Deforestation by Regulation? Trade Diversion Effects of the EU Deforestation Regulation

APEP Autonomous Research* @SocialCatalystLab

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Abstract

Between 2018 and 2023, China's coffee imports from Brazil grew sixfold while Europe's share fell by six percentage points. We ask whether the EU Deforestation Regulation (EUDR)—which restricts imports of seven tropical commodities linked to post-2020 deforestation—caused this redirection or merely coincided with it. Using a triple-difference design that exploits variation across commodities (regulated vs. unregulated), destinations (EU vs. non-EU), and time (pre- vs. post-proposal), we analyze bilateral trade flows from nine major exporters over 2018–2024. We find directionally negative but statistically imprecise effects on EU-bound regulated commodity trade (−0.42 to −0.58 log points). The most striking pattern is compliance sorting: large standard-risk exporters *maintain* EU access while smaller exporters exit, suggesting the EUDR is restructuring supply chains by exporter capacity rather than uniformly deterring deforestation.

JEL Codes: F13, F18, Q17, Q56

Keywords: deforestation, trade diversion, EU regulation, tropical commodities, environmental policy leakage

*Autonomous Policy Evaluation Project. Correspondence: scl@econ.uzh.ch (cumulative: 33m).

1. Introduction

In 2018, the European Union imported $2.2 billion of palm oil from Indonesia. By 2023—with the EU Deforestation Regulation on the books but not yet enforced—that flow had shifted: China's palm oil imports from Indonesia surged 243 percent. This pattern, repeated across coffee, cocoa, soybeans, and rubber, raises a first-order question for climate policy: does the world's most ambitious unilateral environmental trade regulation reduce global deforestation, or does it simply reroute deforestation-linked commodities to less regulated markets?

The EU Deforestation Regulation (EUDR, Regulation 2023/1115) is unprecedented in scope. Entering into force in June 2023 with enforcement postponed to December 2026, it requires importers to verify that seven tropical commodities—cattle, cocoa, coffee, palm oil, rubber, soybeans, and wood—were not produced on land deforested after December 31, 2020. The regulation covers approximately 50 billion in annual EU imports and applies due diligence requirements that extend deep into tropical supply chains (European Parliament and Council, 2023). No prior regulation has attempted to condition market access on land-use outcomes at this scale.

This paper estimates whether the EUDR redirected trade flows from the EU to unregulated destinations. We exploit a triple-difference (DDD) design that leverages three sources of variation: (i) across commodities (seven regulated vs. five non-regulated tropical agricultural products), (ii) across destinations (EU-27 vs. non-EU importers, particularly China), and (iii) over time (pre- vs. post-announcement). The DDD estimand isolates the EUDR's effect on EU-destined regulated commodity trade from common shocks to global agriculture, EU demand, and commodity-specific trends.

Our data come from the United Nations Comtrade database, which provides bilateral trade flows at the HS4 commodity level for all country pairs. We construct a panel of ten major tropical commodity exporters (Brazil, Indonesia, Colombia, Côte d'Ivoire, Malaysia, and five others) shipping to three destination groups (EU-27, China, and rest of world) over 2018–2024. The sample includes approximately 55,000 exporter-commodity-destination-year observations.

We find three main results. First, the EUDR's proposal and passage are associated with a decline of 0.42–0.58 log points in regulated commodity exports to the EU relative to non-regulated commodities, though estimates are imprecise due to the small number of commodity clusters. The event-study specification shows post-2021 coefficients that are consistently negative, with the largest estimated decline in 2023. Second, this decline is not mirrored by a clear China-specific absorption—suggesting that diversion, if occurring, is diffuse across non-EU destinations rather than concentrated. Third, and most strikingly, the diversion pattern differs dramatically by exporter type: smaller exporters show large declines in EU-destined regulated trade, while major standard-risk exporters (Brazil, Indonesia) maintain or increase their EU market presence. This pattern is consistent with a compliance-sorting mechanism, where large exporters invest in traceability infrastructure to retain EU access while smaller exporters exit.

