

Is It Just About Sustainability? Politics at Home and the Trade Impacts of Voluntary Standards Abroad¹

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Abstract

Voluntary sustainability standards (VSS) can promote environmental and socio-economic benefits, yet critics contend that they can also create trade barriers. While prior research reports have been mixed with regard to VSS effects, our study examines whether domestic political dynamics and public–private interactions significantly explain some of these outcomes. We investigate Bonsucro certification for Brazilian sugar and ethanol exports to the EU. Bonsucro verifies that exports meet EU biofuels regulations and additional EU criteria. Should influential European interests drive these criteria to be overly stringent, Brazilian exports could suffer. Through qualitative analysis, we show that import-competing interests do not solely account for EU meta-regulation of VSS. Our staggered difference-in-differences analysis reveals that Bonsucro certification correlates with increased EU exports, although its benefits are concentrated mainly among the largest exporters, contributing to export concentration. These findings have broad implications for debates on hybrid governance and the legitimacy of VSS as environmental policy instruments.

Keywords: Sustainability standards, trade relations, domestic politics, nonstate actors governance, hybrid governance

Voluntary sustainability standards (VSS) can be effective tools for environmental governance, despite their weaknesses (Dietz et al. 2022). However, the acceptance of VSS as a policy tool depends largely on whether producing countries view them as a trade barrier or as potential disguised protectionism by developed economies (CNI 2021). Certified goods and services can facilitate global market access through product differentiation, trust building, and compliance with international sustainability standards (Tröster and Hiete 2018). However, VSS can be costly, especially for smaller producers, and may lead to negative spillovers (Heilmayr et al. 2020) that affect trade outcomes. Additionally, VSS

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1. Replication materials are available at: https://github.com/ejamello/sustainability_certifications_paper, last accessed April 7, 2025.

are increasingly intertwined with trade policies and have become important tools for ensuring compliance with public regulations (Marx et al. 2017, 2022). For example, the EU Deforestation-Free Regulation (EUDR) states that compliance information “may include information supplied by certification or other third-party verified schemes, including voluntary schemes recognized by the Commission.”² We investigate the extent to which fears of VSS being a disguised protectionist tool are justified, particularly in their interaction with public policies that may align with import-competing interests. In other words, what are the effects of certifications on South–North trade in a context of increasing entanglement between public regulations and private rule making? Does the politics of domestic lawmaking in the Global North help explain VSS outcomes in the Global South? These questions are important. Despite the growing incorporation of VSS into global trade practices, much remains to be understood about their effects on the export patterns of developing countries (Marx et al. 2022; Schleifer and Sun 2020). On one hand, studies to date have found mixed or favorable effects regarding certifications on exports from the Global South (Bemelmans et al. 2023; Elamin and Córdoba 2020). On the other hand, existing studies generally overlook how the complex dynamics between private rule makers and public authorities might influence trade patterns.

This study addresses the preceding questions by exploring the role of Bonsucro certification in Brazil’s exports of sugar and ethanol to the EU. Bonsucro is a voluntary multistakeholder initiative aimed at promoting responsible practices along the sugar supply chain. We argue that Bonsucro is a paradigmatic case (Flyvbjerg 2006) for understanding the trade effects of certifications in a new policy context characterized, first, by a growing trend toward unilateral trade policies (World Trade Organization 2023) and, second, by the reliance on public–private interactions to ensure compliance with trade regulations (Marx et al. 2022). Bonsucro is one of the few certifications recognized by the EU to certify products along the renewable energy supply chain under the EU’s biofuels regulations (EU Renewable Energy Directive [EU RED]). Therefore the Bonsucro certification case provides a valuable perspective into the new dynamics of international trade, particularly after the loss of emerging countries in the World Trade Organization (WTO) dispute DS600.³ The focus on Brazil–EU trade is also significant as Brazil is an influential case (Seawright and Gerring 2008) in commodity trading and forestry conservation and the EU a hub from where global norms emanate (Baccini et al. 2015).

2. Regulation (EU) 2024/115 of the European Parliament and the Council of May 31, 2023.
3. Malaysia and other countries have challenged the EU biofuels regulation—an example of unilateral trade and sustainability policy—and, on March 5, 2024, the panel ruled mostly against emerging economies. Malaysia argued that the regulation was discriminatory, was unjustifiable, and ignored the needs of developing countries. Despite implementation issues, which the EU considered manageable, the WTO deemed the regulation justifiable and legitimate.

We begin with a basic framework of domestic politics and lobbying (Baldwin and Robert-Nicoud 2007; Junk 2016) and economies of scale (Krugman 1987). Contra the hypothesis that orchestration⁴ depends on the entrepreneurship of bureaucrats (Abbott et al. 2021), we hypothesize that import-competing interests have captured the EU's VSS meta-regulation⁵ to push for import-restrictive measures. Therefore we expect that adopting the Bonsucro certification will lead to lower average exports from Brazil to the EU for products in direct competition with EU producers. However, owing to economies of scale, we expect this effect to be heterogeneous. Specifically, we predict that the highest-exporting municipalities with Bonsucro-certified firms will export more to the EU, while the least-exporting municipalities will experience an even greater decline in exports compared to cities without Bonsucro-certified firms. If these hypotheses are confirmed, there will be important implications for the legitimacy of VSS as a tool for environmental protection in the Global South.

We employ both qualitative and quantitative methods to test our hypotheses. First, we trace the debate on the inclusion of VSS in the EU RED between 2005 and 2010, drawing on seminal publications in the field (Renckens 2020) and supplementing these with primary data. Next, we use a staggered difference-in-differences design to analyze municipality-level export data. This approach helps address potential endogeneity concerns, such as pretreatment trends and time-varying unobservables, that are common issues in trade effect studies. We also examine heterogeneous effects across municipalities that traditionally export the most and the least to the EU. Our findings are nuanced. Contrary to our expectations, import-competing interests did not capture VSS meta-regulation in the EU. As a result, the trade outcomes in Brazil cannot be attributed to the success of disguised protectionist interests in the EU. We also found that Bonsucro's effects on Brazil's EU exports are generally positive. However, Bonsucro disproportionately benefits producers in high-exporting municipalities, while decreasing the export volume in low-exporting regions. This suggests that highly productive actors can absorb the costs of regulation and leverage product differentiation in foreign markets. Additionally, it indicates that Bonsucro and the EU RED may have exacerbated a historical trend of export concentration in Brazil, which is closely tied to the country's history of land concentration and pro-ethanol public policies promoting the vertical integration of production.

Our results make significant contributions to the literature on environmental politics. They suggest that the interaction between VSS and public

4. Orchestration is an indirect mode of governance in which international organizations or states enlist actors to voluntarily help them meet certain goals (Abbott and Snidal 2009).
5. VSS meta-regulation refers to a set of common practices and requirements that apply to VSS across the board. An example of meta-regulation is the ISEAL Alliance. States can also perform meta-regulation by including minimum requirements for recognizing VSS in public policies and public procurement, for instance.

policies can be a legitimate tool for environmental protection, with concerns about disguised protectionism potentially overstated. However, to fully realize the potential of VSS, policymakers must be mindful of the unintended effects of the standards they orchestrate. This article provides new insights into the role of private standards as complements to or substitutes for state-based command-and-control measures, with broader implications for the literature on the legitimacy of non-state actor governance (Auld and Gulbrandsen 2010; Bernstein 2011; Bernstein and Cashore 2007; Pallas 2017). At the same time, it demonstrates that directive orchestration (Abbott and Snidal 2009) can result in uneven effects abroad. In addition to the introduction and conclusion, the article is structured as follows. First, we offer a concise review of the literature on the effects of private certifications. Second, we outline our key hypotheses. Third, we describe the methods and materials used in this research. Finally, we present and discuss our quantitative and qualitative findings.

The (Trade) Effects of VSS

A growing number of studies assess the impacts of voluntary standards (Auld and Gulbrandsen 2010; Elamin and Córdoba 2020; Tran and Goto 2019), and the key understanding to date is that these schemes have mixed to positive effects (Bartley 2003; Darnall and Sides 2008; Marx et al. 2022; Schleifer and Sun 2020). Based on a meta-study of 175 papers, however, Dietz et al. (2022) find that the volume of skeptical works on the effects of certifications has increased recently. On one hand, certifications may enhance trade flows by giving a competitive advantage to complying producers, affirming high quality and signaling sustainability actions that help products access foreign markets. Certifications may therefore have a demand-enhancing effect on Global South exports due to quality and product differentiation (Masood and Brümmer 2014). VSS may also lead to trade-enhancing effects by helping to mitigate information asymmetry and by modernizing supply chains, thus increasing productivity. For importers, they may help reduce variable costs and sunk trade costs through lower search costs and greater information provision (Andersson 2019). On the other hand, the limited effects of private certifications often stem from the negative incentives the certifications may create. For instance, voluntary standards may open space for certification shopping, which can lead to a race to the bottom rather than an improvement in environmental and social outcomes (Hidalgo et al. 2023; Turcotte et al. 2014).

