To Cut or not to Cut: Deforestation Policy under the Shadow of Foreign Influence

BSE Working Paper 1441

April 2024 (Revised Agust 2024)

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bse.eu/research

To cut or not to cut: Deforestation policy under the shadow of foreign influence*

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August 24, 2024

Abstract This article explores the complex interplay between deforestation policies and foreign influence, using a game theoretical model to analyze geopolitical factors influencing forest conservation decisions in countries with significant rainforests. The model highlights the conflicting interests of foreign powers – one aiming for economic benefits from agriculture and the other advocating for forest preservation to protect environmental services. The paper demonstrates how domestic political dynamics and economic shocks from the international economic influence regulatory decisions on deforestation in the shadow of foreign influence. This understanding is crucial for formulating strategies that balance developmental needs and global environmental concerns.

Keywords: Foreign influence, geopolitics, deforestation, food security, Brazil, China, rainforest.
JEL Codes: D72, D74, O13, Q23, P33

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*Declarations of interest: none. Esther Hauk acknowledges financial support from the Spanish Agencia Estatal de Investigación (AEI), through the Severo Ochoa Programme for Centers of Excellence in R&D (Barcelona School of Economics CEX2019-000915-S) and from the Ministerio de Ciencia e Innovación through research project PID2021-126209OB-I00 funded by MCIN/AEI/10.13039/501100011033 and by ERDF A way of making Europe.

1 Introduction

Between 1 million and 1.5 million hectares of primary Amazon rainforest have been lost per year since 2002 (Global Forest Watch 2024). The literature on tropical deforestation documents that the main driver of deforestation is not logging per se, but mechanical clearing of land for crops and raising cattle.[1] Deforestation has significant global spillover effects due to its impact on climate change and the loss of biodiversity. The management of the rainforest is, therefore, not only a national issue but also an international concern, and many policies to save the Amazon have been implemented under international pressure. This has motivated theoretical and empirical studies on foreign influence attempts towards the preservation of this valuable natural resource.[2] However, not all foreign influence attempts push towards preservation; other interests are at play as well. One example is China. The Chinese government faces the dual challenge of maintaining economic growth while feeding the country's growing urban population with a limited supply of agricultural land.[3] As a consequence, it has started to outsource its production of cereals, rice, soybeans, and beef to Brazil, Argentina, and Thailand (Yu et al. 2016), which has triggered deforestation in areas like the Amazon rainforest (see, e.g., Dos San-

[1] See, e.g., Souza-Rodrigues (2019). Balboni et al. (2023) provide a literature review.

[2] Moreno-Cruz and Harding (2022) propose a theory of climate policy-motivated foreign intervention to study different forms of international climate governance in the presence of power imbalances. Abman et al. (2021) provide empirical evidence that including environmental protection in regional trade agreements (RTAs) entirely offsets the net increases in forest loss observed in similar RTAs without such provisions. Harstad (2022) develops a theoretical model on this topic.

[3] China's agricultural sector supports 20% of the world's population but has access to only 7% of the arable land (Bräutigam 2015b). China's main motive is (obviously) not deforestation per se, but to "provide long-term, offshore insurance for its food security" (Bräutigam 2015a).

tos et al. (2021) or Ferreira (2023)). We document in the next section how higher demand from China for Brazilian soybeans and beef, triggered by the trade war that began in 2018 between China and the USA, is linked to forest loss in Brazil.

The main aim of this paper is to develop a new game theoretical model of deforestation policy under the influence of foreign powers. We emphasize the geopolitical aspects of the problem by modeling two foreign powers with conflicting interests, seeking to influence the forest regulation policy of a target country that hosts a large rainforest. The model helps understand how internal political events in the target country, geopolitical factors, and economic shocks from the world market affect the choices made by the target country to regulate and protect its forest resources.

In the model, the government of the target country regulates the conversion of forest land into agricultural use. The target country cares both about agricultural profits (a proxy for economic development) and about preserving the forest for the many citizens who rely on its resources for their livelihood.[4] Two foreign powers with conflicting interests seek to influence the target country's forest regulation policy. One power is interested solely in the global eco-services of the forest, aiming to preserve it as a net carbon sink and a reservoir of biodiversity. The other power requires access to a food supply and, therefore, desires the target country to permit deforestation to use the land for agricultural production. We model the strategic interaction between the target country and the two foreign powers as a common agency game, as described in Bernheim and Whinston (1986a). The two foreign powers, acting as principals, seek to influence the regulation

[4] Globally, about 1.6 billion people, including nearly 70 million indigenous peoples, earn their living from forest resources. Importantly, keeping the forest intact helps regulate local temperature and rainfall patterns, offering positive benefits for human health and agricultural productivity (Global Forest Watch 2024).

policy of the target country (the agent) by offering 'rewards' to alter the cost at which the forest can be converted into agricultural land.[5]

The foreign pressure to convert forest to agricultural production is driven by food security concerns. In the case of China, a combination of different strategies has been employed to pursue this goal. These strategies include the direct purchase of agricultural and forest land in target countries;[6] loans with below-market interest rates or discounted risk insurance for firms that buy land and operate in the Amazon (Gallagher et al. 2012); and the provision of regulatory concessions and financial incentives for investment by Chinese companies abroad (Shandra and Sommer 2020; Smaller et al. 2012). These interventions lower the effective cost of converting rainforest into agriculture. Another strategy is to invest in Amazonian infrastructure to facilitate accessibility and connections to ports (Fearnisde et al. 2013; Fearnside and Figueiredo 2017). This, at the same time, supports the Brazilian government's economic development goals and lowers the cost of exporting produce from more remote areas inside the Amazon.

To reflect this reality, we make a distinction between 'local' and 'foreign-supported' farmers in the model. The former group is part of the target country's political support

[5] Foreign powers interested in protecting the rainforest have employed a range of strategies using both the 'carrot' and the 'stick'. The 'carrot' measures include sponsoring the creation of protected forest areas (Burgess et al. 2019), supporting the management of forest resources by indigenous people (Baragwanath and Bayi 2020), and integrating environmental protection clauses into trade agreements (Abman et al. 2021). The 'stick' measures include enforcing laws with sanctions or the threat thereof (Vieira et al. 2023; Assunção et al. 2023) and initiating supply chain measures through certifications like the 2006 Soy Moratorium (Gollnow et al. 2018).

[6] Farming a combination of regularized legal agricultural land and illegally converted areas is one way to bypass the Soy Moratorium by trading, e.g., soy produced in illegal areas together with soy from legalized areas within the same property (Carvalho et al. 2019; Rausch and Gibbs 2016).

base, and its government cares about the profits these farmers make. The latter group is not part of the political support base in the target country. These farmers are supported via cheap loans or other subsidies by the foreign power interested in securing access to agricultural output from the target country as an insurance policy. This foreign power does this because it cares directly about the food supply that these farmers can deliver if needed. The price of the agricultural product is determined by the world market, so we are not assuming that the foreign power can buy the output cheaply. What we have in mind is an insurance scheme under which the foreign power, in case it is cut off from other sources of international supply, has priority in buying the products from the farmers it supports at the prevailing world market price. In the model, the policy variable of the target country is the cost of converting forest into agricultural land. In reality, this results from regulation and the implementation and enforcement of such regulation.

The model delivers several results that provide new insights into the interaction between geopolitical factors and domestic politics as major drivers of deforestation and the over-exploitation of global public goods. It enables a rich investigation into the effect of world market price shocks on forest deregulation and deforestation. We find that trade wars can accelerate deforestation in countries not directly affected by the war; that isolationism of the target country is not a guarantee for enhanced forest protection, but a rise in international environmental concerns is; and that forest regulation policy is pro-cyclic and thus serves as an 'automatic forest stabilizer'.

