THERE IS NO PLANET B: STAKEHOLDER GOVERNANCE THAT ALIGNS INCENTIVES TO PRESERVE THE AMAZON RAINFOREST

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ABSTRACT

How do firms design incentives compatible with environmental protection? The new institutional economics identifies the challenges of governing common-pool resources and the difficulties of internalizing environmental externalities into regular market transactions. New stakeholder management theory suggests that firms may avoid the tragedy of the commons through the formation of a polycentric governance structure among stakeholders. This paper evaluates these theoretical claims by analyzing the activities of Natura, a Brazilian cosmetics company, regarding Amazon rainforest preservation. We argue that, in line with theoretical predictions, Natura internalizes positive externalities arising from environmental protection by sharing value with stakeholders in rural Amazon communities. To test this proposition, the paper presents a differences-in-differences analysis comparing forest preservation in the municipalities that Natura entered versus those in which it did not. The study employs an instrumental variable based on missing satellite images, which Natura relies upon to make decisions about entry into different municipalities. Images are missing due to technical problems in satellite operations, which are uncorrelated with stakeholder needs on the ground. Quantitative results show that Natura's entry into a municipality helps to preserve forested areas. Analysis of three mechanisms using information on crop yields and carbon density ties Natura's involvement with stakeholder decisions to cultivate forest-generated crops rather than to engage in clear-cutting. The polycentric governance system that Natura stimulated also led to reforestation of previously cleared areas. This study contributes to the management literature by suggesting how firms can foster environmental protection through incentive alignment with critical stakeholders.

KEYWORDS: Governing the commons, internalizing externalities, new institutional theory, new stakeholder theory, Amazon rainforest.

INTRODUCTION

Climate change is a grand challenge of the highest order (George, Howard-Grenville, Joshi, & Tihanyi, 2016; Henderson & Serafeim, 2020; Henderson, 2020). As a common good, the natural environment has been excessively exploited and depleted in a “tragedy of the commons” (Hardin, 1968; Ostrom, 1990, 2005). This challenge has led management scholars to call for research on causes and remedies (Bansal & DesJardine, 2014; Bansal & Roth, 2000; Delmas & Toffel, 2008; Dowell, Hart, & Yeung, 2000; Henderson, Gulati, & Tushman, 2015; Luo & Kaul, 2018). The new stakeholder management literature (Barney, 2018; McGahan, 2020) suggests that engaging stakeholders in governance over the natural environment may enhance the effectiveness of private organizations in addressing collective-action problems such as climate change (Amis, Barney, Mahoney, & Wang, 2020; Garcia-Castro & Aguilera, 2015; Gatignon & Capron, 2020; Klein, Mahoney, McGahan, & Pitelis, 2019; Porter & Kramer, 2006, 2011). However, despite the potential, relatively little is known about how stakeholder engagement compatible with environmental preservation occurs. The contribution of this paper is the elucidation of an innovative set of mechanisms for stakeholder engagement through the alignment of incentives to preserve the Amazonian rainforest by a Brazilian cosmetics company called Natura.

Research on the governance of the commons indicates that incentive malalignment leads to overexploitation of the common-pool resources. This depletion occurs as the result of absent property rights, the high transaction costs of internalization, and free-riding problems associated with common-pool resources (Coase, 1960; Demsetz, 1967; Hardin, 1968; Ostrom, 1990, 2005; Stavins, 2011). As a result, for-profit organizations confront managerial challenges as they consider their impact on the environment. For a firm seeking to resolve the managerial challenges associated with impact on the environment, these challenges include both (i) an internalization of environmental externalities in managerial decision-making and (ii) the development of a governance system to align the incentives of proximate stakeholders to the firm in the project of environmental stewardship (Bansal & DesJardine, 2014; Bansal & Roth, 2000; Dowell et al., 2000; Henderson et al., 2015; Luo & Kaul, 2018).

One approach to the development of an aligned governance structure is "polycentrism," in which proximate stakeholders have voice in the decision-making of the organization (Andersson & Ostrom, 2008; Gatignon & Capron, 2020; Klein et al., 2019; Ostrom, 2005). Under such an approach, value created jointly by the firm and enfranchised stakeholders is shared among the participants (Amis et al., 2020; Barney, 2018; Donaldson & Preston, 1995; Garcia-Castro & Aguilera, 2015; Jones, 1995; Klein et al., 2019; Lieberman, Garcia-Castro, & Balasubramanian, 2017; McGahan, 2020; Porter & Kramer, 2011). When the value created through polycentric governance is significant enough to compensate relevant stakeholders for their alignment, then the firm's financial returns improve (Eccles, Ioannou, & Serafeim, 2014; Flammer, 2013, 2015; Henisz, Dorobantu, & Nartey, 2014; Jones, Harrison, & Felps, 2018) simultaneously with socio-environmental performance (Bowen, Bansal, & Slawinski, 2018; Delmas & Toffel, 2008; Devinney, McGahan, & Zollo, 2013; Henderson et al., 2015; Lumpkin & Bacq, 2019). To date, empirical testing of polycentrism has been limited by difficulties of measuring incentive alignment, stakeholder voice, managerial decisions, and impact on the environment.

The analysis reported in this paper seeks to overcome these difficulties in a study of Natura, a Brazilian cosmetics company, which has implemented polycentric governance in its activities in the Amazon rainforest (Gatignon & Capron, 2020). Natura has been recognized in prior research as stakeholder-oriented (Gatignon & Capron, 2020; Marquis, 2020). This paper builds on this literature by testing Natura's environmental impact through a differences-in-differences estimation model with two-way fixed effects (Callaway & Sant'Anna, 2019; Chakraborty & Jayaraman, 2019; de Chaisemartin & D'Haultfoeuille, 2018; Goodman-Bacon, 2018). The effect of Natura's intervention on rainforest depletion is assessed using publicly available georeferenced satellite data on the number of forested areas preserved and the number of fire incidents per municipality in the Brazilian Amazon between 2000 and 2018.

The results show that Natura's entry into an Amazonian municipality increased the environmental preservation of forested areas by 47.9%, which represents 1.8 million hectares or 1.7 million football fields. The mechanism giving rise to this result involves polycentric decisions executed by Natura, community leaders, and local farmers regarding the agricultural models in municipalities vulnerable to rainforest clearing. By aligning the incentives of these proximate stakeholders, Natura compelled a shift away from conventional agriculture such as soybean and cattle farming that required clearing land through deforestation. Instead, stakeholders jointly elected to pursue the so-called Amazonian cultivation of forest-compatible products such as *açaí* and cocoa. The heterogeneity of the Amazonian products sourced by Natura from local farmers drove both forest conservation and forest regeneration. The municipalities in which Natura engaged mitigated growing trends in fire incidents for two main reasons. The first is the reduced incentive for local stakeholders to set fires for clearing land. The second is that the superior carbon mass of the retained forest enhanced ambient humidity, thus reducing fire vulnerability. The data analysis includes an instrumental variable estimation (Mariano, 1977; Nagaraj, 2017) to address possible endogeneity in Natura's choice of municipalities. The instrument, which is explained fully below, relies on the missing images from the satellite representations of potential sites that Natura's managers used in making decisions about which municipalities to enter. The environmental impact of Natura's entry into municipalities includes both preservation of forested areas and reduced fire incidents.

This paper contributes to the new stakeholder theory (McGahan, 2020) by demonstrating that the development of a polycentric governance system by a stakeholder-oriented firm aligns incentives among proximate stakeholders in ways that associate mutual value creation with environmental protection. As an empirical assessment of the effect of a for-profit organization on areas critical to climate change, the study relies on a novel dataset representing satellite-generated information (advocated by Ostrom & Nagendra, 2006). Recognizing that "there is no planet B," the paper also contributes to the integration into the field of management measures of performance that reflect the United Nations' Sustainable Development Goals (SDGs), i.e., SDG 13.2 on integrating climate change measures into strategies[1] and SDG 15.2 on promoting the implementation of sustainable management of forests.[2]

NEW STAKEHOLDER THEORY ON GOVERNING THE COMMONS

The present study draws on two main streams of literature: the *governance of the commons* (Bowen et al., 2018; Gatignon & Capron, 2020; Hardin, 1968; Ostrom, 1990, 2000; Stavins, 2011), and *new stakeholder management theory* (Barney, 2018; Delmas & Toffel, 2008; Devinney et al., 2013; Donaldson & Preston, 1995; Dorobantu & Odziemkowska, 2016; Flammer & Kacperczyk, 2016; Henisz et al., 2014; Jones et al., 2018; Klein et al., 2019; Lumpkin & Bacq, 2019; McGahan, 2020). This section briefly describes these two streams and presents a formal model of the paper's central argument.

[1] SDG #13. Available at: < https://sdgs.un.org/goals/goal13 >. Accessed on September 16th, 2020.
[2] SDG #15. Available at: < https://sdgs.un.org/goals/goal15 >. Accessed on September 16th, 2020.

The Tragedy of the Commons and the Polycentric Governance Solution

Ostrom's seminal work describes the challenges of establishing rules and norms to govern common-pool resources (Ostrom, 1990). Governing the commons is complicated because, by definition, relevant resources are rivalrous in consumption and are non-excludable in access or use. These features lead to ill-defined property rights, weak incentives for preservation, and, consequently, to the "tragedy of the commons" (Demsetz, 1967; Hardin, 1968; Stavins, 2011). The feature that gives rise to the tragedy is that stakeholders each have private incentives to exploit the resource to the detriment of the common interest. This malalignment leads to overexploitation of the common-pool resources to its exhaustive depletion (Demsetz, 1967; Hardin, 1968; Marciano, Frischmann, & Ramello, 2019; Ostrom, 1990; Stavins, 2011). In the words of Demsetz (1967): "If a person seeks to maximize the value of his communal rights, he will tend to overhunt and overwork the land because some of the costs of his doing so are borne by others." (Demsetz, 1967, p. 354).

The prevalence of the tragedy of the commons in the environment is extensive, and includes detrimental exploitation of fishery waters, river basins, air pollution, communal grazing lands, and natural forests. In each of these environments, access to resources is non-excludable among a proximate group of stakeholders. Open access among stakeholders with an incentive for private optimization of usage leads to a negative externality for the group. In the case of natural forests where property rights are held jointly, individual stakeholders have logged, mined, trafficked wild animals, and deforested for private agricultural use. In doing so, these stakeholders have generated private gains and public losses (Demsetz, 1967; Hardin, 1968; Ostrom & Nagendra, 2006; Ostrom, 1990; Stavins, 2011).

Ostrom (1990) suggests that improvements in governance among proximate stakeholders can reduce the tragedy of the commons, even without demarcating property rights over the forest for each individual stakeholder. The polycentric governance system described in Ostrom (1990) arises when individual stakeholders co-define a set of rules and norms for accessing and exploiting common-pool resources. It is collective action in the private interests of each proximate stakeholder that gives rise to these rules and norms (Ostrom, 2005). This "polycentric governance system" (Andersson & Ostrom, 2008; Ostrom, 2005) relies on the feature that "(…) the users of each common-pool resource would have some authority to make at least some of the rules related to how a particular resource will be utilized" (Ostrom, 2005, p. 283). Shared authority guarantees use and access, enables co-management of the common-pool resource, and reduces the likelihood of tyrannical authorities overruling minorities. Nevertheless, as expected, this system also has some disadvantages, such as the generation of conflict among participants, and managerial complexity. In general, the difficulty of achieving polycentrism rises with the number of discrete stakeholders enfranchised in the project.

Mitigation of the Challenges of Polycentric Governance by a Stakeholder-Oriented Firm

Recent advances in the *new stakeholder theory* literature indicate that firms with a stakeholder orientation have several advantages over firms with a shareholder orientation (Barney, 2018; Kaplan, 2019; McGahan, 2020). In some situations, an orientation towards stakeholders may immediately and directly improve a firm's economic performance (Barney, 2019; Eccles et al., 2014; Flammer & Kacperczyk, 2019; Flammer, 2013, 2015; Henisz et al., 2014; Henisz & McGlinch, 2019; Jones et al., 2018; Jones, 1995), and on the firm's socio-environmental performance (Bansal & Roth, 2000; Bowen et al., 2018; Delmas & Toffel, 2004, 2008; Devinney et al., 2013; Henderson et al., 2015; Lazzarini, 2020; Lumpkin & Bacq, 2019). In a different class of situations, the achievement of polycentric governance requires innovation in the enfranchisement and alignment of stakeholders with the firm through a reconstruction of the collective's approach to value creation and to the distribution of value (Amis et al., 2020; Donaldson & Preston, 1995; Donaldson, 2002; Freeman, Wicks, & Parmar, 2004; Garcia-Castro & Aguilera, 2015; Horwitz & McGahan, 2019; Klein et al., 2019; Lieberman et al., 2017; Porter & Kramer, 2006, 2011).

Research in the new stakeholder theory on polycentrism has led to significant insights. A stakeholder-orientated firm can establish a polycentric governance structure to align incentives among diverse agents and provide innovative solutions to collective problems (Eccles et al., 2014; Hart & Dowell, 2011; Luo & Kaul, 2018). Firms may promote polycentric governance structures in their operations (Klein et al., 2019). For example, Gatignon and Capron (2020) showed that Natura did so in their interaction with diverse actors such as rural suppliers, civil society organizations, direct sellers, shareholders, and final consumers. The firm managed to address failures in local market institutions by developing an "open institutional infrastructure," which empowers a wide range of actors, including both participants and non-participants in the governance scheme. Natura's enablement of an efficient supply chain of Amazonian agriculture inputs increased profitability by shifting volume towards products with higher prices, which led in turn to the allocation of financial value to stakeholders participating in the polycentric governance system (Boehe, Pongeluppe, & Lazzarini, 2014; Gatignon & Capron, 2020; Marquis, 2020; Narsalay, Pongeluppe, & Light, 2015). These insights affirm the theoretical mechanisms suggested in research on value creation and distribution (Garcia-Castro & Aguilera, 2015; Lieberman et al., 2017). For-profit organizations may elect to internalize externalities when such internalization enables stakeholder alignment (Coase, 1960; Dowell et al., 2000; Luo & Kaul, 2018; Teodorovicz, Cabral, Lazzarini, & McGahan, 2019). However, to date, neither empirical research on Natura nor theoretical research on polycentric governance has addressed specifically how the alignment of interests among proximate stakeholders can lead specifically to decentralized preservation of the environment.

To facilitate understanding of the economic rationale behind the incentive alignment argument, the paper presents a simple formal model based on Teodoridis (2018) that considers how polycentric governance over the natural environment in the Amazon rainforest emerged at Natura. Following the literature on value creation, appropriation, and distribution (Garcia-Castro & Aguilera, 2015; Lieberman et al., 2017), the model suggests that if the firm purchases specific forested inputs from farmers in Amazonian municipalities at prices above the next-based opportunities for these farmers, then these rural agents will seek to preserve the forest rather than to allow clear-cutting. The challenge in implementing the polycentric governance model for the firm is to assure that the group of proximate stakeholders in each municipality (i.e., the farmers and local officials) are of sufficiently small number that collective action to preserve the rainforest can be aligned with (i) Natura's ability to achieve a price premium on products generated from forest-preserving inputs, (ii) the creation of enough value through the sale of these products to support better economic returns for each enfranchised stakeholder than next-best alternatives, and (iii) the scope of authority of stakeholders in each municipality to make decisions over how Amazonian land is productively deployed (i.e., over which crops are cultivated).

Formal Model

Consider a set $V = \{V_{AMZ}, V_{CON}\}$ of opportunities to create value from agricultural products, where V_{AMZ} represents the value of Amazonian agricultural production, such as *açaí*, Brazil nut, and cocoa, and V_{CON} represents the value of conventional agricultural production, such as cattle, soybean, and corn. Also, consider a set $C = \{C_{AMZ}, C_{CON}\}$ of costs to produce different agricultural products, where C_{AMZ} is the cost incurred to produce or collect the Amazonian inputs, and C_{CON} is the cost incurred to deforest and produce conventional agricultural products. Finally, consider a set $B = \{B_{1,\ldots,n}\}$ of value distributed back with the rural communities by the stakeholder-oriented firm. There are n types of possible ways by which value is distributed with the community. For instance, the stakeholder-oriented firm might distribute value through payments for traditional knowledge (aka. communitarian knowledge), investments in local infrastructure and institutions, provision of training and technical support, carbon credit purchases, among others.

With these notations, consider a set of individuals agents $i(V^i, C^i, B)$ deciding how to allocate their efforts in the production of alternative agricultural goods. V^i is the value created in the production of one type of agriculture product by the agent i, C^i is the cost of the specific type of agricultural production chosen by i, and B is the total amount of value distributed back with the community by the stakeholder-oriented firm. The model considers only two types of production: Amazonian agriculture (AMZ) and conventional agriculture (CON).