Furthermore, the uptake of voluntary schemes may generate negative trade-offs between different sustainability dimensions (Brandi 2017). An example is the “responsible soy” certification in Brazil: it helps reduce greenhouse gas (GHG) emissions in the municipalities where certified farms are located but may also increase income inequality by privileging the largest farmers (Garrett and Rausch 2016). Certifications may also further limit smallholders’ access to

foreign markets due to high compliance and monitoring costs (Elamin and Córdoba 2020). For one, the costs of certifications are largely fixed, giving wealthier producers greater marginal returns and more opportunities to reap economies of scale. Larger producers are also more likely to comply with stricter quality criteria (Oya et al. 2018). Since the motivations for adopting certifications are often economic rather than environmental (Pyk and Abu Hatab 2018), landowners recognize the increased returns to scale of their investments. Moreover, for some commodities, the potential for certifying smallholders is limited, as in the case of palm oil certifications (Jelsma et al. 2019). As a result, “certification is associated with higher farm incomes and changes in farm practices among large but not among small farms” (Meemken and Qaim 2018).

The literature shows that the positive trade effects of certifications in terms of productivity may be offset by the reduction in opportunities and capacity for smaller and less productive entities to export. As Bonsucro is also closely connected to the EU’s public regulations, these positive or adverse economic effects can be amplified by the very politics underlying the EU’s policymaking process. This article contributes to the existing literature in two ways. First, it recognizes that the mixed results related to the effects of certifications are connected to their heterogeneity. We seek to uncover some of that heterogeneity to distinguish positive from negative outcomes. Second, the existing literature does not fully account for the effects of hybrid governance on the volume of Global South exports to Global North partners. As a result, politics is virtually absent from current impact evaluations. This, in turn, limits our ability to offer policy-relevant insights to policymakers on the potential legitimacy effects of trade and environmental policies that use or might use VSS for compliance verification—including, most notably, the EUDR. While private certificates are market based, the role of the state in privileging certain standards over others can be subject to regulatory capture, mitigating, amplifying, or shifting the economic effects of certifications on countries’ exports. Although other works have discussed the limitations of the EU RED and its VSS orchestration (Renckens 2020; Schleifer 2013), to the authors’ knowledge, this is the first study to connect the actual trade effects of VSS in the Global South with the domestic politics of EU biofuels.

Between Domestic Politics and Economies of Scale?

VSS interact with state regulation even if—by definition—the state cannot formally use its sovereignty to require compliance with voluntary standards (Cashore et al. 2004). The decision to engage with VSS can be a way to avoid creating extra costs by delegating (or orchestrating) some monitoring tasks to private actors. In doing so, governments define the goals they want private actors to help them achieve and may directly or indirectly influence the internal dynamics of VSS, such as their objectives, metrics, and governance tools. Some

governments may impose certain criteria to be met by VSS or recognize only certain VSS to the detriment of others; this is done via public procurement and trade policies (e.g., the EFTA-Indonesia trade deal), for instance (Marx et al. 2022). In doing so, the state acts as a meta-regulatory body (Coglianese and Mendelson 2010; Naiki 2021). In a context where private certifications and public policies are entangled, we would expect the principal-agent logic at the domestic level to influence VSS requirements affecting third countries. That should be the case for the EU biofuels law, which we concisely present later. Domestic lobbying could, for example, lead the EU to recognize only certifications with already stringent standards or to incentivize rigorous additional VSS requirements for recognizing sustainable biofuels.⁶ That logic could potentially affect Global South exports to the EU, as requirements might involve complex documentation, advanced traceability systems, and compliance with labor, environmental, and governance criteria that are not easily met or that simply discourage exports to the EU.

To unfold the preceding dynamics, we derive simple hypotheses based on lobbying and domestic politics and on the new trade theory (NTT). From a domestic politics perspective, we would expect considerable pressure from EU domestic interest groups to close the EU markets to imports of products that compete against more expensive EU products. We also expect import-dependent industries to lobby for trade openness with Brazil and other sugar-exporting countries. This should include, for instance, the Association of Chocolate, Biscuit and Confectionery Industries of Europe (CAOBISCO), which is strongly dependent on cheap sugar imports. CAOBISCO lobbied in favor of greater access of Mercosur-produced sugar to the EU market (Association of Chocolate, Biscuit and Confectionery Industries of Europe [CAOBISCO] 2023), as opposed to COPA-COGECA, which lobbied against the measure. However, when it comes to the domestic battle for the upper hand in setting standards (including additional requirements for VSS), we expect the import-competing industries to prevail. Sugar and renewable fuels in Europe are two such industries (Follador et al. 2021). They may thus want the government to impose very demanding minimum requirements for VSS to certify sugar and ethanol abroad so as to indirectly create nontariff barriers.

We expect import-competing interests to have the upper hand because of the “losers lobby harder” paradox (Baldwin and Robert-Nicoud 2007). The logic is based on findings from prospect theory (Tversky and Kahneman 1992) and assumes an asymmetric mobilization of interest groups: industries facing competition from imports (losers) are more likely to organize and exert political pressure for protectionist policies than are sectors that benefit from trade (winners) to push for further liberalization. This dynamic can lead to a situation in

6. Existing works show that the biofuel political debate within the EU has influenced the additional requirements imposed on the VSS accredited by the EU (Ponte and Daugbjerg 2015; Renckens 2020).

which trade policies disproportionately reflect the interests of less competitive domestic industries. Therefore, even if interest groups and the public stand to gain from importing cheaper products from Brazil, those that stand to lose are more likely to influence policymakers to adopt standards that limit imports under the justification of “leveling the playing field.” Table 1 presents a simplified schematic of the connection between the intention to restrict imports and the actual trade outcomes of VSS. Depending on the level of mobilization of certain industries, we expect there to be intentional actions to restrict imports and an actual restriction of trade as import-competing interests put pressure on the government to impose standards that are difficult to meet for Global South producers. The “intention” is measured by the preference attainment (Lowery 2013; Dür and De Bièvre 2007) of import-competing industries, as the EU sets the additional VSS requirements.

An alternative explanation would be based on orchestration and the European Commission’s ability to enlist VSS, leveraging its autonomy to promote its worldview. By requiring private sustainability certification for specific imports, the EU leverages its market power to encourage global adherence to environmental best practices (Poletti and Sicurelli 2018). In turn, engagement with private rule makers addresses some of the capacity gaps within state mechanisms that have historically hindered effective trade governance (Marx et al. 2017). Government involvement helps reinforce the transparency and accountability

Table 1
Linking VSS Trade Effects and Political Motivations

| | <i>Restrictive Effects</i> | <i>Nonrestrictive Effects</i> |
|--------------------------|---|--|
| Intention to restrict | Q1: VSS meta-regulation by the state is captured by interests competing against imports, creating <i>de jure</i> and <i>de facto</i> trade barriers that are difficult to overcome because they are costly and/or because ambiguity allows for interpretations of the regulation in a way that limits imports. | Q2: VSS meta-regulation by the state is captured by import-competing interests, but market adjustments or loopholes neutralize effects. The largest producers may adapt to barriers due to increased scale and lower costs at the margin. |
| No intention to restrict | Q3: VSS meta-regulation by the state unintentionally restricts trade due to high costs, administrative burden, or certification barriers. The effects might be more pronounced among the smallest producers due to higher marginal costs. | Q4: VSS meta-regulation by the state not driven by the objective to restrict trade. Entry costs and administrative burdens are overcome by scale and/or mitigated by improved efficiency and market access. |

of private standards, thereby increasing awareness of their strengths and limitations while preventing capture (Auld and Gulbrandsen 2010). Abbott and Snidal (2009), in turn, hypothesize that orchestration is more likely to take place when agents are given more slack by their principals. However, later findings suggest that orchestration is both welcomed and mandated by principals (Abbott et al. 2020), including states, citizens, and interest groups. As such, if import-competing interests have the upper hand in domestic discussions, they might capture the EU's VSS orchestration.

We expect the effects of VSS orchestration abroad to be heterogeneous and more pronounced in some cases than in others. NTT posits that, in addition to comparative advantage, trade gains are significantly influenced by economies of scale and market preferences (Krugman 1980). In markets where economies of scale are prevalent, producers can achieve lower costs per unit through increased production levels. This principle is particularly relevant to the agricultural sector, where scaling up production can lead to more efficient use of resources and inputs. This means that highly productive municipalities that already export significantly to the EU might be better positioned to reap economies of scale. In turn, NTT highlights the importance of differentiated products in fostering trade. As municipalities reap economies of scale and engage with the Bonsucro certification, they signal higher sustainability, effectively differentiating the sugar they produce in the eyes of EU consumers. This could lead to increased demand among highly productive municipalities, particularly from EU consumers who prioritize environmental and social standards.

H_1 (trade restriction effects): The effects of Bonsucro on the total value of Brazilian municipalities' sugar and ethanol exports to the EU will be negative, on average.

