The Great Game: A Model of Geoeconomic Competition

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Abstract

We build a model of two hegemons that have valuable trading relationships with each other and at the same time compete in exerting geoeconomic power over countries in the rest of the world. When the hegemons trade with each other their optimal policy is shaped both by classic economic considerations - the profitability of that specific trade - and by geoeconomic competition - how the trade affects the power of each hegemon vis-a-vis the rest of the world. We show that containment, a policy mix in which an hegemon limits sales of its inputs to the rival hegemon and uses its power to demand that the rest of the world shift away from sourcing from the rival, arises when the two hegemons offer relatively substitutable exports since a stronger rival would offer a better outside option to the targeted countries. Accommodation between the hegemons, instead, occurs when power motives are small and the two hegemons focus on purely economic profit motives. Countries in the rest of the world benefit, all else equal, from hegemons containing each other since they partially squander their power with offsetting demands. However, containment policy can also worsen the efficiency of global production, leaving the rest of the world worse off.

Keywords: Great Power Rivalry, World Order, Economic Statecraft, Geopolitics, Export Controls, Sanctions, Tariffs, Industrial Policy.

JEL Codes: F10, F30, F40, F50, L10, N40, P45.

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1 Introduction

The global economy is characterized by two large hegemonic countries, the US and China, that have valuable economic relationships with each other but also compete in exerting power over the rest of the world. This form of interdependent geoeconomic competition employs many of the traditional policy instruments – such as tariffs, industrial policy, and export controls – as well as economic threats, but has different underlying motivations for the use of these instruments than those in classic economic analysis. We provide a model to analyze optimal policy between two competing hegemons that attempt to accommodate or contain each other, and characterize the welfare implications for the hegemons as well as the rest of the world.

In this paper we show that when the two hegemons trade with each other, optimal policy is shaped both by economic motives – the profitability of that particular trade – and geoeconomic ones – how that trade affects the power of each hegemon vis-a-vis the rest of the world. For example, the US faces two separate motives when it considers selling advanced semiconductors to Chinese industries. First, selling the semiconductors to China directly generates profits for the US semiconductor industry and might also help that industry to scale up and become more productive. Second, the semiconductors acquired from the US are used by Chinese firms to produce other products, such as artificial intelligence, that are then sold worldwide in competition with US AI firms. Since countries like the US and China exert their geoeconomic power by threatening countries in the rest of the world with the withdrawal of access to their respective technologies, this competition has two components. First, even in the absence of geoeconomic threats, the downstream industries of each hegemon compete for economic profits worldwide. Second, from the perspective of a country in the rest of the world being threatened by an hegemon with a cutoff, the rival hegemon is the outside option. For example, a country might not fear losing access to US technology if Chinese technology is a viable substitute.

We show that hegemons choose to either accommodate or contain each other depending on the relative substitutability and profitability of the exports that they can offer to the rest of the world. A policy of containment, in which the US, for example, imposes export controls on semiconductor sales to China and uses some of its power to induce countries in the rest of the world to scale down purchases of Chinese downstream technology, is more likely to occur when the two hegemons' downstream technologies are closer substitutes and when U.S. technology is relatively more attractive for the targeted countries. The substitutability matters because it induces a motive for each hegemon to make the rival technology less attractive to decrease the targeted country's outside option. The relative profitability of the sectors matters because it provides the initial heterogeneity that the hegemons try to exploit to build further power. Conversely, we show that these motives are small when the hegemons' downstream products are largely separable in the production function of targets, leading the hegemons to accommodate one another and focus on pure profit extraction from the rest of the world.

Our model features two hegemonic countries populated by a downstream and upstream sector as in Figure 1. The upstream sector sells inputs to the downstream sectors of both hegemonic countries. The downstream sector of each hegemon sells its output to the rest of the world. We assume that the downstream sector of each hegemon has an external economy of scale so that it becomes more productive the more it produces. The rest of the world consists of two types of countries. One type is countries that are naturally in the economic sphere of one of the two hegemons, which we call aligned countries. These countries produce only using the inputs of one hegemon. The other type is countries that produce using the inputs of both hegemons, which we call nonaligned countries. Intuitively, we think of aligned countries as those that for geographic or natural reasons have an overwhelming close relationship with only one hegemon, while most other countries (the nonaligned) do business with both.

Each country has a representative consumer and a representative government that maximizes its country's welfare. The policy game takes place over two stages, the Beginning and the Middle, while all production and consumption takes place at the End. In the Middle, the two hegemons exert their power over the rest of the world. They do so, following the framework of Clayton et al. (2026, 2024), by threatening the other countries with loss of access to the inputs (the downstream sector output) that they control. They demand that countries in the rest of the world take a set of costly actions if they want to avoid being cut off from the inputs. These costly actions take two forms: wedges and transfers. Wedges are demands that the targeted country change its sourcing choices of inputs between the two rival hegemons. Technically, they are wedges in the target country's first order conditions in production, the revenue of which is remitted lump-sum to the targeted country's consumer. These wedges help us capture a mix of taxes/subsidies or quantity restrictions that are common in practice, such as US demands that other countries do not use Chinese telecommunication equipment. Transfers are paid by the targeted government to the hegemon and can represent either direct monetary transfers, in-kind transfers, or political concessions.

Countries that are being targeted in the Middle stage, decide whether to accept or reject each hegemon's contract (the set of threats and demands). We employ a Nash-in-Nash bargaining approach, whereby each government accepts or rejects the contract of each hegemon taking as given that it accepts the rival hegemon's contract and the terms of that contract. Geoeconomic competition arises in this context because in each relationship the outside option for the targeted country is the relationship with the rival hegemon. The Nash-in-Nash structure allows for substantial tractability of the problem, but does not allow for the terms of a hegemon's contract to be set directly to influence the other hegemon's contract terms. Instead, we capture the economics of influencing the terms of the other hegemon's contract with the Beginning policy stage.

In the Beginning, both hegemons set in a Nash game an export wedge on sales of their upstream industry to the rival hegemon. In doing so, they take into account the equilibrium effect in the Middle and End periods not only on prices, industries' productivity and profits, but also on geoeconomic

power and the terms of the contract offered by the rival hegemon. Importantly, the export wedges set in the Beginning are not revenue neutral and each hegemon can use them to extract rents from the rival.

The two hegemons are interdependent and have a potentially profitable economic relationship with each other because they each produce in the downstream sector using inputs from both the domestic and the rival hegemon's upstream sectors. This economic relationship gives rise to a standard motive for policy vis-a-vis the rest of the world: terms of trade manipulation. All else equal, each hegemon wants to apply an export wedge to make its industries internalize their monopoly power in the presence of a finitely elastic rest of the world demand curve. This is a classic motive for trade policy and the foundation for optimal tariffs or export taxes to maximize profits by increasing the relative price of exports compared to imports.

In a hegemonic setup, however, the terms of trade manipulation is not the only force. The hegemon also pays attention to how the export wedge affects the inside and outside options of the countries in its economic network (i.e., the hegemon's power). If the two hegemons' downstream sectors are relatively substitutable as inputs in the production function of nonaligned countries, then each hegemon aims to contain its rival. The hegemon uses export wedges to make the downstream industry of its rival less attractive to the targeted countries, thus aiming to worsen their outside option. While this imposes direct losses on the profits of the hegemon's upstream industry that can no longer do as much (profitable) business with the rival hegemon, it raises overall welfare (profits plus transfers) for the hegemon by increasing its power over the targeted countries by more than the profits lost in its economic relationship with the rival hegemon.