Assumptions. The model makes four main assumptions. First, it assumes, without loss of generality that $C^i_{AMZ} \equiv C^i_{CON} > 0, \forall\, i$. In other words, the individual cost to produce an Amazonian agriculture input or a conventional agriculture input is equivalent and greater than zero for all agents. This assumption is motivated by the fact that to produce either type of product, agents will spend the same amount of time and effort. Second, it assumes that $V^i_{CON} > V^i_{AMZ} \gg 0, \forall\, i$. Therefore, the value of conventional agriculture is always greater than the value of Amazonian agriculture, and both values are significantly greater than zero. Third, it assumes that the conventional agriculture market is perfectly competitive with perfect information. Note that assumptions two and three are motivated to represent institutionalized markets for conventional agriculture products. In contrast, there are not necessarily institutionalized markets for most Amazonian agriculture inputs. These features reduce the financial attractiveness of products based on Amazonian agriculture compared to those based on conventional agriculture (Pokorny, de Jong, Godar, Pacheco, & Johnson, 2013; Pokorny & Pacheco, 2014). Finally, the model assumes that the stakeholder-oriented firm maximizes value creation when gaining access to Amazonian inputs. This arises because the firm has a price premium when selling products incorporating Amazonian compounds to final consumers (Boehe et al., 2014).[3]

Agents' optimal choices. The model evaluates the optimal choices of each agent i who is seeking to maximize a payoff that depends on the presence, or not, of a stakeholder-oriented firm in the municipality where the agent's rural community is based. Figure 1 presents the agent i's options and payoffs.

<< Insert Figure 1 here >>

Stakeholder-oriented Firm is Out. Consider that a stakeholder-oriented firm is ***out*** of the municipality where the agent's i rural community is located. The agent chooses to deforest or not the area in which the agent resides. If the agent opts to keep the ***forest***, as there is no entity to which the Amazonian agriculture inputs may be sold, the potential value is not realized, but there is no cost incurred. In this case, the agent's payoff is zero. However, suppose the agent opts to ***deforest*** the area and convert it into conventional agriculture production. In that case, the agent incurs a cost C_{CON}^{i} which equals the cost of deforestation plus production. At the same time, the agent receives the value V_{CON}^{i} when selling the conventional agriculture production in an

[3] As the firm always maximizes its payoff when accessing the Amazonian inputs, for simplicity, we are not including the firm's payoffs in Figure 1.

institutionalized market. Considering that the conventional agriculture market is perfectly competitive, the agent's best response is to ***deforest*** the area as long as the price of the conventional agricultural products equals or exceeds the marginal cost of production.

Stakeholder-oriented Firm is In. Consider that a stakeholder-oriented firm is ***in*** the municipality where the agent's i rural community is located. Again, the agent chooses to deforest or not the area in which the agent resides. In this new scenario, if the agent opts to ***deforest*** the area and convert it into conventional agriculture production, then the agent incurs a cost C_{CON}^{i} which equals the cost of deforestation plus production. At the same time, the agent receives the value V_{CON}^{i} when selling the conventional agriculture production in the institutionalized market. However, suppose the agent opts to preserve the forest, as the stakeholder-oriented firm is present in the location. In that case, then the agent may generate value with Amazonian agriculture inputs production/collection. Thus, the agent incurs a cost C_{AMZ}^{i} which equals the cost of the production or collection of the Amazonian agriculture inputs. At the same time, the agent realizes the value V_{AMZ}^{i} for the supply of these inputs to the firm. As the stakeholder-oriented firm distributes value to the municipalities, the agent receives an additional value B. Therefore, the agent's best response is to keep the ***forest*** standing as long as the amount of value distributed is greater than the difference between the value created from the conventional and Amazonian agriculture production types, i.e., $B > \Delta V = (V_{CON} - V_{AMZ}) \gg 0$.

Proposition. *The equilibrium outcome depends on the amount of value* (B) *distributed by the firm once it enters a municipality, such that if the amount of value distributed is sufficiently large, then, in equilibrium, agents will preserve the forest more than what might occur when the firm is not present.*

Proof. Consider the optimal choice of each agent i whose goal is to maximize the agent's payoff. It follows that when the value distributed by the firm is sufficiently large such that $B > \Delta V$, the sum of the value created by the Amazonian agriculture (V_{AMZ}), and the value distributed by the firm (B) is larger than the value created by conventional agriculture production (V_{CON}). Thus, if the firm enters a municipality, the agent has an economic incentive to preserve the forest that is greater than if the firm does not enter the municipality. Consequently, analyzing the subgame following history $h = In$, the subgame perfect equilibrium is $\Gamma(\text{h}) = (In, Forest)$. ■

This proposition encapsulates the central argument in this paper: the equilibrium depends on the firm's ability to foster polycentric governance. This ability allows the firm to internalize positive externalities from environmental protection by distributing value to local, rural farmers generating Amazonian agriculture goods that constitute inputs into the firm's processes. In doing so, the firm creates an economic incentive for rural farmers to develop Amazonian agriculture goods rather than conventional goods. In distributing value to the community, the firm aligns incentives with the protection of the environment, which in this case is forest preservation.

NATURA AND THE AMAZON RAINFOREST COMMUNITIES

Founded in 1969 in Brazil, Natura Corporation is a multinational cosmetic company. In 2019, the company had a yearly revenue of R$ 8.4 billion (U$ 2.1 billion on Dec. 31st, 2019). The firm intensified its internationalization strategy through the acquisition of Australian *Aesop* (2014), British *the Body Shop* (2017), and American *Avon* (2019). One of Natura's distinct characteristics is a commitment to positive socio-environmental impact through reliance on biologically diverse ingredients in its products (Boehe et al., 2014; Gatignon & Capron, 2020; Marquis, 2020; Narsalay et al., 2015). Natura's emphasis on environmental protection drove the firm to international recognition and awards such as the United Nations' Champion of the Earth Award in 2015.[4] The primary approach that Natura implements to advance its environmental mission is procurement of

[4] UN Champion of the Earth 2015 video. Available at <https://www.youtube.com/watch?v=xdIctBWLYlM&t=22s>. Accessed on January 10th, 2020.

ingredients from the Amazon rainforest to produce soaps, lipsticks, and creams within the *Natura Ekos* product line.[5]

The development of an ecosystem of suppliers in Amazon communities arose gradually as Natura sought to develop stakeholder relationships with farmers and local leaders in municipalities rather than to procure conventional inputs on institutionalized markets through arms-length transactions. Historically, the Amazon region has been neglected both by the private and the public sectors. For decades, the region was considered the archetype of wilderness and underdevelopment (Fernández-Llamazares et al., 2020). Some political figures in the Brazilian government went as far as to claim that the natural environment in the Amazonian region impeded the country's economic progress and that the rainforest should be destroyed (Nazareno & Laurance, 2020; Pokorny et al., 2013; Pokorny, Johnson, Medina, & Hoch, 2012). Historically, deforestation was encouraged to yield economically valuable timber and animals (Nunes, Oliveira, Siqueira, Morton, & Souza, 2020; Pokorny et al., 2013; Pokorny & Pacheco, 2014; Rajão et al., 2020; Silva Junior et al., 2020). Voracious depletion of these natural resources in the region was accompanied by violations of human rights, including underpayments, enslavement, and even violence against native persons (Mendes, 1989).[6] To establish a network of Amazonian suppliers, Natura invested heavily during the 2000's in its "Amazon Plan," which increased its presence from four municipalities in 2000 to 56 municipalities in 2018 (see APPENDIX 2 for a visual representation of this expansion).

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[5] Natura Ekos product line. < https://www.naturabrasil.fr/en-us/about-us/our-lines/ekos > Accessed on April 20th, 2020.

[6] For anecdotal evidence of this phenomena the documentary "*Chico Mendes: Voice of the Amazon*" (1989) and the movie "*Iracema – Uma Transa Amazônica*" (1975) provide an interesting picture of the social situation in the locality which is marked by deforestation, illegal trade of prime wood, slavery, prostitution, murder, and diverse forms of social marginalization and oppression. IMDB, available at: <https://www.imdb.com/title/tt0293033/> <https://www.imdb.com/title/tt0126968/?ref_=nv_sr_srsg_0>. Accessed on January 16th, 2020.

To implement the "Amazon Plan," Natura performed several activities. Aiming to be energy efficient and pool production at a single place (Plambeck, 2012), the firm built an industrial plant in the Amazon (city of Benevides, Pará State), which subsequently became an "Eco-Park" for multiple firms working in the Amazon region. Natura established a dedicated team to develop relationships with rural communities, the so-called "Ecorelations" team. The mandate of the Ecorelations team is to prospect possible supplier communities from which there is potential to source Amazonian inputs for new cosmetics. After identifying a potential ingredient with technical and marketing appeal, the team approaches municipalities to co-create a governance structure for organizing an association/cooperative in the locality, and for collectively setting the terms of sale on price and quantity. This process is followed and supported by local non-governmental organizations (NGOs), grassroots organizations representing farmers, and civil society associations that together constitute the stakeholders in the polycentric governance system (Andersson & Ostrom, 2008; Boehe et al., 2014; Gatignon & Capron, 2020; Marquis, 2020; Narsalay et al., 2015).

After governance arrangements are established in local municipalities, Natura's team works with the community to identify processes through which ingredients can be extracted without damaging the forest to ensure the forest's sustainability over time (Saes, Silva, Nunes, & Gomes, 2014). A critical feature of this approach is the regeneration of the Amazonian ingredients in the forest into perpetuity. The Ecorelations team secures long-term stability and a fair trade price for the inputs. Rural suppliers are then responsible for collecting, processing, and shipping the Amazonian inputs to Natura's industrial plant, where they are paid (see APPENDIX 1 for visual illustrations from the field). At the plant, the ingredients are constituted into natural oils, butters, and pastes that become the essence of the cosmetics in the *Natura Ekos* product line. Natura advertises the social, environmental, and technical benefits of their products to final consumers, which command a price premium (see APPENDIX 13).

<< *Insert Figure* 2 *here* >>

A significant portion of the value created in this process is distributed to suppliers in Amazonian municipalities. Figure 2 shows that, among the total payments that Natura makes into the communities, 39% on average covers the costs incurred to grow and harvest the ingredients (V_{AMZ}) and 61% is a premium to compensate communities in excess of costs (B). The value B is distributed in several different ways; for example, Natura makes payments for access and use of traditional knowledge (71.5% of the total), local research on Amazonian inputs (16.5% of the total), investments in infrastructure, institutional development of communities (5% of the total), provision of training programs and technical support (4% of the total), and payments for commercial images and carbon credits (3% of the total). In 2019, Natura paid Amazonian suppliers a total of R$ 33.5 million (U$ 8.33 million on Dec. 31st, 2019), of which R$ 20 million (U$ 5.1 million on Dec. 31st, 2019) was the premium over directly incurred production costs.[7] Also, Natura distributes value into Amazonian communities in other ways than cash payments. The firm provides income stability to rural communities that avoid fluctuations in conventional agricultural prices. Reduced risk for local suppliers strengthens the partnership.

Natura employees, executives, and shareholders emphasize the importance of sharing value with local communities to align incentives and maintain the Amazonian supply-chain operation. It is precisely the distribution of value that enables the alignment between environmental and economic incentives with the Amazonian rural communities. According to Natura's CEO:

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[7] APPENDIX 14 presents the total investment Natura made in the Amazon rural communities from 2014 to 2019.

"To prevent ucuúba trees from being cut down for the production of brooms, sold in local shops, the group [Natura] *decided to pay twice the amount that the Amazon community received for their work. Instead of cutting, they started to earn more to keep the trees upright and extract only the seeds, which have moisturizing properties for the production of creams."* -- Roberto Marques, Natura Co. CEO. Available at UOL ECOA.[8]

As Amazonian inputs are ingredients in Natura's products, the firm benefits from establishing polycentric governance, which aligns environmental and economic incentives with rural communities. To test this proposition, the paper proceeds to the data and method section.

DATA AND METHOD

Data and Variable Definitions

The main database on which the analysis depends is drawn from the Brazilian National Institute for Spatial Research (INPE), which reports georeferenced satellite information on environmental protection for each of the 760 municipalities in the Brazilian Amazon region from 2000 to 2018. The INPE system uses images from Landsat (NASA) satellite, which has a spatial resolution of 30 meters. This system has been internationally recognized as a reliable monitoring system for forest preservation (Kintisch, 2007).

INPE's database was merged with a dataset made available from Natura, which specifies the geographical locations of each Amazon supplier, the year in which Natura entered those locations, and the Amazon inputs that these suppliers provide. Finally, we use data from the Brazilian Geography and Statistics Institute (IBGE) on the yearly Municipal Agricultural Production census.

[8] UOL ECOA. *Com investimento bilionário, Natura quer zerar desmatamento na Amazônia.* Available at: < https://www.uol.com.br/ecoa/ultimas-noticias/2020/07/13/com-investimento-bilionario-natura-quer-zerar-desmatamento-na-amazonia.htm?cmpid=copiaecola >. Accessed on July 16th, 2020.

Dependent variables. To measure the degree of environmental protection/depletion, we use two primary outcomes. The first, **Forested Areas (in km^2),** describes the total preserved area of the Amazon rainforest in each municipality. This value is updated every year by INPE's satellite images. The second, **Fire Incidents (in number of occurrences),** shows the number of fire incidents in each year by municipality. Unfortunately, INPE does not differentiate wildfire occurrences from anthropic fire occurrences. Nevertheless, given the logic of the Amazonian deforestation process, these fire incidents are usually caused by farmers and loggers aiming to "clear" forested areas for future cultivation and cattle farming (Costa, 2020; Pokorny et al., 2013; Rajão et al., 2020; Silva Junior et al., 2020).[9]

We linearize both variables given the skew in their distribution (Galasso & Schankerman, 2015). The mean of Forested Areas is 3.995 km^2, and the median equals 223 km^2, and the 75th percentile is 2.325 km^2. The number of Fire Incidents has a mean of 767 incidents, the median is 101 incidents, and the 75th percentile is 552 incidents. Removal of skew supports accuracy in interpretation of the regression coefficients and, consequently, of the phenomena (see distributions at APPENDIX 4). The dependent variables are expressed as $Y_{m,t} = Log(Outcome_{m,t} + 1)$ for each municipality m in each year t.

Independent Variable (Natura). The primary independent variable is a binary measure that takes the value of 1 if Natura entered the municipality, i.e., the firm established supply-chain relations with a rural community in the municipality in that particular year, and 0 otherwise. This variable is not co-linear with yearly effects because Natura entered municipalities successively over the nineteen-year period under analysis. This variable is characterized as:

[9] APPENDIX 3 shows a temporal comparison of the two indicators from 2000 to 2018 for all municipalities in Brazilian Amazon.

$$Natura_{m,t} = \begin{cases} 1 \; if \; m = Natura \; Municipality \; and \; t = Post \; Entrance \\ 0 \; if \; m = Not \; a \; Natura \; Municipality \; or \; t = Pre \; Entrance \end{cases}$$

Controls. As both dependent variables come from satellite images, we include satellite controls, including information on the amount of "not forested areas" (in km^2), which are natural savanna areas or urban areas; "hydrographic areas" (in km^2); such as lakes, rivers, and sea; and "cloud areas" (in km^2), i.e., areas in which the satellite system does not discern topographic characteristics because of cloud coverage. All control variables vary by municipality and year.

Satellite images are considered an ideal measure for tracking forest evolution among researchers studying the tragedy of the commons. According to Ostrom and Nagendra (2006): "Satellite remote sensing is the most frequently used technique for mapping changes in forest cover. When combined with on-the-ground observations, studies of land-cover change enable us to analyze social incentives and actions and explore environmental and social change" (Ostrom & Nagendra, 2006, p. 19225). Table 1 presents basic descriptive statistics for the main variables of interest.

<< Insert Table 1 here >>

Estimation Model

We expect Natura's entry into a municipality to positively impact environmental protection compared to what would have occurred had Natura not entered.[10] To test this proposition, the paper uses a two-way fixed effects differences-in-differences analysis (Callaway & Sant'Anna, 2019; Chakraborty & Jayaraman, 2019; de Chaisemartin & D'Haultfoeuille, 2018; Goodman-Bacon, 2018). The estimation model enables verification of the effect of Natura's entrance β on forested areas and the number of fire incidents in a municipality m subsequently from the year of entry $t =$

[10] The study predictions were preregistered at the *AsPredicted.org* webpage. An anonymized version of the registration is available at < https://aspredicted.org/blind.php?x=bd4uy8 >.