M_1 (EU domestic political determinants): Import-competing interests captured the EU biofuels debate by imposing additional import-restrictive requirements for VSS recognition, thus creating a barrier to Brazilian exports.

H_2 (economies of scale effects): The effects of Bonsucro on the total value of Brazilian municipalities' sugar and ethanol exports to the EU will be positive for the largest-exporting municipalities and negative for the lowest-exporting ones.

Although, for convenience, we framed the hypotheses according to the specific case we are studying, they are fully testable in similar contexts marked by strong import competition, which is the norm for numerous commodities flowing between the Global South and the Global North, such as oranges (fruits and juices) in the case of the United States; strong private-public relations, in which the state may act as a "directive orchestrator" (Abbott and Snidal 2009) of private rule makers; and the possibility of economies of scale and product differentiation among producers seeking certification.

Data and Empirical Strategy

In this article, we focus specifically on the impact of Bonsucro certification—a leading private sustainability standard in the sugarcane industry—on Brazil’s exports to the EU. We followed a “paradigmatic” case selection strategy (Flyvbjerg 2006). A paradigmatic case offers a prototype of a new set of events and sets a standard. In the case of this article, Bonsucro illustrates a new trend in trade policies: the rise of unilateral sustainable import policies in which private rule makers help public authorities ensure compliance. Although the connection between trade and VSS is not new, the Bonsucro certification represents a new chapter in that relationship, especially after the March 5, 2024, WTO decision against Malaysia (DS600). And why Brazil? The country is an influential case (Seawright and Gerring 2008) from the perspective of trade and sustainability for two key reasons. First, its dominant position in global agricultural markets means that shifts in its trade patterns due to sustainability certifications can have widespread implications. Second, Brazil is at the forefront of global sustainability and environmental issues, as the Amazon is home to approximately 10 percent of all known biodiversity (UN Sustainable Development Solutions Network 2020). Negative or positive conservation outcomes in Brazil are therefore likely to have impacts far beyond the country’s borders. The EU, in turn, is a norm diffuser. It creates regulations that other countries emulate, learn from, or are coerced to accept (Baccini et al. 2015; Simmons et al. 2006).

To test our hypotheses, we first revisit the political forces underpinning the EU biofuels debate, which has direct impacts on Brazilian ethanol and sugar exports to the EU. Bonsucro is now inextricably connected to the EU’s Renewable Energy Directive as one of the few accredited standards certifying foreign products along the biofuels supply chain as RED compliant. Specifically, we document the EU consultations around the EU RED during the 2005–2010 period and the positions of concerned interest groups. Such an analysis will shed light on the plausibility of the mechanism behind our first hypothesis.⁷ In doing so, we expect to find that the decision to orchestrate VSS as part of the EU RED was not merely a cost–benefit analysis by the European Commission but was also influenced by domestic politics. In particular, we expect to find that import-competing interests sought to shape how the EU would orchestrate VSS—and Bonsucro—as part of the RED to limit import competition from abroad and “level the playing field” between domestic and international producers. We assess the extent to which these interests captured the debate by

7. We decided against evaluating only the impact of the RED-compliant version of the Bonsucro certification and instead analyzed all Bonsucro-certified units. This is because the decision to adopt Bonsucro certification and its effects is likely to have been broadly influenced by EU biofuel regulations. Therefore excluding certain Bonsucro-certified units could lead to an underestimation of our results. For instance, a producer may adopt Bonsucro certification without additional EU requirements as an intermediate step while anticipating eventual compliance with the EU’s extra requirements.

analyzing their degree of preference attainment (Dür and De Bièvre 2007; Lowery 2013).

We then employ a staggered difference-in-differences design with a doubly robust estimator (Callaway and Sant'Anna 2021) that enables us to estimate the impact of Bonsucro certification on the exports of sugarcane-based products from Brazilian municipalities to the EU. This model is particularly well suited to our analysis due to the phased nature of Bonsucro certification across firms in different municipalities over time, allowing for a dynamic examination of certification effects relative to when producers in each municipality became certified. By using municipality-level export data, we are able to isolate the certification's influence from other concurrent economic trends and policy changes. This granular data set encompasses detailed export volumes and values, delineated by sugarcane product category, over a period that spans several waves of Bonsucro certification adoption.

Our independent variable is whether a given Brazilian municipality hosts firms with Bonsucro certifications at time t . For instance, Usina Vale do Tijuco, in the municipality of Uberaba, Minas Gerais, was first certified on January 28, 2015. In turn, Raízen Energia Unidade Gasa, in Andradina, São Paulo, was first certified on December 19, 2012. Owing to data limitations, we consider as treated municipalities that have at least one certified firm, even if all other firms are not certified. We argue that the market structure of sugarcane production in Brazil allows for inference despite this limitation. Sugarcane and ethanol production in Brazil is highly concentrated in large production units. This means that a change in the production patterns of one firm should affect the production of the municipality as a whole. Indeed, the average number of sugar-producing units across Brazilian municipalities is 1.86,⁸ and the median is 1, according to the Brazilian Institute of Geography and Statistics (IBGE). For biofuels production, the average is 1.67 units per municipality, and the median is 1. If anything, this limitation makes Brazilian ethanol and sugarcane production a hard test for the effects of VSS on trade. In other words, if we observe a change triggered by VSS despite this limitation, we can be even more confident that VSS are relevant to trade.

To gather data on our key dependent variable, we rely on municipality-level statistics on Brazil's sugarcane-based product (e.g., sugar and ethanol) exports to all EU-26 countries. We selected all Brazilian municipalities exporting to the EU and obtained data on their municipal-level exports from Comexstat, the statistical database of the Brazilian Ministry of Development, Industry, Commerce, and Services.⁹ For each municipality, we also collected export data (Free-on-Board value of exports) for the following categories at the Harmonized

8. Only counting nonnull values or, in other words, municipalities with at least one sugar-producing unit.
9. To filter the export data, we utilize the definition of EU countries provided by Comexstat. The data set containing the country codes is available at: <https://balanca.economia.gov.br/balanca/bd/tabelas/PAISBLOCO.csv>, last accessed April 7, 2025.

System (HS) four-digit commodity level,¹⁰ with data ranging from 2009 to 2022 (Table 3):

HS 2207: Undenatured ethyl alcohol of an alcoholic strength by volume of 80 percent vol. or higher; ethyl alcohol and other spirits, denatured, of any strength.

HS 1701: Cane or beet sugar and chemically pure sucrose, in solid form.

Brazil's economic sector classification (CNAES) differs from the HS, thus requiring a matching of both registers, which we applied as follows:

CNAES 19.31.4: ethanol manufacturing (equivalent to HS 2207)

CNAES 10.72.4: refined sugar (equivalent to HS1701)

We run a staggered difference-in-differences model with multiple groups and multiple treatment times (Callaway and Sant'Anna 2021) to estimate the impact of Bonsucro certification on the sugarcane and ethanol export levels of each Brazilian municipality with sugarcane production. We take advantage of the staggered municipal-level adoption of Bonsucro-certified producers to estimate the impacts of Bonsucro certification on the outcomes of interest. The staggered difference-in-differences design implies that, for each time t , we have some municipalities that already have at least one Bonsucro-certified producer (treatment group) and some municipalities that are not yet treated (control group). This allows us to estimate the causal parameter of Bonsucro certification's impact on exports by identifying systematic differences between treated and not-yet-treated groups. We explore annual certification adoption as a means to compare municipalities that were treated earlier with those that received treatment later. Our empirical strategy follows the estimators proposed by Callaway and Sant'Anna (2021) for difference-in-differences with a staggered design. We focus on the average treatment effects on the treated (ATT) estimand, recovered from the following regression:

$$Y = \alpha_1^{g,t} + \alpha_2^{g,t} \cdot G_g + \alpha_3^{g,t} \cdot 1\{T = t\} + \beta^{g,t} \cdot (G_g \times 1\{T = t\}) + \varepsilon^{g,t}, \quad (1)$$

where $\beta^{g,t} = \text{ATT}(g, t)$ and $\text{ATT}(g, t)$'s aggregated causal parameter is given by

$$\theta = \sum_{g \in G} \sum_{t=2}^{\tau} w(g, t) \cdot \text{ATT}(g, t). \quad (2)$$

In the preceding equations, θ represents the overall impact of Bonsucro certification on exports, calculated as a weighted sum of the estimated treatment

10. By focusing on export value, we center our analysis on the intensive margins of trade, which is precisely our goal: to understand if VSS affect *how much* Brazilian municipalities export to the EU.

effects across all groups G and time periods t . The term $ATT(g, t)$ captures the average treatment effect on the treated for municipalities in group g at time t , reflecting how certification influences export values. The weight $w(g, t)$ accounts for differences in group sizes, certification adoption timing, and potential variations in treatment effects across municipalities. Given the presence of small cohorts (Table 2), we place greater reliance on dynamic aggregate ATT estimates than we do solely on group estimates. These estimations are calculated for all municipalities with at least one Bonsucro-certified company. Finally, we explore heterogeneous treatment effects by estimating separate ATTs for the upper and lower deciles of the export distribution, determined based on pretreatment period data. We also use the fixed effects counterfactual estimator (FEct), which is appropriate for situations with heterogeneous treatment timing and time-varying confounders (Liu et al. 2024), without facing the common concern about negative weights (de Chaisemartin and D’Haultfœuille 2020; Goodman-Bacon 2021). In this estimator, the target estimand is again the ATT. The FEct estimator addresses treated observations by considering them as missing data and imputing their potential outcomes. As this modeling framework includes time and municipality fixed effects, it controls for all

