	Yes	Yes

Panel B: Interactions with *Bank* Traits

	(1)	(2)	(3)	(4)
Bank Trait	*Bank* Size	*Bank* High-Risk Credit Ratio	*Bank* Capitalization Ratio	*Bank* Government-Owned
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Independent Variables				
Av Forest	0.00679	-0.00822*	-0.0151**	0.0527***
	(0.0116)	(0.00455)	(0.00653)	(0.00676)
ΔIBAMA × Av Forest	-0.119	-0.0290	-0.118	-0.447**
	(0.107)	(0.0703)	(0.100)	(0.153)
ΔIBAMA × Bank Trait	0.110	-0.0120	-0.0361	0.0321
	(0.0979)	(0.0321)	(0.0336)	(0.0509)
Av Forest × Bank Trait	-0.0123	0.0110	0.0204	-0.0633***
	(0.0124)	(0.0118)	(0.0118)	(0.00646)
Δ IBAMA × Av Forest × Bank Trait	-0.191*	-0.202**	-0.101	0.274
	(0.111)	(0.0710)	(0.0882)	(0.165)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,915	3,915	3,915	3,909
R-squared	0.001	0.002	0.014	0.031
Controls	Yes	Yes	Yes	Yes

TABLE 6
Internal Capital Markets Reallocation and *Profitability* Analyses

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank internal capital markets reallocation from the bank to the branches, which is proxied two ways: change in the share of internal liabilities to assets (vis-à-vis the branch) using a narrow definition in Columns (1)-(2) and an extended definition in Columns (3)-(4), where the narrow definition considers only intra-bank credits in the numerator, whereas the extended definition adds intra-bank deposits in the numerator. Columns (1) and (3) present models with federal state and bank fixed effects only, while Columns (2) and (4) present models that additionally include controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio).

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Panel A: *Internal Capital Markets* Reallocation from Bank to Branches

	(1)	(2)	(3)	(4)
Intra-bank capital movements	*Narrow* ICM	*Narrow* ICM	*Extended* ICM	*Extended* ICM
Dependent Variable	Δ ICM Reallocation	Δ ICM Reallocation	Δ ICM Reallocation	Δ ICM Reallocation
Independent Variables				
Av Forest	-0.003	-0.005	0.001	-0.001
	(0.003)	(0.004)	(0.002)	(0.003)
Δ IBAMA × Av Forest	-0.107*	-0.116**	-0.107**	-0.107**
	(0.053)	(0.051)	(0.046)	(0.046)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.125	0.141	0.129	0.136
Controls	No	Yes	No	Yes

Panel B: Bank Branch *Profitability*

	(1)	(2)
Dependent Variable	Δ ROA 2018-2019	Δ ROA 2018-2020
Independent Variables		
Av Forest	0.00004	-0.0001
	(0.0001)	(0.0001)
Δ IBAMA × Av Forest	-0.004**	-0.002**
	(0.001)	(0.001)
FEs	Federal and Bank	Federal and Bank
Observations	3,909	3,909
R-squared	0.199	0.328
Controls	No	Yes

TABLE 7
Political Economy Analysis

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), when considering sample splits according to the median of federal state' political alignment with the Bolsonaro administration (share of Bolsonaro-supporting political contributions in the Brazil's federal election in 2018) proxied two ways. Columns (1) and (2) show estimation results for sample splits using the share of political contributions for Bolsonaro's party (PSL or Social-Liberal Party) (larger vs. lower than the median). Columns (4) and (5) show estimation results for sample splits using the share of political contributions for Bolsonaro's coalition consisting of the parties PSL, PRTB, PRB, PSC, PTB, PL, PATRI, and PP (larger vs. lower than the median).