0. Municipality fixed effects are represented by γ_m and year fixed effects are represented by λ_t. The model:

$$Y_{m,t} = \alpha + \gamma_m + \lambda_t + \boldsymbol{\beta Natura_{m,t}} + X'_{m,t}\rho + \epsilon_{m,t}$$

$$\hat{\beta}_{DiD} = \left(\bar{Y}_{1,Natura,Post} - \bar{Y}_{0,Natura,Pre}\right) - \left(\bar{Y}_{1,Not\ Natura,Post} - \bar{Y}_{0,Not\ Natura,Pre}\right)$$

The central assumption behind the DiD model is that treated and untreated units would have parallel trends in the absence of the treatment. In other words, if Natura had not entered, then municipalities would similarly tend toward deforestation and fire incidents, i.e., $E[Y_{m,t}|m,t] = \gamma_m + \lambda_t$.

MAIN RESULTS

The first set of results provides evidence that Natura's entry into a municipality has a positive effect on forest preservation in that municipality. As indicated in the DiD model presented in Table 2, column (2), forested preservation is 47.9% ($p < 0.05$) higher in municipalities where Natura entered. Figure 4 brings an event study-style graph showing that, from the year that Natura enters onwards ($t \geq 0$ year indexes), there is a positive trend towards forest preservation. The trend is significant relative both in cross-section and intertemporally, as the trend lines after Natura's entry are statistically different than those prior to Natura's entry even in the municipalities of entry. Natura's entrance in a municipality "saved" about 1.8 million hectares, which is equivalent to 1.7 million football fields, relative to what the model estimates would have occurred had Natura not entered. Considering that the average forested hectare in the Amazon rainforest stores an additional 80 tons of Carbon compared to a deforested hectare (Souza-Rodrigues, 2018), Natura contributed to saving about 145 million tons of Carbon.[11]

<< Insert Table 2 and Figure 4 here >>

The results on fire incidents are complex. Table 2, column (4), shows that the number of fire incidents in the municipalities that Natura entered increased by 49.4% ($p < 0.01$) after Natura's engagement through supply-chain agreements with stakeholders in those municipalities. Natura's presence is associated with an increase of 1,100 in the total number of fire incidents. Again, Figure 4 provides an event study-style graph showing the estimated effect of Natura ($t \geq 0$ year indexes). However, the analysis on previous periods ($t < 0$ year indexes) suggests different pre-treatment trends between treated and control groups. This result suggests that Natura may have elected to enter municipalities in which fire incidents were extensive and imminent in order to curtail subsequent clearing to levels below what would have occurred had it not entered. In other words, although Natura's entry is associated with greater fire incidents cross-sectionally, the intertemporal trends suggest a reduction of fire incidents below the trend in those communities that Natura entered.

Robustness checks

Following theoretical and empirical pieces of evidence from an extensive literature on DiD (Bertrand, Duflo, & Mullainathan, 2004; Chakraborty & Jayaraman, 2019; de Chaisemartin & D'Haultfoeuille, 2018; Goodman-Bacon, 2018; Greenstone, Hornbeck, & Moretti, 2010; Moser & Voena, 2012), the study presents several robustness checks. First, the study offers a time trend robustness check. APPENDIX 5 shows that the results are robust to including both linear and

[11] APPENDIX 12 estimate what is the Natura effect in terms of Carbon tons for different scenarios. Also, it shows what would be the monetary value of the positive externality generated by Natura, and their suppliers, if the carbon saved had been commercialized in the European carbon markets.

quadratic time trends components. Also, the magnitudes of the coefficients are reasonably similar to the ones in the main model.

Next, the study presents a robustness check for the possibility of different pre-treatment trends, which would imply a violation of the parallel trends assumption. As described in Figure 4, visually, both Natura (treated) and non-Natura (control) municipalities seem to follow a similar trend for forested areas before entrance; however, the same does not seem to hold for fire incidents. To be more confident in this conclusion, we tested whether pre-treatment trends for treated and control municipalities are statistically similar. APPENDIX 6 demonstrates that the results are robust for the Forested Area variable (no statistically significant difference in pre-treatment trends) but not for the Fire Incidents variable ($p < 0.01$). These results emphasize that the fire finding from the main model was not driven by Natura's entrance but rather by different pre-existent tendencies between municipality types (treated and control).

Next, the study shows a placebo test simulating the results for a hypothetical entrance of Natura five years before the actual entrance period, in this sense $Natura_{m,t} = 1 \; if \; m = Natura \; Municipality, \; t = (Post \; Entrance \; Year - 5); \; 0 \; o.w.$ To be comprehensive, the expected result in a placebo test is to find that coefficients are not significant. APPENDIX 7 presents the test which supports the results for Forested Areas but not for Fire Incidents. The coefficient of the Fire Incidents model column (4) is about 3.5 p.p. higher in the placebo test than in the main DiD model ($p < 0.01$). This finding reinforces the interpretation that the growing trend in fire incidents in treated municipalities preceded Natura's entrance, suggesting that Natura's entry acts to slow down the increase in fire incidents.

The study presents additional analysis using a matching estimation (Abadie, Drukker, Herr, & Imbens, 2004; Abadie & Imbens, 2006). For the same year, the models paired the most similar municipalities on area and their distances to Natura's industrial plant (see APPENDIX 8). The process was repeated considering socioeconomic characteristics based on the Brazilian national census from 2000 and 2010. In this second case, we used information on the municipalities' total population, total working-age population, income per capita, Gini index, and municipal HDI (see APPENDIX 9). Both estimations statistically validate the main DiD results, despite slight variations in the magnitude.

Finally, as the study uses a two-way fixed effects differences-in-differences model in which treated units enter treatment in different periods (de Chaisemartin & D'Haultfoeuille, 2018; Goodman-Bacon, 2018), it is recommended to perform a decomposition analysis over the results (Goodman-Bacon, Goldring, & Ichols, 2019). APPENDIX 10 shows that 96% of the DiD estimator's weight comes from the "treatees vs. never treated" group. This is plausible since only four counties are always treated, and 56 among 760 counties entered treatment gradually in two decades. Therefore, these results confirm the adequacy of our main estimators.

MECHANISMS ANALYSES

Three possible mechanisms are relevant to the main results.

Mechanism One: Trade-off between Conventional and Amazonian Agriculture

A main finding from the DiD model is Natura's effect on forest preservation. How exactly did this preservation arise? Field evidence points to a possible trade-off between conventional and Amazonian agriculture. As stated by a cocoa supplier:

> *"Usually, there is cocoa and pasture (…), but 70% of the people who are involved in the organic production program, the main income comes from cocoa. (...) if it wasn't for cocoa, you had to move cattle (...) it is as follows, to keep up with cattle, you need to have at least 100 hectares of pasture, right?! And with cocoa, a family with 10 hectares of cocoa, they already support themselves, got it? (…) these 10 hectares generate about R$3.000 per month* [U$ 750]*."* -- Amazonian cocoa supplier. Personal communication.

The supplier describes that if it were not for the cocoa program developed in partnership with Natura, the local rural producers would need to switch from cocoa to cattle raising. To enable cattle production, these producers would have had to clear-cut the forest and transform the area into pasture land, a phenomenon well documented by the literature (Pokorny et al., 2013; Rajão et al., 2020). In line with the formal model, this piece of evidence suggests that a possible mechanism by which Natura managed to promote forest preservation was by providing a viable economic option to small rural producers to keep the forest standing and simultaneously earn income from renewable products of the forest. This alternative increased forest preservation because by aligning economic incentives with preservation rather than deforestation. Therefore, fewer areas were converted to conventional agriculture, such as cattle raising and soybean production.

The study uses data from the Brazilian Geography and Statistics Institute (IBGE) present on the Municipal Agriculture Production census database to test this argument. This database provides information on the yearly agricultural production of all Brazilian municipalities for a variety of products. We selected six types of agricultural products on which to test the mechanism, including three conventional products (total soybean production area in hectares, total corn production area in hectares, and total cattle herd in number of animals), and three Amazonian agricultural products (total *açaí* production area in hectares, total cocoa production area in hectares, and total passionfruit production area in hectares). This selection was based on two criteria. First, soybean, corn, and cattle are the main products of cleared areas that were previously forested. Second, Natura has a long tradition of using *açaí*, cocoa, and passionfruit in its products.[12]

[12] Unfortunately, IBGE does not have information on other Amazonian inputs used by Natura.

We expect that Natura's entry into a municipality had a negative impact on sales of conventional agricultural products and a positive impact on sales of Amazonian agricultural products. This is because, in line with the proposition, Natura's entry reduces the area dedicated to conventional agriculture and increases the area dedicated to Amazonian agriculture relative to the control group.

To test for type 2 error, the models consider two "placebo" agricultural outputs. The first, a conventional product, is the total buffalo herd in number of animals. Buffalo raising is not a prominent alternative for deforested Amazon areas. The second, an Amazonian product, is total *urucum* production in hectares. *Urucum* is an Amazonian nut that Natura does not procure and for which it has no product.

As expected, Table 3 shows that Natura's entry is negatively and significantly associated with soybean production (54.0% reduction at $p < 0.05$), cattle production (16.5% reduction at $p < 0.05$), and corn production (51.6% reduction at $p < 0.01$). As expected, Natura's entry had a null effect on the conventional placebo agriculture, the buffalo production. This validates that Natura's entry reduced the number of areas dedicated to conventional agriculture in the treated municipalities compared to the controls.

<< Insert Table 3 and Table 4 here>>

Table 4 shows that Natura's entry had a positive and significant effect on *açaí* production area (166.0% increase at $p < 0.01$) and cocoa production (20.2% increase at $p < 0.05$), in line with expectations. Surprisingly, the passionfruit production area was negatively affected by Natura's entry (36.1% reduction at $p < 0.01$). Natura's employees explained the reasons for this result. First, a potential trade-off arose between the cultivation of *açaí* and passionfruit as both grow under similar conditions. *Açaí*'s higher demand by Natura (almost three times higher than passionfruit) might have driven this result.[13] Second, according to Natura's employees, passionfruit can be cultivated in regions other than Amazon; therefore, the result might reflect a tendency to allocate resources toward *açaí*, which has "locational asset specificity" (Williamson, 1996) to the Amazon. As expected, Natura's entrance had a null effect on the Amazonian placebo agriculture, i.e., *urucum* production. Figure 5 visually represents Natura's effect on both agriculture types.

<< Insert Figure 5 here>>

Mechanism one helps us to understand that the forest preservation promoted by Natura mainly arose from a negative incentive to engage in conventional agriculture and a positive incentive to engage in Amazonian agriculture production. In using Amazon inputs in their products, Natura internalized the benefits of forest preservation while simultaneously aligning the incentives of farmers and other decision-makers in municipalities with practices that would preserve the forest.

Mechanism Two: Heterogeneity in Amazonian Inputs

The finding of relatively higher numbers of fire incidents in communities working with Natura as compared to those without Natura agreements raises questions about underlying heterogeneity. An alternative explanation to the one described above for this seemingly paradoxical result is that the products that Natura sought to purchase from Amazonian farmers required reforestation to cultivate specific types of crops relative to what was available in specific communities. On the one hand, we may expect some Amazonian agricultural products to have a higher effect on forest preservation than others, particularly if, for instance, they come from big Amazonian trees that are scattered around a large area. On the other hand, we might expect a higher

[13] Based on Natura's information, their demand for *açaí* was about 350 thousand kilograms/year in 2019 while the demand for passionfruit was about 122 thousand kilograms/year in 2019.

effect on fire incidents; insofar some Amazon inputs might come from previously deforested areas, which are regenerated at the forest edge, and are more likely to experience anthropic fires (Silva Junior et al., 2020). This possibility is aligned with the expectation of Natura's employees when describing a new product based on an input they are currently sourcing:

> *"We are working with a new species now, the tucumã, which is a palm tree that grows mainly in pre-deforested areas. Similarly to babaçu, it grows in pasture areas (...) this species grows naturally in these areas trying to dominate the environment. They also grow inside the forest, but they are often found in these more open areas."* -- Natura Ecorelations supply-chain coordinator. Personal communication.

Natura's effect on forest preservation might be the sum of its effect on both conservation and regeneration (Nunes et al., 2020). To this end, the study presents a heterogeneity analysis on the impact each different Amazonian input has on forested areas and the number of fire incidents. Table 5 presents these analyses.

<< Insert Table 5 here >>

The results indicate considerable heterogeneity in forest preservation across the inputs. Joint significance of *F-tests* equals 94.95 ($p < 0.000$). Analyzing the individual coefficients, for example, *ucuúba*[14], Brazil Nut (pt. *castanha*)[15], and *andiroba*[16] have a positive and large correlation with forested areas, respectively 308.3%, 239.0%, and 69.9% ($p < 0.01$). Not surprisingly, these inputs come from massive Amazonian trees that cover an extensive area.

<< Insert Figure 6 here >>

[14] Natura Ekos Ucuúba. < https://www.naturabrasil.fr/en-us/about-us/our-lines/ekos/ekos-ucuuba > Accessed on April 20th, 2020.
[15] Natura Ekos Castanha. < https://www.naturabrasil.fr/en-us/about-us/our-lines/ekos/ekos-castanha > Accessed on April 20th, 2020.
[16] Natura Ekos Andiroba. < https://www.naturabrasil.fr/en-us/about-us/our-lines/ekos/ekos-andiroba > Accessed on April 20th, 2020.

There is also heterogeneity in fire incidents. The *F-test* on differences in the coefficients equals 294.61 ($p < 0.000$). In this case, inputs such as *pataqueira*, *cupuaçu*[17], and *açaí*[18] are positively and strongly correlated with fire incidents at, respectively, 323.2%, 165.3%, and 113.8% ($p < 0.01$). Figure 6 presents a visual illustration of the input heterogeneity analysis.

This result reinforces recent scientific arguments showing that "in Amazonia, fire typically occurs in forest edges by escaping from deforested areas, pastures, and agricultural fields and leaking into surrounding forests" (Silva Junior et al., 2020, p. 6). Note that *cupuaçu* and *açaí* grown on trees that tend to be cultivated in previously pasture lands, so they are associated with forest regeneration in the forest edge (Nunes et al., 2020; Silva Junior et al., 2020). In contrast, *pataqueira* is a type of Amazonian grass that does not require much space and can be cultivated in irrigated beds. Interestingly, a blog post on Natura's website reports that fire is traditionally used to produce this species.

> *"According to local traditions, fire is used to plant* pataqueira*. The vegetation that margins the streams is burned and, after this, the plant is sown. We* [Natura] *had to find a new way of doing it without using fire, chemical inputs, and in a distant location from the water streams, which are protected areas. (…)*
>
> *The combination of local knowledge and agronomy techniques showed results. Tests were made with irrigated beds, far away from the streams. We grew the plant in different ways simultaneously. Some techniques were proposed by us and others by the community in order to develop and define a combined growing system. This entire process was managed collectively, and through trial and error, new paths were discovered until we finally succeeded."* -- Available at the Natura Campus Blog (2016).[19]

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[17] Natura Cupuaçu Video. < https://www.youtube.com/watch?v=lO-ubNfwIEg > Accessed on April 20th, 2020.
[18] Natura Ekos Açaí. < https://www.naturabrasil.fr/en-us/about-us/our-lines/ekos/ekos-acai > Accessed on April 20th, 2020.
[19] Natura Campus Blog. *Óleo essencial da pataqueira: união da técnica com as tradições amazônicas.* Available at: < http://www.naturacampus.com.br/cs/naturacampus/post/2016-04/oleo-essencial-pataqueira-tradicoes-amazonicas >. Accessed on August 20th, 2020. Translated by the author.

The quote illustrates why *pataqueira* input has the strongest correlation with fire incidents among all inputs sourced by Natura. The company aims to co-create solutions and to produce the *pataqueira* in collaboration with stakeholders with minimally harmful practices in the environment.

The input heterogeneity analyses help to explain Natura's positive impact on forested areas. The effects appear to arise from both superior forest conservation and forest regeneration at the forest edge. Regeneration was mainly driven by inputs from locations previously deforested under programs for re-building natural coverage by cultivating these inputs. The seemingly paradoxical result on fire incidents relates at least in part to input heterogeneity. Some inputs are more likely to be correlated with fire incidents in forest edge regeneration sites.

Mechanism Three: Carbon Mass Effect

The third mechanism deals more deeply with the results of fire incidents. Natura's entry is correlated with greater numbers of fire incidents by municipality. As suggested, this might arise from specific product choices such as *pataqueira*. Recall, however, that the pre-treatment trends of fire incidents in control and treated municipalities differ. This difference indicates selection by Natura of municipalities for entry with different characteristics than those not selected for entry.