Our model contributes to the small theoretical literature on foreign influence with multiple intervening countries. Bonfatti (2017) develops a theory of foreign influence in which two trade partners seek to influence the trade policy of a target country by inducing regime change. The incentive of the two foreign powers is to empower the group in the target country with the largest gains from trade with them. A key insight of the model is that attempts at foreign influence can be more than offset by local politics. Eguia (2022) presents a theory of policy-motivated multilateral conflict. He analyzes two different settings. In the first setting, only the most powerful country can intervene. The

second setting, which is closer to our model, represents a multipolar world, where each of several powers can intervene in a target country to replace its regime and its policies, and any country can support or oppose any intervention.[7] To the best of our knowledge, our model is the first that focuses on deforestation, taking into account the strategic interaction between several foreign powers with an interest in the target country's forest policy. Unlike previous theoretical studies, which focus on what Aidt et al. (2021) classify as 'regime change interventions' aimed at changing the target country's institutions, our model focuses on 'policy interventions' where the objective is to change the policy choice of the target country without changing its institutions.

The rest of the paper is organized as follows. In Section 2, we present motivating evidence. We show how soy and beef production have affected deforestation in the Brazilian Amazon, and we document the effects of the 2018 US-China trade war and Bolsonaro's presidency. In Section 3, we develop the theoretical model, solve it, and derive the comparative static results. Section 4 concludes.

2 Empirical Motivation

In this section, we present some important stylized facts about deforestation in Brazil that motivate our theoretical model. According to the Global Forest Watch, in 2010, Brazil boasted 492 million hectares of natural forest, covering 59% of its land area (Global Forest Watch 2024). However, by 2022, it had experienced a loss of 3.23 million hectares of natural forest, corresponding to 2.00 gigatons of CO2 emissions. The expansion of land used for agriculture is the predominant force driving the loss of Amazonian forest cover over the long term (see, e.g., Souza-Rodrigues 2019). The study by Souza-Rodrigues

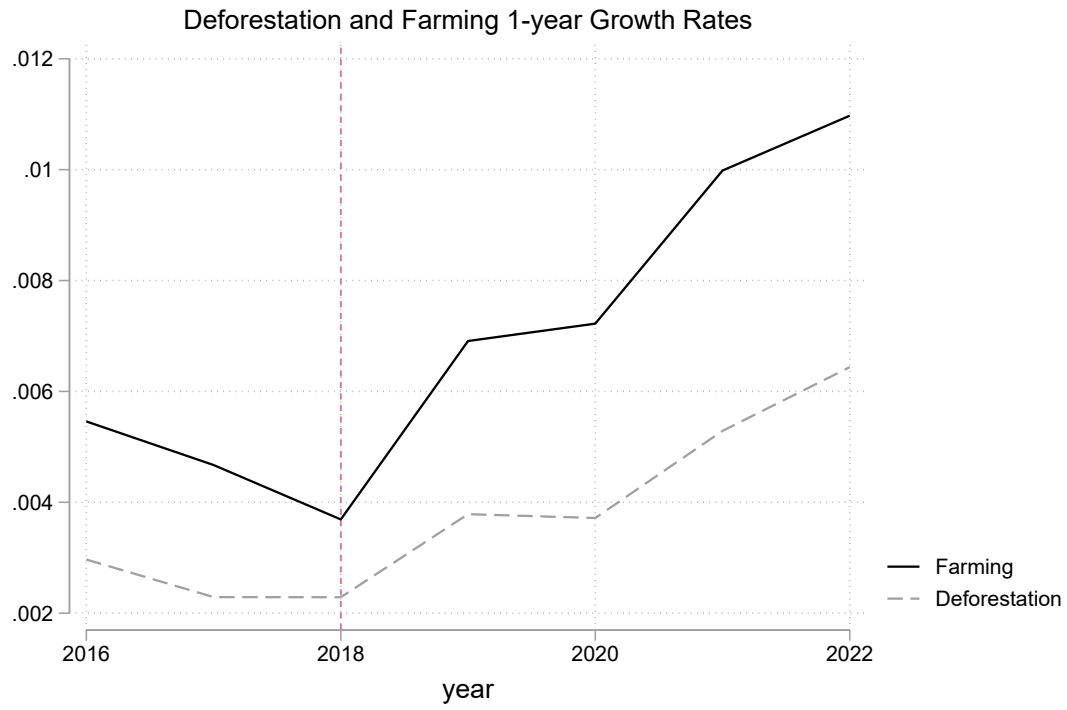
[7] The literature on sanctions has long recognized that the effectiveness of sanctions depends on the ease with which the sanctioned countries can replace their trading partners (see, e.g., Galtung 1967). These ideas are, however, with the exception of Kavaklı et al. (2020), rarely incorporated into theoretical models.

(2019) provides detailed insights into the distribution of private land within the Amazon. This reveals that while private land constitutes roughly 18% of the Amazon's expanse, this figure swells to 45% in the southern Amazon, where recent deforestation has been most pronounced. Pasture occupies the lion's share of this private land, approximately 49%, primarily utilized for cattle ranching to meet the global demand for beef. Brazil, boasting the second-largest cattle population worldwide, with around 40% reared in the 'Legal Amazon', stands as the third-largest beef producer globally. Additionally, approximately 10% of private properties in the Amazon are designated for crop cultivation, with soybeans dominating this segment, encompassing about 22% of crop areas.

To track the parallel evolution of deforestation and the expansion of farming, Figure 1 illustrates the yearly growth rates of land used for farming and deforestation between 2016 and 2022 in Brazil. Until 2018, the growth rate of land used for agriculture was positive but declining, while the growth rate of forest loss remained constant. This dynamic changed dramatically in 2018. Since then, the year-on-year growth rates of both deforestation and agricultural land use have increased, nearly tripling over the subsequent four years.

This recent upward trend in deforestation (and the expansion of farming) coincides with Bolsonaro's term as president. In Brazil, increased awareness of deforestation spurred the implementation of progressively stringent measures to safeguard delicate biomes during the early 2010s. Deutsch (2021) argues that in his 2018 presidential campaign, Jair Bolsonaro attempted to halt these environmental efforts by fostering anti-environmental sentiments and cultivating antagonism towards environmentalists. Upon assuming office, he promptly embarked on efforts to dismantle the nation's environmental governance frameworks.

However, the changes in regulation or enforcement of environmental legislation aimed at protecting the rainforest introduced during Bolsonaro's term as president do not fully explain the trend shift observed in 2018. The onset of the US-China trade war also played an important role. Using data from UN Comtrade, Figures 2 and 3 show histograms that

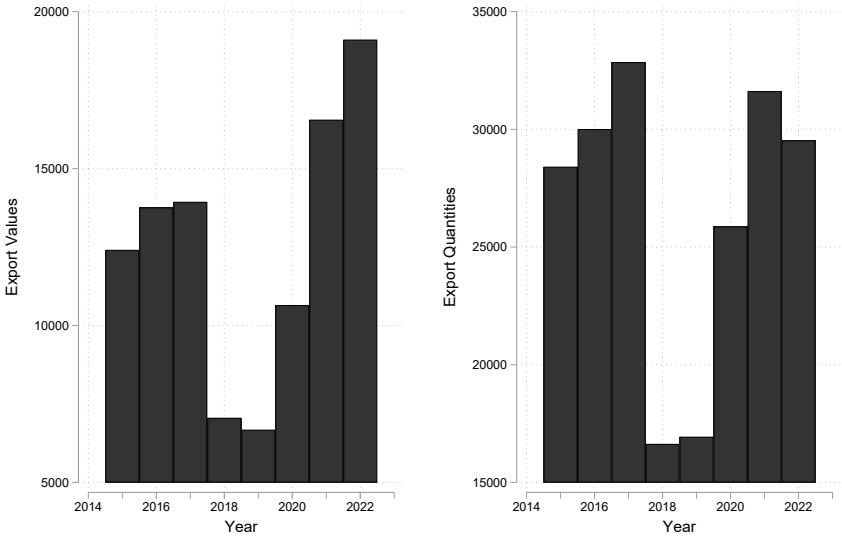


Note: The dotted line shows the year-on-year growth rate of forest loss in Brazil and the solid line shows the year-on-year growth rate of the land area devoted to agriculture in Brazil.
Source: Data are available at `https://mapbiomas.org/`. See Souza et al. (2020).