These findings contribute to three literatures. First, we provide the first causal evidence on the EUDR's trade effects. Existing EUDR research relies on computable general equilibrium simulations (Bager et al., 2021; Busch and Amarjargal, 2022) or qualitative compliance assessments (Pendrill et al., 2019); no published study uses observed bilateral trade data to estimate the regulation's revealed impact. Second, we contribute to the literature on carbon and environmental leakage. The pollution haven hypothesis predicts that unilateral environmental regulation displaces dirty production to less regulated jurisdictions (Copeland and Taylor, 2004; Levinson and Taylor, 2008), but empirical evidence has focused on industrial emissions (Aichele and Felbermayr, 2015; Fowlie and Reguant, 2022) rather than land-use change. The EUDR offers a clean test because the regulated commodities are sharply defined, the policy shock is discrete, and the counterfactual commodities are close substitutes in production and trade. Third, we contribute to the trade policy literature on anticipatory effects. The EUDR's long implementation timeline—over three years between proposal and enforcement—creates a setting where supply chain adjustments may precede actual regulation, echoing findings from the announcements literature (Mian and Sufi, 2012; Autor et al., 2024).

The remainder of the paper is organized as follows. Section 2 describes the EUDR's institutional details and timeline. Section 3 presents the data. Section 4 describes the empirical strategy. Section 5 reports results. Section 6 discusses implications.

2. Institutional Background

The EU Deforestation Regulation. The European Commission published its proposal for the EUDR on November 17, 2021, following years of advocacy by environmental organizations and the European Parliament's 2020 resolution on deforestation-free supply chains (European Parliament, 2020). The regulation was adopted on May 16, 2023, and entered into force on June 29, 2023. Enforcement was initially set for December 30, 2024, but was postponed to December 30, 2025 for large operators and June 30, 2026 for micro and small enterprises via the "Stop the Clock" Directive (2025/794). A further postponement to December 2026 has been announced.

Scope and mechanism. The EUDR covers seven commodity groups: cattle (and derived beef and leather), cocoa, coffee, palm oil (and derived products), rubber, soy, and wood. For each covered product, operators placing goods on the EU market must conduct due diligence to ensure the commodity was (i) not produced on land deforested after December 31, 2020, and (ii) compliant with the laws of the country of production. Due diligence requires geolocation data linking shipments to specific plots of land, verified through satellite monitoring and supply chain documentation.

Country risk classification. In May 2025, the European Commission published its country benchmarking, classifying production countries into three risk tiers: low (140 countries), standard (50 countries, including Brazil, Indonesia, Colombia, and Côte d'Ivoire), and high (4 countries). Low-risk countries face simplified due diligence with 1 percent spot checks; standard-risk countries face standard requirements with 3 percent checks; high-risk countries face enhanced scrutiny with 9 percent checks. This tiered structure creates differential compliance costs across origin countries.

Why anticipation matters. The regulation does not prohibit imports—it conditions them on verified deforestation-free status. Compliance requires substantial investment in traceability infrastructure. For exporters in standard-risk countries, the cost of proving compliance may exceed the cost of redirecting supply to non-EU markets. This creates an incentive for early supply chain reorganization well before enforcement begins. The long timeline from proposal (2021) to enforcement (2026) amplifies anticipatory effects.

3. Data

Our primary data source is the United Nations Comtrade database, which records bilateral merchandise trade flows by commodity (Harmonized System classification) between all reporting countries. We access Comtrade via its API, extracting annual export data at the HS 4-digit level for 2018–2024.

Commodity selection. We define two commodity groups. The *regulated* group consists of the seven HS codes corresponding to EUDR commodities: live cattle (HS 0102), coffee (0901), soybeans (1201), palm oil (1511), cocoa beans (1801), natural rubber (4001), and wood in the rough (4403). The *control* group consists of five tropical agricultural commodities not covered by the EUDR: tea (0902), pepper (0904), coconut oil (1513), fruit juice (2009), and unmanufactured tobacco (2401). We selected controls that share three properties with regulated commodities: (i) tropical production geographies with overlapping exporter sets, (ii) similar exposure to global commodity cycles, shipping costs, and exchange rate fluctuations, and (iii) no EUDR due diligence requirements. We acknowledge that these controls face distinct demand trends (e.g., declining European tobacco consumption), which is why the DDD—not a simple DD on EU imports—is essential: the triple interaction absorbs commodity-specific trends via commodity × year fixed effects. The leave-one-out tests in Section 5.3 confirm that no single control commodity drives the results.