The areas selected for entry by Natura may have had a higher carbon mass, and greater carbon mass is associated with larger numbers of fire incidents. The forested areas of the Amazon store, on average, 188.5 tons of carbon per hectare (tC/ha). Deforested areas of the Amazon store, on average, 107.9 tC/ha. A forested Amazon hectare has about 80 tC/ha more than a deforested one (Souza-Rodrigues, 2018, p. 2730). Therefore, a possible explanation is that a higher number of fire incidents occur after Natura's entry because of two factors. First, the firm tends to enter municipalities with greater carbon density. Second, after entry, Natura seeks to preserve and regenerate more forest than in the control group, which results in greater marginal fire incidents due to the carbon density of the local forest in the municipality.

To test this possibility, a variable called **forested proportion (in %)** was constructed. This variable measures the percent of forested areas per area in each municipality. We then performed a test to evaluate the correlation between this variable with the number of fire incidents. Table 6 presents the results.

<< *Insert Table 6 here* >>

Table 6, column (1), shows that the higher the forest proportion in a municipality, the greater the number of fire incidents ($p < 0.01$). This finding corroborates the previous interpretation of the carbon mass effect. Table 6, column (2), shows that, even when controlling for Natura's entry, the forest proportion coefficient remains significant ($p < 0.01$) and greater in magnitude by 3.6 p.p. In other words, controlling for Natura's entry, the number of fire incidents is strongly correlated with the proportion of forested areas a municipality has. This result confirms that Natura tends to enter high carbon density municipalities, increasing this density further after entry.

<< *Insert Figure 7 here* >>

Fire incidents are correlated with Natura's entry in part because the treated municipalities have a greater tendency of fire due to higher forest proportion *ex ante* (pre-treatment trend). At the same time, Natura's entry leads to increases in the forested area, and thus is the tendency of a higher number of fire incidents post-treatment. Figure 7 illustrates this result.

SATELLITE MISSING IMAGES AS INSTRUMENTAL VARIABLE

One of the main limitations of the DiD model is the possible endogeneity of the treatment. This endogeneity may arise from lack of randomness in Natura's entry decision. The main models include municipality fixed effects that allow us to control for municipality selection on observable characteristics. To further rule out possible endogeneity, we conduct additional analysis using an instrumental variable estimation (Angrist & Pischke, 2008; Mariano, 1977).

The objective in the selection of the instrument $Z_{m,t}$ is, first, relevance $corr[Z_{m,t}, Natura_{m,t}] \neq 0$ for all municipalities m and years t. Second, the instrument must be independent, i.e., unrelated to omitted variables present in the error term $Z_{m,t} \coprod \epsilon_{m,t}$ or $E[\boldsymbol{Z'_{m,t}}, \epsilon_{m,t}] = 0$. Finally, the instrument must satisfy the exclusion restriction, according to which the instrument $Z_{m,t}$ only affects the outcome $Y_{m,t}$ through a single channel, the treatment variable, i.e., the $Natura_{m,t}$ dummy.

Instrumental variable ("missing images"). The use of satellite data as instruments has already been explored in the literature, particularly using clouds as an instrument for firms' investment decisions (Nagaraj, 2017). As cloudy images block the visualization of the terrain, they fit the three instrument assumptions in some cases. However, in this study, we would expect a higher incidence of clouds to be correlated with more forested areas and less fire because of biological properties. Thus, clouds are rejected. Instead, the study applies an alternative instrument based on satellite data: the presence of "missing satellite images," which are technical omissions that arise from idiosyncrasies of the satellites rather than features of the natural environment (see Figure 8).

<< Insert Figure 8 here >>

The INPE georeferencing system relies on Landsat satellites (Kintisch, 2007). These satellites register images on 220 different scenes covering all Brazilian Amazon region every year (Camara, Valeriano, Vianei, da Motta, & Maurano, 2013, p. 11). Sometimes the satellites fail to take a picture of specific scenes. Technical problems cause these failures at the moment the satellite is taking the picture. The failure then leads to an absence of images for a particular scene in a given year. The absence is accounted for each one of the municipalities as "not observed areas" and converted in km^2. Thus, in the final database, INPE registers the amount of areas for which images were missing (not observed) by municipality m at year t. As described by one of INPE's coordinator:

> *"(...) in the past, you had fewer data available; 10 to 15 years ago, you basically had Landsat* [images] *only once a year and would feel happy with that. So, eventually, you use to have the problem of not having a full scene* [one of the 220 Amazon scenes], *because it was not recorded, because the picture failed, because the antenna had a problem. Then, as you did not have a full Landsat scene, they were classified as a 'not observed data.'"* -- INPE coordinator. Personal communication.

As the technical failures have no relation with the topographic coverage of an area, the independence assumption holds for missing images. The relevance assumption also holds as Natura managers evaluate a municipality for entry on three criteria: the production potential of the location for a specific Amazon input, the organization level of the local supplier, and the information from INPE satellite data in the year before the entry. In the words of a Natura Ecorelations supply-chain manager:

> *"We do not evaluate extensively whether the location had images for each specific year. But of course, we usually get the least available data* [from the year before] *and take a look to make the decision. For example, suppose it is a region that is very 'problematic'* [a high number of missing images]. *In that case, we might even decide to proceed with the relation in the new community, but aware of this problem."* -- Natura Ecorelations supply-chain coordinator. Personal communication.

Therefore, the instrument also satisfies the relevance assumption, i.e., the missing satellite images correlate with Natura's decision about entering a municipality.

Although it is difficult to claim categorically that Natura is the only agent using the satellite data, it is unlikely that other agents such as loggers and large farmers use this information in their decisions to deforest an area. This is because technical failures almost never occur in the same place in successive years. And even if they occur, INPE can track missing scenes in the subsequent years, evaluate whether an area was deforested during the period of technical failure, and then inform the federal police to perform command and control actions in those locations (Souza-Rodrigues, 2018). So, the instrument also satisfies the exclusion restriction assumption.

Considering that the current instrument satisfies all required assumptions, the paper presents the estimation of the Natura effect on forest preservation and fire incidents through a just identified two-stage least squares (2SLS) model, as follows:

$$\boldsymbol{Natura_{m,t}} = \alpha' + \gamma'_m + \lambda'_t + \phi[\boldsymbol{Log(Missing\ Image\ + 1)_{m,t-1}} \times (\boldsymbol{1 - Natura_{m,t-1}})] + X'_{m,t}\rho + \epsilon'_{m,t}$$

$$Y_{m,t} = \alpha + \gamma_m + \lambda_t + \boldsymbol{\beta \widehat{Natura}_{m,t}} + X'_{m,t}\rho + \epsilon_{m,t}$$

As the dataset has a panel data structure, the instrumental variable varies per municipality m and year t. Therefore, it is essential to account for Natura's entry year in a municipality on the use of the instrument. For example, if Natura entered a municipality in year t, we would expect that they have used the information about missing images from year $t-1$ in the decision making. However, in the years $t+1$, $t+2$, $t+3$, onwards, as Natura has already entered the municipality, they will not use the satellite data on the entry decision anymore. Thus, the models consider the term $(1 - Natura_{m,t-1})$ to account for the fact that the satellite information on missing images is used by Natura up to entry in year t, but not subsequently.[20]

Results. Table 7, columns (2) and (4), show that Natura's entry in a municipality is negatively correlated with the number of missing image areas ($p < 0.01$). In the second stage,

[20] APPENDIX 11 presents an additional test of the instrumental variable estimation without the correction for Natura's possible entrance in year $t-1$. The results are statistically similar, however, in the later case we have a weakly identified model.

columns (1) and (3), the results reinforce the previous findings concerning Natura's effects. According to the model, Natura's entry has a significant positive effect on forested areas ($p < 0.01$). However, it has no significant effect on fire occurrences. Interestingly, the magnitude of the coefficient for the forested areas equals 19.36%, which is considerably smaller than the estimate in the DiD models.[21] As instrumental variable analyses are biased towards OLS, the model helps to reinforce the validity of previous findings.

<< *Insert Table 7 here* >>

Finally, the models reject the possibility of a weak instrument (weak identification). The model *F-stat* equals 12.46, which reinforces the strong correlation between the instrument and the endogenous regressor (Andrews, Stock, & Sun, 2018; Angrist & Pischke, 2008; Mariano, 1977).

CONCLUSION

Achieving remediation of change in climate has been intractable in part because of the challenges of aligning private-sector activity with environmental preservation. Internalizing environmental externalities and governing common-pool resources is particularly complex (Dowell et al., 2000; Henderson, 2020). The literature on the tragedy of the commons has shown that polycentric governance structures, in which a wide range of agents participate in the decision making and value appropriation, is a potentially effective remedy (Andersson & Ostrom, 2008; Ostrom, 2005). This study shows how Natura, a well-known stakeholder-oriented firm (Boehe et al., 2014; Gatignon & Capron, 2020; Marquis, 2020), managed to co-create a polycentric governance structure with rural Amazon communities, successfully aligning incentives among critical proximate stakeholders to achieve both economic and environmental goals (Barney, 2018;

[21] As the 2SLS model has a level-log equation in the first stage and a log-level equation in the second stage, the interpretation of the $\beta\widehat{Natura}$ in the second stage is already in percent.

Delmas & Toffel, 2008; Eccles et al., 2014; Garcia-Castro & Aguilera, 2015; Gatignon & Capron, 2020; Klein et al., 2019; McGahan, 2020).

The analysis reported in this paper demonstrates that Natura's polycentric governance system has also yielded significant environmental effects. Natura's entry into Amazonian municipalities preserved and reconstituted forested areas. Through a DiD approach, this paper compares municipalities in which Natura entered with municipalities that Natura did not enter between 2000 and 2018. The results show that Natura's entry led to preservation of an estimated 1.8 million hectares, saving approximately 145 million tons of Carbon (tC). Relative to pre-treatment trends, the firm's entry reduced fire incidents. Where fire incidents increased with Natura's entry, they were associated with shifts in crops toward forest-sustaining alternatives and high-carbon forestation.

An analysis of mechanisms suggests that the increase in forestation occurred because Natura creates economic incentives for small rural communities to produce Amazonian inputs instead of conventional agriculture products, which usually deplete the forest. The heterogeneity in inputs Natura sources leads some communities to conserve and others to regenerate the forest. The fire results seem to be a consequence of the higher carbon mass in the municipalities in which Natura operates, both *ex ante* and *ex post* treatment. Analyses using missing images from satellites as an instrument variable support the conclusion that the positive effect that Natura's entry had on forest preservation was not accompanied by increased fire incidents.

This paper makes three main contributions to the management literature. First, the paper contributes to theory by showing that stakeholder-oriented firms can contribute to the preservation of common goods such as the Amazonian forest through polycentric governance co-created with critical proximate stakeholders. Second, the paper advances empirical results by relying on a novel dataset describing georeferenced satellite images to measure the impact of aligned stakeholder governance on environmental protection. This data measures real environmental impact instead of relying on the firm's self-reported data or third-party rating scores. Third, the paper contributes to a practical understanding of how innovative practices in the private sector foster achievement of the UN's Sustainable Development Goals (SDGs), and specifically of SDG #13 (Climate Action) and SDG #15 (Life on Earth). By developing innovative governance structures that account for limitations of resource exploitation in the natural environment, private-sector actors can take inspiration from Natura's achievements in preserving and reconstituting the Amazon rainforest. There is no Planet B.

REFERENCES

Amis, J., Barney, J., Mahoney, J. T., & Wang, H. (2020). Why we need a Theory of Stakeholder Governance - And Why This is a Hard Problem. *Academy of Management Review*, *45*(3), 499–503.

Andersson, K. P., & Ostrom, E. (2008). Analyzing decentralized resource regimes from a polycentric perspective. *Policy Sciences*, *41*(1), 71–93. https://doi.org/10.1007/s11077-007-9055-6

Andrews, I., Stock, J., & Sun, L. (2018). *Weak Instruments and What to do About Them*. *NBER Working Paper*. https://doi.org/10.7591/9781501731884-002

Angrist, J. D., & Pischke, J.-S. (2008). *Mostly Harmless Econometrics: An Empiricist's Companion*. Princeton University Press. https://doi.org/10.1057/be.2009.37

Bansal, P., & DesJardine, M. (2014). Business sustainability: It is about time. *Strategic Organization*, *12*(1), 70–78. https://doi.org/10.1177/1476127013520265

Bansal, P., & Roth, K. (2000). Why Companies Go Green: A Model of Ecological Responsiveness. *Academy of Management Journal*, *43*(4), 717–736. https://doi.org/10.1117/1.2220527

Barney, J. B. (2018). Why resource-based theory's model of profit appropriation must incorporate a stakeholder perspective. *Strategic Management Journal*, *39*(13), 3305–3325. https://doi.org/10.1002/smj.2949

Barney, J. B. (2019). Guidepost Trilogy - Claims on the Corporation: Directions for Stakeholder Research in the Field of Management - Measuring Firm Performance in a Way that is Consistent with Strategic Management Theory. *Academy of Management Discoveries*, *6*(1), 5–7. https://doi.org/10.5465/amd.2018.0219

Bayer, P., & Aklin, M. (2020). The European Union Emissions Trading System reduced CO_2 emissions despite low prices. *Proceedings of the National Academy of Sciences*, 201918128. https://doi.org/10.1073/pnas.1918128117

Bertrand, M., Duflo, E., & Mullainathan, S. (2004). How much should we trust differences-in-differences estimates? *Quarterly Journal of Economics*, *119*(1), 249–275.

Boehe, D. M., Pongeluppe, L. S., & Lazzarini, S. G. (2014). Natura and the development of a sustainable supply chain in the Amazon region. In L. Liberman, S. Garcilazo, & E. Stal (Eds.), *Multinationals in Latin America: 49-71. London: Palgrave Macmillan.* (pp. 1–22). London: Palgrave McMillan.

Bowen, F. E., Bansal, P., & Slawinski, N. (2018). Scale matters: The scale of environmental issues in corporate collective actions. *Strategic Management Journal*, *39*(5), 1411–1436. https://doi.org/10.1002/smj.2764

Callaway, B., & Sant'Anna, P. H. C. (2019). Difference-in-Differences with Multiple Time Periods. *Working Paper*, 1–37.

Camara, G., Valeriano, D., Vianei, J., da Motta, M., & Maurano, L. (2013). *Metodologia para o Cálculo da Taxa Anual de Desmatamento na Amazônia Legal*. São José dos Campos, Brazil.

Chakraborty, T., & Jayaraman, R. (2019). School feeding and learning achievement: Evidence from India's midday meal program. *Journal of Development Economics*, *139*(October 2018), 249–265. https://doi.org/10.1016/j.jdeveco.2018.10.011

Coase, R. H. (1960). The Problem of Social Cost. *Journal of Law and Economics*, *3*(1), 1. https://doi.org/10.1086/466560

Costa, C. (2020). Amazon under threat: fires, loggers and now virus. Retrieved May 21, 2020, from https://www.bbc.com/news/science-environment-51300515

de Chaisemartin, C., & D'Haultfoeuille, X. (2018). *Two-way fixed effects estimators with heterogeneous treatment effects*. *SSRN*.

Delmas, M. A., & Toffel, M. W. (2004). Stakeholders and Environmental Management Practices: An Institutional Framework. *Business Strategy and the Environment*, *222*, 209–222.

Delmas, M. A., & Toffel, M. W. (2008). Organizational Responses to Environmental Demands: Opening the Black Box. *Strategic Management Journal*, *29*, 1027–1055. https://doi.org/10.1002/smj

Demsetz, H. (1967). Toward a Theory of Property Rights. *American Economic Review*, *57*(2), 347–359.

Devinney, T. M., McGahan, A. M., & Zollo, M. (2013). A Research Agenda for Global Stakeholder Strategy. *Global Strategy Journal*, *3*, 325–337. https://doi.org/10.2139/ssrn.2320371

Donaldson, T. (2002). The Stakeholder Revolution and the Clarkson Principles. *Business Ethics Quarterly*, *12*(2), 107–111.

Donaldson, T., & Preston, L. E. (1995). The Stakeholder Theory of the Corporation: Concepts, Evidence, and Implications. *Academy of Management Review*, *20*(1), 65–91.