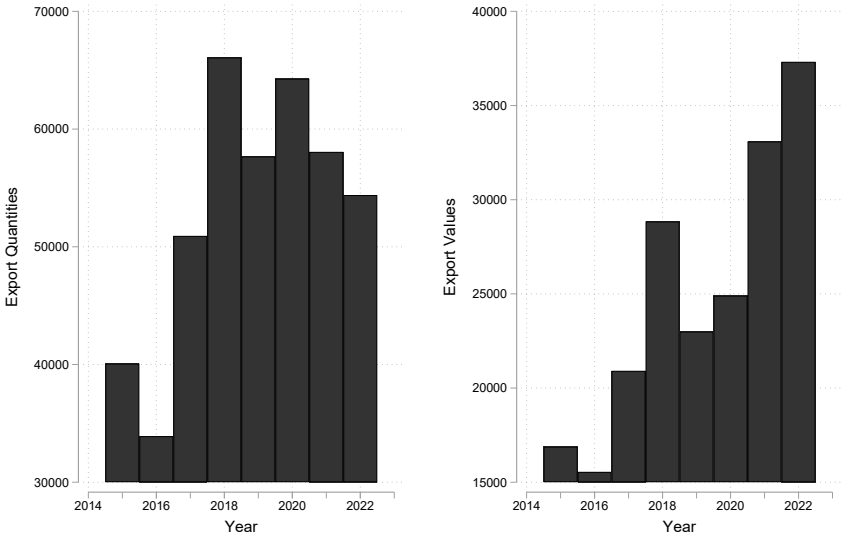
Figure 1: Deforestation and farming in Brazil, 2016-22

illustrate the evolution of exports of soybeans and bovine meat from the US and Brazil, respectively, to China over the period 2015-2022. From these figures, we observe a marked and significant shift in China's import patterns for meat and soybeans in 2018: there was a sharp decline in US exports of soybeans and bovine meat to China, while exports of these products from Brazil experienced a notable increase, both in terms of value and quantity.

From Brazil's perspective, the surge in exports to China does not signify a reduction in exports to other destinations; rather, it indicates a consistent increase in the total exports of both soybeans and meat over time. This trend is evident from Figure 4, which displays Brazilian exports of bovine meat and soybeans to the rest of the world from 2015 to 2022. This strongly suggests that the growing demand from China does not result



(a) US exports of Soybeans to China

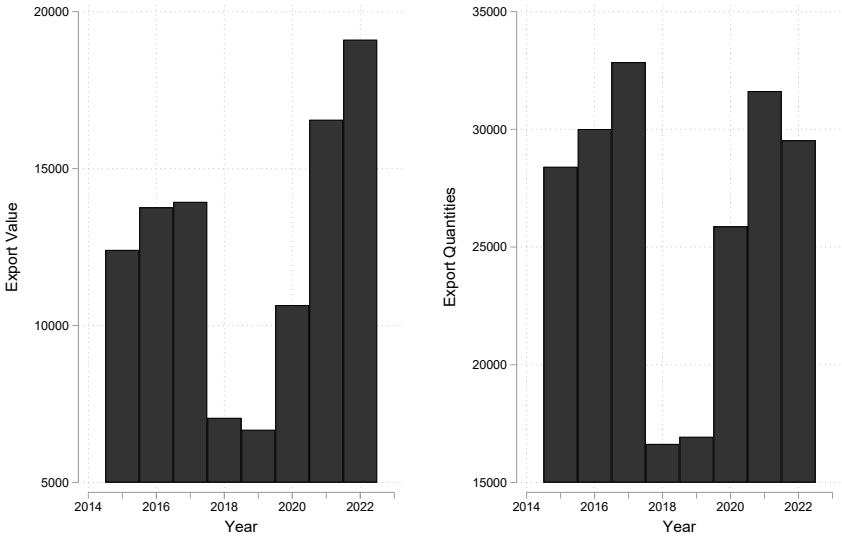


(b) Brazilian exports of Soybeans to China

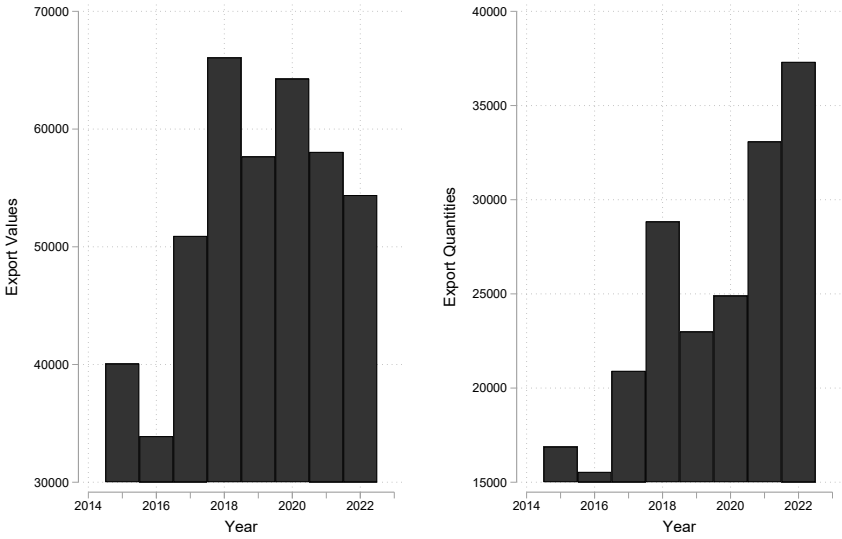
Note: The left-hand histograms show export values while the right-hand histograms show export quantities.
Source: Data are available at `https://comtrade.un.org/`.

Figure 2: Export of Soybeans from the US or Brazil to China, 2015-22

in a substitution effect in Brazilian exports to other regions. Instead, total exports of both bovine meat and soybeans have shown sustained growth, which inevitably increases demand for land for production.



(a) US exports of Bovine Meat to China

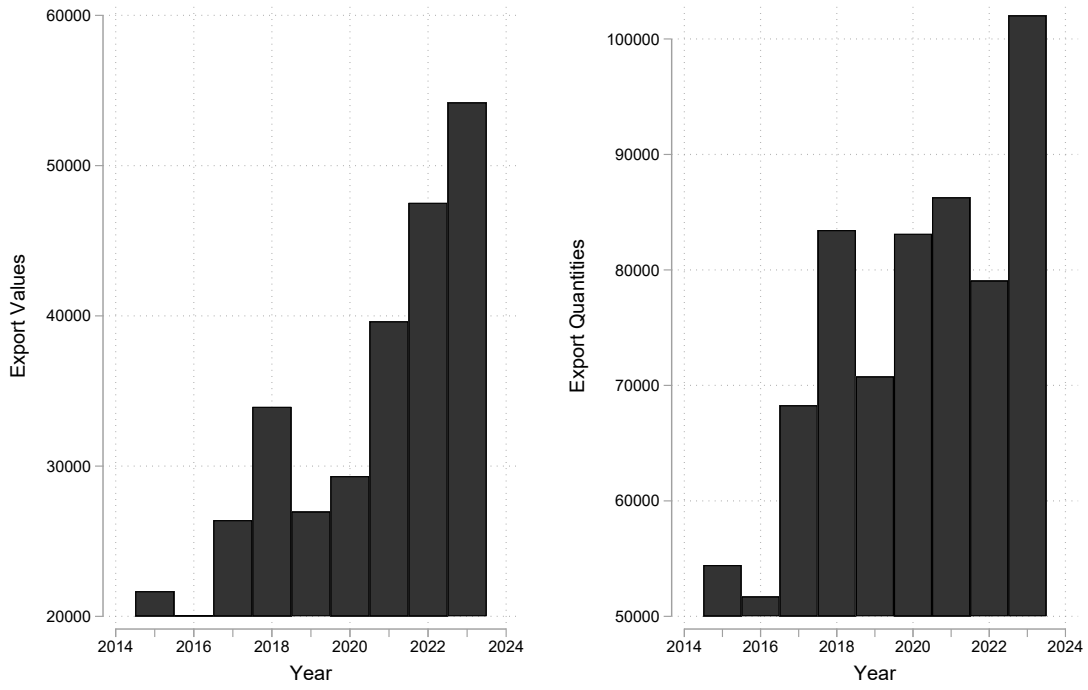


(b) Brazilian exports of Bovine Meat to China

Note: The left-hand histograms show export values while the right-hand histograms show export quantities.
Source: Data are available at `https://comtrade.un.org/`.