An increase in substitutability leads the hegemons to symmetrically increase the containment toward each other. For example, the extent to which Chinese and US technology have become in recent years closer substitutes contributes to the rise of symmetric containment policies. The US restricts advanced chips exports to China, and China restricts exports of processed rare earths and magnets to the US. In both cases, the aim is to impact the rival downstream technology. More generally this captures an increase in hegemonic competition whenever an upcoming rival starts to approach the technological sophistication of the incumbent hegemon, thus being able to serve as a viable outside option for the rest of the world.

Asymmetric containment can occur if the baseline productivity of using the two hegemons' downstream goods diverges. For example, suppose that the productivity for the rest of the world countries of using US inputs increased compared to the Chinese inputs, the US would move more toward containment and China toward accommodation. The asymmetry is driven by the non-linearity of geoeconomic power. From the perspective of the US, a relatively less productive rival hegemon is becoming less profitable as a customer but retains its value as an outside option. Power increases disproportionally as the targeted rest of the world countries are left with little or no outside option. This channel induces the US to focus on shrinking the rival hegemon for power reasons.

China, instead, moves toward accommodation because its ability to build power is lowered by low productivity, while the US becomes a more profitable customer as it scales up.

In setting their export wedges towards each other, the two rival hegemons are taking into consideration three effects: the classic terms of trade, the viability of the rival as a passive outside option, and influencing the rival geoeconomic policies. Geoeconomic competition is this latter effect. For example, to build its own power, the US attempts to induce China to do two things: (i) For China to scale down its containment policy towards the US, and (ii) For China to scale down its attempts to resist US containment policy. In practice, US policy aims to induce changes in Chinese policies that lower Chinese demands that the rest of the world use more of Chinese goods and less of US goods.

We characterize how the welfare of the nonaligned countries is affected by geoeconomic competition. The presence of a rival hegemon can help the nonaligned country by providing it with a better outside option, especially when the rival hegemons are using their power to contain each other. Each hegemon is using some of its power to contain the other hegemon, but since their demands pull in opposite directions, from the perspective of the nonaligned country they partly offset each other. Similarly, each hegemon might use its policies to make its industries attractive to the nonaligned country in an attempt to build up its own power. Yet, since each hegemon is doing this, each hegemon is also providing the nonaligned country with an attractive outside option vis-a-vis the rival hegemon, and hence improving the bargaining position of the nonaligned country.

These forces capture historical episodes such as nonaligned countries during the Cold War benefiting from competition between the US and the USSR. For example, Nasser's Egypt benefited by bargaining simultaneously with each Cold War hegemon that demanded Egypt mostly form an economic and military relationship with them and not their rival. In present times, these forces are again at play in many developing countries that are rich in mineral resources. For example, the US and China are competing to secure a supply of minerals from countries in the African Copper Belt. These countries, for example Zambia, are potentially benefiting from being able to extract better terms and infrastructure financing from China and the US who are putting forward competing offers.

In our model, however, the partial equilibrium effects above can be swamped by general equilibrium considerations. As the two hegemons try to contain each other, they are affecting the world production frontier. For example, each hegemon restricting the rival's access to its upstream goods lowers the efficiency of the world production frontier. To the extent that the rest of the world countries suffer from this unwind of the gains of globalization for production, their welfare is lower. Intuitively, while these countries benefit from the hegemons' offsetting demands all else equal, these demands are also associated with the hegemons destroying some of the world production efficiency as they compete with each other. US and China denying each other access to critical inputs can leave the rest of the world worse off. Returning to the example of countries in the African Cop-

per Belt, their welfare suffers if China and US competition were to sufficiently impair the global production function as to overall reduce the demand for the minerals.

Related Literature. There is a deep literature in political science and in history on great power competition, including in economic statecraft. Among many contributions, there are notable ones by Hirschman (1945), Baldwin (1985), Kindleberger (1973), Krasner (1976), Keohane and Nye (1977), Gilpin (1981), Keohane (1984), Kennedy (1987), Ikenberry (2001), Mearsheimer (2003), Blackwill and Harris (2016), Walt (2018), and Farrell and Newman (2019). Waltz (1979) emphasizes how economic interdependence interacts with anarchic and hierarchical international orders.

This paper is related to an emerging literature in economics studying how multiple hegemons compete in the economic and geopolitical sphere. Broner, Martin, Meyer and Trebesch (2024) considers a model of spheres of influence in which two hegemons use trade relationships to align a continuum of countries with their preferred geopolitical actions. Meyer and Wesseler (2025) build a model of carrots and sticks being used by multiple hegemons and confronts it with data from the Cold War. Becko et al. (2025) consider multiple hegemons using tariffs as a way to induce geopolitical alignment. Madsen and Prat (2026) build a formal contracting model with multiple principals and a single agent and apply it to geoeconomic competition. We build on our work in Clayton et al. (2026, 2024). The appendix of Clayton et al. (2026) introduces a model with multiple hegemons but only considers cases of full separability or perfect overlap between the two hegemons.

More generally there is a fast growing literature on geoeconomics including work by Kleinman et al. (2024), Thoenig (2023), Antràs and Miquel (2023), Fernández-Villaverde et al. (2024), Becko and O'Connor (2024), Konrad (2024), Liu and Yang (2024), Kooi (2024), Mattoo et al. (2024), Alekseev and Lin (2024), Ndiaye (2024), Pflueger and Yared (2024), Egorov et al. (2025), Fernández-Villaverde et al. (2025), Mayer et al. (2025), Abadi et al. (2026), and Fernández-Villaverde et al. (2026).[1] We also relate to the literature on whether closer trade relationships promote peace (Martin, Mayer and Thoenig (2008, 2012)).

The Nash-in-Nash protocol that we use is related to the theory of Horn and Wolinsky (1988), and has been used to study trade agreements by Bagwell et al. (2020, 2021). The linear-quadratic modeling in trade settings was prominently used by Melitz and Ottaviano (2008) and Mayer et al. (2014), and by Bagwell and Staiger (2005), Bagwell (2009), and Amador and Bagwell (2013) to study optimal tariffs. Many of the optimal policy tools that we study also relate to their classic analysis in the macroeconomics and trade literature that analyzed optimal industrial, trade, and capital control policies: Ottonello, Perez and Witheridge (2023), Liu (2019), Bartelme, Costinot, Donaldson and Rodriguez-Clare (2019), Juhász et al. (2022), Juhász et al. (2023), Eaton and Engers (1992), Bagwell and Staiger (1999), Bagwell and Staiger (2001), Bagwell and Staiger (2004), Grossman and Helpman (1995), Ossa (2014), Farhi and Werning (2016), Costinot et al. (2014), Costinot and Werning (2019),

[1] See Mohr and Trebesch (2024) and Clayton et al. (2025b) for overviews of the literature.

Sturm (2022), Elliott and Jackson (2025).

2 Model Setup

The global economy has two hegemonic countries, which are large and indexed by $h \in \mathcal{H} = \{US, CH\}$. There are also small open economies that are going to be the targets of hegemonic coercion. We partition these small economies into three groups. Two groups are aligned with one of the two hegemons, denoted a_{CH} and a_{US}. One group is nonaligned, denoted b. Each group consists of a unit mass of small open economies. Figure 1 provides a visualization of the global economy in this model.