Dorobantu, S., & Odziemkowska, K. (2016). Valuing Stakeholder Governance: Property Rights, Autonomy, and Collective Action. In *Academy of Management Proceedings*. Briarcliff Manor, NY 10510: Academy of Management, 2016. https://doi.org/https://doi.org/10.5465/ambpp.2016.17298abstract

Dowell, G., Hart, S., & Yeung, B. (2000). Do corporate global environmental standards create or destroy market value? *Management Science*, *46*(8), 1059–1074. https://doi.org/10.1287/mnsc.46.8.1059.12030

Eccles, R. G., Ioannou, I., & Serafeim, G. (2014). The impact of corporate sustainability on organizational processes and performance. *Management Science*, *60*(11), 2835–2857. https://doi.org/10.1287/mnsc.2014.1984

Fernández-Llamazares, Á., Terraube, J., Gavin, M. C., Pyhälä, A., Siani, S. M. O., Cabeza, M., & Brondizio, E. S. (2020). Reframing the Wilderness Concept can Bolster Collaborative

Conservation. *Trends in Ecology and Evolution*, *35*(9), 750–753. https://doi.org/10.1016/j.tree.2020.06.005

Flammer, C. (2013). Corporate Social Responsibility and Shareholder Value: The Environmental Consciousness of Investors. *Academy of Management Journal*, *56*(3), 758–781. https://doi.org/10.2139/ssrn.1888742

Flammer, C. (2015). Does Corporate Social Responsibility Lead to Superior Financial Performance ? A Regression Discontinuity Approach. *Management Sciecnce*, *61*(11), 2549–2568.

Flammer, C., & Kacperczyk, A. (2016). The Impact of Stakeholder Orientation on Innovation: Evidence from Natural Experiment. *Management Sciecnce*, *62*(7), 1982–2001. https://doi.org/10.2139/ssrn.2668126

Flammer, C., & Kacperczyk, A. (2019). Corporate social responsibility as a defense against knowledge spillovers: Evidence from the inevitable disclosure doctrine. *Strategic Management Journal*, (February). https://doi.org/10.1002/smj.3025

Freeman, R. E., Wicks, A. C., & Parmar, B. (2004). Stakeholder Theory and "The Corporate Objective Revisited." *Organization Science*, *15*(3), 364–369. https://doi.org/10.1287/orsc.1040.0066

Galasso, A., & Schankerman, M. (2015). Patents and Cumulative Innovation: causal Evidence from the Courts. *The Quarterly Journal of Economics*, 317–369. https://doi.org/10.1093/qje/qju029.Advance

Garcia-Castro, R., & Aguilera, R. V. (2015). Incremental Value Creation and Appropriation in a World with Multiple Stakeholders. *Strategic Management Journal*, *36*, 137–147. https://doi.org/10.1002/smj.2241

Gatignon, A., & Capron, L. (2020). The Firm as an Architect of Polycentric Governance: Building Open Institutional Infrastructure in Emerging Markets. *Strategic Management Journal*, 1–38.

George, G., Howard-Grenville, J., Joshi, A., & Tihanyi, L. (2016). Understanding and Tackling Societal Grand Challenges Through Management Research. *Academy of Management Journal*, *59*(6), 1880–1895.

Goodman-Bacon, A. (2018). Difference-in-Differences with Variation in Treatment Timing. *NBER Working Paper Series*, (25018). Retrieved from http://www.nber.org/papers/w25018

Goodman-Bacon, A., Goldring, T., & Ichols, A. (2019). Bacondecomp: Stata module for decomposing difference-in-differences estimation with variation in treatment timing. Retrieved from https://ideas.repec.org/c/boc/bocode/s458676.html

Greenstone, M., Hornbeck, R., & Moretti, E. (2010). Identifying Agglomeration Spillovers: Evidence from Winners and Losers of Large Plant Openings. *Journal of Political Economy*, *118*(3), 536–598.

Hardin, G. (1968). The Tragedy of the Commons. *Science*, *162*(June), 1243–1248.

Hart, S. L., & Dowell, G. (2011). A natural-resource-based view of the firm: Fifteen years after. *Journal of Management*, *37*(5), 1464–1479. https://doi.org/10.1177/0149206310390219

Henderson, R. (2020). *Reimagining Capitalism in a World on Fire* (Vol. 53). New York, NY: PublicAffairs.

Henderson, R., Gulati, R., & Tushman, M. (2015). *Leading Sustainable Change: An Organizational Perspective*. Oxford, UK: Oxford University Press. https://doi.org/10.1093/acprof:oso/9780198704072.003.0001

Henderson, R., & Serafeim, G. (2020). Tackling Climate Change Requires Organizational Purpose. *AEA Papers and Proceedings*, *110*, 177–180.

https://doi.org/10.1257/pandp.20201067
Henisz, W. J., Dorobantu, S., & Nartey, L. J. (2014). Spinning gold: The financial returns to stakeholder engagement. *Strategic Management Journal*, *35*, 1727–1748. https://doi.org/10.1002/smj
Henisz, W. J., & McGlinch, J. (2019). ESG, Material Credit Events, and Credit Risk. *Journal of Applied Corporate Finance*, *31*(2), 105–117. https://doi.org/10.1111/jacf.12352
Horwitz, J. R., & McGahan, A. M. (2019). Collaborating to Manage Performance Trade-offs: How Fire Departments Preserve Life and Save Property. *Strategic Management Journal*, *40*, 408–431. https://doi.org/10.1002/smj.2993
Jones, T. M. (1995). Instrumental Stakeholder Theory: A Synthesis of Ethics and Economics. *Academy of Management Review*, *20*(2), 404–437.
Jones, T. M., Harrison, J. S., & Felps, W. (2018). How applying instrumental stakeholder theory can provide sustainable competitive advantage. *Academy of Management Review*, *43*(3), 371–391. https://doi.org/10.5465/amr.2016.0111
Kaplan, S. (2019). *The 360° Corporation: From Stakeholder Trade-offs to Transformation*. Stanford University Press.
Kintisch, E. (2007). Improved monitoring of rainforests helps pierce haze of deforestation. *Science*, *316*(5824), 536–537. https://doi.org/10.1126/science.316.5824.536
Klein, P. G., Mahoney, J. T., McGahan, A. M., & Pitelis, C. N. (2019). Organizational Governance Adaptation: Who Is In, Who Is Out, and Who Gets What. *Academy of Management Review*, *44*(1), 6–27.
Lazzarini, S. G. (2020). The Nature of the Social Firm: Alternative Organizational Forms for Social Value Creation and Appropriation. *Academy of Management Review*, *45*(3), 620–645.
Lieberman, M. B., Garcia-Castro, R., & Balasubramanian, N. (2017). Measuring Value Creation and Appropriation in Firms: The VCA Model. *Strategic Management Journal*, *38*, 1193–1211. https://doi.org/10.1002/smj.2565
Lumpkin, T., & Bacq, S. (2019). Civic Wealth Creation: A New View of Stakeholder Engagement and Societal Impact. *Academy of Management Perspectives*, *33*(4), 383–404. https://doi.org/10.5465/amp.2017.0060
Luo, J., & Kaul, A. (2018). Private action in public interest: The comparative governance of social issues. *Strategic Management Journal*, (August 2018), 476–502. https://doi.org/10.1002/smj.2961
Marciano, A., Frischmann, B. M., & Ramello, G. B. (2019). Tragedy of the Commons after 50 Years. *Journal of Economic Perspectives*, *33*(4), 211–228. https://doi.org/10.2139/ssrn.3451688
Mariano, R. S. (1977). Finite Sample Properties of Instrumental Variable Estimators of Structural Coefficients. *Econometrica*, *45*(2), 487–496.
Marquis, C. (2020). *Better Business: How the B Corp Movement Is Remaking Capitalism*. Yale University Press.
McGahan, A. M. (2020). *Integrating Insights from the Resource-Based View of the Firm into the New Stakeholder Literature*.
Mendes, C. (1989). *Fight for the Forest: Chico Mendes in His Own Words* (2nd ed.). Rio de Janeiro, Brazil: Latin America Bureau Ltd.
Moser, B. P., & Voena, A. (2012). Compulsory Licensing: Evidence from the Trading with the Enemy Act. *American Economic Review*, *102*(1), 396–427.
Nagaraj, A. (2017). The Private Impact of Public Information: Landsat Satellite Maps and Gold

Exploration. *Working Paper*. Retrieved from http://abhishekn.com/files/nagaraj_landsat.pdf

Narsalay, R., Pongeluppe, L., & Light, D. (2015). The Hidden Pitfalls of Inclusive Innovation. *Stanford Social Innovation Review*, *Winter*(Winter), 48–53.

Natura Campus Blog. (2016). Pataqueira essential oil: a combination between technique and Amazon traditions. Retrieved April 20, 2020, from http://www.naturacampus.com.br/cs/naturacampus/post/2016-04/oleo-essencial-pataqueira-tradicoes-amazonicas

Nazareno, A. G., & Laurance, W. F. (2020). Investors can help rein in Amazon deforestation. *Science Letters*, *369*(6504), 635–636. https://doi.org/10.1126/science.abd6977

Nunes, S., Oliveira, L., Siqueira, J., Morton, D. C., & Souza, C. M. (2020). Unmasking secondary vegetation dynamics in the Brazilian Amazon. *Environmental Research Letters*, *15*(3). https://doi.org/10.1088/1748-9326/ab76db

Ostrom, E. (1990). *Governing the Commons: The Evolution of Institutions for Collective Action*. Cambridge, UK: Cambridge University Press.

Ostrom, E. (2000). Collective Action and the Evolution of Social Norms. *Journal of Economic Perspectives*, *14*(13), 7–158. https://doi.org/10.1257/jep.14.3.137

Ostrom, E. (2005). *Understanding Institutional Diversity*. *Public Choice* (Vol. 132). New Jersey: Princeton University Press. https://doi.org/10.1007/s11127-007-9157-x

Ostrom, E., & Nagendra, H. (2006). Insights on linking forests, trees, and people from the air, on the ground, and in the laboratory. *Proceedings of the National Academy of Sciences of the United States of America*, *103*(51), 19224–19231. https://doi.org/10.1073/pnas.0607962103

Plambeck, E. L. (2012). Reducing greenhouse gas emissions through operations and supply chain management. *Energy Economics*, *34*(SUPPL.1), S64–S74. https://doi.org/10.1016/j.eneco.2012.08.031

Pokorny, B., de Jong, W., Godar, J., Pacheco, P., & Johnson, J. (2013). From large to small: Reorienting rural development policies in response to climate change, food security and poverty. *Forest Policy and Economics*, *36*, 52–59. https://doi.org/10.1016/j.forpol.2013.02.009

Pokorny, B., Johnson, J., Medina, G., & Hoch, L. (2012). Market-based conservation of the Amazonian forests: Revisiting win-win expectations. *Geoforum*, *43*(3), 387–401. https://doi.org/10.1016/j.geoforum.2010.08.002

Pokorny, B., & Pacheco, P. (2014). Money from and for forests: A critical reflection on the feasibility of market approaches for the conservation of Amazonian forests. *Journal of Rural Studies*, *36*, 441–452. https://doi.org/10.1016/j.jrurstud.2014.09.004

Porter, M. E., & Kramer, M. R. (2006). Strategy and society: the link between competitive advantage and corporate social responsibility. *Harvard Business Review*, 78–93.

Porter, M. E., & Kramer, M. R. (2011). Creating Shared Value. *Harvard Business Review*, *89*(1/2), 62–77.

Rajão, R., Soares-Filho, B., Nunes, F., Börner, J., Machado, L., Assis, D., … Figueira, D. (2020). The rotten apples of Brazil’s agribusiness. *Science (New York, N.Y.)*, *369*(6501), 246–248. https://doi.org/10.1126/science.aba6646

Saes, M. S. M., Silva, V.-L., Nunes, R., & Gomes, T. M. (2014). Partnerships, Learning, and Adaptation: A Cooperative Founded by Japanese Immigrants in the Amazon Rainforest. *International Journalof Business and Social Science*, *5*(12), 131–141.

Silva Junior, C. H. L., Aragão, L. E. O. C., Anderson, L. O., Fonseca, M. G., Shimabukuro, Y. E., Vancutsem, C., … Saatchi, S. S. (2020). Persistent collapse of biomass in Amazonian forest edges following deforestation leads to unaccounted carbon losses. *Science Advances*, *6*, 1–9.

Souza-Rodrigues, E. (2018). Deforestation in the Amazon: A Unified Framework for Estimation and Policy Analysis. *The Review of Economic Studies*, (December 2018), 2713–2744. https://doi.org/10.1093/restud/rdy070

Stavins, R. N. (2011). The problem of the commons: Still unsettled after 100 years. *American Economic Review*, *101*(1), 81–108. https://doi.org/10.1257/aer.101.1.81

Teodoridis, F. (2018). Understanding team knowledge production: The interrelated roles of technology and expertise. *Management Science*, *64*(8), 3625–3648. https://doi.org/10.1287/mnsc.2017.2789

Teodorovicz, T., Cabral, S., Lazzarini, S. G., & McGahan, A. M. (2019). *How a firm strengthens relationships with contract workers by investing in their general human capital*.

Williamson, O. E. (1996). *The Mechanisms of Governance*. Oxford: Oxford University Press.

FIGURES

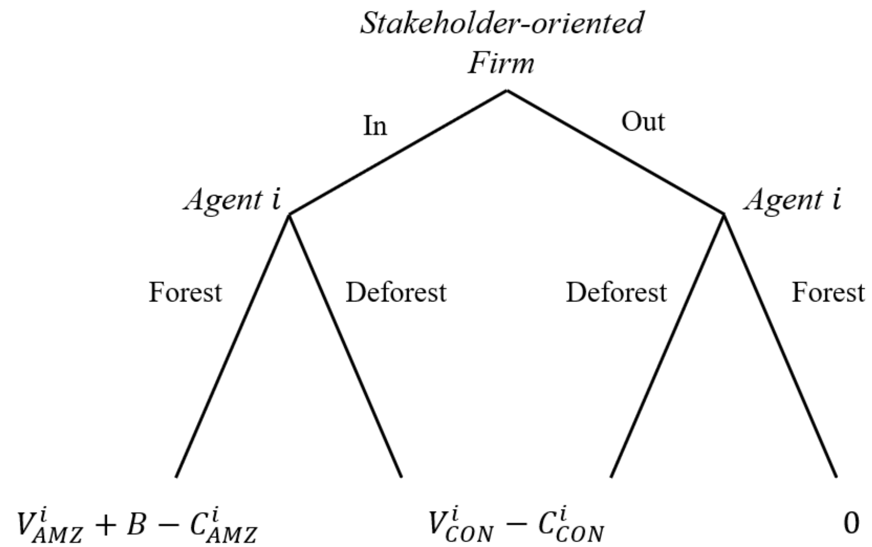


Figure 1 – Decision Tree for Agent i in the Amazonian Rural Communities

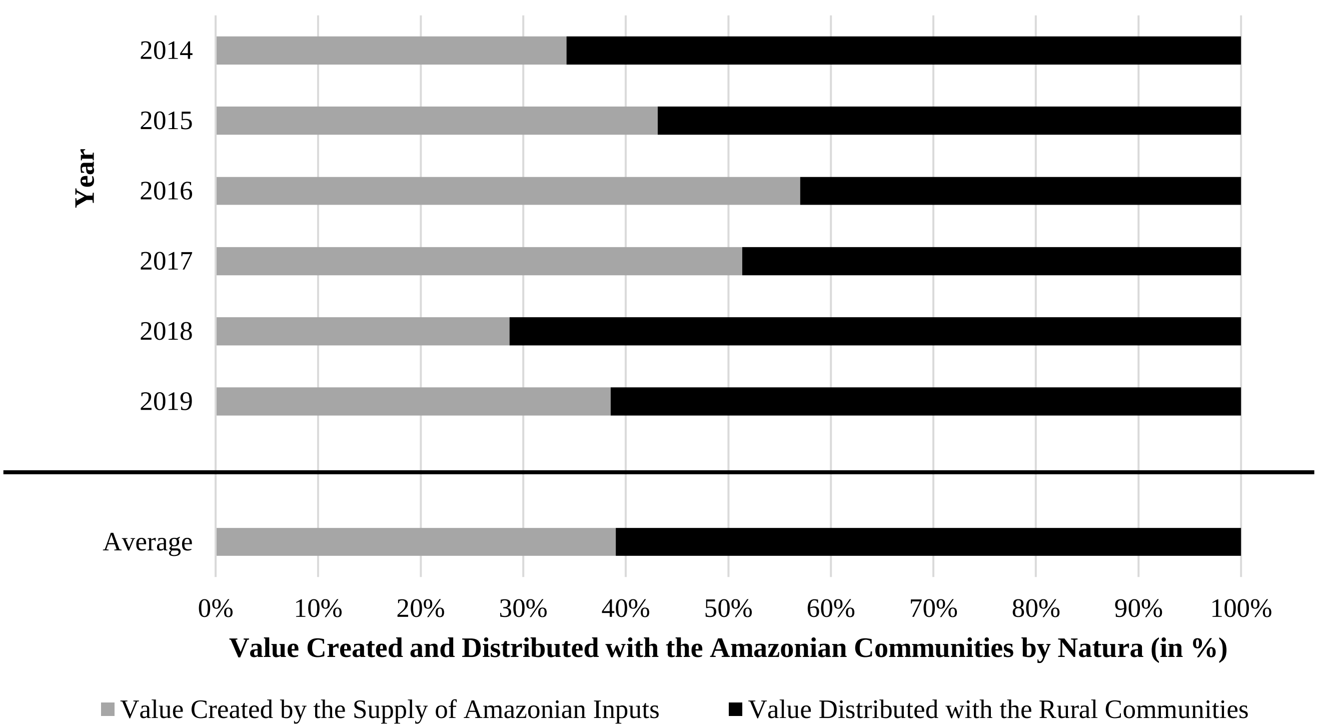


Figure 2 – Value Created (V_{AMZ}) and Value Distributed (B) with the Amazonian Communities by Natura

Note: Data from Natura's Annual Report 2019 and Annual Report 2016. GRI 203-1 indicator. Both accessed on May 28th, 2020. More details are presented in APPENDIX 14.