Figure 3: Export of Bovine Meat from the US or Brazil to China, 2015-22

The literature extensively documents China's role in spurring agricultural expansion in the Amazon region, the associated deforestation, and its openly declared motive to secure the supply of agricultural goods. Fearnisde et al. (2013) contend that the surge in China's



Note: The left-hand histograms show export values while the right-hand histograms show export quantities.
Source: Data are available at `https://comtrade.un.org/`.

Figure 4: Total Exports of Bovine Meat and Soy Beans from Brazil to the Rest of the World, 2015-22

imports of soybean and meat products has profoundly accelerated deforestation in the Amazonian region of Brazil. Their analysis highlights China's substantial investments in Amazonian infrastructure, ranging from road renovations to the construction of locks and dams, all aimed at enhancing connectivity between Brazil's agricultural hubs and Chinese export centers.[8]

[8] Fearnisde et al. (2013) also emphasize the connections between Chinese economic interests and Brazilian agribusiness and their influence on shifts in environmental legislation and administration. An illustrative example is the Chinese investment in infrastructure projects such as the proposed Mato Grosso railway.

Based on these stylized facts, a model of the effects of foreign influence on deforestation must accommodate at least three features: (a) foreign powers are not only interested in protecting the forest but often have a clear interest in expanding land use for agriculture; (b) these incentives interact with developments in the world economy, such as trade wars and world market price shocks; and (c) foreign intervention interacts with domestic politics in the target country, as the policy agenda and the geopolitical alignment of the incumbent government either foster or hinder attempts at foreign influence.

3 A Theory of Foreign Influence and Deforestation

We consider a world with three countries and the rest of the world. Two of the countries, C and E, are referred to as the two foreign powers. They have an interest in the policy choice made by the third country, T – the target country – in relation to the use of a natural resource (a rainforest). The two foreign powers seek to influence the policy choice in the target country. Land in country T can either be preserved as rainforest or converted into agricultural production of soybeans. The forest provides eco-services, which are a global public good, while soybean production is a private good. Country C has a strategic interest in obtaining access to land for soybean production, whereas country E wants the land to be preserved as forest. The model is designed to capture this tension and to provide a new political economy theory of the geopolitics of deforestation.

3.1 The land market

Strategic interactions take place within a given period. Country T has a stock of land which is either forest F or converted to agriculture A. For simplicity, we assume that agricultural land is used for soybean production, but it could have other productive uses as well. At the beginning of the period, there is some land that is already converted into agricultural use, call that A_0. It is possible to turn forest F into agriculture A at a cost $k > \underline{k}$ per unit with $\underline{k} > 0$. This cost depends on government regulation and the enforcement of that regulation (among other things). The cost is higher, the stricter

the regulation is and the better enforced it is. The land in agricultural use at the end of the period is $A_1 \geq A_0$. The extent of deforestation over the period is, therefore, $\Delta F = A_1 - A_0$.

The market for already-converted agricultural land is a competitive rental market where potential producers of beans can rent the land input needed for production at the rental price P_A. All producers take the market price as given when deciding on the scale of production. Figure 5 illustrates the market. The vertical (red) line is the supply of rental land for agriculture at the beginning of the period and the downwards sloping (blue) line is aggregate demand for agricultural land (to be derived below). If the cost of conversion of forest land into agricultural land (k) is higher than P_A^*, say at k_1, then the market price is P_A^* – the rental price that clears the market at the pre-existing stock of agricultural land – and no forest land is converted during the period. If, on the other hand, the cost of conversion is lower than P_A^*, say, at k_0, then the land is converted till the market price is pushed down to that level, i.e., $P_A = k_0$, as supply is expanded to meet demand. The market price (P_A^M), therefore, is

$$P_A^M(k) = min\{k, P_A^*\}. \tag{1}$$

The demand for agricultural land comes from two types of farmers: local farmers from country T and farmers who are supported (through loans or grants to acquire land) by the government of country C. The fixed number of local farmers is N_T and the fixed number of foreign-supported farmers is N_C. The total number of farmers is $N = N_T + N_C$. Each farmer, indexed by i, produces beans (b_i) with the same production technology irrespective of his type

$$b_i = G(A_i). \tag{2}$$

Output is increasing and concave in the land cultivated by farmers i. Beans are sold in the world market at the (given) world market price p_b. To ensure interior solutions, we

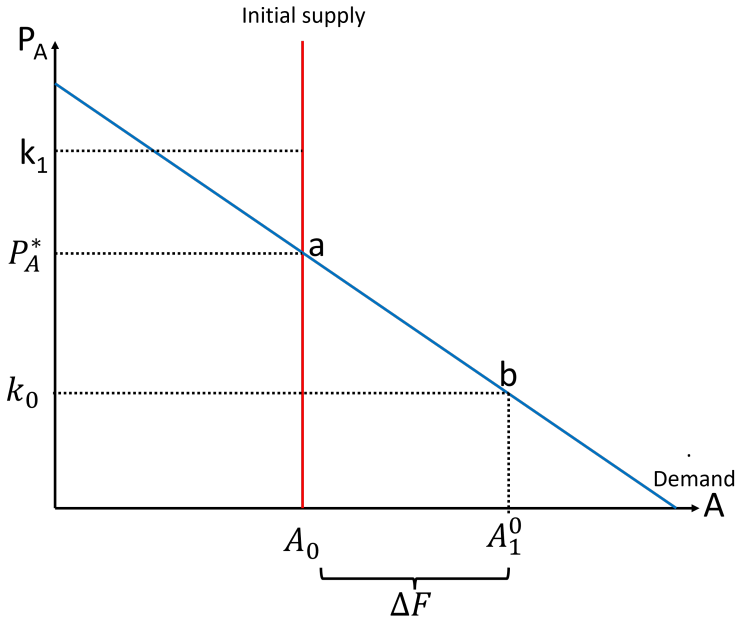


Figure 5: The market for agricultural land

assume that the world market price is below an upper bound $\bar{p}_b$. The profit earned by farmer i is

$$\pi_i = p_b G(A_i) - p_A^M A_i \tag{3}$$

and demand for agricultural land from farmer i is governed by the (necessary) condition for profit maximization:

$$p_b \frac{\partial G}{\partial A_i} = p_A^M. \tag{4}$$

Solving this first-order condition, we get the individual demand function for land from farmer i. All farmers demand the same amount of land, which we denote $A^*(p_A^M, p_b)$ for all i. Aggregate demand for agricultural land is $\hat{A}(p_A^M, p_b) = NA^*(p_A^M, p_b)$. This is the (blue) demand curve in Figure 5. If aggregate demand is large enough all the already converted land (A_0) plus some newly converted land will be traded at the rental market price k. If aggregate demand is sufficiently low, then the rental price of existing land is below k and there is no demand for new land. The amount of deforesting, therefore, is

$$\Delta F(k) = max\{0, \hat{A}(p_A^M(k), p_b) - A_0\}. \tag{5}$$

We assume that the minimum cost of forest conversion, $\underline{k}$, is such that $\hat{A}(\underline{k}, \bar{p}_b) < F$, i.e., it is not optimal even at the lowest possible conversion price for farmers to covert the entire forest into bean production at the maximum world market price of beans. As noted, the parameter k captures the cost of converting forest and is a function of the design and enforcement of forest protection legislation. Lax regulation lowers the cost of converting land but cannot lower it beyond $\underline{k}$. A boom in the world market price of beans can change the situation in the land market from one where the rental price at the initial supply of agricultural land is below k (as with point a in Figure 5) to one where the market price is above k and thus triggers deforestation. The profit function for a representative farmer is $\pi(p_b, p_A^M)$ and is decreasing in the market price of agricultural land and increasing in the world market price of beans. Supply of beans per farmer is $b(p_b, p_A^M) = \frac{\partial \pi}{\partial p_b}$ by Hotelling's lemma.