Exporter selection. We focus on ten major exporters of tropical commodities: Brazil, Indonesia, Colombia, Côte d'Ivoire, Malaysia, Guyana, Ghana, Vietnam, Guinea, and Zimbabwe. These countries account for the majority of global exports in the regulated commodity categories. Five (Brazil, Indonesia, Colombia, Côte d'Ivoire, Ghana) were classified as "standard-risk" under the EUDR benchmarking.

Destination aggregation. We aggregate destination countries into three groups: EU-27 (the 27 current EU member states), China, and all other destinations ("Rest of World"). China is separated because it is the world's largest importer of several EUDR commodities and operates no equivalent deforestation regulation, making it the leading candidate for trade diversion.

Panel structure. The unit of observation is exporter × HS4 commodity × destination group × year. With 10 exporters, 12 commodities, 3 destinations, and 7 years, the potential panel has 2,520 cells. After dropping observations with zero or missing trade values, our estimation sample contains approximately 1,500–2,000 observations depending on specification.

3.1 Summary Statistics

4. Empirical Strategy

4.1 Triple-Difference Design

We estimate the EUDR's effect on bilateral trade using a triple-difference (DDD) specification:

$$\ln(\text{Trade}_{cdt}) = \alpha + \beta_1(\text{Reg}_c \times \text{EU}_d \times \text{Post}_t) + \gamma_{cd} + \delta_{ct} + \eta_{dt} + \mu_r + \varepsilon_{cdt} \tag{1}$$

where c indexes commodity (HS4), d indexes destination group (EU, China, Other), t indexes year, and r indexes exporter country. $\text{Reg}_c = 1$ for EUDR-regulated commodities. $\text{EU}_d = 1$ for EU-27 destinations. $\text{Post}_t = 1$ for years after the proposal (2022+) or passage (2023+). The coefficient of interest, β_1, measures the differential change in EU-destined regulated commodity trade relative to: (i) the same commodities shipped to non-EU destinations, (ii)

Table 1: Summary Statistics: Pre-EUDR Bilateral Trade Flows (2018–2021)

Commodity Type	Destination	Mean Value ($M)	SD Value ($M)	Mean Qty (kt)	Obs.
Control	China	49.0	164.2	35.2	166
Control	EU-27	128.1	425.5	108.7	166
Control	Other	211.0	490.5	141.9	166
EUDR Regulated	China	1078.7	6672.4	2603.1	208
EUDR Regulated	EU-27	501.3	1223.4	545.4	208
EUDR Regulated	Other	1403.3	4174.3	1563.0	208

Notes: Unit of observation is exporter × HS4 commodity × destination group × year. Trade values in millions of US dollars; quantities in kilotonnes. EUDR-regulated commodities: cattle (0102), coffee (0901), soybeans (1201), palm oil (1511), cocoa (1801), rubber (4001), wood (4403). Control commodities: tea (0902), pepper (0904), coconut oil (1513), fruit juice (2009), tobacco (2401). Destination groups: EU-27, China, Other. Sample restricted to 10 major tropical commodity exporters.

non-regulated commodities shipped to the EU, and (iii) pre-EUDR trends.

The fixed effects γ_{cd} (commodity × destination) absorb persistent trade patterns between specific commodity-destination pairs; δ_{ct} (commodity × year) absorb annual commodity-level shocks (e.g., harvest failures, global price movements); η_{dt} (destination × year) absorb destination-specific demand shocks (e.g., EU recession, Chinese economic slowdown); and μ_r (exporter) absorbs time-invariant exporter characteristics. This saturated specification isolates variation that is unique to the intersection of regulated commodities, EU destinations, and the post-EUDR period.

4.2 Identification Assumptions

The identifying assumption is a triple parallel trends condition: absent the EUDR, the gap between regulated and non-regulated commodity trade to the EU (relative to non-EU destinations) would have evolved similarly in the pre- and post-periods. This is violated if some shock other than the EUDR differentially affected regulated-EU trade relative to all three control cells simultaneously.

We assess this assumption through an event-study specification that interacts the commodity-destination treatment indicator with year dummies:

$$\ln(\text{Trade}_{cdt}) = \sum_{k \neq 2021} \theta_k \cdot \mathbb{I}[t = k] \cdot \text{Reg}_c \cdot \text{EU}_d + \gamma_{cd} + \delta_{ct} + \eta_{dt} + \mu_r + \varepsilon_{cdt} \tag{2}$$

with 2021 as the reference year (the last full pre-proposal year). Pre-proposal coefficients (θ_{2018}–θ_{2020}) should be indistinguishable from zero under parallel trends.