Table 2
Distribution of Treatment Cohorts

| | <i>Count</i> |
|---------------|--------------|
| Year | |
| 2011 | 160 |
| 2012 | 160 |
| 2013 | 112 |
| 2014 | 64 |
| 2015 | 48 |
| 2016 | 128 |
| 2017 | 80 |
| 2018 | 128 |
| 2019 | 80 |
| 2020 | 48 |
| 2021 | 16 |
| 2022 | 64 |
| 2023 | 48 |
| Never treated | 87,836 |
| Total | 88,972 |

time-invariant or slowly changing confounders (e.g., distance to export locations and institutions) and time-varying confounders that are constant across units (e.g., international crises). We estimate the following:

$$Y_{mt}(0) = X'_{it}\beta + \alpha_i + \varsigma_t + \varepsilon_{mt}.$$

The FEct estimator is particularly useful in this case because it includes controls for municipality fixed effects, which, among other things, addresses concerns over the effects of gravitational forces on trade (Head and Mayer 2014). As discussed subsequently, the two estimators yield similar results, which increases our confidence that our statistical models produce robust results.

Results

We now present the results of our analysis, starting with a concise discussion of how Bonsucro is legally connected to the EU's biofuels requirements, followed by an examination of the political underpinnings behind Bonsucro and the biofuels debate in the EU. After that, we present an econometric analysis of the effects of Bonsucro on Brazil's exports to the EU. Our results confirm H_2 , albeit with some nuances specific to the Brazilian context. We did not find support for H_1 , and despite some concessions to import-competing interests, they did not capture the EU debate, contra M_1 . Our results fall mostly under Q3 and Q4 of Table 1, with no apparent capture of the EU biofuels debate by import-competing interests but still some unintentional effects on the lowest-exporting municipalities in Brazil.

Bonsucro and EU Biofuels Regulations

Brazil is one of the largest sugar and ethanol producers in the world. Data from the World Bank indicate that in 2021, it accounted for 36.7 percent of the global sugar supply, twice as much as the second-largest supplier. While only 2.42 percent of Brazilian sugar exports went to the EU, 6.57 percent of Brazil's ethanol exports were destined for the bloc. Behind South Korea (37.03%) and the United States (25.22%), the EU is the most frequent destination of Brazil's ethanol. To promote more responsible production along the sugar supply chain, producers may abide by certification systems, such as Bonsucro.

Bonsucro seeks to promote sustainable production of sugarcane and its derivatives, including ethanol. It establishes standards for environmental, social, and economic practices within the supply chain. Producers seeking certification must adhere to specific requirements, such as limiting GHG

emissions, ensuring that at least 80 percent of water extracted for irrigation is returned to the environment, and implementing measures to prevent deforestation and protect biodiversity. Social criteria include compliance with labor laws, fair wages, prohibition of child and forced labor, and safe working conditions. Economic criteria focus on operational efficiency and profitability, requiring accurate monitoring of production inputs and outputs. The certification process involves a self-assessment to identify gaps, followed by operational adjustments and verification through third-party audits, which include field inspections and documentation reviews. Certified producers must maintain records and undergo periodic recertifications to ensure ongoing compliance, facilitating access to international markets that prioritize sustainability standards.

To obtain Bonsucro certification, producers must be verified as compliant with six key principles, each with specific criteria and indicators:

- Principle 1: Obey the law
- Principle 2: Respect human rights and labour standards
- Principle 3: Manage input, production, and processing efficiencies to enhance sustainability
- Principle 4: Actively manage biodiversity and ecosystem services
- Principle 5: Continuously improve key areas of the business
- Principle 6: Additional mandatory requirement for biofuels under the EU Renewable Energy Directive. (EU RED)

Principle 6 is the point of contact between EU public regulations and Bonsucro as a private rule maker. The EU's biofuels regulations are governed by the RED, a legal framework dating back to 2009 that aims to establish a common framework for promoting renewable energy sources by, among other things, defining sustainability criteria for biofuels and bioliquids. In its Article 18, the EU RED states that "the Commission can decide that voluntary national or international schemes setting standards for the production of biomass products contain accurate data for the purposes of Article 17(2) or demonstrate that biofuel consignments comply with the sustainability criteria set out in Articles 17 (3) to (5)."¹¹ In other words, the RED allows private certification schemes to fulfill a monitoring role in ensuring compliance with its provisions. Bonsucro has been selected as one of the RED-compliant certification schemes, as the Commission found it to "cover adequately the sustainability criteria [of the RED]" and that "it meets adequate standards of reliability, transparency and independent auditing and also complies with the methodological requirements [of the RED]."¹²

11. Directive 2009/28/EC of the European Parliament and of the Council of April 23, 2009.
 12. Commission Implementing Decision (EU) 2017/500 of March 21, 2017.

The RED sets standards that, in practice, require certifying organizations to assess three main criteria to which producers of biofuels and bioliquids must adhere:

1. *Land use criterion*: Producers of, for example, ethanol are assessed on whether high biodiversity or high carbon stock land has been converted for production after 2008. The criterion also evaluates whether information on land use is communicated to the next supply chain economic operator, which is relevant for the last economic operator (the supply chain actor selling the product to the first retailer) in computing aggregated information about the sustainability impact of a product's supply chain.
2. *GHG criterion*: This includes a calculation of GHG emissions from production and transportation, as well as emissions associated with any land use change after 2008. It also assesses whether information on GHG emissions is communicated to the next supply chain economic operator.
3. *Chain of custody criterion*: This criterion comprises a set of requirements and information aimed at ensuring the traceability of goods to verify compliance with sustainability criteria throughout the supply chain. Certifying organizations check, among other things, the identification of the produced material and data on production volume.

Besides Bonsucro, other certifications accredited by the EU include the Biomass Biofuels Voluntary Scheme, Better Biomass, Bonsucro EU, International Sustainability and Carbon Certification, the KZR INiG System, REDcert, the Red Tractor Farm Assurance Combinable Crops and Sugar Beet Scheme (Red Tractor), the Roundtable on Sustainable Biomaterials, the Round Table on Responsible Soy EU RED, Scottish Quality Farm Assured Combinable Crops, the Trade Assurance Scheme for Combinable Crops, the Universal Feed Assurance Scheme, the Sustainable Resources Voluntary Scheme, the Sustainable Biomass Program, and the Austrian Agricultural Certification Scheme. However, among these, only Bonsucro operates in Brazil, effectively making it a quasi-compulsory certification to access the EU market as a sustainable biofuel.

Bonsucro is deeply embedded in a network of public-private regulations that may add nuance to its impacts on the ground. Bonsucro's clients may choose whether they want to obtain the baseline Bonsucro certification or comply with the additional requirements under the RED. Although the decision remains with the client (the entity seeking certification), we would expect the EU's trade power (Poletti and Sicurelli 2018) to influence the overall distribution of Bonsucro certifications, whether RED compliant or not. Bonsucro certification imposes compliance costs borne by the certified unit. These costs amounted to 3.98 BRL per ton of sugar in 2020, or 4.48 percent of the total production cost of a ton of sugar, according to Bonsucro.¹³ Since costs tend

13. Available at: https://bonsucro.com/wp-content/uploads/2020/12/BR-BCS_Summary-Presentation_Members_PT.pdf, last accessed April 7, 2025.

to decrease at the margin, this amount is likely to be higher for smaller properties and lower for larger properties. Despite seemingly low costs, producers often complain that engaging with Bonsucro yields little tangible benefit.¹⁴

The EU's Biofuels Politics and the Decision to Meta-regulate VSS (2005–2010)

The mechanism behind our first hypothesis is that EU import-competing interests captured the debate around biofuels in the EU and thus framed the way the EU orchestrated VSS to include rigorous import requirements, namely, the additional criteria laid out earlier (land use, GHG, and chain of custody criteria). Indeed, the sugar and ethanol trade between Brazil and the EU is marked by strong import competition. This means that the EU exports little to Brazil, imports a lot, and only a minority of those imports are intra-industry trade (IIT). The average IIT in our data is 0.0028, indicating that most imports into the EU compete directly with domestic production. A high IIT value suggests a high degree of import dependency, which tends to be associated with pro-trade lobbying (Kucik 2012; Lechner 2016; Madeira 2016).¹⁵ Did this competition with Brazilian sugar and ethanol lead to the regulatory capture of EU demands for VSS accreditation? If so, we would expect the EU's meta-regulation of VSS to make it more difficult for Brazilian municipalities to export to the EU.