To aid the presentation of results below, we assume a particular functional form for the production technology:[9]

$$b_i = 2\sqrt{A_i}. \tag{6}$$

With this specification, for each farmer i, the profit function is $\pi(p_b, p_A^M) = \frac{p_b^2}{p_A^M}$ and demand for land is $A^* = \left(\frac{p_b}{p_A^M}\right)^2$ for all i. Aggregate land demand is $\hat{A} = (N_T + N_C)\left(\frac{p_b}{p_A^M}\right)^2$. Total land demand from the foreign-supported farmers is $N_C\left(\frac{p_b}{p_A^M}\right)^2$ and their combined production of beans is $2N_C\left(\frac{p_b}{p_A^M}\right)$.

3.2 The geo-political game

We index the three governments by in $j \in \{T, C, E\}$ and model the strategic interaction between them as a common agency game (Bernheim and Whinston 1986a,b). The government of country T is the agent that decides how strict the regulation of the forest resource is. This affects the cost of conversion k. For simplicity, we assume that government T can decide directly on k. The two foreign powers C and E are the principals.

[9] The results generalize to any strictly increasing, concave production function.

They want to influence the choice of k for reasons that we return to below. To this end, they seek non-cooperatively to influence government T by offering a 'reward', K_j, for shifting k in the direction that each of them desires.

Government T gets political support from two sources. First, it is supported by the local farmers. Second, it is also supported by domestic groups that care about the forest and the eco-services it can provide. This creates a clear-cut tension when it comes to regulating the forest and land use. Specifically, we assume that political support can be measured as the profit of the N_T local farmers in the country T net of the forest loss over the period, if any:

$$W_T(k) = N_T \pi(p_b, p_A^M(k)) - \sigma \Delta F(k), \tag{7}$$

where $\sigma \geq 0$ is the weight of forest protection relative to economic profits. The government of country T also cares about rewards from the two foreign powers. We write its overall objective function as:

$$W_T^G(k) = \gamma W_T(k) + \sum_{j \in \{C,E\}} \delta_j K_j(k), \tag{8}$$

where $\delta_j \geq 0$ is the weight that government T attaches to the reward, K_j, from foreign power j given in exchange for setting the policy variable equal to k. The parameter $\gamma > 0$ is the relative weight on domestic political support, $W_T(k)$, compared to the rewards from the two foreign powers. We can interpret γ as an *index of isolationism*: when γ is large, the incumbent government of the target country takes a more isolationist stance and is reluctant to engage with the two foreign powers. We can interpret δ_j as a measure of the degree of *geopolitical alignment* between the target country's government and foreign power j: when δ_j is large, it puts a higher weight on the rewards that engagement with foreign power j can bring because it is more closely aligned with that power.

Foreign power C has an insurance motive to influence the policy choice of government T. Its primary concern is to secure access to a steady supply of beans (at the world market price) in case of supply shortages in the world market or geopolitical restrictions

on access to other sources of supply. To ensure a claim on the supply of beans from country T, in the eventuality that it is needed, government C supports N_C farmers in the country T (e.g., by giving them credit to rent land for bean production). The objective function of foreign power C is:

$$W_C(k) = \beta N_C b(p_b, p_A^M(k)), \tag{9}$$

where $N_C b(p_b, p_A^M(k)))$ is aggregate bean production from the supported farmers and is the portion of production that foreign power C can access in times of need. The parameter β is the expected shadow price of this option from the perspective of C. The shadow price has two components:

$$\beta = p_b + \rho. \tag{10}$$

Since foreign power C buys beans at the world market (in normal times) at the price p_b and since it does not internalize the externality cost of forest loss, the world market price reflects the social opportunity cost of beans for C. On top of this, foreign power C has an insurance motive and this increases the shadow price, in expectation, above the world market price. This is captured by $\rho \geq 0$. Foreign power C wants regulation in country T to be lax as this expands the production of beans. Its net payoff is $W_C(k) - K_C(k)$ where $K_C(k)$ is the reward function offered by government C for each value of k chosen by government T.

Foreign power E cares (solely) about the eco-services provided by the forest in country T:

$$W_E(k) = \Gamma - \alpha \Delta F(k), \tag{11}$$

where Γ is a positive constant and $\alpha \geq 0$ is the weight on forest loss. Foreign power E rewards government T for making deforestation costly and its net payoff is $W_E(k) - K_E(k)$, where $K_E(k)$ is its reward function.

The three countries play a common agency game in which E and C offer T rewards in return for a movement of k towards the regulation policy each of them respectively would like to see adopted by government T.

3.3 Two benchmark cases

It is useful to define two benchmarks that can provide perspectives on outcomes in the political equilibrium (characterized in Subsection 3.4). The first benchmark is the policy that country T would have chosen in the absence of any attempt at foreign influence by the governments of country C and E. This benchmark defines the status quo without foreign intervention. In that case, government T would, with the functional forms and assuming that $p_A^M = k$, select k to maximize

$$W_T(k) = N_T \frac{p_b^2}{k} - \sigma(N\frac{p_b^2}{k^2} - A_0). \tag{12}$$

Lemma 1 characterizes the optimal regulation policy from the perspective of country T.

Lemma 1 *Assume that $p_A^M = k$. Without foreign influence, the optimal regulation policy is*

$$\hat{k} = max\{\underline{k}, \frac{2\sigma N}{N_T}\}. \tag{13}$$

Proof. The first order condition for an interior solution is

$$p_b^2(-N_T\frac{1}{k^2} + 2\sigma N\frac{1}{k^3}) = 0, \tag{14}$$

which we can solve to get equation (13). The second order condition is satisfied at $\hat{k}$ as $-\frac{1}{8}p_b^2\frac{N_T^4}{N^3\sigma^3} < 0$. For the optimal policy to be interior, we require that $\frac{2\sigma N}{N_T} > \underline{k}$ ■

We see that the government of the target country would strengthen its regulation of the forest resource if it cares more about deforesting (σ is large) or if the demand from foreign farmers for land is large (N is large because N_C increases). Conversely, it would adopt more lax regulation if there are many domestic farmers whose economic

well-being enters its political support function ($\frac{\partial \hat{k}}{\partial N_T} = \frac{-2\sigma N_C}{N_T^2}$). We notice that shocks to the world market price of beans do not affect the regulation policy chosen by government T. This is an implication that derives from the particular functional forms, but it has the expositional advantage that any feedback from the world market for beans to forest regulation must then come from geopolitical considerations, i.e., it allows us to isolate the role of geopolitics.

The second benchmark characterizes the 'ideal' policy from a global perspective. We define this 'ideal' policy as the choice of k that maximizes world utilitarian welfare, i.e.,

$$W_T(k) + W_C(k) + W_E(k). \tag{15}$$

Using the function forms and assuming that $p_A^M = k$, Lemma 2 characterizes the optimal policy from a global perspective.

Lemma 2 *Assume that $p_A^M = k$. The policy that maximizes world utilitarian welfare is*

$$k^o = max\{\underline{k}, \frac{2N(\alpha+\sigma)}{N_T + \frac{2(p_b+\rho)N_C}{p_b}}\}. \tag{16}$$

Proof. The first order condition for an interior solution is

$$p_b \frac{-2k(p_b+\rho)N_C + 2N\alpha p_b + 2N\sigma p_b - kN_T p_b}{k^3} = 0, \tag{17}$$

which we can solve to get equation (16). The second order condition is satisfied at k^o as $-\frac{1}{8p_b^2}\frac{(2(p_b+\rho)N_C+N_T p_b)^4}{N^3(\alpha+\sigma)^3} < 0$. For the optimal policy to be interior, we require that $\frac{(\alpha+\sigma)2N}{N_T+\frac{2(p_b+\rho)N_C}{p_b}} > \underline{k}$ ■

The value of k that maximizes world utilitarian welfare is, generally, different from the value that is preferred by government T in isolation ($\hat{k} \neq k^o$). This is because government T does not internalize the effect of its regulation policy on the welfare of the other two countries. As stressed by Aidt et al. (2021), the fundamental reason why the two foreign powers want to influence the policy choice of the target country is precisely the fact that

its regulation policy is associated with a transnational policy externality. The second benchmark enables us to characterize the political bias in the regulation policy that arises when foreign powers seek to influence policy-making in a target country and to find conditions under which there is not such a political bias.