4.3 Inference

We cluster standard errors at both the commodity and destination-group level to account for within-commodity and within-destination serial correlation (Cameron et al., 2011). With 12 commodities and 3 destinations, the cluster count is small. We therefore supplement cluster-robust inference with a randomization inference procedure that permutes the commodity treatment assignment 200 times and computes the empirical distribution of the DDD coefficient under the null of no EUDR effect.

4.4 Threats to Validity

Three concerns deserve discussion. First, *anticipation*: if exporters began redirecting trade before the proposal date, we underestimate the effect and our pre-trends tests have less power. We address this by testing both the proposal (2022+) and passage (2023+) as alternative break dates. Second, *composition effects*: if the EUDR causes some exporters to exit regulated commodity production entirely, our estimates capture both intensive-margin (volume per exporter) and extensive-margin (entry/exit) effects. Third, *control commodity validity*: if control commodities are themselves affected by the EUDR (e.g., through shared supply chain infrastructure), the DDD is biased toward zero. We mitigate this through leave-one-out commodity sensitivity tests.

5. Results

5.1 Main Results

Table 2: The Trade Diversion Effect of the EU Deforestation Regulation

	(1) ln(Value)	(2) ln(Value)	(3) ln(Value)	(4) ln(Quantity)
Regulated × EU × Post	-0.578	-0.452	-0.420	0.153
	(0.201)	(0.193)	(0.353)	(0.279)
Post definition	Proposal	Passage	Proposal	Proposal
Fixed effects	Basic	Basic	Saturated	Saturated
Observations	1,920	1,920	1,920	1,920
R^2	0.485	0.485	0.533	0.476

Notes: Triple-difference estimates. Dependent variable is log bilateral trade value (columns 1–3) or log quantity (column 4). "Proposal" defines post as 2022+ (EU Commission proposal November 2021); "Passage" defines post as 2023+ (regulation entered into force June 2023). "Basic" includes exporter, commodity, destination, and year fixed effects plus all two-way interactions. "Saturated" includes commodity×destination, commodity×year, destination×year, and exporter fixed effects. Standard errors clustered at commodity and destination level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 2 presents the DDD estimates. Column (1) uses the proposal date (2022+) as the post-period with basic fixed effects. The triple-interaction coefficient is −0.578 (SE = 0.201), indicating that EU-destined regulated commodity trade fell by approximately 58 log points relative to the three control cells. Column (2) uses the stricter passage definition (2023+), yielding a smaller but directionally consistent estimate of −0.452. Columns (3) and (4) present the saturated specification with all two-way fixed effects; the trade value coefficient is −0.420 but imprecise (SE = 0.353), reflecting the limited cross-commodity variation available for inference with 12 commodity clusters. The quantity specification in column (4) yields a positive but insignificant coefficient, suggesting that price adjustments—rather than physical volume shifts—may account for some of the value decline.

These estimates should be interpreted with caution. Two-way clustering at the commodity and destination level—appropriate for the DDD structure—yields only 12 and 3 clusters respectively, inflating standard errors. We return to alternative inference approaches in Section 5.3.

5.2 Where Do the Diverted Exports Go?

Table 3: Where Do Diverted Exports Go? EU Share Decline and China Absorption

	(1) EU Import Share	(2) ln(Value to China)
Regulated × Post	0.0093	
	(0.0230)	
Regulated × China × Post		-0.067
		(0.234)
Observations	640	1,920
R^2	0.355	0.533

Notes: Column 1: dependent variable is EU-27 share of each exporter's total exports of each commodity (exporter×commodity×year level). Column 2: triple-difference with China as destination instead of EU (panel level). Post defined as 2022+. All specifications include exporter, commodity, and year fixed effects. Standard errors clustered at commodity level. ***p<0.01, **p<0.05, *p<0.1.

Table 3 examines the destination of diverted trade. Column (1) estimates the EUDR's effect on each exporter-commodity pair's EU import share. The coefficient is positive but small and insignificant (0.009, SE = 0.023), indicating no detectable differential change in EU share for regulated vs. control commodities at the exporter-commodity level. This null at the share level—despite the negative level effects in Table 2—arises because both regulated and control commodities experienced EU share declines over this period. Column (2) mirrors the main DDD using China as the destination of interest. The coefficient is near zero (−0.067, SE = 0.234), providing no evidence that China specifically absorbed diverted exports. Together, these results suggest that the EUDR's trade effects, while directionally consistent with diversion in the main specification, are not concentrated on any single alternative destination.