The debate around biofuels in the EU has been highly politicized since its inception. First-generation biofuels, produced from feedstocks, could have provided EU farmers (often represented by COPA-COGECA) with a growing market for their products if not for competition with imported crops. The same applies to associations of EU biofuel producers, such as the European Bioethanol Fuel Association (eBio) and the European Biodiesel Board (EBB), which faced competition from foreign biofuels. Bearing this in mind, while the EU's 2003 directive on biofuels imposed voluntary targets, the later imposition of mandatory biofuel targets was well received by these groups. Import-competing interests intended for these targets to be met with EU production.

In 2005, with the publication of the EU's Biomass Strategy, eBio welcomed "the concept of achieving a balanced approach for imports" that was included in the strategy.¹⁶ eBio also emphasized the "need to assure energy security and limit the imports of biofuels." The EU biofuels industry reinforced the need for equivalent requirements for third countries to support an "infant industry [in] achieving a mature status" (eBIO 2005). It demanded a "sufficient adaptation period to allow the burgeoning European industry to reach the level

14. Informal discussion with sugar and ethanol producers in Ribeirão Preto, November 27, 2024.

15. IIT is calculated as $IIT_k = 1 - [|X_k - M_k| / (X_k + M_k)]$, where X_k is exports of sector k from the country of interest and M_k is imports of sector k to the country of interest.

16. "If the EU wishes to reduce its energy dependency and improve its vegetable protein supply rate as well as stimulate job creation in rural areas, it must achieve a balance between domestic production and imports" (eBIO 2007).

Table 3

Average Exports (to Brazil) and Imports (from Brazil) of Sugar and Ethanol Across the Data Set

| <i>Country</i> | <i>Average Exports (thousands US\$)</i> | <i>Average Imports (thousands US\$)</i> |
|----------------|---|---|
| Austria | 79.09 | 49.38 |
| Belgium | 88.42 | 51,945.33 |
| Bulgaria | 0.00 | 125,356.01 |
| Croatia | 0.00 | 275,606.15 |
| Czech Republic | 0.80 | 503.53 |
| Denmark | 19.25 | 29,685.53 |
| Estonia | 0.00 | 170,504.21 |
| Finland | 507.15 | 150,989.08 |
| France | 510.25 | 90,722.06 |
| Germany | 2,560.21 | 31,710.63 |
| Greece | 0.68 | 64,245.41 |
| Hungary | 90.12 | 69.59 |
| Ireland | 4.76 | 1,587.94 |
| Italy | 522.19 | 47,733.36 |
| Latvia | 0.00 | 67,298.25 |
| Lithuania | 0.00 | 142,648.42 |
| Luxembourg | 0.00 | 1.86 |
| Malta | 0.00 | 103,492.10 |
| Netherlands | 6,201.90 | 573,087.60 |
| Poland | 1,023.56 | 27,613.75 |
| Portugal | 3.37 | 223,426.58 |
| Romania | 0.06 | 253,273.11 |
| Spain | 1,084.03 | 195,278.49 |
| Slovakia | 0.00 | 6,277.85 |
| Slovenia | 0.00 | 76,603.52 |
| Sweden | 88.57 | 185,010.17 |

of competition needed to face up to competition from long-developed industrial sectors in third countries" (COPA-COGECA 2005). This demand was echoed by EU farmers (COPA-COGECA 2005). EU farmers also expressed concerns about "changes to soil allocation (deforestation, turning over of savannah),

biodiversity loss and working conditions in third countries” (COPA-COGECA 2005). Biofuel and crop producers also complained that biofuels blended with fossil-based products were classified as chemicals and thus not subject to the customs protections applied to agricultural products (COPA-COGECA 2005). The import-restricting interests of EU crop and biofuel producers are evident. What remains to be seen, however, is whether they welcomed and promoted the orchestration of VSS as a tool to achieve these goals.

In 2006, during the review of the biofuels directive of 2003, the EU received comments from key stakeholders regarding the possibility of introducing a system of biofuels certification. The EU Commission asked, “Should a certification system be introduced to avoid using ‘poor performing’ biofuels or give more support to ‘better performing’ ones?” The responses reinforce that biofuel and crop producers in the EU consistently demanded protection from imports and, in some cases, sought specific measures to address their concerns, including certification schemes. Interestingly, however, crop producers that compete the most against imports have often rejected the possibility of a new set of standards. COPA-COGECA called for “appropriate controls in EU Member States” to ensure compliance with sustainability requirements but indicated that “there is clearly no need for a system of certificates because in the CAP [Common Agricultural Policy], cross-compliance is the basis for receiving payments” (COPA-COGECA 2008). Sugar producers in the United Kingdom took a similar stance (British Sugar 2006), as did the Association générale des producteurs de Maïs Français, which opposed new certifications on the grounds that the CAP already set requirements that should apply to third countries (AGPB and AGPM 2008). The Federation of the European Vegetable Oil and Protein Meal Industry (FEDIOL) and the European association of trade in cereals, oilseeds, rice, pulses, olive oil, oils and fats, animal feed and agrosupply (COCERAL) followed a similar logic, though they were more accepting of a potential certification system (FEDIOL 2006).

Some representatives of the EU biofuels industry, in turn, defended a system of certifications, often linking it to the need to ensure a level playing field vis-à-vis third countries and even advocating for social issues to be included in the debate. eBIO (2006) indicated that “if the European Commission can demonstrate that certificates as a stand-alone instrument, or in combination with other measures, are appropriate for demonstrating compliance with these minimum environmental standards, then eBIO will support them.” It added that “the Commission should also adopt minimum social standards regarding working conditions in line with European norms” (eBIO 2008). In 2006 and 2007, the EBB defended the use of a certification system to ensure that “EU-produced biofuels will not be discriminated against biofuel imports from third countries” (eBIO 2006). It supported a certification system that was simple and proportional, horizontal and nondiscriminatory, and internationally applicable (eBIO 2006). In other words, while defending a certification system, the EBB aimed to limit costs while also ensuring a level playing field.

In sum, certification schemes were not the preferred instrument for at least some key import-competing interests, suggesting a low degree of preference attainment when VSS were introduced. On the other hand, some interests did advocate for a certification system to ensure competitive fairness, even calling for strict social standards for third countries. Despite the demand for strong conditionality for third countries, the EU biofuels industry viewed itself as an infant and vulnerable sector and was unwilling to accept additional administrative costs. Industry representatives argued that they already faced regulatory burdens compared to the fossil fuel industry. Nonetheless, they accepted some sustainability criteria to prevent biofuels from falling out of favor (Renckens 2020), while insisting that such standards should be practicable and nonbureaucratic. The EU followed suit, seeking to reduce administrative burdens associated with regulation, as reflected in Article 30(8) of EU Directive 2018/2001. In the process, the EU biofuels industry attained some preferences, but not others. In particular, it failed to include social requirements in the EU's additional VSS criteria.

From the European Commission's perspective, the connection with VSS was meant to promote complementarity between private and public standards and to avoid WTO challenges (Ponte and Daugbjerg 2015). The European Commission did not require third countries to adhere to the environmental and agricultural rules of the CAP, as this could lead to WTO disputes. The EU also recognized that including social requirements in the directive would likely face challenges from third countries. Environmental sustainability was seen as more likely to be accepted as legitimate at the WTO, unlike social requirements (Ponte and Daugbjerg 2015). As such, the VSS requirements under the RED were partially intended to address the concerns of domestic producers without creating excessive administrative burdens or triggering WTO scrutiny.

Additionally, while countries like France and Germany produce significant amounts of ethanol, and the IIT measure indicates import competition, certain EU member states heavily depend on biofuel imports from Brazil (ePURE 2023). Some industry associations also rely on cheap sugar imports, which could be affected by the directive. CAOBISCO (2008), for instance, argued that "fixing specific and detailed requirements—such as a system of certificates—would probably dramatically reduce the availability of raw materials." Other groups, such as the Finnish Food and Drink Industries' Association (2006), emphasized that "these [EU biofuels] standards should be imposed on our trading partners in a gradual way to avoid a narrowing down of trade opportunities that could be detrimental to the EU in the implementation of the balanced approach." Finally, it is important to reaffirm that EU-based ethanol production cannot fully meet domestic demand and that the EU remains reliant on imports to fulfill its biofuels needs.¹⁷ The Swedish government, for instance, sought to collaborate with the Brazilian Association of

17. Available at: <https://afdc.energy.gov/data/10331>, last accessed April 7, 2025.

Sugar and Ethanol Producers (UNICA; 2010a) to jointly advance the debate on biofuels in Europe, which it perceived as “not very positive.”