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA* × *Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)
Political alignment to Bolsonaro	Federal States with a *Large* Share of PSL to Total Donations	Federal States with a *Low* Share of PSL to Total Donations	Federal States with a *Large* Share of Bolsonaro's Coalition to Total Donations	Federal States with a *Low* Share of Bolsonaro's Coalition to Total Donations
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Independent Variables				
Av Forest	0.004	0.004	0.002	0.004
	(0.01)	(0.006)	(0.006)	(0.012)
Δ IBAMA × *Av Forest*	-0.320***	0.0479	-0.368**	-0.0505
	(0.0769)	(0.150)	(0.133)	(0.147)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.033	0.056	0.056	0.016
Controls	Yes	Yes	Yes	Yes

TABLE 8
Real Effects: *Deforestation* Analysis

This table uses a municipality-level sample and reports regression estimates that explain real "deforestation" effects using two different empirical approaches. Column (1) shows regression estimates that explain the relation between the change in credit supply to agro-industrial firms (a sector associated with large-scale deforestation) from 2018 to 2019 and change in natural forest area from 2018 to 2019. Columns (2) and (3) show regression estimates that explain the relation between the sudden relaxation in environmental law enforcement in Brazil after Bolsonaro's election in 2019 which increased bank credit supply to agro-industrial firms and the change in natural forest area from 2018 to 2019 for Brazil as a whole and for Brazilian Amazonia only, respectively.

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the municipality-level panel into a single observation per municipality, in the spirit to Khwaja and Mian (2008). We collapse observations for each municipality over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in natural forest area, bank share of agribusiness credit, and environmental oversight personnel as key variables for the analysis. The sample covers 2,085 Brazilian municipalities for the full sample and 318 Brazilian municipalities for Brazilian Amazonia only. The dependent variable is *Δ Natural Forest Area*, the change in natural forest area from 2018 to 2019, which is at municipality-year level. The key independent variables are *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is collapsed at municipality-year level. or *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics collapsed at municipality level, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the municipality level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)
Sample	*Full Sample*	*Full Sample*	*Only Amazonia*
Dependent Variable	Δ Natural Forest Area 2018-2019	Δ Natural Forest Area 2018-2019	Δ Natural Forest Area 2018-2019
Independent Variables			
Av Forest		-0.008	0.008
		(0.007)	(0.007)
Δ IBAMA × Av Forest		0.097**	0.210**
		(0.046)	(0.078)
Δ AG Credit (2018-2019)	-0.018**		
	(0.008)		
FEs	Federal State	Federal State	Federal State
Observations	2,085	2,085	318
R-squared	0.150	0.162	0.173
Controls	Yes	Yes	Yes

TABLE 9
Robustness Tests

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), when considering several robustness tests. Column (1) repeats our baseline specification for convenience of comparison. Columns (2) and (3) show estimation results when the dependent variable is the log change in agribusiness credit without and with controls included, respectively. In Column (4), we drop the metropolitan regions, including all capital municipalities per state. In Column (5), we replace the federal state fixed effects with micro-region fixed effects, where micro-regions are statistical units of approximately 3.5 municipalities on average.

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. Unless noted otherwise, the dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)	(5)
	Baseline Specification *(Repeated for Convenience)*	Log Change Growth Rate - No controls	Log Change Growth Rate - With controls	Drop Metropolitan Regions	Micro-Region FEs
Dependent Variable	Δ AGCredit	Δ Ln AGCredit	Δ Ln AGCredit	Δ AGCredit	Δ AGCredit
Av Forest	0.002	0.023	0.009	0.002	-0.004
	(0.007)	(0.024)	(0.022)	(0.007)	(0.008)
Δ IBAMA × Av Forest	-0.207***	-0.745**	-0.798**	-0.189**	-0.420**
	(0.051)	(0.282)	(0.336)	(0.073)	(0.197)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank	Micro-Regional
Observations	3,909	3,909	3,909	3,339	3,881
R-squared	0.033	0.087	0.098	0.031	0.126
Controls	Yes	No	Yes	Yes	Yes

TABLE 10
Placebo Tests

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), when considering several falsification tests. Panel A shows placebo test results when we falsely assume that the environmental law enforcement change and the decline in IBAMA oversight personnel occurred 3, 2, or 1 year earlier than the actual shock in 2016, 2017, and 2018, respectively instead of the actual which is 2019. Panel B shows placebo test results when we consider the change in bank branch share of credit to sectors not associated with large-scale deforestation, such as the change in the bank branch share of credit to consumers, commercial, and residential housing sectors, instead of agribusiness.