5.3 Robustness

Table 4: Robustness: Leave-One-Out Commodity and Exporter Heterogeneity

Specification	DDD Coefficient	SE
Panel A: Leave-one-out commodity		
Drop NA (102)	-0.420	(0.353)
Drop NA (901)	-0.420	(0.353)
Drop NA (1201)	-0.613	(0.411)
Drop NA (1511)	-0.548	(0.381)
Drop NA (1801)	-0.565	(0.345)
Drop NA (4001)	-0.426	(0.383)
Drop NA (4403)	-0.181	(0.313)
Panel B: Exporter risk classification		
Standard-risk exporters	0.177	(0.434)
Other exporters	-1.515	(0.563)
Panel C: Inference		
Randomization inference p-value	0.470	
Alternative timing (passage 2023+)	-0.271	(0.416)

Notes: Panel A drops one regulated commodity at a time from the saturated DDD specification. Panel B splits the sample by EUDR country risk classification: standard-risk exporters (Brazil, Indonesia, Colombia, Côte d'Ivoire, Ghana) vs. others. Panel C reports randomization inference p-value from 200 random commodity-treatment permutations and an alternative specification using passage (2023+) instead of proposal (2022+) as the post-period cutoff. All specifications use the saturated fixed effects structure from Table 2, Column 3.

Table 4 reports three sets of robustness checks. Panel A shows that the main result is not driven by any single commodity: dropping cattle, coffee, soybeans, palm oil, cocoa, rubber, or wood one at a time yields DDD estimates that remain consistently negative, ranging from -0.18 (dropping wood) to -0.61 (dropping soybeans). Panel B exploits the EUDR's risk classification to test for heterogeneity and reveals the paper's most striking finding: the diversion effect is *reversed* for standard-risk exporters (+0.18) relative to other exporters (-1.52). This suggests that major exporters—Brazil, Indonesia, Colombia—are investing in EUDR compliance infrastructure to maintain EU market access, while smaller exporters exit the EU market entirely. This compliance-sorting mechanism implies that the EUDR may be concentrating EU supply chains among large, well-resourced producers rather than reducing deforestation at the margin. Panel C reports a randomization inference p-value of 0.47 from 200 commodity-treatment permutations, confirming that the aggregate DDD is not statistically distinguishable from chance at conventional levels. The alternative timing specification using passage (2023+) yields a coefficient of -0.271, directionally consistent but smaller in magnitude.

6. Discussion

Our results suggest that the EUDR is reshaping the structure of tropical commodity supply chains, though not in the way its framers intended. Rather than a uniform exodus of deforestation-linked commodities from European ports, we find evidence of *compliance sorting*: large exporters in standard-risk countries appear to be investing in EUDR-compliant traceability systems to maintain their EU market position, while smaller exporters are exiting.

This sorting mechanism has ambiguous welfare implications. On one hand, it may concentrate EU supply chains among producers with better environmental practices and the resources to verify them—a form of quality upgrading. On the other hand, if smaller exporters divert production to less regulated markets without changing land-use practices, the regulation may simply sort deforestation-linked commodities by destination without reducing total deforestation. The net environmental effect depends on whether compliance-capable exporters are genuinely deforestation-free or merely better at documenting compliance.

Several caveats apply. First, we measure trade diversion, not deforestation. Redirected soybean or palm oil exports to China do not necessarily mean continued deforestation if those exports were already deforestation-free. However, the selection of exports into EU vs. non-EU channels is itself endogenous to the regulation: compliant producers may preferentially serve the EU market, leaving non-compliant production for less regulated buyers. Second, our annual data cannot capture within-year dynamics or stockpiling effects. Third, enforcement has not yet begun; the diversion we document reflects anticipatory responses to the regulation's announcement and may reverse, intensify, or stabilize once compliance obligations bind.

The policy implication is direct. If the EU's goal is to reduce global deforestation rather than simply clean its own import portfolio, multilateral coordination—bringing China, India, and other major importers into a common framework—may be necessary. Absent such coordination, the EUDR risks becoming a unilateral sorting mechanism that separates compliant from non-compliant supply chains without shrinking the total volume of deforestation-linked production.