3.4 Political equilibrium

In this section, we consider the political equilibrium that determines the level of regulation in country T. Following Bernheim and Whinston (1986a,b), Dixit et al. (1997) and many others, we model the interaction between the three governments as a political common agency. Interactions take place in two stages. In the first stage, the two foreign powers simultaneously and independently offer the government in the target country T reward schedules that relate a 'reward' to a particular policy outcome k. In the second stage, government T, taking the reward schedules and the economic behavior of the private sector as given, decides on its regulation policy k. This policy choice determines the cost of converting forest into agricultural use. After the regulation policy has been implemented, the private sector adjusts to the new policy circumstances and land is allocated between the two uses.

We look for a sub-game perfect equilibrium of this multi-stage game. In particular, we consider equilibria in which the reward schedules, and, hence, the two foreign powers' strategies, are differentiable twice. We solve the model by backward induction. For a given regulation policy, the behavior of the private sector has already been described in Section 3.1. Hence, we can concentrate on the influence activities of the two foreign powers. In the second stage, the government of the target country T selects a regulation policy that maximizes its political support taking into account the effect the choice has on the rewards it will receive from the two foreign powers according to the reward schedules

offered in the first stage (see equation (8)). The first-order condition associated with this optimization problem is:

$$\gamma \frac{\partial W_T}{\partial k} + \sum_{j \in \{C,E\}} \delta_j \frac{\partial K_j(k)}{\partial k} = 0. \tag{18}$$

Assume for now that this is both necessary and sufficient. Next, consider the first stage. Since each foreign power takes as given the reward schedule of its rival, the relationship between each foreign power and the government of country T can be described as a bilateral agency relationship. Each foreign power uses its reward schedule to influence government T's regulation policy. Government T can, of course, choose to disregard a particular foreign power and strike a bargain with the other. Accordingly, the reward function from foreign power $j' \in \{C, E\}$ has to satisfy the following participation constraint:

$$\gamma W_T(k) + \sum_{j \in \{C,E\}} \delta_j K_j(k) \geq \gamma W_T(k^{-j'}) + \sum_{j \neq j'} \delta_j K_j(k^{-j'}), \tag{19}$$

where $k^{-j'}$ is the regulation policy in country T when foreign power j' does not reward government T. This defines the outside option of government T in the bilateral agency relationship with foreign power j': the payoff it can achieve were it to ignore foreign power j' and only accept rewards from foreign power j. Since each foreign power has no incentive to leave unnecessary rent to government T, the two participation constraints bind at the equilibrium. Denote the equilibrium regulation policy by k^*. Solving the participation constraints in equation (19) for the reward function of foreign power j' and substituting the results back into the respective objective functions, we can rewrite the objective functions of the two foreign powers as:

$$W_C(k^*) + \frac{\gamma}{\delta_C}(W_T(k^*) - W_T(k^{-C}) + \frac{\delta_E}{\delta_C}(K_E(k^*) - K_E(k^{-C})) \tag{20}$$

and

$$W_E(k^*) + \frac{\gamma}{\delta_E}(W_T(k^*) - W_T(k^{-E}) + \frac{\delta_C}{\delta_E}(K_C(k^*) - K_C(k^{-E})). \tag{21}$$

The two foreign powers want to design their reward functions to maximize equations (20) and (21), respectively, taking the reward function of the rival as given. As shown by Dixit (1996), the property of local controllability implies that each foreign power (each principal), for a given specification of the reward function of the other foreign power, can, by an appropriate reward offer, induce the government of the target county T to pick any regulation policy that it desires in the neighborhood of equilibrium. Hence, foreign power C and E act *as if* they were maximizing equations (20) and (21), respectively, with respect to k. The two first-order conditions are:

$$\frac{\partial W_C}{\partial k} + \frac{\gamma}{\delta_C}\frac{\partial W_T}{\partial k} + \frac{\delta_E}{\delta_C}\frac{\partial K_E}{\partial k} = 0 \tag{22}$$

$$\frac{\partial W_E}{\partial k} + \frac{\gamma}{\delta_E}\frac{\partial W_T}{\partial k} + \frac{\delta_C}{\delta_E}\frac{\partial K_C}{\partial k} = 0. \tag{23}$$

Use the target country's first order condition in equation (18) to rewrite equations (22) and (23) as

$$\frac{\partial W_j}{\partial k} = \frac{\partial K_j}{\partial k},\ j \in \{C, E\}. \tag{24}$$

We see that, in the neighborhood of k^*, the reward functions offered by the two foreign powers truthfully reflect their marginal valuations of a marginal change in country T's regulation policy away from the equilibrium policy. We can substitute these conditions of 'local truthfulness' back into equation (18) to see that the equilibrium choice of regulation policy k^* must necessarily satisfy:

$$\gamma\frac{\partial W_T}{\partial k} + \sum_{j\in\{C,E\}} \delta_j \frac{\partial W_j}{\partial k} = 0. \tag{25}$$

That is, at the sub-game perfect equilibrium of the common agency game between the two foreign powers and the government of the target country, the chosen regulation policy (k^*) maximizes a weighted sum of the political support functions of the agent and the two principals. The relative weight given to foreign power j is $\frac{\delta_j}{\gamma}$, reflecting negatively the weight that government T gives to its own domestic political support and positively how

it views rewards from foreign power j, i.e., factors related to isolationism and geopolitical alignment.[10]

We can use the specifications of the political support functions for the three governments above along with the functional form for the production technology (equation (6)) to derive a closed-form solution for the equilibrium policy and verify that the necessary conditions are also sufficient and that the solution is interior.

Proposition 3 *Assume that $p_A^M = k$. At the sub-game perfect equilibrium of the common agency game between the two foreign powers and the government of the target country, the equilibrium regulation policy is*

$$k^* = max\{\underline{k}, \frac{2N(\sigma\gamma + \alpha\delta_E)}{\gamma N_T + \frac{2(p_b+\rho)\delta_C N_C}{p_b}}\}. \tag{26}$$

Proof. Using the fact that the equilibrium regulation policy choice must satisfy equation (25), write the first-order condition (for an interior solution) with the functional forms as

$$p_b \frac{2N\sigma\gamma p_b - 2k(p_b+\rho)\delta_C N_C + 2N\alpha\delta_E p_b - k\gamma N_T p_b}{k^3} = 0. \tag{27}$$

The second order condition, $-\frac{1}{8p_b^2}\frac{(2(p_b+\rho)\delta_C N_C + \gamma N_T p_b)^4}{N^3(\sigma\gamma+\alpha\delta_E)^3} < 0$, is satisfied at k^*. The solution is interior if $\frac{2N(\sigma\gamma+\alpha\delta_E)}{\gamma N_T + \frac{2(p_b+\rho)\delta_C N_C}{p_b}} > \underline{k}$ ■

[10] To characterize the equilibrium policy choice, we only require that the reward functions offered in the first stage satisfy the condition of local truthfulness (equation (24)). Many reward functions will satisfy this condition. It is common in the literature to focus on compensating or globally truthful reward functions (see, e.g., Bernheim and Whinston 1986b). We do not pursue this here, as we are primarily interested in the equilibrium policy choice and not in how the surplus of the common agency is divided between the three players.

The equilibrium policy may be laxer or stricter than the one that would maximize the political support of government T in the absence of foreign influence. To see this, notice that for $\delta_C = 0$, we get

$$k^*_{\delta_C=0} = \frac{2N(\sigma\gamma + \alpha\delta_E)}{\gamma N_T} > \frac{2\sigma N}{N_T} \equiv \hat{k} \tag{28}$$

and for $\delta_E = 0$, we get

$$k^*_{\delta_E=0} = \frac{2N\sigma\gamma}{\gamma N_T + \frac{2\beta\delta_C N_C}{p_b}} < \frac{2\sigma N}{N_T} \equiv \hat{k}. \tag{29}$$

The reason for this is that the two foreign powers pull in different directions. We get too lax regulation if country C is the only foreign power that seeks influence and too strict regulation if country E is alone in seeking influence, relative to what country T wants.