Hegemon h has an upstream sector e_h with an endowment $\overline{e}_h > 0$ of the that sector's good, and a downstream sector d_h that produces its own differentiated good. We denote the prices of these sectors' output p_{e_h} and p_{d_h}, respectively. Each country $n \in \mathcal{N} = \{a_{CH}, a_{US}, b\}$ has a final good producing sector that produces a numeraire final good. The numeraire is common across countries. Each sector consists of a unit continuum of identical firms, and hence we refer to a representative firm. Each country has a representative consumer and a government.

Small Open Economy n. The small open economy (of type) n's final goods producing sector produces the numeraire final good out of the downstream goods d_h of each of the two hegemons. Its production function is

$$f_n(x_n) = \sum_{h \in \mathcal{H}} \left[\theta_{nd_h} x_{nd_h} - \frac{1}{2} \kappa_n x_{nd_h}^2 \right] - K_n \prod_{h \in \mathcal{H}} x_{nd_h}, \tag{1}$$

where $x_n = \{x_{nd_h}\}_{h \in \mathcal{H}}$ is the vector of usage x_{nd_h}, which is the use of sector d_h's good by sector n. The final term on the right hand side captures nonseparability: the hegemons' downstream goods are separable if $K_n = 0$, substitutes if $K_n > 0$, and complements if $K_n < 0$. The profits of a firm in sector n are[2]

$$\Pi_n(x_n) = \sum_{h \in \mathcal{H}} \left[(\theta_{nd_h} - p_{d_h}) x_{nd_h} - \frac{1}{2} \kappa_n x_{nd_h}^2 \right] - K_n \prod_{h \in \mathcal{H}} x_{nd_h}. \tag{2}$$

Country n's representative consumer owns the final goods producers in her country and consumes the numeraire consumption good only. The consumer's budget constraint is $C_{nf} \leq \Pi_n$, and her utility for simplicity is $U_n(C_{nf}) = C_{nf}$.

What distinguishes aligned and nonaligned countries in our model is the fact that aligned countries can only make productive use of one of the two hegemon's productive goods. For example, for a country a_{US} aligned with the US we have: $\theta_{a_{US} d_{CH}} = 0$, and $K_{a_{US}} = 0$. We think of aligned countries as those that due to geography or other invariable constraints are naturally in the eco-

[2] We assume that $\kappa_n > |K_n|$ so that each firm's optimization problem is convex.

nomic sphere of one of the hegemons. Nonaligned countries instead have positive productivity using both hegemon's goods. We think of this as capturing countries that have a profitable economic relationship with both hegemons and our aim is to characterize the extent of these relationships in equilibrium.

Hegemon h. The downstream sector d_h uses the upstream goods, e_h and e_{-h}, of both hegemons in its production process. Throughout the paper, we use the notation $-h$ to refer generically to the other hegemon. In keeping with the linear-quadratic structure of the paper, we assume that the downstream sector uses a constant fraction of inputs from the two hegemons' upstream sectors. This corresponds to a Leontief production function. We assume that the downstream sector has an external economy of scale that makes each individual firm more productive the higher the output of the sector. The resulting cost function of an individual firm in sector d_h is[3]

$$C_{d_h}(y_{d_h}) = \left(\theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk}\ p_{e_k} - \xi y^*_{d_h}\right) y_{d_h}. \tag{3}$$

Each downstream firm's cost function is linear in its own output y_{d_h}, but features an external economy of scale at the sectoral level: the unit cost of production is declining in aggregate sectoral production $y^*_{d_h}$. The parameter $\xi \geq 0$ captures the strength of the economy of scale, with a value of zero corresponding to no economies of scale. The term $\theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk}\ p_{e_k}$ is the (per unit) cost of upstream goods purchased for the optimal bundle of inputs in production, with θ_h capturing total factor productivity. The cost function embeds that the demand by firms in sector d_h for upstream good e_k is $x_{d_h e_k} = \theta_h^{-1} \alpha_{hk}\ y_{d_h}$, that is inputs are a constant share of output. Given the cost function, and the fact that each individual firm is a price taker in the continuum of firms in its sector, the profit function of a firm in sector d_h is

$$\Pi_{d_h}(y_{d_h}) = \left(p_{d_h} - \theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk}\ p_{e_k} + \xi y^*_{d_h}\right) y_{d_h}. \tag{4}$$

Hegemon h's representative consumer owns the domestic upstream good endowment and the domestic downstream sector, with profits Π_{d_h}. The consumer has linear preferences, $U_h(C_{he_h}, C_{hf}) = \tilde{p}_{e_h} C_{he_h} + C_{hf}$ over its own upstream good and the numeraire final good. Therefore, the parameter $\tilde{p}_{e_h}$ pins down the domestic cost of opportunity of utilizing the upstream good e_h in downstream production rather than consumption, that is $p_{e_h} = \tilde{p}_{e_h}$.[4] The consumer's budget constraint is

$$p_{e_h} C_{he_h} + C_{hf} \leq p_{e_h} \bar{e}_h + \Pi_{d_h}.$$

[3] Appendix A.1.4 provides a production function that generates this cost function and expenditure shares.

[4] We assume that the endowment $\bar{e}_h$ is sufficiently large that the consumer is marginal at a positive level of consumption.

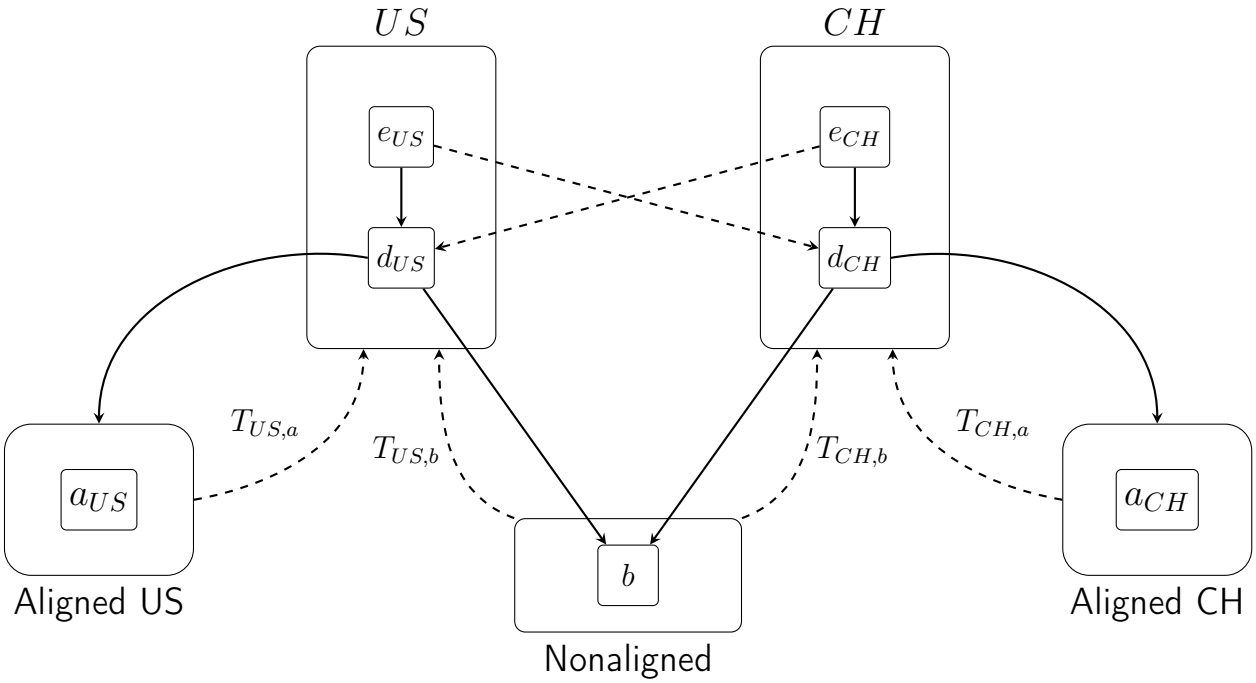


Figure 1: This figure displays the global economic structure of the model.