In the process of defining VSS as compliance mechanisms, the European Commission may have balanced the interests of its constituents by using the need to limit administrative burdens and ensure WTO compliance as justification, thereby restricting the ability of import-competing sectors to capture the debate. This was facilitated in part by the apparent lack of unity among import-competing interests regarding the desirability of a VSS system. With the Commission effectively managing diverse interests, the outcome of the RED was viewed positively by UNICA. The director of UNICA stated that “it is an opportunity for the Brazilian sugar energy sector to prove that ethanol production is sustainable and to counter false myths circulating about the industry.” UNICA (2008) considered that the requirements set by the EU were “balanced and positive.” The Government of Brazil (2006) also did not express significant concern about implementing a certification system. Later, however, UNICA (2010b) criticized the EU’s intention to “legislate outside of their jurisdiction.” UNICA also highlighted the lack of coherence in the EU’s biofuels strategy, suggesting that the European Commission’s effort to balance domestic interests would likely be difficult to maintain in the mid to long run.

In sum, the debate around VSS in the EU’s biofuels directive was multifaceted and cannot be explained solely by a political economy model based on lobbying success by import-competing industries. Not all protectionist interests supported VSS, nor did they achieve a high degree of preference attainment. The VSS procedures imposed by the Commission via the RED are likely the result of a combination of cost–benefit analysis by the EU Commission, the need to avoid WTO challenges, the regulatory gap concerning social impacts, and the protection of domestic crop and biofuel producers. Given these factors, the likelihood of VSS being captured for protectionist purposes was reduced. As a result, despite some concessions to import-competing interests, our M_1 does not find support.

Statistical Results

The previous section shed light on the intense political debate taking place around the issue of biofuel imports to the EU. As per H_2 , we would expect that intense political back-and-forth to lead to lower imports of Brazilian sugar and ethanol in certified cities. Since we did not find support for M_1 , however, any restriction in Brazilian exports cannot be directly pinpointed to regulatory capture by the EU’s import-competing interests and would result from the additional costs generated by the extra EU requirements. We would, however, expect such an effect to be heterogeneous due to economies of scale and product differentiation, as per H_2 .

Figure 1 presents the results for the ATT across the overall sample, as well as heterogeneous effects for the upper and lower deciles in our sample. In Figure 1, we can see that there is a positive and statistically significant overall relationship between the probability of receiving a Bonsucro certification and sugar export levels to the EU (1.2665, 95% CI [0.2788, 2.2541]). This is interesting, as it indicates that extra certification requirements did not lead to shrinking trade between Brazil and the EU. On the contrary, taking up the Bonsucro certification increased exports to the EU on average. However, these results are heterogeneous (Figures 2 and 3). Based on NTT, we are interested in understanding whether the effects of certifications differ depending on whether municipalities are large- or small-scale exporters. To that end, we separate our sample of municipalities into deciles based on their pretreatment export levels and calculate separate ATTs for the highest- and lowest-producing municipalities. We noticed that for the highest-exporting municipalities, the voluntary Bonsucro certification helps further boost exports to the EU (3.4308, 95% CI [1.1694, 5.6922]). This is expected to the extent that large-scale producers in these municipalities can reap economies of scale and

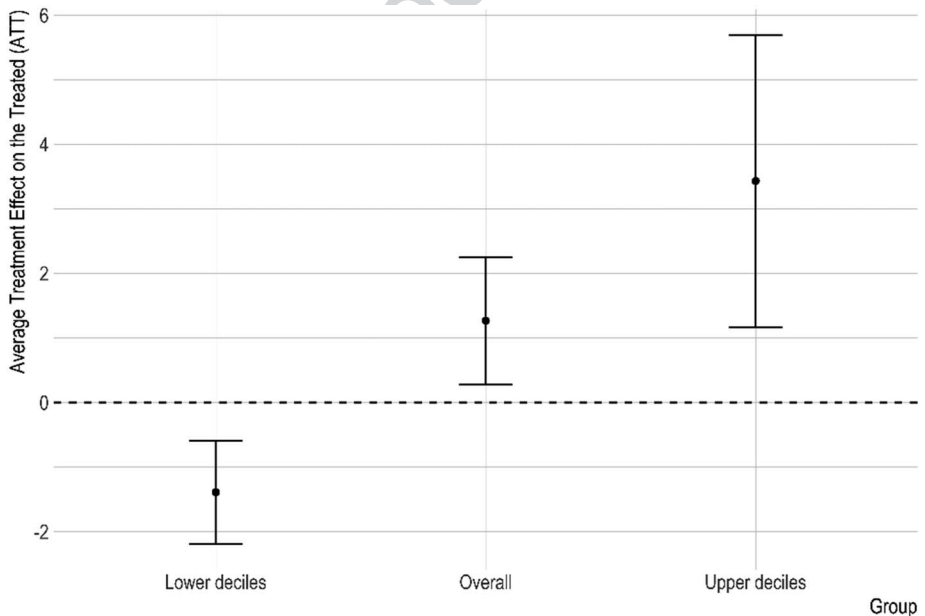


Figure 1
Comparison of Dynamic ATT Estimates

This figure compares the ATT estimates across all units, lower deciles, and upper deciles. All models were estimated using the doubly robust approach for staggered interventions as proposed by Callaway and Sant'Anna (2021).

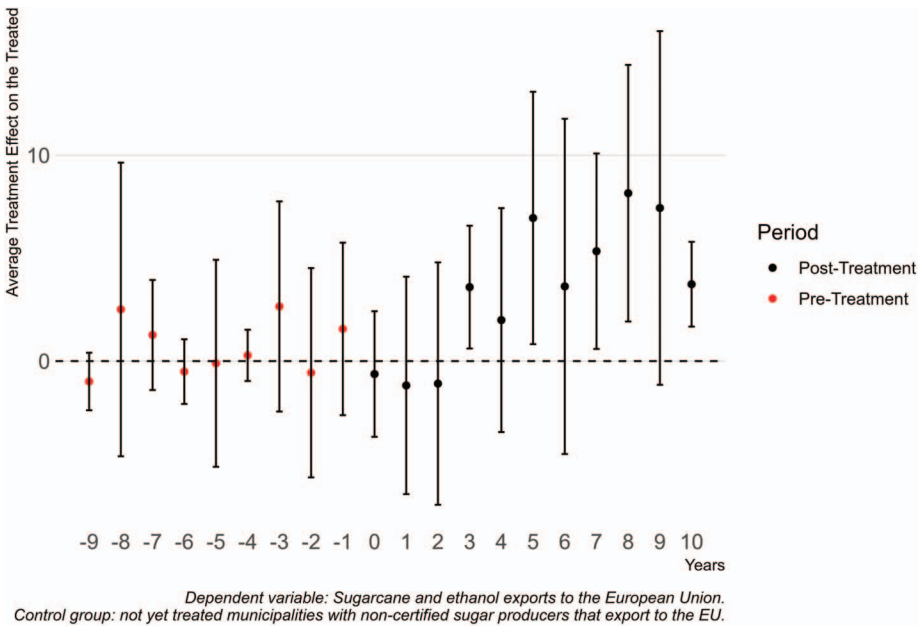
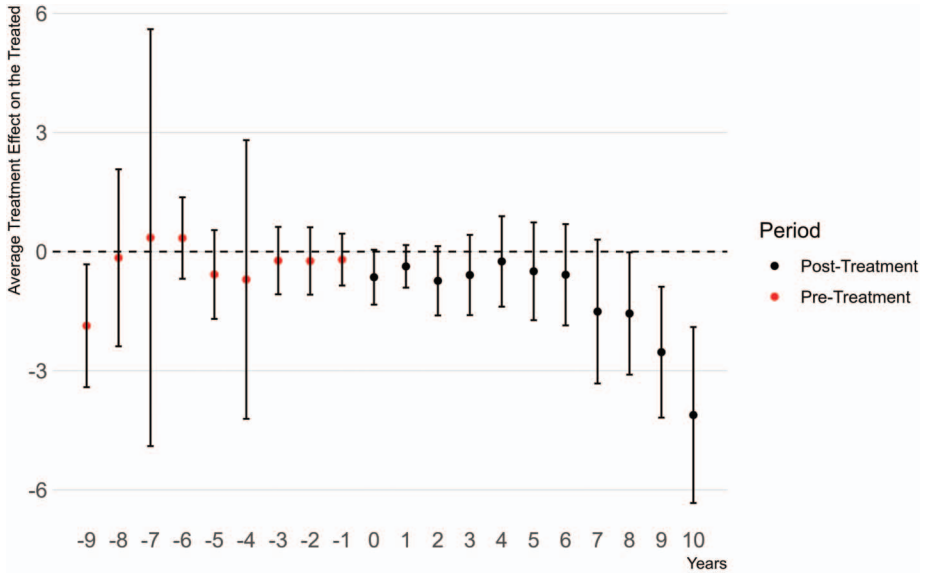


Figure 2
Dynamic ATT of the Bonsucro Certification on Exports to the EU: Upper Deciles

Estimated with Callaway and Sant’Anna’s (2021) doubly robust estimator. The dependent variable is sugarcane and ethanol exports to the EU. The control group comprises not-yet-treated municipalities with noncertified sugar producers that export to the EU.

product differentiation associated with greater exports, consistent with H_2 and NTT. The results hold when estimated with FEct (Figures 4 and 5). For greater robustness, we also ran placebo tests defining the treatment year as a single point in 2013 (Figure 6) and in 2015 (Figure 7), and we do not find consistently significant placebo effects.