The equilibrium policy is on the Pareto frontier of the agency relationship between the three countries but this policy will not, in general, match the one that maximizes utilitarian world welfare (equation (16)). Only in the special case where $\frac{\delta_C}{\gamma} = \frac{\delta_E}{\gamma} = 1$ will the regulation policy at equilibrium match the policy that is optimal from a global perspective. As in Aidt and Hwang (2014), this requires that all parties affected by the policy choice of the target country (here the two foreign powers) must offer rewards, they must be treated symmetrically by the target country ($\delta_E = \delta_C$), and the target country must value domestic political support and rewards from the two foreign powers equally ($\gamma = \delta_E = \delta_C$). This shows that foreign influence *can* be a vehicle for internalizing transnational external costs, but also that there is no guarantee that the costs will be fully internalized.

3.5 Results

We can use Proposition 3 to derive five comparative static results that can help us understand how internal political events in the target country, geopolitical factors, and

economic shocks from the world market affect the choices made by the target country to regulate and protect the forest resource within its jurisdiction.

3.5.1 Trade wars and deforesting

A key motivation for foreign power C to seek lax forest regulation in the target country is that it wants to make it easy for the farmers it supports to expand production by converting forest into agricultural land. It wants to do this as an insurance policy: if it gets cut off from supply from other sources for geopolitical reasons, it wants to have the first claim on at least part of the production from the target country. In the model, this is captured by the expected shadow price parameter ρ: the higher ρ is, the more foreign power C values having preferential access to production from country T as an insurance policy. Using equation (26), we can, for a given world market price, calculate

$$\frac{\partial k^*}{\partial \rho} = -\frac{4N\delta_C N_C p_b(\sigma\gamma + \alpha\delta_E)}{(2\rho\delta_C N_C + \gamma N_T p_b + 2\delta_C N_C p_b)^2} < 0. \tag{30}$$

The more foreign power C values having insurance, the more it is willing to reward the target country for a lax regulation policy. The consequence is, as we can see from equation (30), a fall in the conversion price of forest to bean production and the result is accelerated deforesting. The expected shadow price ρ can increase for two reasons: the likelihood that insurance is needed goes up or the value of having access to bean supply in times of need goes up. The 'risk element' is related to geopolitical factors and trade wars, while the 'value element' is related to domestic factors in country C such as population pressures.

3.5.2 Isolationism and geopolitical alignment

The government of the target country trades off domestic political support for rewards from the two foreign powers. Who holds power in the target country, therefore, matters for how this trade-off is perceived and how easy it is for the two foreign powers to 'buy'

influence. A more isolationist government wants to disengage with the two foreign powers both diplomatically and economically and try to make country T more self-reliant.

In the model, the parameter γ controls the weight that government T puts on domestic political support relative to the rewards from foreign powers and can be viewed as an index of how isolationist the incumbent government of country T is. Using equation (26), we can calculate

$$\frac{\partial k^*}{\partial \gamma} = -2Np_b \frac{\alpha\delta_E N_T p_b - 2\sigma\delta_C N_C(\rho + p_b)}{(2\rho\delta_C N_C + \gamma N_T p_b + 2\delta_C N_C p_b)^2}. \tag{31}$$

The sign of this is ambiguous. The reason is that a reduction in γ, brought about, say, by a new less isolationist government coming into power in country T, makes it easier for both foreign powers to influence the new government's regulation policy. The strategic response of both foreign powers is to scale their influence activities up. The net effect of this is uncertain and depends amongst other factors on the degree of geopolitical alignment between government T and the two foreign powers. To see this, we can rearrange equation (31) and show that $\frac{\partial k^*}{\partial \gamma}$ is positive if

$$\frac{\delta_C}{\delta_E} > \frac{p_b \alpha N}{2\sigma(N_C\rho + p_b)}. \tag{32}$$

We see that if a less isolationist government that is more willing *in general* to let its policy be influenced by foreign powers takes office in country T – a fall in γ – then the result is laxer regulation of the forest resource if condition (32) is satisfied. The condition says that government $T's$ geopolitical alignment with foreign power C – δ_C – is sufficiently large relative to its alignment with foreign power E – δ_E. In that case, the fact that the target government becomes less isolationist benefits the foreign power that wants lax regulation relatively more, and, as a consequence, the equilibrium policy shifts in that direction, and deforestation is accelerated.

The geopolitical alignment of the target country's government with the two foreign powers affects, not only how a move towards or away from isolationism affects defor-

estation, but also exerts a direct impact on the regulation policy for a given level of isolationism. Using equation (26), we can calculate

$$\frac{\partial k^*}{\partial \delta_C} = -\frac{4NN_C p_b\left(\rho + p_b\right)\left(\sigma\gamma + \alpha\delta_E\right)}{\left(2\left(\rho + p_b\right)\delta_C N_C + \gamma N_T p_b\right)^2} < 0 \tag{33}$$

$$\frac{\partial k^*}{\partial \delta_E} = \frac{2N\alpha p_b}{2(\rho + p_b)\delta_C N_C + \gamma N_T p_b} > 0. \tag{34}$$

We see that when the government of the target country becomes more geopolitically aligned with a particular foreign power, then the equilibrium policy shifts in the direction desired by that foreign power. This is because it becomes 'cheaper' for that foreign power to influence the target country when its rewards are valued more due to the close geopolitical links.

3.5.3 World market price shocks and foreign influence

The agricultural output of country T is sold at the world market and producers of beans are, therefore, exposed to movements in the world market price. This has a direct effect on deforestation in the target country for a given regulation policy: when the world market is booming, farmers in the target country are incentivized to convert forest to agricultural production at the going rental price for land. This creates a pro-cyclic pattern of deforestation. However, there is also an indirect effect because the world market price affects the incentives of the two foreign powers to intervene, and that, in turn, affects the equilibrium regulation policy. Using equation (26), we can calculate the effect on the equilibrium regulation policy of a shock to the world market price for beans:

$$\frac{\partial k^*}{\partial p_b} = \frac{4(\sigma\gamma + \alpha\delta_E)N\rho\delta_C N_C}{\left(2(\rho + p_b)\delta_C N_C + \gamma N_T p_b\right)^2} > 0. \tag{35}$$

We see that the link to the world market for agricultural goods induces a pro-cyclic movement in the regulation policy: it becomes stricter in a boom and laxer in a slump. This tends to counter the direct pro-cyclical effect on deforestation, but it is not sufficient

to eliminate the direct effect completely, i.e., the combined effect on deforestation is pro-cyclic:

$$\frac{\partial \Delta F}{\partial p_b} = \frac{1}{2} \frac{\left(2(\rho + p_b)\delta_C N_C + \gamma N_T p_b\right)\left(\gamma N_T + 2\delta_C N_C\right)}{N\left(\sigma\gamma + \alpha\delta_E\right)^2} > 0. \tag{36}$$

To understand why regulation becomes stricter in a boom, let us start by assuming that $\rho = 0$. In that case, the shadow value for foreign power C of having access to production from the target country when it needs it is simply the world market price. In that case, we see from equation (35) that the world market price does not affect the equilibrium level of regulation. The reason is that the payoffs of the three players are proportional to the square of the world market price and their efforts to push the regulation policy in different directions net out. If, however, $\rho > 0$ and foreign power C's shadow price is greater than the world market price, regulation becomes stricter in a boom and weaker in a world market slump. The reason is that bean production endogenously expands, for a given regulation policy, when the world market is booming. This triggers deforestation and gives foreign power E, who cares about the forest, a strong incentive to contribute more to get tougher regulation. Foreign power C has the opposite incentive, but the former effect dominates for $\rho > 0$. The link between forest regulation and the world market for beans would, in the baseline specification of the model, be absent if there were no foreign influence ($\hat{k}$ in equation (13) does not depend on p_b). Consequently, in the absence of foreign influence, the direct effect on deforestation of a boom in bean demand would not be mitigated by a pro-cyclic response in regulation policy. In other words, foreign influence operates as an 'automatic forest stabilizer' in the presence of world market shocks.