The government of h's objective function loads both on its representative consumer's utility and (potentially) on a vector of aggregate quantities z: $U_h(C_{he_h}, C_{hf}) + v_h(z)$. The utility term $v_h(z)$ allows us to capture direct geopolitical objectives like the desire to shrink an opposing hegemon's sector, or caring about the relative resources or wealth of the two hegemons. We set $v_h(z) = 0$ for most of the paper, and activate this force in Section 4.1.

Market Clearing. The market clearing conditions for the upstream and downstream goods of the hegemons are:

$$\sum_{k \in \mathcal{H}} x_{d_k e_h} + C_{he_h} = \overline{e}_h,$$

$$\sum_{n \in \mathcal{N}} x_{n d_h} = y_{d_h},$$

for each $h \in \mathcal{H}$. Market clearing for the numeraire final good follows from Walras' law.

2.1 Geoeconomic Policy Game

The geoeconomic policy game unfolds in a Stackelberg timing structure, summarized in Figure 2. In the End, production and consumption occur as in the previous subsection. In the Middle, each hegemon h offers a contract to the government of each small open economy $n \in \mathcal{N}_h = \{a_h, b\}$ in

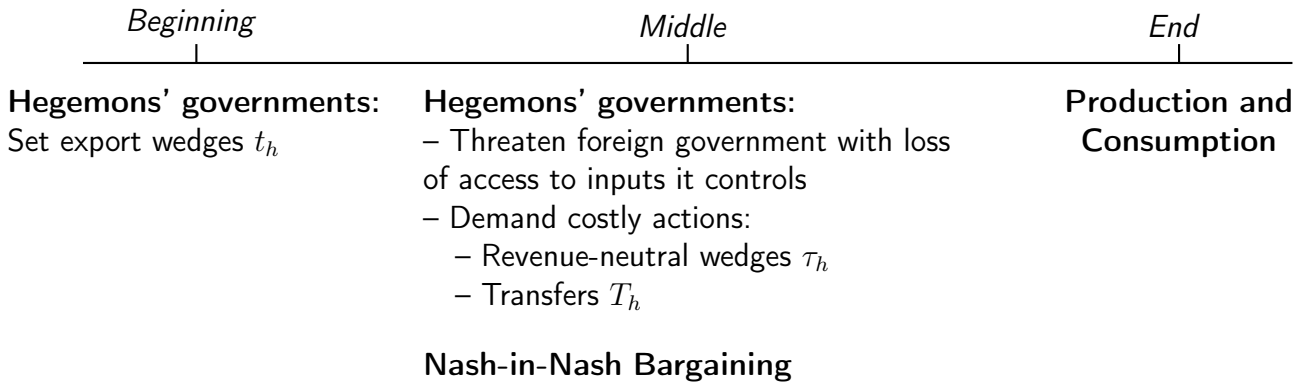


Figure 2: Model Timeline

a Nash-in-Nash game, and countries choose which contract(s) to accept. In the Beginning, each hegemon h can set bilateral export wedges on the sales of its upstream and downstream goods in a Nash game.[5]

2.1.1 Hegemonic Contracting in the Middle

In the Middle, each hegemon h offers a contract to the governments of countries $n \in \mathcal{N}_h$. We focus on contracts of h that are symmetric across small open economies of the same type. Following Clayton et al. (2026), hegemon h's contract offered to the government of country n specifies demands for two types of costly actions: (i) a required transfer $T_{h,n} \geq 0$ from country n's government to country h's government; (ii) changes in downstream good purchases from each hegemon by country n. We represent (ii) as revenue-neutral wedges $\tau_{h,n} = \{\tau_{h,nd_k}\}_{k \in \mathcal{H}}$ on the purchases of downstream goods, with equilibrium revenues $r_{h,n} = \sum_{k \in \mathcal{H}} \tau_{h,nd_k} x^*_{nd_k}$ remitted lump sum to countries n that accept hegemon h's contract.[6] The transfers capture revenue extraction by the hegemon and in practice might be monetary, in kind, or a political concession. The revenue neutral wedges aim to influence the sourcing decisions of the targeted countries and can include both (dis)incentives to purchase inputs from one hegemon or the other.[7] For example, the U.S. might ask of a nonaligned country to increase the purchases of its own goods and decrease the purchases from China.

[5]Given the cost function and expenditure shares, it is without loss of generality to restrict attention to wedges on sales, since wedges on purchases will change the price without changing the input shares.

[6]The notation for wedges has 3 subscripts: the hegemon imposing the wedge, the country on which the wedge is imposed, and the specific relationship the wedge is imposed on. For example, τ_{h,nd_h} is a wedge imposed by hegemon h, on purchases of country n of the downstream good d_h. The remissions leave implicit that $x^*_{a_h d_{-h}} = 0$.

[7]The revenue-neutral wedges can capture Pigouvian taxes and quantity restrictions (e.g., Clayton and Schaab (2022)) and are common in the macroprudential policy literature (Farhi and Werning (2016)). Such instruments capture many government policies such as industrial policy and trade policy. Given the rebates, the wedges most closely resemble quantity restrictions.

To enforce its demands, hegemon h threatens to stop exports of sector d_h to country n in the event that n rejects h's contract.[8] Because hegemon h does not export to the rival hegemon's aligned countries a_{-h}, we assume hegemon h cannot contract with a_{-h}.

We assume that the two hegemons offer contracts in a Nash-in-Nash game in the Middle period. That is, hegemon h offers its contracts taking as given both the terms of hegemon $-h$'s offered contracts and that each country $n \in \mathcal{N}_{-h}$ will accept hegemon $-h$'s offer. The Nash-in-Nash contracting structure (à la Horn and Wolinsky (1988)) is a common simplifying bargaining protocol also used in international economics by Bagwell, Staiger and Yurukoglu (2020, 2021) to study tariff negotiations. It allows each hegemon to internalize the effect of its offer on the equilibrium, but not on the offer of the rival hegemon. This simplifies the analysis by smoothing out the best response of h, which otherwise might involve offers that induced the target to reject $-h$'s contract. This set-up does not allow for the possibility that one hegemon offers a contract with terms that are contingent on the targeted government accepting/rejecting the rival hegemon's contract, or with specific terms that are contingent on the terms offered by the rival hegemon. On the other hand, we employ the Stackelberg timing structure to instead allow each hegemon in the Beginning period to set policies that, while invariant to whether targeted countries accept or reject contracts in the Middle period, take into account the effects on the terms of the contract offered by the rival hegemon in the Middle period. This set-up balances analytical tractability with capturing the strategic interactions between the hegemons that are important for the economics of the model.

Participation Constraints of Nonaligned Country. A small open economy b receives contracts that are offered by both hegemons. Given the Nash-in-Nash structure, b separately decides whether or not to accept the offer of each hegemon h, taking as given that it accepts the offer from hegemon $-h$. This results in two participation constraints, one for each hegemon.