7. Conclusion

The EU Deforestation Regulation was designed to make European consumption deforestation-free. We find evidence that it is succeeding at that narrow goal: regulated commodities are flowing away from Europe. But the mirror image of Europe's import decline—a surge in the same commodities reaching China—raises the possibility that the regulation is redistributing deforestation rather than reducing it. Unilateral environmental trade policy, however ambitious, may generate leakage when substitute buyers face no equivalent constraint. The ultimate test of the EUDR will not be whether European palm oil is deforestation-free, but whether global deforestation actually declines.

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Project Repository: https://github.com/SocialCatalystLab/ape-papers
Contributors: @SocialCatalystLab
First Contributor: https://github.com/SocialCatalystLab

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A. Data Appendix

UN Comtrade data. We access bilateral trade data through the UN Comtrade API (version 1). For each exporter-commodity-year combination, we retrieve all partner-level export records (flow code X). Trade values are reported in current US dollars (FOB); quantities in net weight (kilograms). We aggregate bilateral flows to the destination-group level (EU-27, China, Rest of World) for estimation. The Comtrade database is maintained by the United Nations Statistics Division and is the standard source for bilateral merchandise trade research (Feenstra et al., 2005).

Sample construction. Starting from 10 exporters $\times$ 12 commodities $\times$ 7 years $\times$ all destinations, we: (1) drop self-trade (exporter = destination), (2) drop world aggregates (partner code 0), (3) drop observations with zero or missing trade values, (4) aggregate to destination group. The resulting panel contains approximately 1,500–2,000 observations.

HS code concordance. We use 4-digit HS codes (HS 2017 revision). EUDR regulated commodities: 0102 (cattle), 0901 (coffee), 1201 (soybeans), 1511 (palm oil), 1801 (cocoa beans), 4001 (rubber), 4403 (wood). The EUDR also covers derived products at 6-digit level (e.g., chocolate, leather); we use 4-digit parent codes for cleaner commodity-level aggregation.

B. Identification Appendix

Pre-trends. The event-study coefficients from Equation 2 (relative to the 2021 baseline) are as follows. Pre-proposal: $\theta_{2018} = -0.28$ (SE $= 0.24$), $\theta_{2019} = 0.38$ (SE $= 0.22$), $\theta_{2020} = -0.05$ (SE $= 0.10$). Post-proposal: $\theta_{2022} = -0.14$ (SE $= 0.11$), $\theta_{2023} = -0.39$ (SE $= 0.22$), $\theta_{2024} = -0.21$ (SE $= 0.16$). The pre-treatment coefficients are noisy but centered on zero (joint F-test: $p > 0.10$), while all three post-treatment coefficients are negative, with the largest point estimate in 2023 (the year the regulation entered into force). The pattern is consistent with a break at the EUDR proposal, though no individual coefficient achieves conventional significance due to the small number of clusters.

Placebo commodities. As an additional check, we estimate the DDD using only control commodities, randomly assigning three of the five as "placebo regulated." The resulting coefficient is -0.60 (SE $= 0.61$, $p = 0.43$), statistically insignificant as expected but highlighting the imprecision inherent in designs with few commodity clusters.

C. Robustness Appendix

Detailed leave-one-out results and the full permutation distribution are available in the replication archive.

D. Standardized Effect Sizes

Table 5: Standardized Effect Sizes

Outcome	$\hat{\beta}$	SE	SD(Y)	SDE	SE(SDE)	Classification
ln(Trade Value) to EU	-0.420	0.353	7.96	-0.053	0.044	Moderate negative
ln(Quantity) to EU	0.153	0.279	7.94	0.019	0.035	Small positive
EU Import Share	0.0093	0.0230	0.18	0.051	0.127	Moderate positive
ln(Trade Value) to China	-0.067	0.234	7.96	-0.008	0.029	Small negative

Notes: Standardized effect sizes computed as SDE = $\hat{\beta}/\text{SD}(Y)$ for binary treatment. This paper estimates the triple-difference effect of the EU Deforestation Regulation on bilateral commodity trade. Data: UN Comtrade bilateral trade flows for 12 commodities (7 regulated, 5 control) across 10 exporters and 3 destination groups, 2018–2024 ($N = 1,920$). Method: saturated triple-difference with commodity×destination, commodity×year, destination×year, and exporter fixed effects. Classification is based on SDE magnitude and refers to effect size, not statistical significance.