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. Unless noted otherwise, the dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

Panel A: Placebo Tests: Assume Shock Occurred 3 Years, 2 Years, or 1 Year Earlier

	(1)	(2)	(3)	(4)
Test	Baseline Specification (Actual Sample: 2018-2019) *(Repeated for Convenience)*	Placebo 1: Assume Shock Occurred 3 Years Ago (Placebo Sample: 2015-2016)	Placebo 2: Assume Shock Occurred 2 Years Ago (Placebo Sample: 2016-2017)	Placebo 3: Assume Shock Occurred 1 Year Ago (Placebo Sample: 2017-2018)
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Independent Variables				
Av Forest	0.002	-0.00	0.004	-0.0037
	(0.007)	(0.005)	(0.005)	(0.007)
Δ IBAMA × Av Forest	-0.207***	-0.009	0.066	0.168**
	(0.051)	(0.017)	(0.040)	(0.06)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.033	0.132	0.140	0.087
Controls	Yes	Yes	Yes	Yes

Panel B: Placebo Tests: Credit to Sectors *Not* Associated with Large-Scale Deforestation

Industrial Sector	Baseline Specification *(Repeated for Convenience):* AgriBusiness	Placebo 1: Consumer	Placebo 2: Commercial	Placebo 3: Residential Housing
Dependent Variable	Δ AGCredit	Δ Commercial Credit	Δ Residential Mortgage	Δ Consumer Credit
Independent Variables				
Av Forest	0.002	-0.015	0.053	-0.010
	(0.007)	(0.006)	(0.010)	(0.005)
Δ IBAMA × Av Forest	-0.207***	0.008	-0.044	0.157***
	(0.051)	(0.027)	(0.028)	(0.030)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909
R-squared	0.033	0.271	0.031	0.077
Controls	Yes	Yes	Yes	Yes

TABLE 11
Impact of Climate Law Enforcement Change on Bank Agribusiness Credit – Robustness: Horse Race with *Municipality* Traits

This table uses a bank branch-level sample and reports regression estimates from a quasi-difference-in-difference model Eq. (1) that explains the relation between a sudden relaxation in environmental law enforcement in Brazil and the change in bank credit supply to agro-industrial firms (a sector associated with large-scale deforestation), when including a competing interaction term with municipality characteristics (*Mun Var*), all as of 2017. Municipality characteristics considered are as follows: municipality log of their GDP, municipality log population, municipality log total bank assets, municipality GDP per capita, and municipality share of agribusiness product to total GDP.

The table uses combined data from four main sources of administrative records from Brazil covering the period 2017 to 2019: i) granular bank branch balance sheet data at branch municipality-month level; ii) consolidated bank call report data at bank-month level ; iii) records of geographical areas dedicated to agriculture, forestry, or to natural environments, including areas available for deforestation at the municipality-year level; and iv) administrative data of IBAMA's personnel at the federal state-year level. The combined data is collapsed at the bank branch-level panel into a single observation per branch, in the spirit to Khwaja and Mian (2008). We collapse observations for each bank branch over the two periods of pre (2018) and post Bolsonaro's presidential election (2019) and use the change between periods in bank share of agribusiness credit and environmental oversight personnel as key variables for the analysis. The final sample covers 3,909 branches belonging to 20 banking conglomerates, operating in 2,093 Brazilian municipalities. The dependent variable is *Δ AGCredit*, the change in the bank branch share of credit to agro-industrial firms from 2018 to 2019 which is at bank branch-municipality-month level. The key explanatory variables are *Δ IBAMA × Av Forest* and the uninteracted terms *Δ IBAMA* and *Av Forest*, where *Δ IBAMA* is the change in environmental oversight personnel of the Brazil national agency IBAMA from 2018 to 2019 across federal states which is at federal state-year level and *Av Forest*, the *ex-ante* area available to deforest as of 2017 which is at municipality-year level. The standalone term *Δ IBAMA* is redundant due to the inclusion of federal state fixed effects. Variable definitions are in Table 1. All regressions include *Federal State* fixed effects and *Bank* fixed effects and controls for key bank branch characteristics, all as of 2017: size (the natural log of branch total assets), liquidity (branch liquid assets to total assets ratio), profitability (branch return on assets), and deposit ratio (branch deposits to total liabilities ratio). Heteroskedasticity-robust *t*-statistics clustered at the bank level are reported in parentheses below the coefficient estimates. Significance at the 10%, 5%, and 1% levels is indicated by *, **, and ***, respectively.