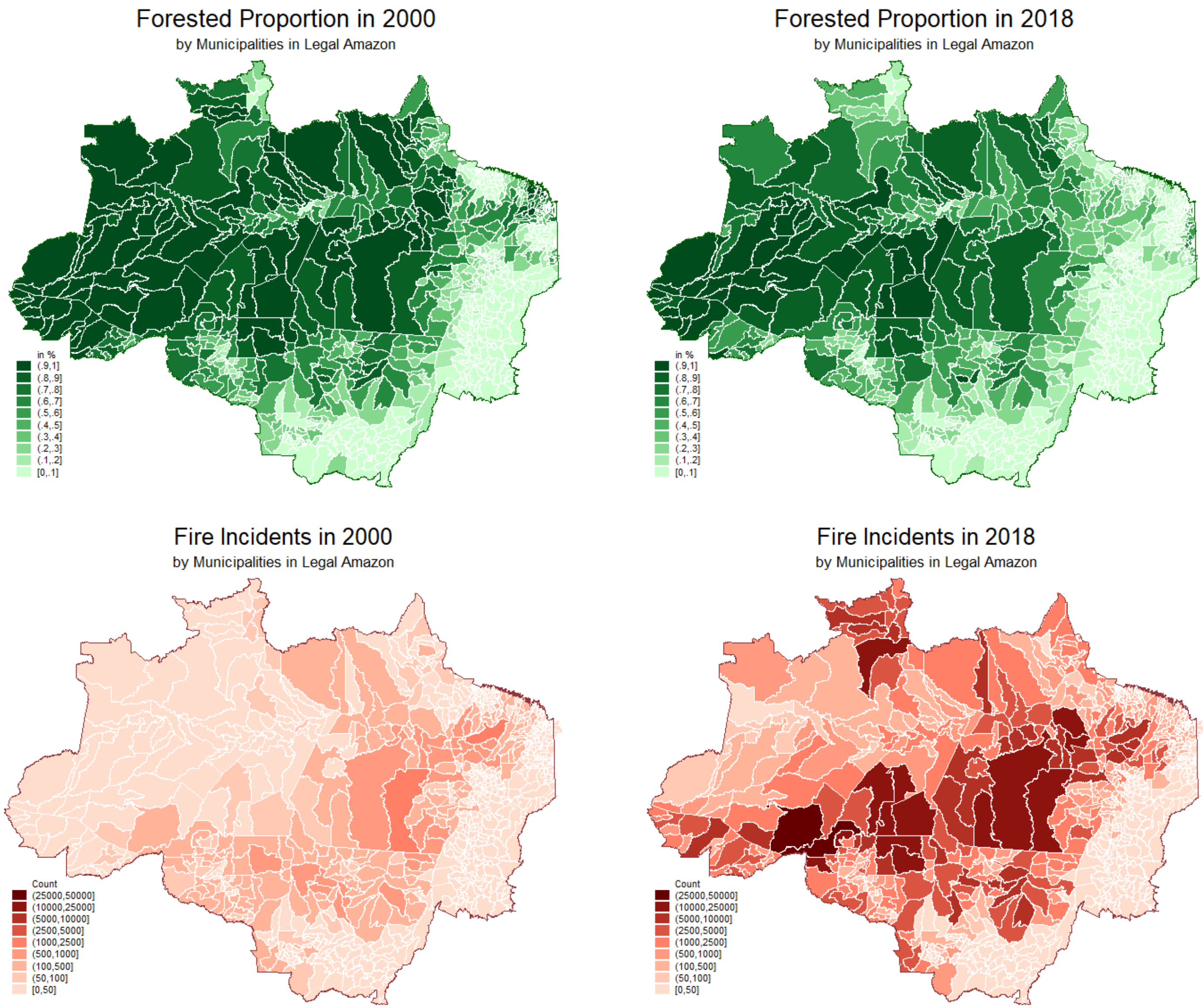
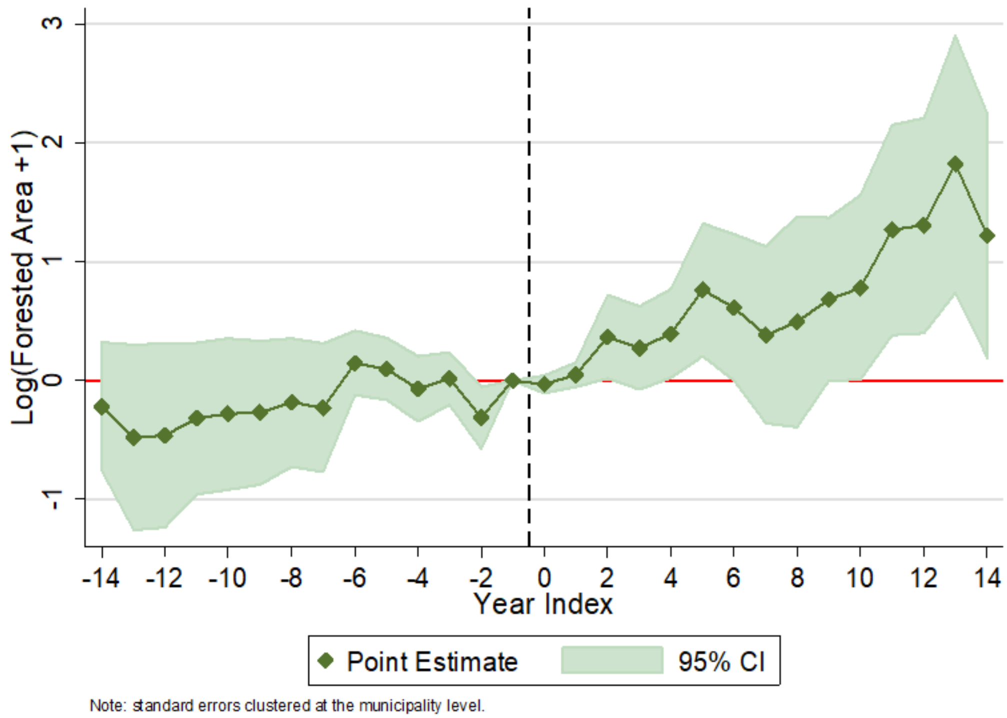


Figure 3 – Forested Proportion and Fire Incidents in Brazilian Amazon, from 2000 to 2018

Note: data from INPE PRODES, Terra Brasilis, and IBGE.



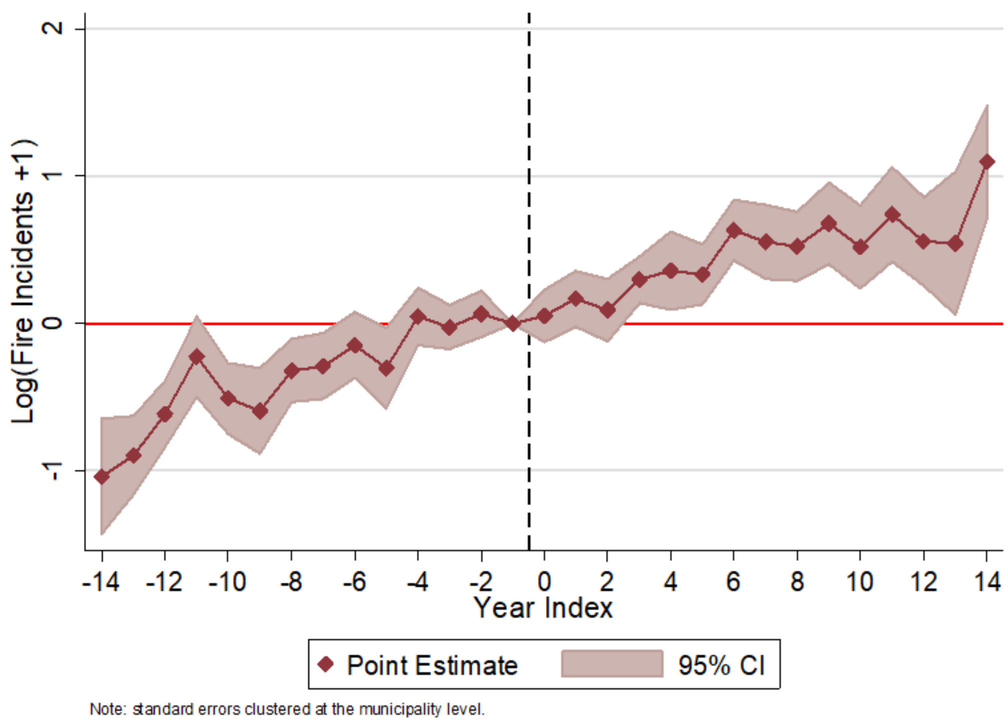


Figure 4 – Evolution of Forest Preservation Indicators

Note: Baseline set at year immediately before Natura's entrance. The graph's y-axes are on different scales.

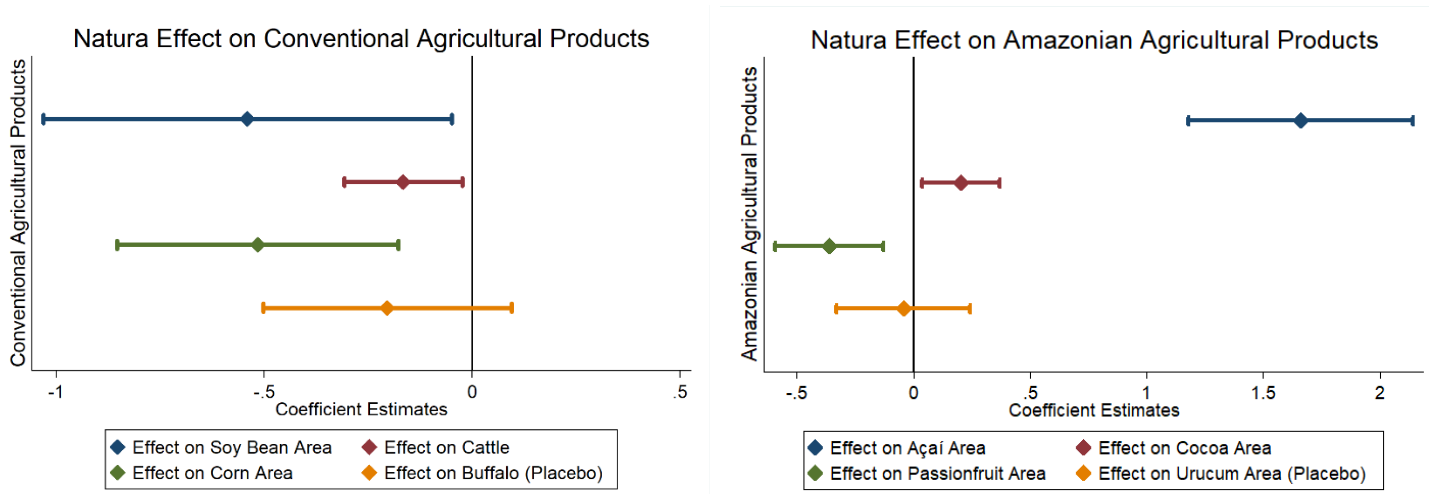


Figure 5 – Mechanism One: Substitution Effect on Agricultural Products

Note: Data from the Brazilian Municipal Agricultural Production census. The graph's x-axes are on different scales.

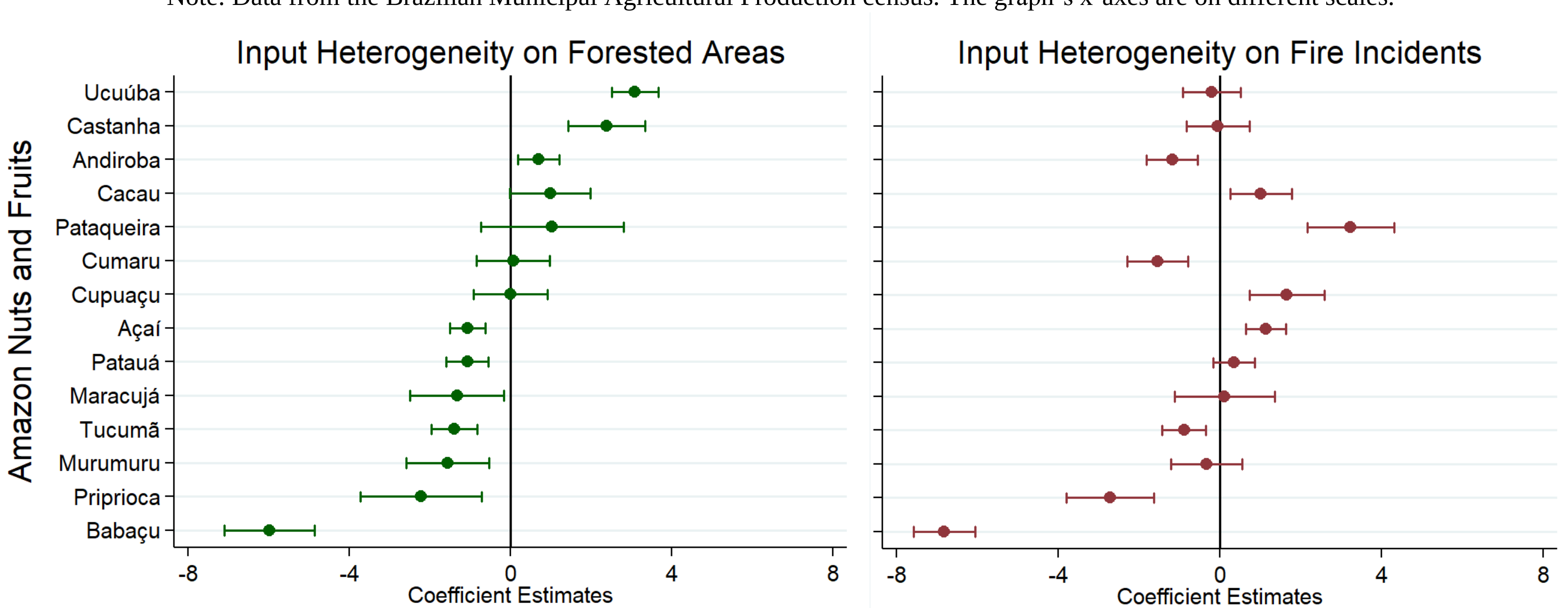


Figure 6 – Mechanism Two: Amazon Inputs Heterogeneity Analysis

Note: All names are in Brazilian Portuguese.

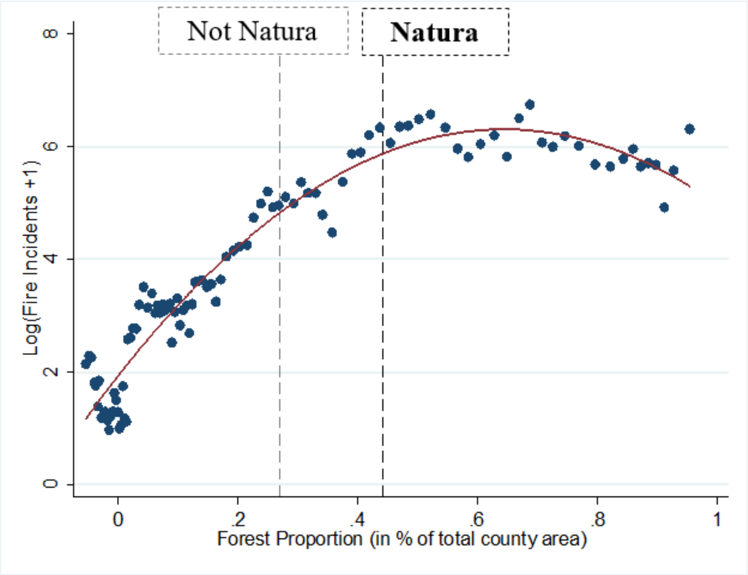


Figure 7 – Mechanism Three: Carbon Mass Analysis

Note: dashed lines at the average forest proportion for “Natura” and “Not Natura” municipalities.