If b accepts both offers, it achieves value $V_b(\overline{\tau}_b) - \sum_{h\in\mathcal{H}} T_{h,b}$, where

$$V_b(\overline{\tau}_b) = \max_{x_b} \ \Pi_b(x_b) - \sum_{h\in\mathcal{H}}\sum_{k\in\mathcal{H}} \tau_{k,bd_h} x_{bd_h} + \sum_{h\in\mathcal{H}} r_{h,b}. \tag{5}$$

where $\overline{\tau}_b = \{\tau_{h,b}\}_{h\in\mathcal{H}}$ is the vector of both hegemons' wedges. If instead country b rejects h's contract (while accepting $-h$'s contract), then it achieves value $V_b^{-h}(\tau_{-h,b}) - T_{-h,b}$, where

$$V_b^{-h}(\tau_{-h,b}) = \max_{x_b^{-h}} \ \Pi_b(x_b^{-h}) - \tau_{-h,bd_{-h}} x_{bd_{-h}}^{-h} + r_{-h,b} \quad s.t. \quad x_{bd_h}^{-h} = 0. \tag{6}$$

We use the superscript $-h$ to denote outside option values when country b has rejected the contract offered by hegemon h. For example, $x_{bd_{-h}}^{-h}$ denotes the usage by country b of the downstream good

[8] Because the target of threats (a government of a small open economy) is infinitesimal in global markets, exclusion of that country from purchasing hegemon h's inputs does not change the equilibrium. Hegemon h is willing to punish the individual infinitesimal government because it loses no value by doing so.

of hegemon $-h$ when b has rejected hegemon h's contract; hence $x_{bd_h}^{-h} = 0$ because b has been cut off by hegemon h.

The participation constraint of country b in its contracting relationship with hegemon h is given by $V_b(\overline{\tau}_b) - \sum_{h\in\mathcal{H}} T_{h,b} \geq V_b^{-h}(\tau_{-h,b}) - T_{-h,b}$, which simplifies to

$$V_b(\overline{\tau}_b) - T_{h,b} \geq V_b^{-h}(\tau_{-h,b}). \tag{7}$$

The participation constraint with respect to the other hegemon $-h$ is entirely symmetric, given the indexing notation.

Participation Constraints of Aligned Country. Because the aligned countries a_h are economically linked only to hegemon h, they have an outside option of 0 (no production). If a_h accepts hegemon h's offer, it achieves value

$$V_{a_h}(\tau_{h,a_h d_h}) = \max_{x_{a_h d_h}} \ \Pi_{a_h}(x_{a_h d_h}) - \tau_{h,a_h d_h} x_{a_h d_h} + r_{h,a_h}. \tag{8}$$

The participation constraint of country a_h is

$$V_{a_h}(\tau_{h,a_h d_h}) - T_{h,a_h} \geq 0. \tag{9}$$

Hegemon h Maximization Problem in the Middle. Hegemon h takes as given the contracts offered by hegemon $-h$ and that they are accepted, and chooses its contracts to maximize its final payoff, $U(C_{he_h}, C_{hf}) + v_h(z) + T_{h,a_h} + T_{h,b}$, subject to the participation constraints (equations 7 and 9) and to the determination of the equilibrium in the End.[9]

2.1.2 Hegemon h's Problem in the Beginning.

In the Beginning, hegemon h can impose on its own firms: (i) a bilateral wedge $t_{h,d_{-h}e_h}$ on sales of its upstream good to the rival hegemon's downstream sector; (ii) a bilateral wedge t_{h,nd_h} on sales of its downstream good to country n.[10] The wedge revenues are remitted lump sum to hegemon h's representative consumer. Given the production functions, at the firm level there is full passthrough

[9] So that the hegemon's contracting problem is convex, we assume that $\xi < \frac{1}{2}\frac{\kappa_a\kappa_b}{\kappa_a+\kappa_b}$ and that $K_b^2 < \frac{\kappa_a\kappa_b - 2\xi(\kappa_a+\kappa_b)}{\kappa_a - 2\xi}\frac{1}{\kappa_b}\left(\frac{(\kappa_a+\kappa_b)\xi - \kappa_a\kappa_b}{\kappa_a - \xi}\right)^2$. Since each hegemon takes the other hegemon's revenue remissions as given in the best response problem, an off-equilibrium deviation by one hegemon to offering an alternative contract can generate nonzero net revenues for the other hegemon. We assume that such revenues are remitted lump sum to that hegemon's representative consumer.

[10] It is without loss of generality to abstract from bilateral wedges on sales of e_h to d_h. Provided that the transfer non-negativity constraints do not bind, it is also without loss of generality to abstract from bilateral wedges on sales of d_h to a_h and b. Intuitively, this is because the hegemon h is indifferent whether it uses its power in the Middle or the wedges in the Beginning to induce changes in n's behavior. We will focus the exposition of the paper on cases in which the transfer non-negativity constraints do not bind.

of the wedges into the export prices. Therefore, the aim of these wedges from the perspective of the hegemon is both to raise revenue from the other hegemon and to affect the production of the downstream sector of the other hegemon that faces higher input costs as a consequence.

Indeed, the other hegemon's downstream sector d_{-h} faces an import price for e_h given by $p_{e_h} + t_{h,d_{-h}e_h}$. In the rest of the paper, it is helpful to define $t_{h,d_{-h}} = \theta_{-h}^{-1}\alpha_{-hh}t_{h,d_{-h}e_h}$, which is the implied wedge that hegemon h is placing in the sales price of sector d_{-h} to all other countries. We derive results below directly in terms of $t_{h,d_{-h}}$. Similarly, small open economy n faces an import price $p_{d_h} + t_{h,nd_h}$ for purchases of downstream good h.

3 Geoeconomic Competition: Economic Threats

We solve our model by backward induction, and begin by characterizing the outcome of the geoeconomic game in the Middle, taking as given the wedges that each hegemon has already set in the Beginning.

3.1 Equilibrium Contracts

The two key wedges in h's contract offered to the nonaligned country are the wedge on purchases of the downstream good d_h by the nonaligned country, τ_{h,bd_h}, and the wedge on purchases of the rival hegemon's downstream good d_{-h} by the nonaligned country, $\tau_{h,bd_{-h}}$.

Intuitively, given the wedges it demands, hegemon h always sets the transfer $T_{h,b}$ so that b's participation constraint vis-a-vis h binds, since if h left slack in the constraint it could always improve its own welfare by increasing the demanded transfer. Since the participation constraint binds, we characterize below the contract in terms of wedges, and back out the transfer from the binding constraint.

The optimal wedge that hegemon h demands on the nonaligned country's purchases of the other hegemon's downstream good d_{-h} is given by

$$\tau_{h,bd_{-h}} = \Bigg(\underbrace{-t_{h,d_{-h}}}_{\text{Terms of Trade}} + \underbrace{\left(x_{bd_{-h}}^{-h} - x_{bd_{-h}}\right)\xi}_{\text{Building Power over } b} \Bigg) \Bigg(1 + \underbrace{\frac{\xi}{\kappa_a - \xi}}_{\text{Amplification through } a_{-h}}\Bigg). \tag{10}$$

This traces hegemon h's best response, taking as given not only the wedges set in the Beginning, but also the wedges demanded by the other hegemon in the Middle.

The first term, $-t_{h,d_{-h}}$, takes into account that if hegemon h subsidizes purchases of the rival hegemon's downstream good, that indirectly boost the demand for h's upstream good. If in the Beginning hegemon h had imposed an export markup, $t_{h,d_{-h}} > 0$, on sales of its upstream good to the other hegemon's downstream sector, then the extra demand for its upstream good generates economic profits for h's upstream sector. This force helps us to capture a traditional rationale

for boosting the demand of other countries goods in as much as those sectors are dependent on upstream goods that the hegemon's economy supplies.