3.5.4 Domestic politics: farmers versus the indigenous people

The government of the target country derives domestic political support from two sources: the local farmers and groups that want the forest protected (see equation (7)). This includes indigenous people who earn their living from forest resources. Different incumbent

governments may put different weights on the two sources of support and this is captured by the parameter σ. Using equation (26), we can calculate

$$\frac{\partial k^*}{\partial \sigma} = \frac{2Np_b\gamma}{p_b\gamma N_T + 2(p_b+\rho)\delta_C N_C} > 0. \tag{37}$$

A shift to a government whose support base is more aligned with agriculture and less with forest protection and the rights of indigenous people (a fall in σ) leads to more deforestation and laxer regulation. This is true both in the presence and in the absence of foreign influence (see equation (13)). Interestingly, the presence of foreign influence moderates this effect:

$$\frac{\partial k^*}{\partial \sigma} - \frac{\partial \hat{k}}{\partial \sigma} = -\frac{4N(p_b+\rho)\delta_C N_C}{N_T\left(p_b\gamma N_T + 2\beta\delta_C N_C\right)} < 0. \tag{38}$$

This happens because the government in country T is being influenced by the government in country C which wants lax regulation. Its influence activities dampen the effect of σ. It has less reason to seek influence when the government of the target country becomes more aligned with agriculture as this will by itself make the regulation policy laxer. Conversely, it got more reason when the government of the target country becomes less aligned with agriculture. Either way, this moderates the effect of alignment shifts in the political support base of the target country on its regulation policy relative to what it would have been in the absence of foreign intervention.

3.5.5 International environmental awareness

International environmental awareness in particular, in relation to protection of global commons such as the rainforest, has increased since the turn of the century (see, e.g., Eurostat 2024; Hillman and Ursprung 1992). This is likely to have changed the internal political calculus of foreign powers that seek to strengthen policies that regulate and protect tropical rainforest resources abroad. In the model, this type of effect is captured

by the parameter α. It controls the strength of foreign power $E's$ concern for deforestation in country T. Using equation (26), we can calculate

$$\frac{\partial k^*}{\partial \alpha} = \frac{2Np_b\delta_E}{p_b\gamma N_T + 2(p_b+\rho)\delta_C N_C} > 0. \tag{39}$$

A rise in environmental awareness in country E will trigger more pressure from it and, as a consequence, the regulation policy of the target country becomes stricter.[11]

4 Discussion of the Results

We analyze the dynamics of forest protection policies under the influence of foreign powers with conflicting interests, using a game theoretical approach. We focus on how geopolitical factors and foreign influence interact with domestic political factors to shape policies that regulate forest land use in nations with extensive rainforest. Our theoretical model brings to the forefront a set of important factors that can help us understand the process of tropical rainforest destruction and preservation.

First, the analysis shows that trade wars between countries that themselves do not harbor rainforests can have serious indirect effects on deforestation in those that do. The theoretical mechanism is that a trade war involving a foreign power with an interest in securing access to agricultural produce from a rainforest-rich target nation will give that power extra incentives to pursue looser forest regulation in the target nation to secure agricultural outputs as a form of economic insurance. This leads to increased deforestation. A recent example of this is the 2018 trade war between the US and China. The war, which significantly increased the cost for China of buying US agricultural goods, prompted China to seek a stable supply of soybeans and beef by encouraging agricultural expansion in Brazil, resulting in laxer forest regulation and significant forest loss (Fe-

[11] Aidt (2005) shows that a rise in environmentalism does not always foster more protection. In fact, when pollution is relatively immobile and environmentalists are concerned with pollution in other countries than their own, it may be counterproductive.

doseeva and Zeidan 2022). Another similar situation arose with the 1980 US embargo on soybean exports to the Soviet Union. According to Fuchs et al. (2019), this was, in some years, responsible for nearly one-quarter of the total annual deforestation of the Amazon.

Second, the government of a forest-rich target nation may adopt a more isolationist stance and shift its geopolitical alignments to insolate itself from attempts at foreign intervention. While it is true that a more isolationist government is less open to foreign influence, the effect of this on deforestation is unclear. This is because all foreign powers will reduce their influence activities when faced with a more isolationist government in the target country, and since they, generally, have different objectives concerning the target country's forest regulation policy, the net effect on deforestation is unclear and depends on the strength of the geopolitical alignment of the target country with the foreign powers. Our model, therefore, suggests that withdrawal by a target country from international politics is neither a guarantee that its forest resource will be protected nor an inevitable sign that accelerated deforestation will follow. Conversely, a target country that becomes more open with a less isolationist stance will not necessarily become more protective of its forest. In fact, Brazil offers a good example of the opposite: the less isolationist stance taken under President Bolsonaro in conjunction with a greater alignment with agricultural interests led to policies favoring deforestation.

Third, fluctuations in world market prices of agricultural goods can impact deforestation rates, both directly and indirectly via a change in forest regulation policy. Deforestation tends to be pro-cyclic because a boom in the world market of agricultural goods makes it profitable for local farmers to convert forest land into agricultural production to take advantage of higher international prices. Our model, however, shows that this can partially be mitigated by a pro-cyclic movement of the strictness of forest regulation: forest regulation is stricter in a boom than in a recession. This counter-posing effect is due to the incentives that world market shocks provide for foreign intervention and, in our model, foreign intervention serves as a kind of 'automatic forest stabilizer'. The pro-

cyclic movement in deforestation is consistent with evidence from Brazil. Carvalho et al. (2019) show that 70% of the deforestation slowdown in Brazil occurred between 2004 and 2007. During this period, the exchange rate of the US dollar against the Brazilian Real fell by more than half, in turn, making soy and beef exports less profitable. Assunção et al. (2015) show that only half of the deforestation slowdown can be attributed to preservation policies while the other half is accounted for by a drop in agricultural prices. Similarly, Berman et al. (2023) estimate that increases in crop prices can account for about 35% of the total deforestation in the tropics over the period 2001-2018.

Fourth, domestic political chocks in the forest-rich target country can significantly affect its deforestation policy but, importantly, this interacts with attempts at foreign influence. Governments that prioritize agricultural profits over forest preservation tend to implement looser regulations, leading to more deforestation. As one would expect, this is true with and without foreign influence, but our model adds the insight that foreign influence tends to moderate the effects of such political shifts. This helps us understand why the preservation of the Amazon is linked to the president in power in Brazil, and why Bolsorano's presidency increased deforestation.[12] During the 2018 election campaign, Bolsonaro openly linked Brazil's economic failures to past measures taken to combat biodiversity loss and species extinction and to protect the Amazonian rainforest (Deutsch 2021). As a result, deforestation jumped by 50% between August and October 2018, during the Brazilian presidential election campaign (Fuchs et al. 2019).[13] Once Bolsonaro had gained power, actual measures were taken to accelerate the 'development' of the

[12] For a study of the period before Bolsorano, see Burgess et al. (2019). They study how Amazon deforestation discretely changes at the Brazilian international border to isolate the effect of state policy on the preservation of the Amazon.

[13] Oliveira et al. (2023) uses a shift-share instrumental variables approach to examine how the political discourse affects deforestation in the Brazilian Amazon region relying on municipal level monthly panel data for 2019. High exposure to anti-protection political rhetoric increases forest loss by at least 2.3% and forest fires by 2.2%.

Amazon region (Dos Reis et al. 2021). Our model suggests that this effect would have been even stronger in the absence of foreign influence activities.

Finally, increasing international awareness about environmental issues can encourage foreign powers to advocate more strongly for forest conservation in forest-rich target countries. This pushes towards more forest preservation. The upward trend in international environmental awareness is clearly illustrated by the responses given to questions about how important environmental issues are in the Euro-barometer survey. In 1974, only 42% thought that the environment was 'very important', today (2021) more than nine out of ten people surveyed consider climate change to be a serious problem (Eurostat 2024). Our model, therefore, suggests that the global rise in environmental awareness can be viewed as a critical factor in shaping policies aimed at reducing deforestation and preserving biodiversity.

In conclusion, the paper demonstrates how international and domestic factors intertwine to influence deforestation policies. The complex interplay between economic interests, political ideologies, and environmental concerns underscores the need for nuanced approaches to managing and preserving the world's vital forest resources and highlights the importance of taking foreign influence activities into account. A key challenge for future research is to disentangle some of these effects empirically and in that way gain a better understanding of how important a role the activities of foreign powers with a diverse set of objectives play in internalizing global environmental externalities.

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