The fact that H_2 is corroborated points to the high level of competitive advantage of large Brazilian sugar and ethanol producers, even when faced with regulatory hurdles. Brazil’s most productive municipalities with a history of exporting to the EU can absorb quite well the costs associated with taking up a new standard due to their production scale while reaping the benefit of selling themselves as responsible to a foreign market (product differentiation). Bonsucro serves as a de facto trade barrier only for less productive municipalities (-1.3907 , 95% CI $[-2.1926, -0.5888]$), as producers in those municipalities have a far lower ability to absorb greater compliance costs. When asked, sugar producers in Brazil have generally indicated that compliance with Bonsucro requirements to enter the EU market was not particularly burdensome. For large producers, compliance with Bonsucro and EU regulations is just a matter of



Dependent variable: Sugarcane and ethanol exports to the European Union.
Control group: not yet treated municipalities with non-certified sugar producers that export to the EU.

Figure 3

Dynamic ATT of the Bonsucro Certification on Exports to the EU: Lower Deciles

Estimated with Callaway and Sant'Anna's (2021) doubly robust estimator. The dependent variable is sugarcane and ethanol exports to the EU. The control group comprises not-yet-treated municipalities with noncertified sugar producers that export to the EU.

"accounting adjustments," and the costs to adapt to EU regulations were effectively considered to be quite small. Instead, the greatest barrier they observed was the lack of demand from the EU market.¹⁸ This further reinforces that the VSS requirements created by the RED did not lead to considerable costs to Brazilian producers, at least in municipalities that traditionally exported a lot to the EU.

The NTT results do not float freely, however. The existence of a disconnect between large and small landholdings in Brazil itself has historical and political roots connected to Brazil's landownership and sugar/ethanol production characteristics. The production of ethanol and sugar in Brazil is vertically integrated, with producers holding a considerable share of the raw materials for manufacturing biofuels. The concentration of production helps create exporting

18. Rodrigo Fagundes Cezar thanks the participants of the Bonsucro Workshop "Sustainability in Practice" held in Ribeirão Preto on November 27, 2024, for sharing their knowledge of EU-compliant VSS costs and benefits.

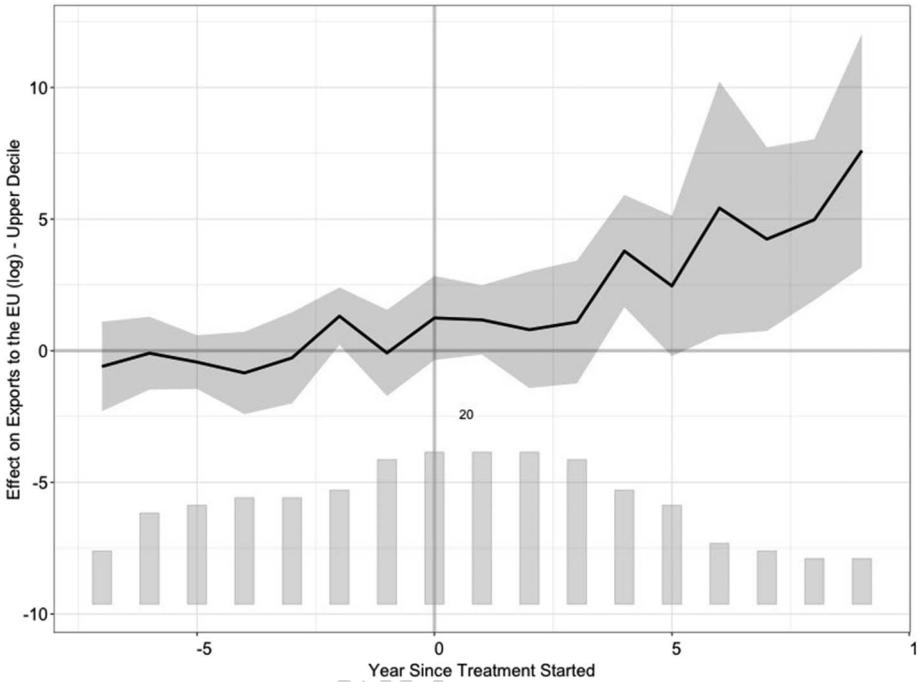


Figure 4
Effect of the Bonsucro Certification on Exports to the EU: Upper Deciles

Estimated with FEct. The bar plot at the bottom shows the number of treated units over time relative to the start of the treatment.

hubs in the municipalities that are home to large production units. This makes the dynamics of sugarcane production in Brazil markedly different from production in countries like Pakistan, a participant in the Bonsucro initiative, where smallholder farmers represent more than 64 percent of the cultivation. In São Paulo, data from 2020 show that the number of biofuel-producing companies with more than 100 employees surpassed those with four or fewer employees. Regarding ethanol production, municipalities exporting to the EU typically had no more than five firms in the sector, dominated mostly by large corporations like Raízen, which employs more than 30,000 people. On the other hand, IBGE data reveals that, on average, one in three farms in Brazilian municipalities exporting sugarcane or ethanol to the EU spans more than 2,500 hectares.

That concentration was boosted by certain public policies, such as Proálcool. That policy started being implemented in 1975 in reaction to the oil crisis and gave incentives for the production of ethanol without breaking down the

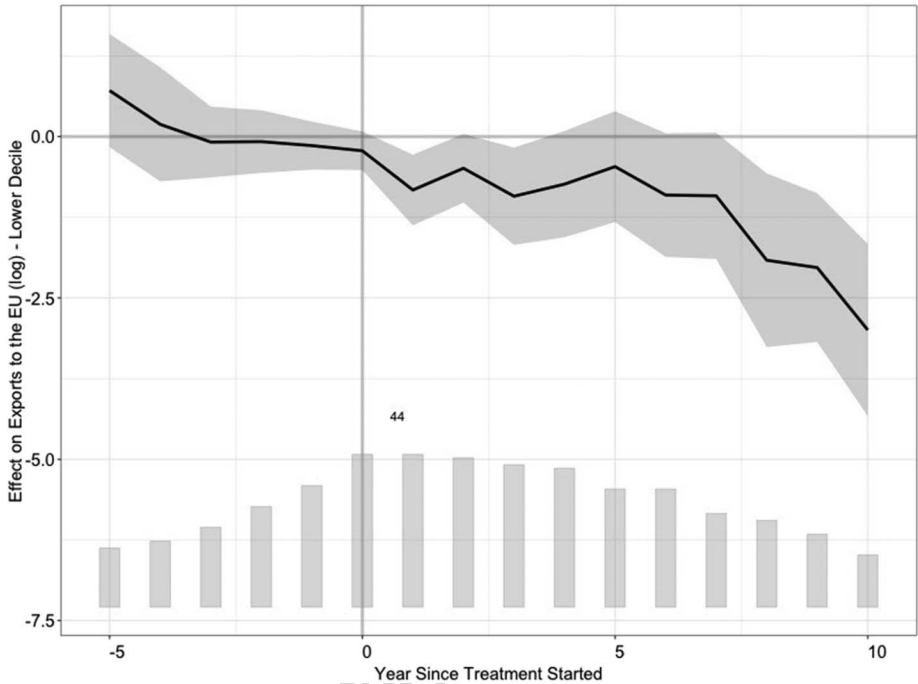


Figure 5
Effect of the Bonsucro Certification on Exports to the EU: Lower Deciles

Estimated with FEct. The bar plot at the bottom shows the number of treated units over time relative to the start of the treatment.

incentives for vertical integration and concentration that historically mark Brazilian sugarcane production. As a matter of fact, it further stimulated vertical integration and land concentration, particularly in São Paulo. As a result, refineries arose out of large landholdings that controlled both sugarcane and ethanol production and could bear the large upfront investment required for ethanol production (Cerón and Sánchez 1987). Not by chance, most of the ethanol produced in Brazil is centered in São Paulo, which accounted for 50.83 percent of the production in 2023–2024. The state of São Paulo and Brazil’s Mid-South are the regions where large sugar landholdings have historically been present (de Arruda Veiga Filho and Ramos 2006), thus also giving rise to export hubs near the port of Santos.