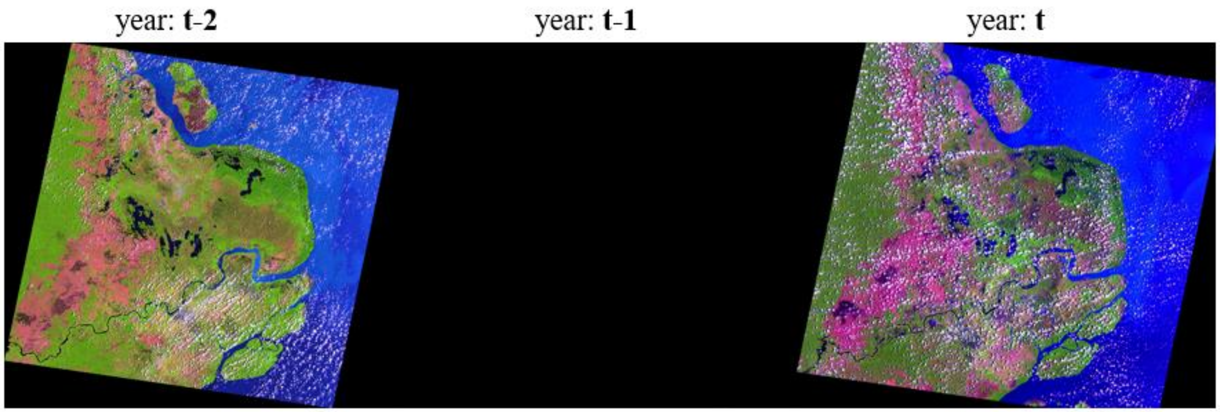


Figure 8 – Illustration of “Missing Images” from Satellite Data

Source: data from INPE PRODES. The illustration is provided for explanation purposes.

Note: In the satellite images, the green colors represent forested areas, red deforested or agricultural areas, the blue lakes, rivers or sea, and the white clouds. In the year t-1, this particular scene was not observed.

TABLES

Table 1 – Descriptive Statistics

#	Variable	Obs.	Mean	Std. Dev.	Min.	Max.	Correlation Matrix		
							1	2	3
1	**1(**Natura**)**	14,440	0.04	0.19	0.00	1.00	1.000		
2	Log (Forested Area + 1)	14,440	5.12	3.25	0.00	11.93	0.121**	1.000	
3	Log (Fire Incidents + 1)	14,440	3.95	2.95	0.00	11.43	0.149**	0.644**	1.000

Note: ** p<0.01, * p<0.05, + p<0.1

Table 2 – Differences in Differences Analysis of Natura Effect on Forested Areas Preservation and Fire Incidents

	(1)	(2)	(3)	(4)
DV =	Log(Forested Area + 1)		Log(Fire Incidents + 1)	
Natura	**0.468***	**0.479***	**0.495****	**0.494****
	(0.231)	**(0.224)**	**(0.0850)**	**(0.0844)**
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Satellite Controls	N	Y	N	Y
Constant	5.232**	5.303**	2.565**	2.541**
	(0.0371)	(0.0368)	(0.0446)	(0.0449)
Observations	14,440	14,440	14,440	14,440
R-squared	0.949	0.951	0.955	0.956
Number of municipalities	760	760	760	760

Note: Robust standard errors clustered at municipality level in parentheses. ** p<0.01, * p<0.05, + p<0.1

Table 3 – Mechanism One: Substitution Effect on Agricultural Products

	(1)	(2)	(3)	(4)
DV =	Log(Soybean Area +1)	Log (Cattle +1)	Log(Corn Area +1)	Log (Buffalo +1)
Natura	**-0.540***	**-0.165***	**-0.516****	**-0.204**
	(0.257)	**(0.0742)**	**(0.177)**	**(0.156)**
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Constant	1.229**	9.877**	6.151**	2.949**
	(0.0857)	(0.0547)	(0.0497)	(0.0577)
Observations	14,440	14,440	14,440	14,440
R-squared	0.841	0.918	0.784	0.802
Number of municipalities	760	760	760	760

Note: Robust standard errors clustered at the municipality level in parentheses.
** p<0.01, * p<0.05, + p<0.1

Table 4 – Mechanism One: Substitution Effect on Agricultural Products

	(1)	(2)	(3)	(4)
DV =	Log(*Açaí* Area +1)	Log(Cocoa Area +1)	Log(Passionfruit Area +1)	Log(*Urucum* Area +1)
Natura	**1.660****	**0.202***	**-0.361****	**-0.0430**
	(0.251)	**(0.0870)**	**(0.120)**	**(0.150)**
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Constant	0.0281+	0.813**	0.439**	0.249**
	(0.0159)	(0.0284)	(0.0278)	(0.0237)
Observations	14,440	14,440	14,440	14,440
R-squared	0.390	0.908	0.709	0.740
Number of municipalities	760	760	760	760

Note: Robust standard errors clustered at the municipality level in parentheses.
** p<0.01, * p<0.05, + p<0.1

Table 5 – Mechanism Two: Amazon Inputs Heterogeneity Analysis

	(1)	(2)
DV =	Log(Forested Area + 1)	Log(Fire Incidents + 1)
Ucuúba	3.083**	-0.198
	(0.294)	(0.363)
Castanha	2.390**	-0.0530
	(0.486)	(0.398)
Andiroba	0.699**	-1.178**
	(0.260)	(0.321)
Cacau	0.982+	1.014**
	(0.509)	(0.390)
Pataqueira	1.035	3.232**
	(0.901)	(0.547)
Cumaru	0.0683	-1.540**
	(0.462)	(0.386)
Cupuaçu	-0.00725	1.653**
	(0.468)	(0.470)
Açaí	-1.059**	1.138**
	(0.224)	(0.249)
Patauá	-1.073**	0.347
	(0.267)	(0.264)
Maracujá	-1.328*	0.116
	(0.591)	(0.633)
Tucumã	-1.402**	-0.888**
	(0.289)	(0.274)
Murumuru	-1.558**	-0.330
	(0.525)	(0.451)
Priprioca	-2.223**	-2.713**
	(0.764)	(0.552)
Babaçu	-5.984**	-6.818**
	(0.573)	(0.389)
Year FE	Y	Y
Constant	7.463**	6.899**
	(0.459)	(0.366)
Observations	560	560
R-squared	0.719	0.794
Joint Significance Test (F-test)	94.95	294.61
F-test (p-value)	*0.000*	*0.000*

Note: Robust standard errors in parentheses. All names are in Brazilian Portuguese.
** p<0.01, * p<0.05, + p<0.1

Table 6 – Mechanism Three: Carbon Mass Effect

	(1)	(2)
DV =	Log(Fire Incidents + 1)	
Natura x Forest Proportion		-2.129
		(1.351)
Natura		1.991**
		(0.687)
Forest Proportion	**4.699****	**4.735****
	(0.274)	**(0.276)**
Year FE	Y	Y
Municipality FE	Y	Y
Satellite Controls	Y	Y
Constant	1.165**	1.150**
	(0.123)	(0.123)
Observations	14,440	14,440
R-squared	0.332	0.338

Note: Robust standard errors clustered at the municipality level in parentheses. The Forest proportion variable measures the percent of forest over the total area of a municipality.

** p<0.01, * p<0.05, + p<0.1

Table 7 – Instrumental Variable Analysis using Satellite Missing Images

DV =	(1) Second Stage: **Log (Forested Area+1)**	(2) First Stage: **Natura**	(3) Second Stage: **Log (Fire Incidents+1)**	(4) First Stage: **Natura**
$\boldsymbol{Natura}$	**19.36****		**0.362**	
	(5.374)		**(0.572)**	
$\boldsymbol{Log(Missing\ Image\ +1)_{t-1} \times (1 - Natura_{m,t-1})}$		**-0.0127****		**-0.0127****
		(0.00361)		**(0.00361)**
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Satellite Controls	Y	Y	Y	Y
R-squared	0.552	0.704	0.963	0.704
Observations	13,676		13,676	
Number of municipalities	760		760	
Weak Identification test F-stat	12.46		12.46	

Note: Robust standard errors clustered at the municipality level in parentheses.

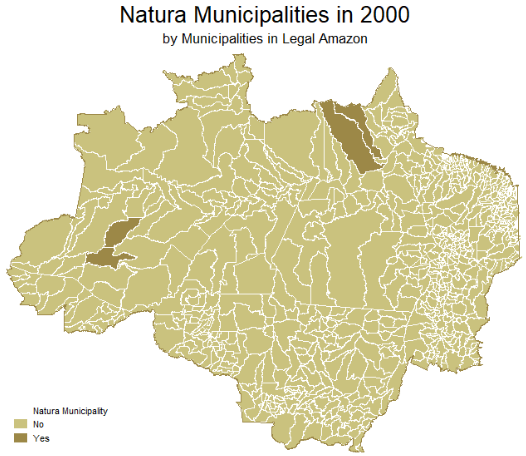
** p<0.01, * p<0.05, + p<0.1

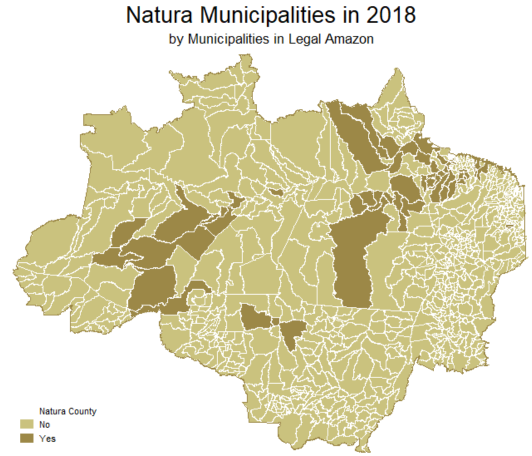
APPENDIX

APPENDIX 1 – PICTURES FROM THE FIELD

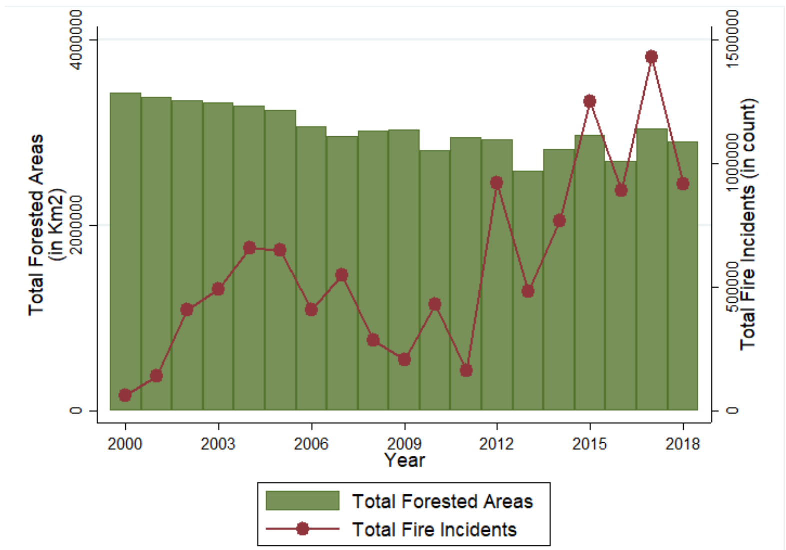
Legend: Supplier's typical house (#1), *açaí* fruit shipment in a boat (#2),
cocoa trees and fruits amid the forest (#3), and the Natura Industrial Plant at the city of Benevides (#4).
Note: All pictures were taken by the authors.

APPENDIX 2 – NATURA EVOLUTION IN BRAZILIAN AMAZON MUNICIPALITIES, FROM 2000 TO 2018



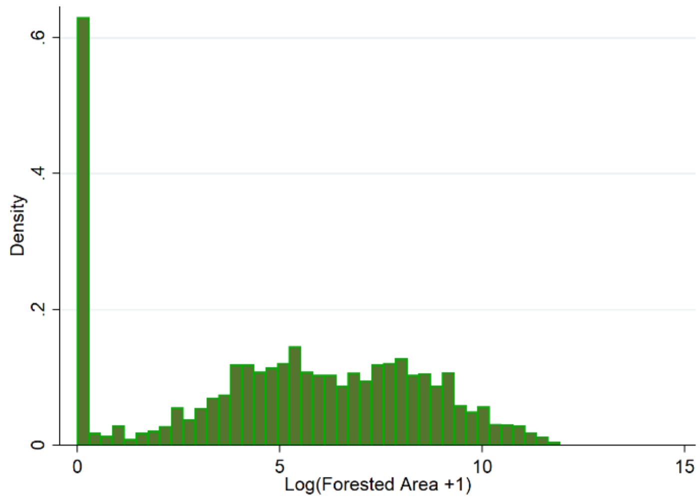


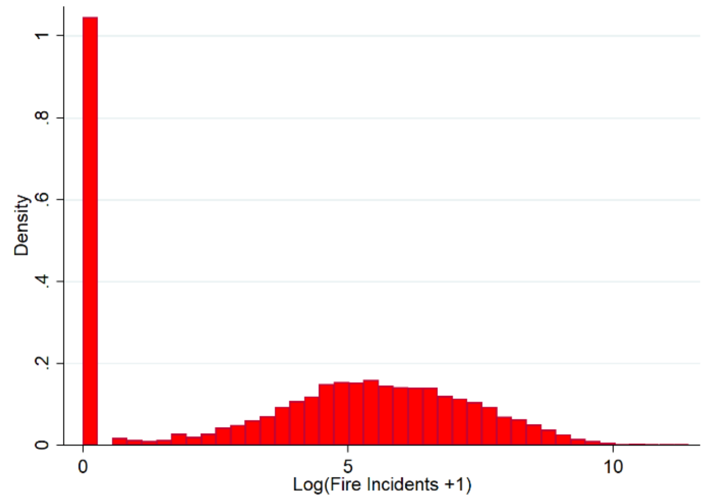
APPENDIX 3 – FOREST PRESERVATION INDICATORS EVOLUTION

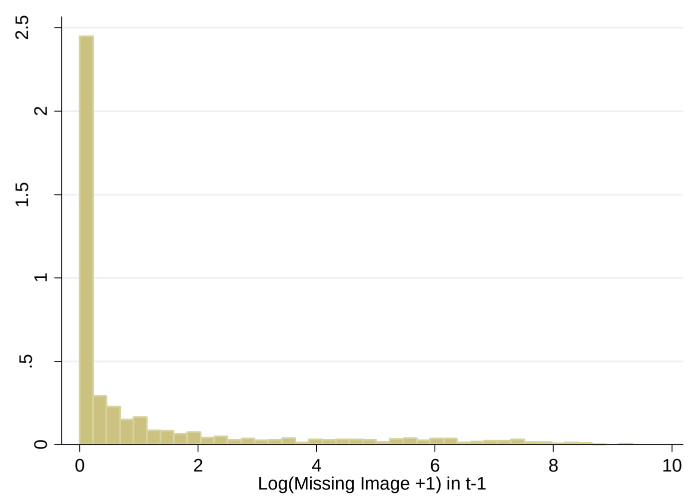


Note: data from INPE PRODES and TerraBrasilis.

APPENDIX 4 – HISTOGRAMS ON FOREST PRESERVATION INDICATORS AND INSTRUMENTAL VARIABLE







APPENDIX 5 – NATURA EFFECT FOREST PRESERVATION INDICATORS CONTROLLING FOR TIME TRENDS

	(1)	(2)	(3)	(4)
DV =	Log(Forested Area + 1)		Log(Fire Incidents + 1)	
Natura	**0.492***	**0.491***	**0.441****	**0.442****
	(0.222)	**(0.223)**	**(0.0884)**	**(0.0888)**
Year Linear Trend	Y	Y	Y	Y
Year Quadratic Trend	N	Y	N	Y
Municipality FE	Y	Y	Y	Y
Satellite Controls	Y	Y	Y	Y
Constant	-6.927	8,416**	-127.8**	-5,281**
	(7.058)	(974.0)	(5.416)	(880.7)
Observations	14,440	14,440	14,440	14,440
R-squared	0.950	0.950	0.939	0.939
Number of municipalities	760	760	760	760

Note: Robust standard errors clustered at the municipality level in parentheses.

** p<0.01, * p<0.05, + p<0.1

APPENDIX 6 – DIFFERENCES-IN-DIFFERENCES PRE-TREND TEST

	(1)	(2)	(3)	(4)
DV =	Log(Forested Area+1)		Log(Fire Incidents+1)	
Natura Treated Municipalities x Pretreatment Trend	**0.0281**	**0.0350**	**0.0761****	**0.0702****
	(0.0223)	**(0.0214)**	**(0.0112)**	**(0.0113)**
Natura Treated Municipalities	-56.79	-70.67	-153.0**	-141.2**
	(44.91)	(43.09)	(22.46)	(22.59)
Year Linear Trend	0.00168	-0.00137	0.0933**	0.0935**
	(0.00357)	(0.00346)	(0.00352)	(0.00351)
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Satellite Controls	N	Y	N	Y
Constant	1.909	8.093	-183.9**	-184.4**
	(7.176)	(6.963)	(7.078)	(7.055)
Observations	14,440	14,440	14,440	14,440
R-squared	0.949	0.951	0.956	0.956
Number of municipalities	760	760	760	760

Note: Robust standard errors clustered at the municipality level in parentheses.