The crucial force in our model is captured by the second term, $x^{-h}_{bd_{-h}} - x_{bd_{-h}}$, that traces how the hegemon manipulates the inside and outside options of the nonaligned countries in order to build power. The term $x_{bd_{-h}}$ is the nonaligned country's use of hegemon $-h$'s downstream good at the inside option, while the term $x^{-h}_{bd_{-h}}$ is the nonaligned country's use of that same good at the outside option in which it has rejected hegemon h's contract and been cutoff from purchasing good d_h. $x^{-h}_{bd_{-h}} - x_{bd_{-h}}$ is therefore the gap in use of good d_{-h} by the aligned country at the outside versus inside options in its contracting relationship with hegemon h. To understand this motive, we first define the power that hegemon h has over the nonaligned country b,

$$\text{Power}_h = V_b(0, \tau_{-h,b}) - V_b^{-h}(\tau_{-h,b}) = \frac{1}{2\kappa_b} \frac{\Big(\kappa_b(\theta_{bd_h} - p_{bd_h}) - K_b(\theta_{bd_{-h}} - p_{bd_{-h}})\Big)^2}{\kappa_b^2 - K_b^2} \tag{11}$$

where $p_{bd_k} = p_{d_k} + \tau_{-h,bd_k}$ is the price faced for downstream good d_k by the producers in the nonaligned country, which accounts for the impact of other hegemon's demands. This is Micro-Power, as introduced by Clayton et al. (2026), and captures the maximal private value of costly actions that the hegemon h can demand of the nonaligned country b before its contract is rejected. In making this assessment, country b takes as given all equilibrium aggregates, including its outside option with the other hegemon. In political science and in international relations, this resonates with the notion of relational power: "A has power over B to the extent that he can get B to do something that B would not otherwise do" (Dahl (1957)).

Power grows disproportionately in the gap between the value for the producers in country b of using hegemon h's downstream good d_h compared to the value of using the other hegemon's downstream good d_{-h}. Those values are captured by the terms $\theta_{bd_h} - p_{bd_h}$ and $\theta_{bd_{-h}} - p_{bd_{-h}}$, which are the unit profitabilities of using each type of input. Power decreases the more the two inputs are substitutes, that is an increase in K_b. For illustrative purposes, consider a symmetric configuration with $\theta_{bd_{-h}} - p_{bd_{-h}} = \theta_{bd_h} - p_{bd_h}$, then power comparative statics in K_b are driven by the ratio $\frac{(\kappa_b - K_b)^2}{\kappa_b^2 - K_b^2} = \frac{\kappa_b - K_b}{\kappa_b + K_b}$, which decreases in K_b and converges to zero power when the two inputs are perfect substitutes (the limit of $K_b \uparrow \kappa_b$).

Hegemon h, in offering its contract to each nonaligned country, takes into account the effect of the demanded costly actions on the power it has on all other countries. Following Clayton et al. (2026), the hegemon is building Macro-Power by manipulating the equilibrium in its favor. Under the hegemon's optimal contract, a marginal increase in its demand that the nonaligned country use less of the other hegemon's inputs changes power on all other nonaligned countries by

$$-\frac{\partial[V_b(\overline{\tau}_b) - V_b^{-h}(\tau_{-h,b})]}{\partial p_{d_{-h}}} \frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}} = -(x_{bd_{-h}}^{-h} - x_{bd_{-h}}) \frac{dp_{d_{-h}}}{dx_{bd_{-h}}} = (x_{bd_{-h}}^{-h} - x_{bd_{-h}}) \frac{\kappa_a \xi}{\kappa_a - \xi}. \tag{12}$$

This highlights the non-linear nature of power. As hegemon h demands that each nonaligned country shrinks its usage of the other hegemon's inputs, not only does it build power over the nonaligned countries because their outside options worsen faster than their inside option, but it increases the marginal value of further shrinking the usage of the other hegemon's inputs.

Each nonaligned country accepts the hegemon's demands taking as given the values of all aggregates and prices (Micro-Power), but as all nonaligned countries lower their usage of the rival hegemon's downstream sector, that sector becomes less productive (aggregate economies of scale kick in reverse). A less productive rival hegemon lowers the outside option of all nonaligned countries. This aggregate effect, operating through equilibrium prices and externalities (note $\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}} = -\frac{\kappa_a \xi}{\kappa_a - \xi}$) is the origin of the hegemon's Macro Power. In political science and international relations, it resonates with notions of structural power in which a hegemon shifts an entire equilibrium environment in its favor (Strange (1988)).

Equation 12 characterizes the building power motives in the optimal wedge described by equation 10. The last term in equation 10 traces the effect that changes in the equilibrium have on hegemon's h power over the aligned countries. If equilibrium amplification through the external economies of scale is shut down ($\xi = 0$), then the optimal wedge reduces to $\tau_{h,bd_{-h}} = -t_{h,d_{-h}}$. In this special case, the hegemon purely aims to extract mark-ups from the other hegemon while not distorting the production of nonaligned countries.[11]

The optimal wedge that hegemon h demands on the nonaligned country's purchases of its downstream good d_h is given by

$$\tau_{h,bd_h} = \underbrace{-\xi y_{d_h}}_{\text{Economy of Scale for } d_h}. \tag{13}$$

Hegemon h subsidizes the purchases of its own downstream good to target the presence of a positive production externality. This is a standard policy motive to subsidize a sector with an external economy of scale.[12]

[11] The broader economic insights of the paper, however, do not strictly require the presence of external economies of scale ($\xi > 0$). Many of the effects would arise in a configuration of the model with no external economies of scale, and in which equilibrium amplification happens via prices and marker clearing. These latter forces are shut off in the present configuration since we assumed linear utility by the consumers.

[12] Equation 13 does not include terms related to changes in the hegemon's downstream good's price or building power over the target. In fact, these effects offset each other: a lower price reduces d_h's direct profits, but also increases power over the targets by the same amount. As in Clayton et al. (2026, 2024), the power building motive can dull the incentive for terms-of-trade manipulation, and in this model the two exactly offset.

Containment and Accommodation Policy. We define containment policy to be attempts by hegemon h to build power by making the other hegemon less attractive. Formally, these are captured by the term $(x^{-h}_{bd_{-h}} - x_{bd_{-h}})$ and, we define short hand notation for total containment marginal incentives $t^{tot}_h \equiv x^{-h}_{bd_{-h}} - x_{bd_{-h}}$, where the superscript *tot* is an abbreviation for total containment. Then rearranging equation 10, we have:

$$t^{tot}_h = \frac{\kappa_a - \xi}{\kappa_a \xi}\, \tau_{h,bd_{-h}} + \frac{1}{\xi}\, t_{h,d_{-h}}. \tag{14}$$

Total containment measures how much hegemon h depresses use of the rival hegemon's downstream good by the nonaligned country, relative to the outside option. It optimally does so in two ways: in the Beginning by imposing an export mark-up to the other hegemon downstream sector $t_{h,d_{-h}} > 0$, and in the Middle by using its power over nonaligned countries to demand that they shrink their usage of the other hegemon's input. A positive value of t^{tot}_h means that hegemon h has depressed use of the rival's good relative to the outside option, and we refer to this as *containment*. A negative value of t^{tot}_h means that hegemon h has promoted use of the rival's good relative to the outside option, and we refer to this as *accommodation*.