	(1)	(2)	(3)	(4)	(5)
Municipality Trait	*Municipality* Log GDP	*Municipality* Log Pop	*Municipality* Log Bank Assets	*Municipality* GDP per Capita	*Municipality* Share of Agribusiness to Total GDP
Dependent Variable	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit	Δ AGCredit
Independent Variables					
Av Forest	0.001	0.002	0.001	0.002	0.002
	(0.007)	(0.008)	(0.007)	(0.007)	(0.007)
Δ IBAMA × Av Forest	-0.221***	-0.212***	-0.203**	-0.195***	-0.212***
	(0.062)	(0.059)	(0.071)	(0.057)	(0.047)
Δ IBAMA × Mun Var	0.005	0.001	-0.001	0.000	0.165
	(0.017)	(0.017)	(0.010)	(0.000)	(0.151)
Mun Var	-0.004	-0.00282*	-0.002	0.000	0.001
	(0.002)	(0.002)	(0.002)	(0.000)	(0.013)
FEs	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank	Federal and Bank
Observations	3,909	3,909	3,909	3,909	3,909
R-squared	0.036	0.034	0.034	0.037	0.034
Controls	Yes	Yes	Yes	Yes	Yes

Appendix A: Supplementary Materials

TABLE A.1
IBAMA Staff and Budget Cuts Following Bolsonaro's 2019 Election
Anecdotal Evidence

This table shows news articles that contribute to anecdotal evidence explaining the reduction in budget and staff at the Brazilian Institute of Environment and Renewable Natural Resources (IBAMA) post-President Bolsonaro's 2019 election. The first column shows the news piece's headline and the pertinent IBAMA-related text. Then the respective source, and the primary web link are cited. This anecdotal evidence sheds light on the unanticipated and significant drop in both IBAMA's budget and staffing, revealing the organization's struggles under Bolsonaro's administration.

Headline & IBAMA Information	Source	Website link
"Deforestation is accelerating in Brazil as Bolsonaro's first term ends, experts say"	**CNN**	
[…] Although Bolsonaro has passed some laws to protect the environment, his administration has seen both Brazil's Environment Ministry and environmental protection agency Ibama subjected to budget and staff cuts. Ibama's practice of destroying confiscated equipment used in illegal mining and tree-chopping has also been publicly condemned by the president. The President is also a keen supporter of a set of five draft bills going through Congress known by activists as the "destruction package."	By Camilo Rocha, Marcia Reverdosa and Rodrigo Pedroso Published on September 20, 2022	https://edition.cnn.com/2022/09/20/americas/brazil-bolsonaro-deforestation-term-intl-latam/index.html
"Exclusive: As fires race through Amazon, Brazil's Bolsonaro weakens environment agency"	**Reuters**	
[…] Conservative President Jair Bolsonaro has made no secret of his disdain for the public body, known as Ibama, which he has publicly rebuked as an impediment to the nation's development. Since he took office on January 1, Ibama's budget has shrunk by 25% as part of government-wide belt tightening, according to internal government data collected by the opposition PSOL party and shared with Reuters. Among the cuts: funding for prevention and control of forest fires was reduced 23%.	By Jake Spring and Stephen Eisenhammer Published on August 28, 2019	https://www.reuters.com/article/idUSKCN1VI13Q/
"Brazil's Bolsonaro says he 'loves' the Amazon. But his policies are designed to wreak havoc on it"	**CNN**	
[…] Since he was sworn into office, pro-business Bolsonaro has made significant cuts to Brazil's environmental enforcement agency at a cost amounting to $23 million, according to official data sent to CNN by Observatorio do Clima. Earlier this month, the president fired Ricardo Galvão, the director of Brazil's National Space and Research Institute (INPE). Galvão said he was terminated after defending satellite data that showed deforestation was 88% higher in June compared to a year ago.	By Kara Fox and Marina Lang Published on August 27, 2019	https://edition.cnn.com/2019/08/25/americas/brazil-bolsanaro-environmental-record-intl/index.html
"Bolsonaro is a catastrophe for the environment" […] The dismantling of environmental agencies: To enable all this destruction, Bolsonaro's administration has been weakening	**Greenpeace International** By Diego Gonzaga	https://www.greenpeace.org/international/story/52098/bolsonaro-president-brazil-

government bodies responsible for monitoring the environment and enforcing laws to protect the forest. IBAMA, a crucial agency responsible for environmental policies in the country, got its funds slashed by 30% from 2019 to 2020.	Published on January 26. 2022	amazon-environment/