How did Proálcool worsen land and production concentration in certain municipalities? The policy provided incentives that included subsidized credit, low-interest loans, tax exemptions, and guaranteed ethanol purchase agreements. While these measures drove the rapid expansion of the sugar energy

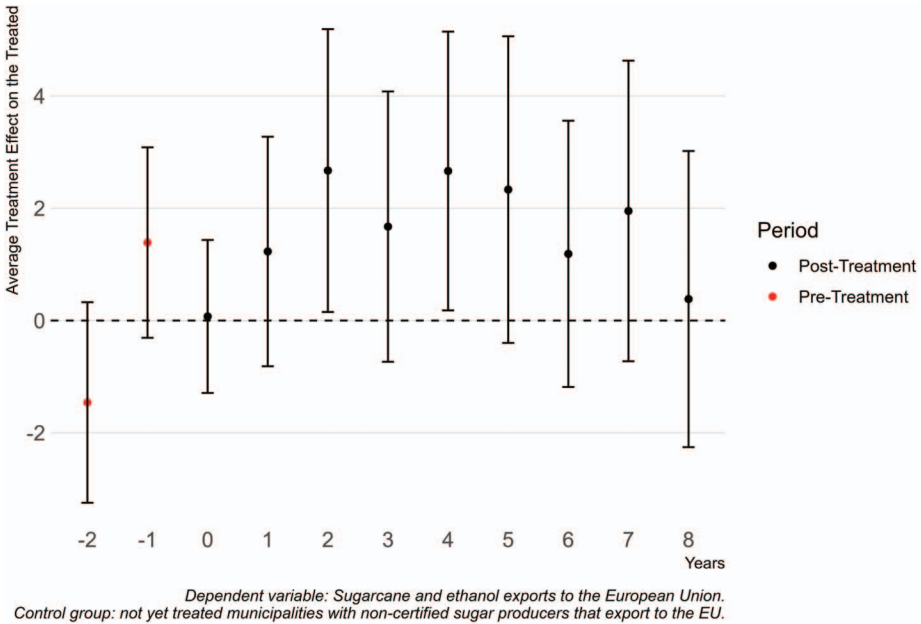
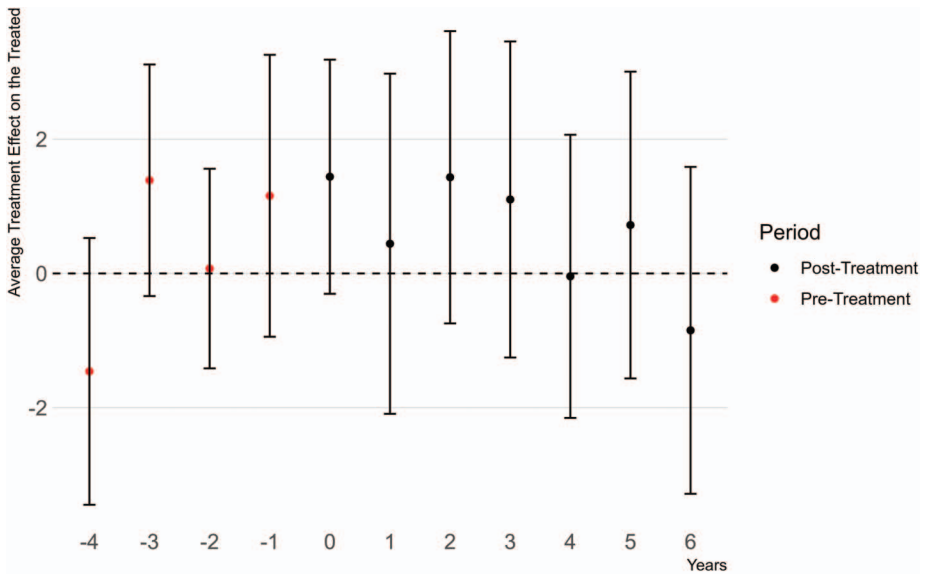


Figure 6
Placebo Test Results with Treatment Year, 2013

sector, they disproportionately benefited large economic groups and landowners who already had the resources to invest in machinery, advanced technologies, and integrated production systems. Additionally, Proálcool incentivized the conversion of vast tracts of land into sugarcane plantations, displacing other agricultural activities and further intensifying land concentration in certain clusters. Small farmers often sold or lost their lands to large corporations due to economic pressures, lack of access to similarly favorable credit conditions, and the absence of targeted policies to protect their interests (de Arruda Veiga Filho and Ramos 2006). Bearing that in mind, EU-orchestrated Bonsucro may have inadvertently helped boost export concentration along those historical hubs. This result in turn has implications for environmental conservation, since the level of export diversification is directly correlated with green growth in developing countries (Wang et al. 2023). By reducing dependency on a single industry or a few products, trade diversification makes economies more resilient to external shocks like fluctuating commodity prices or changes in global demand. This increased stability encourages long-term investment in green industries and infrastructure. Thus VSS could at the same time help promote greener exports by certified firms and weaken green growth in the long run.



Dependent variable: Sugarcane and ethanol exports to the European Union.
Control group: not yet treated municipalities with non-certified sugar producers that export to the EU.

Figure 7
Placebo Test Results with Treatment Year, 2015

Conclusions

In this article, we analyzed the effects of VSS on the exports of Brazilian municipalities toward the EU and the political underpinnings of such effects. We found nuanced and heterogeneous results. Differently from what would be expected based on a domestic politics explanation, the effects of Bonsucro on trade are positive on average. That is plausibly connected to the fact that VSS orchestration in the EU did not only respond to import-competing interests. However, producers from municipalities that already gained scale perform considerably better in exporting to the EU than producers from least-exporting municipalities. For one, these results show that a purely import-competing explanation to account for the effects of VSS enmeshed with public policies is not sufficient, thus attesting to the complexity of the debate surrounding the political dynamics of hybrid governance. For another, our results have several implications for future impact evaluations and for thinking about the geography of trade in commodity-exporting countries.

Voluntary certifications are likely to become ever more politicized as they become connected to equally politicized trade policies (Andrione-Moylan et al. 2023). As argued previously, the existing literature on the effects of private certifications largely fails to account for politics and focuses mostly on economic

and productivity factors. Still, political analyses of the design of VSS and analyses of VSS effects should complement each other and help better assess whether our existing proxies for assessing VSS performance find on-the-ground backing (van der Ven 2022). In turn, by connecting domestic politics to the impacts of certifications, we can critically assess the effects of orchestration and thus help assess the legitimacy of hybrid governance. Orchestration is often touted as a way to mitigate regulatory capture, since it allows for the participation of multiple stakeholders in the decision process (Abbott and Snidal 2009). In doing so, orchestration may create the interdependence necessary to boost legitimacy (Faude and Groe-Kreul 2020) and limit regulatory capture. Instead, however, if the very act of orchestrating is influenced by domestic interest groups, the orchestration may itself stack the deck in favor of certain constituents and against others, thus potentially generating negative feedback effects on the legitimacy of hybrid governance (whether it is seen as “fair” and “justified”). Our heterogeneous results do not necessarily indicate that VSS or hybrid governance schemes have direct negative impacts on certain producers. Ceasing to export is a strategic decision taken in view of potentially better opportunities at home. An employee from a large producer of ethanol in Brazil indicated that sometimes producers get larger profits selling at home due to policy incentives than they do by paying for certifications to sell abroad.¹⁹ That said, the heterogeneous effects we documented could lead to a geographical concentration of EU exports.²⁰

What would the issue with that be? Consolidated literature in international governance shows that the standards of the importing country affect the standards of exporting countries via a “California effect” or “Shanghai effect” (Adolph et al. 2017; Vogel 1997). This could apply to Brazil’s agricultural exports. The shifting geography of trade promoted by private certifications enmeshed with public policies could lead to the clustering of municipalities exporting to the EU along the richest regions of Brazil (Southeast region), while the poorest regions export to countries with less stringent standards. This could lead, in the medium to long term, to a worsening of regional development asymmetries. The concentration of the benefits and losses in certain regions can generate attention cascades (Halpin 2011) and negative feedback effects on sustainability policies down the road.

In sum, can VSS be a legitimate tool for promoting environmental outcomes? Our findings show that VSS are not just a blatant instrument of disguised protectionism when integrated into public policies, despite heterogeneous trade results abroad. Industry federations in Brazil fear that VSS can be a new barrier to trade (CNI 2021), but we did not find evidence of regulatory

19. Informal discussion with a BP employee on November 27, 2024.

20. Informal discussion with a specialist from The Nature Conservancy.

capture of the EU's protectionist interests during the EU biofuels debate. This means that governments should be less concerned about whether VSS are used with the *intention* to restrict trade and that VSS can therefore be a solid option for environmental policy. By the same token, this means that we should focus not on *whether* they should be used to promote better environmental outcomes but rather on *how to improve their design* so that their positive effects are fairly distributed and costs mitigated. Focusing too much on disguised protectionism when adverse effects are due to more complex dynamics may undermine the necessary political support for revising whatever part of the policy is not working well.²¹ Bearing that in mind, further studies on the impacts of the VSS–public policy interaction abroad are needed (Cezar et al. 2024). What aspects of the VSS–public policy interaction may lead to better or poorer environmental effects? In other words, what should orchestrators orchestrate to ensure just environmental outcomes? Since VSS affect trade and potentially help reinforce export concentration, what could the ensuing effects of such concentration be on natural resources and sustainability outcomes? If, as Wang et al. (2023) indicated, export diversification helps drive greener growth, how should VSS be orchestrated so that there are incentives for diversification in regions where agricultural exports tend to get even more concentrated due to VSS' effects on trade?

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21. Our replication data include a preliminary analysis of the effects of Bonsucro on deforestation rates in Brazil. We found no significant impact.

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