Equilibrium Contracts in the Middle. Having intuitively discussed the incentives underlying hegemon h's optimal wedges, we are now ready to characterize the equilibrium contracts offered by the two hegemons in the Middle. In the Proposition below and the rest of the paper, it is useful to introduce a notion of baseline profitability for the nonaligned country of using the inputs of each hegemon, which we denote $\pi_{bd_h} = \theta_{bd_h} - \theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk} \tilde{p}_{e_k}$.[13] The following Proposition characterizes an equilibrium set of wedges, with equilibrium transfers defined by the binding participation constraints of each hegemon.[14]

Proposition 1 *In equilibrium, an optimal set of wedges of hegemon h in the Middle is given by*

$$\begin{aligned}\tau_{h,bd_h} = &- \beta^{own}_a \pi_{a_h d_h} - \beta^{own}_b \pi_{bd_h} + K_b \beta^{rival}_a \pi_{a_{-h} d_{-h}} + K_b \beta^{rival}_b \pi_{bd_{-h}} \\ &+ K_b(\kappa_a - \kappa_b)\beta^{own}_t t_{h,d_{-h}} + \beta^{rival}_t t_{-h,d_h}\end{aligned} \tag{15}$$

$$\begin{aligned}\tau_{h,bd_{-h}} = &K_b \gamma^{own}_a \pi_{a_h d_h} + K_b \gamma^{own}_b \pi_{bd_h} - \gamma^{rival}_a \pi_{a_{-h} d_{-h}} - \gamma^{rival}_b \pi_{bd_{-h}} \\ &+ \gamma^{own}_t t_{h,d_{-h}} + K_b(\kappa_a - \kappa_b)\gamma^{rival}_t t_{-h,d_h}\end{aligned} \tag{16}$$

[13] This captures the unit profits of the nonaligned country from utilization of good h when downstream producer d_h's good price is equal to the opportunity cost of upstream inputs in absence of an external economy of scale.

[14] This proposition, as well as the rest of the paper, focuses on parametrizations for which the resulting equilibrium allocations are interior, $x^*_{a_h d_h}, x^*_{bd_h} > 0$ for $h \in \mathcal{H}$. We assume the model parameters are such that the stability condition $\vartheta > 0$ holds, where ϑ is defined in the proof of Proposition 1

where the scalar loadings $\beta_a, \beta_b, \beta_t^{own}, \gamma_a, \gamma_b, \gamma_t^{rival} \geq 0$ *and* $\gamma_t^{own}, \beta_t^{rival}$ *are defined in the proof.*

An advantage of the linear-quadratic structure of the model is that it results in closed-form linear solutions (the loadings do not depend on the t's). If downstream goods are substitutes, $K_b > 0$, a lower baseline profitability of the rival hegemon ($\downarrow \pi_{bd_{-h}}$) as well as a higher own baseline productivity ($\uparrow \pi_{bd_h}$), lead to more containment in the Middle ($\uparrow \tau_{h,bd_{-h}}$). However, these results are not yet full equilibrium solutions since total containment policy also depends on the wedges set in the Beginning, which are here taken as given. We turn next to solving for the optimal wedges in the Beginning.

4 Geoeconomic Competition: Hegemonic Export Wedges

We study the Nash game of each hegemon setting its export wedge $t_{h,d_{-h}}$ on sales of its upstream good to the rival hegemon's downstream sector in the Beginning. In setting its export wedge, each hegemon internalizes its effect on the terms offered by the rival hegemon in the contracting game in the Middle, and the resulting equilibrium. We label the subset of motives that focus on influencing the offer of the rival hegemon as geoeconomic competition in the Beginning.

Before presenting the optimal export wedge of each hegemon, we start by building intuition for the underlying economic forces, focusing in particular on how anticipation of geoeconomic competition between the two hegemons affects the desired export wedge. The change in hegemon h's welfare from a change in its export wedge $t_{h,d_{-h}}$ can be decomposed as[15]

$$\frac{\partial \mathcal{W}_h}{\partial t_{h,d_{-h}}} = \overbrace{y_{d_{-h}} - \frac{1}{\kappa_a - \xi} t_{h,d_{-h}}}^{\text{Terms of Trade}} + \overbrace{\frac{\kappa_a}{\kappa_a - \xi}(x_{bd_{-h}}^{-h} - x_{bd_{-h}})}^{\text{Building Power}}$$

$$\underbrace{\overbrace{-t_{h,d_{-h}} \frac{1}{\kappa_a - \xi} \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}}}^{\text{Terms of Trade}} + \overbrace{\frac{\kappa_a}{\kappa_a - \xi} \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}}(x_{bd_{-h}}^{-h} - x_{bd_{-h}}) + \frac{\partial \tau_{-h,bd_h}}{\partial t_{h,d_{-h}}}(0 - x_{bd_h})}^{\text{Building Power}}}_{\text{Geoeconomic Competition}}. \quad (17)$$

The first line is the direct effect of the export wedge and the incentives entirely mirror those of equation 10 for the wedges in the Middle. An increase in hegemon's h export wedge impacts the profits it extracts from the downstream sector of the rival hegemon in two ways: positively on the infra-marginal units $y_{d_{-h}}$ and negatively on the marginal unit ($-\frac{1}{\kappa_a - \xi}$). The terms of trade manipulation via an export tax is reminiscent, via Lerner (1936) symmetry, of the motive for an optimal tariff, a tax on imports (Johnson (1953)).[16] In both cases the aim of the optimal tax is to increase the relative price of exports compared to imports. Indeed, Appendix A.1.5 clarifies this

[15] See the proof of Proposition 2.

[16] See Ossa and Redding (2026) for a modern review.

connection by showing how, in a simplified set-up, our model recovers the classic insight that the optimal export tax is the inverse of the elasticity of foreign import demand.

The second term in the first line, labeled "Building Power", is a motive arising from offensive geoeconomic policy, to build power over the nonaligned country. This term would be present irrespective of whether the country $-h$ is a competing hegemon or a passive outside option. Indeed, Clayton et al. (2024, 2026) characterize this term to show how optimal trade policy changes beyond the classic terms-of-trade manipulation result in the presence of geoeconomic consideration.

The second line captures forces specifically arising from geoeconomic competition. Hegemon h takes into account that a higher export wedge in the Beginning will impact the wedges set by the rival hegemon in the Middle. The Terms-of-Trade component arises because, all else equal, hegemon h favors the rival hegemon demanding negative wedges (subsidies) for its own downstream good d_{-h}, which in turn boosts the demand for hegemon's h upstream good. The crucial effects in this paper are the terms labeled Building Power under Geoeconomic Competition. Hegemon h aims to always reduce the other hegemon's containment policy (the last term in equation 17), and how much it fights the containment policy of hegemon h (the second to last term).