** $p<0.01$, * $p<0.05$, + $p<0.1$

APPENDIX 7 – PLACEBO TEST ON NATURA'S ENTRANCE

	(1)	(2)	(3)	(4)
DV =	Log(Forested Area + 1)		Log(Fire Incidents + 1)	
Natura	**0.261**	**0.314**	**0.565****	**0.528****
	(0.268)	**(0.260)**	**(0.0998)**	**(0.0965)**
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Satellite Controls	N	Y	N	Y
Constant	5.231**	5.300**	2.559**	2.536**
	(0.0378)	(0.0373)	(0.0444)	(0.0447)
Observations	14,440	14,440	14,440	14,440
R-squared	0.949	0.951	0.955	0.956
Number of municipalities	760	760	760	760

Note: Robust standard errors clustered at the municipality level in parentheses. As if Natura's entrance had happened five years earlier.
** p<0.01, * p<0.05, + p<0.1

APPENDIX 8 – MATCHING ON MUNICIPALITIES DISTANCE TO NATURA'S INDUSTRIAL PLANT

	(1)	(2)	(3)	(4)
DV =	Log(Forested Area + 1)			
Natura	**0.334****	**0.295****	**0.224****	**0.295****
	(0.0851)	**(0.0675)**	**(0.0634)**	**(0.0627)**
Number of Matches	1	3	5	10
Observations	14,440	14,440	14,440	14,440

Note: Robust standard errors clustered at the municipality level in parentheses. Matches were performed considering municipality area and the distance from the municipality to Natura's industrial plant, located in Benevides (PA) municipality. Geodesic distances were measured using haversine formula based on municipalities' latitude and longitude. Exact years were consider in the matching mechanism. The coefficients present the PATT (Population Average Treatment Effect on the Treated).

** p<0.01, * p<0.05, + p<0.1

	(1)	(2)	(3)	(4)
DV =	Log(Fire Incidents + 1)			
Natura	**0.390****	**0.353****	**0.362****	**0.396****
	(0.103)	**(0.0878)**	**(0.0781)**	**(0.0692)**
Number of Matches	1	3	5	10
Observations	14,440	14,440	14,440	14,440

Note: Robust standard errors clustered at the municipality level in parentheses. Matches were performed considering municipality area and the distance from the municipality to Natura's industrial plant, located in Benevides (PA) municipality. Geodesic distances were measured using haversine formula based on municipalities' latitude and longitude. Exact years were consider in the matching mechanism. The coefficients present the PATT (Population Average Treatment Effect on the Treated).

** p<0.01, * p<0.05, + p<0.1

APPENDIX 9 – MATCHING ON MUNICIPALITIES CHARACTERISTICS (CENSUS)

	(1)	(2)	(3)	(4)
DV =	Log(Forested Area + 1)			
Natura	**0.321****	**0.422****	**0.359****	**0.443****
	(0.119)	**(0.0973)**	**(0.0945)**	**(0.0920)**
Number of Matches	1	3	5	10
Observations	14,440	14,440	14,440	14,440

Note: Robust standard errors clustered at the municipality level in parentheses. Matches were performed considering municipality area and municipality demographics such as total population, total working-age population, income *per capita*, Gini Index, and Municipal HDI. The demographics data come from the Brazilian census in 2000 and 2010. Exact years were consider in the matching mechanism. The coefficients present the PATT (Population Average Treatment Effect on the Treated).

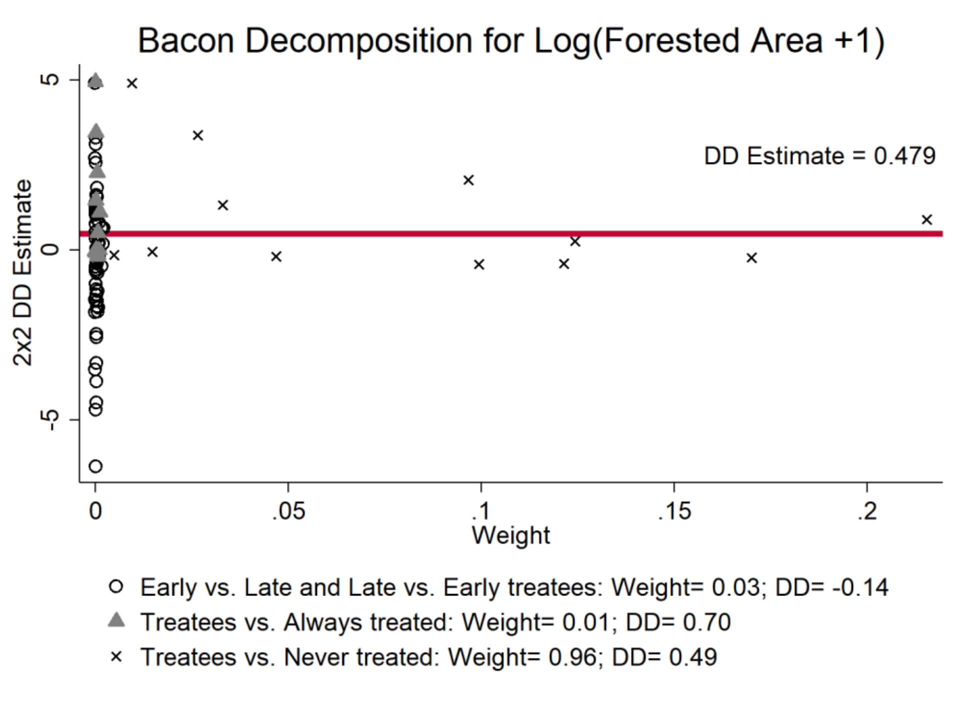
** p<0.01, * p<0.05, + p<0.1

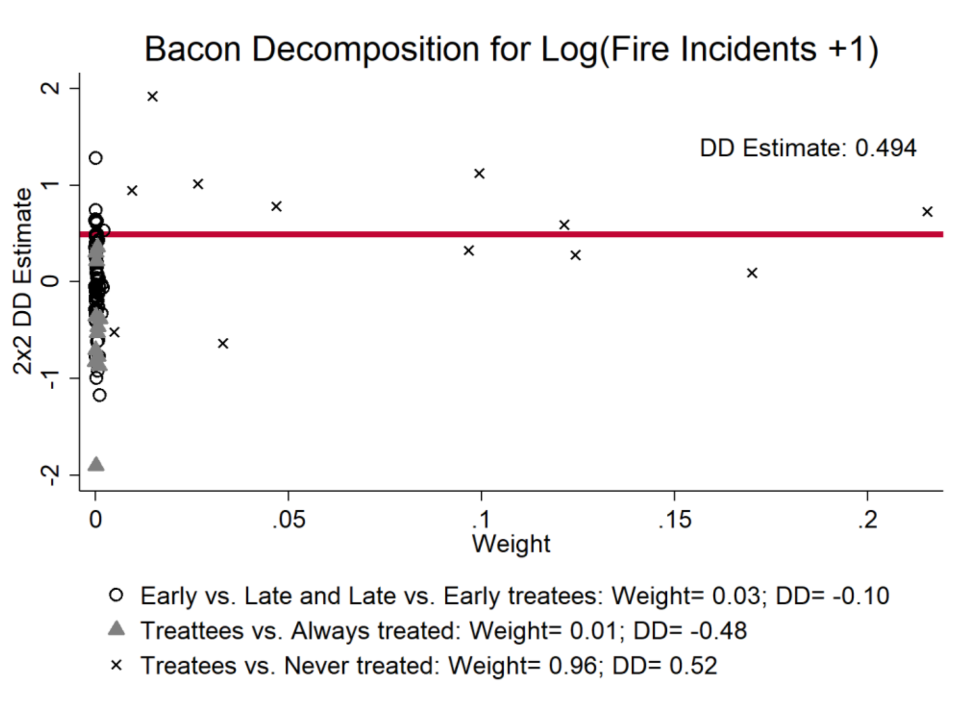
	(1)	(2)	(3)	(4)
DV =	Log(Fire Incidents + 1)			
Natura	**0.449****	**0.615****	**0.668****	**0.933****
	(0.124)	**(0.0948)**	**(0.0920)**	**(0.0907)**
Number of Matches	1	3	5	10
Observations	14,440	14,440	14,440	14,440

Note: Robust standard errors clustered at the municipality level in parentheses. Matches were performed considering municipality area and municipality demographics such as total population, total working-age population, income *per capita*, Gini Index, and Municipal HDI. The demographics data come from the Brazilian census in 2000 and 2010. Exact years were consider in the matching mechanism. The coefficients present the PATT (Population Average Treatment Effect on the Treated).

** p<0.01, * p<0.05, + p<0.1

APPENDIX 10 – BACON DECOMPOSITION OF TWO-WAY FIXED EFFECT DIFFERENCES IN DIFFERENCES ESTIMATOR





Note: based on Goodman-Bacon et al. (2019). Graphs y-axes are on different scales.

APPENDIX 11 – INSTRUMENTAL VARIABLE ANALYSIS WITHOUT NATURA'S ENTRANCE CORRECTION

DV =	(1) Second Stage: Log (Forested Area+1)	(2) First Stage: Natura	(3) Second Stage: Log (Fire Incidents+1)	(4) First Stage: Natura
$\boldsymbol{Natura_t}$	**36.06*** **(14.38)**		**0.913** **(1.023)**	
$\boldsymbol{Log(Image\ not\ observed\ +1)_{t-1}}$		**-0.00725*** **(0.00305)**		**-0.00725*** **(0.00305)**
Year FE	Y	Y	Y	Y
Municipality FE	Y	Y	Y	Y
Satellite Controls	Y	Y	Y	Y
R-squared		0.700	0.963	0.700
Observations	13,676		13,676	
Number of municipalities	760		760	
Weak Identification test F-stat	5.66		5.66	

Note: Robust standard errors clustered at the municipality level in parentheses.

** p<0.01, * p<0.05, + p<0.1

APPENDIX 12 – ESTIMATED EFFECT OF NATURA IN CARBON TONS SAVED AND POTENTIAL PRICE OF THE POSITIVE EXTERNALITY

Estimated Effect of Natura in Carbon Tons (tC) and Price (€)

		- 2sd	- 1sd	**Mean**	+ 1sd	+ 2sd
Carbon stock in Amazon Rainforest (tC/ha)		26.4	53.5	**80.6**	107.7	134.8
Natura Estimated Preservation in Amazon Rainforest (in millions tC)		47,721,702	96,708,752	**145,695,802**	194,682,852	243,669,903
		Natura Estimated Preservation in (in millions €)				
Price of Carbon under the European Union Emissions Trading System (€/tC)	€ 5	€ 239	€ 484	**€ 728**	€ 973	€ 1,218
	€ 15	€ 716	€ 1,451	**€ 2,185**	€ 2,920	€ 3,655
	€ 25	€ 1,193	€ 2,418	**€ 3,642**	€ 4,867	€ 6,092
	€ 35	€ 1,670	€ 3,385	**€ 5,099**	€ 6,814	€ 8,528

Note 1: Carbon stock in Amazon considers the difference between forested and deforested areas. Source (Souza-Rodrigues, 2018: 2730).
Note 2: Natura Estimated preservation takes into account the total number of hectares "saved" by Natura (total of 1.807.640 hectares), which are based on the estimations presented in Table 2 column (2).
Note 3: Carbon prices set considering historical prices and the price on January 1st, 2020, which equals € 24.32/tC. Source: Bayer and Aklin (2020) and ICE EUA Futures. Available at: <https://www.theice.com/products/197/EUA-Futures/data?marketId=5115271&span=3> Accessed on April 16th, 2020.

APPENDIX 13 – NATURA'S ADVERTISEMENT REINFORCING THE BENEFITS OF *MURUMURÚ* SOAP ON TECHNICAL, SOCIAL AND ENVIRONMENTAL DIMENSIONS

Why

a *Murmurú* Natura Ekos soap?

Because

Murumurú butter is extracted by 157 families of producers from different communities in the Amazon whose extraction system conserves approximately 3,000 standing trees.

Because

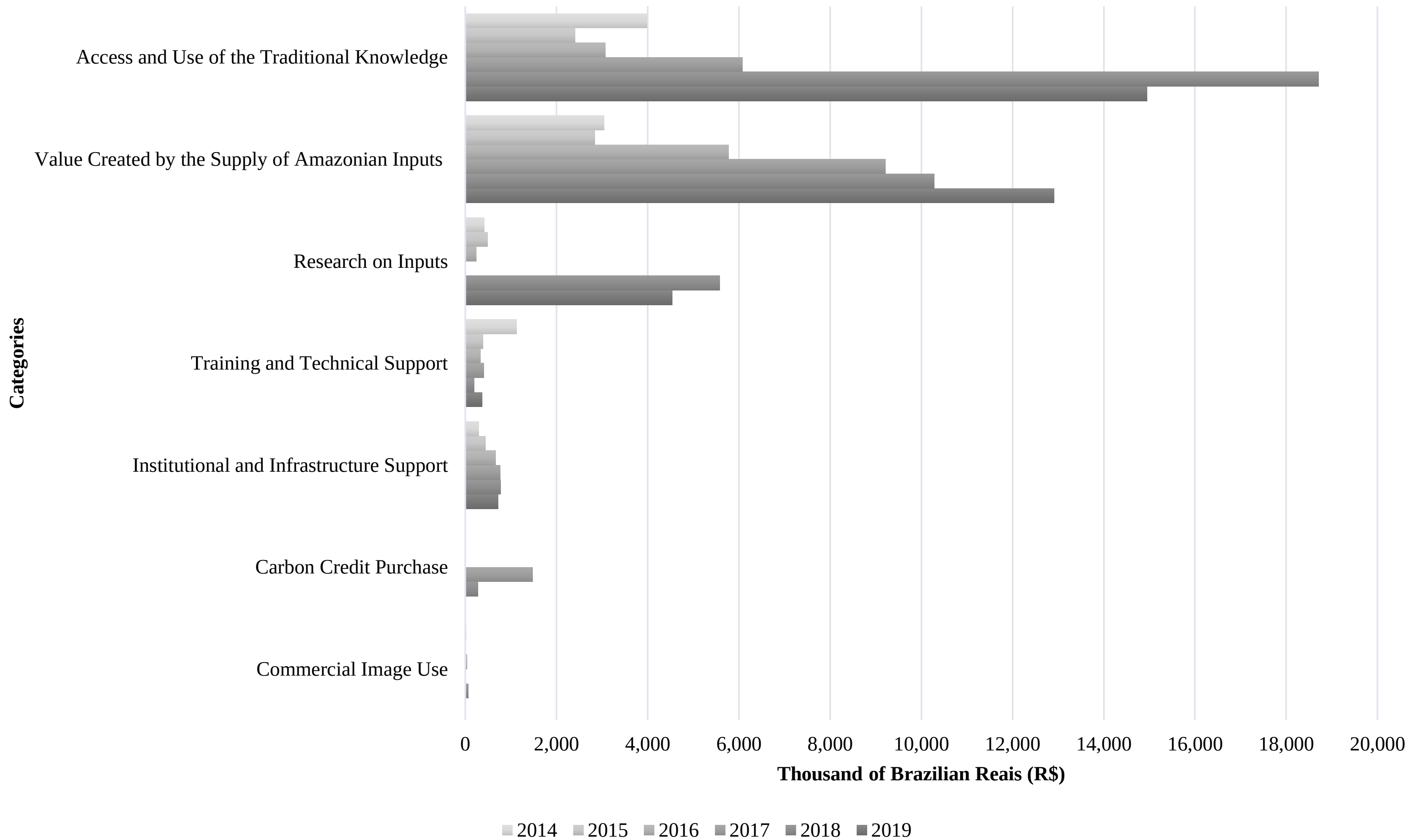
it has a high concentration of *Murumurú* butter, which has made it possible to create a flaky soap of abundant foam that protects your skin.

Because

resources return to communities valuing their work and keeping the forest alive.

Source: *Natura Ekos*. Translated by the authors.

APPENDIX 14 – DETAILED VALUE DISTRIBUTED BY NATURA IN AMAZON COMMUNITIES FROM 2014 TO 2019



Note: Data from Natura's Annual Report 2019 and Annual Report 2016. GRI 203-1 indicator. Both were accessed on May 28th, 2020.