Having characterized the underlying forces that motivate hegemon h's choice of the export wedge in the Beginning, the Proposition below characterizes equilibrium export wedges.[17]

Proposition 2 *In equilibrium, an optimal set of export wedges of hegemon h in the Beginning is given by*

$$t_{h,d_{-h}} = \rho_a^{own}\pi_{a_h d_h} + \rho_b^{own}\pi_{bd_h} + \rho_a^{rival}\pi_{a_{-h}d_{-h}} + \rho_b^{rival}\pi_{bd_{-h}} \tag{18}$$

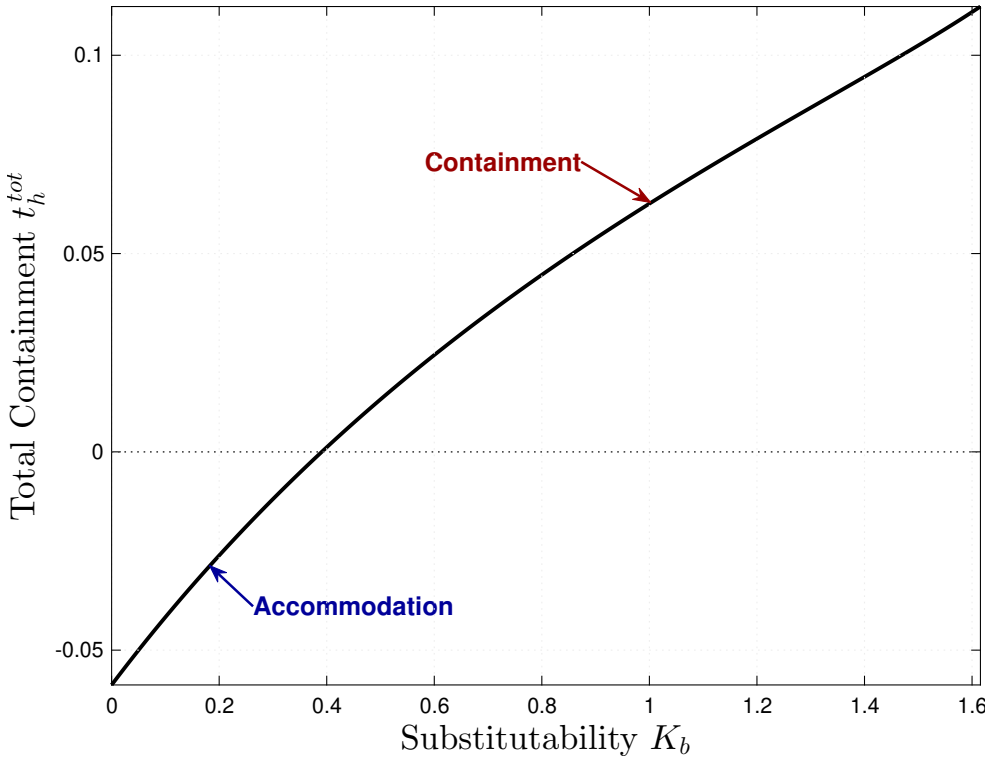
where the scalar loadings ρ_a, ρ_b are defined in the proof.

The proposition above completes the solutions of the model by providing closed form solutions for the export wedges. The linear quadratic structure of the solutions allows for sharp comparative statics in the key objects of interest. We start in Figure 3 by exploring the role of substitutability of the two hegemons downstream goods from the perspective of producers in the nonaligned countries. The parameter K_b in the production function (equation 1) controls how substitutable are the inputs provided by the two hegemons and, therefore, influences how good each hegemon is an outside option for the nonaligned countries.

Figure 3 shows that for low levels of K_b the two hegemons accommodate each other by setting $t_h^{tot} < 0$, as in equation 14. To illustrate the effect consider the case of $K_b = 0$, so that the two hegemons' inputs enter separately in the production of the nonaligned countries. In this case geoeconomic competition forces are muted because from the perspective of each hegemon, the attractiveness of the rival hegemon does not influence directly the outside option of the nonaligned

[17] To ensure that the hegemon's optimization problem is convex, we assume that the model parameters satisfy $\psi > 0$, where ψ is defined in the proof of Proposition 2. We assume the model parameters are such that the stability condition $|\phi/\psi| < 1$ holds, where ϕ is defined in the proof.

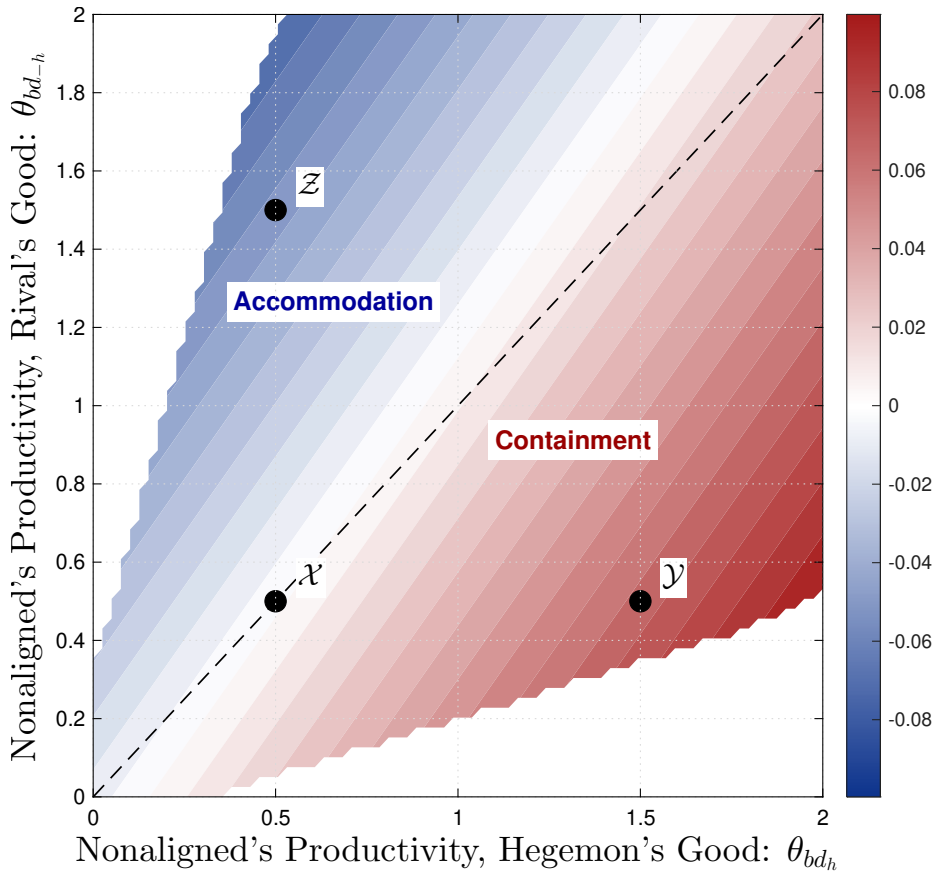
Figure 3: Total Containment When the Two Hegemons Compete



countries. Instead, each hegemon focuses on extracting export rents. They do so by accommodating each other: boosting the demand for the rival hegemon good by the nonaligned countries ($\tau_{h,bd_{-h}} < 0$) while extracting a markup by charging the rival an export wedge ($t_{h,d_{-h}} > 0$). Indeed, Figure 3 shows that at $K_b = 0$ accommodation takes the form of a subsidy on purchases of the rival hegemon good in the Middle in order to maximize rent extraction via a positive export wedge set in the Beginning.

As K_b increases the two hegemons start to face more competition from each other in terms of being better outside options vis-a-vis one another. This latter force keeps increasing in importance and when the two hegemon's goods are sufficiently substitutable with each other, the hegemons optimally switch to containing each other. Containment is implemented in two different ways. First, it pushes the hegemon to set export wedges that are higher than those that would have simply maximized the direct rents extracted from the rival hegemon downstream sector. Higher export wedges are driven by the desire to shrink the rival hegemon's downstream sector, thus making it less productive and therefore less attractive as an outside option for the nonaligned countries. As an example, this captures US export controls on advanced chips that are far stricter than those that would have simply maximized the US chip-makers monopoly rents and are instead aiming to shrink China's AI industry and lower its productivity so that China cannot offer the rest of the world high quality AI models as an alternative to US ones. Second, containment, for sufficiently high K_b, also

Figure 4: Total Containment When the Two Hegemons Compete



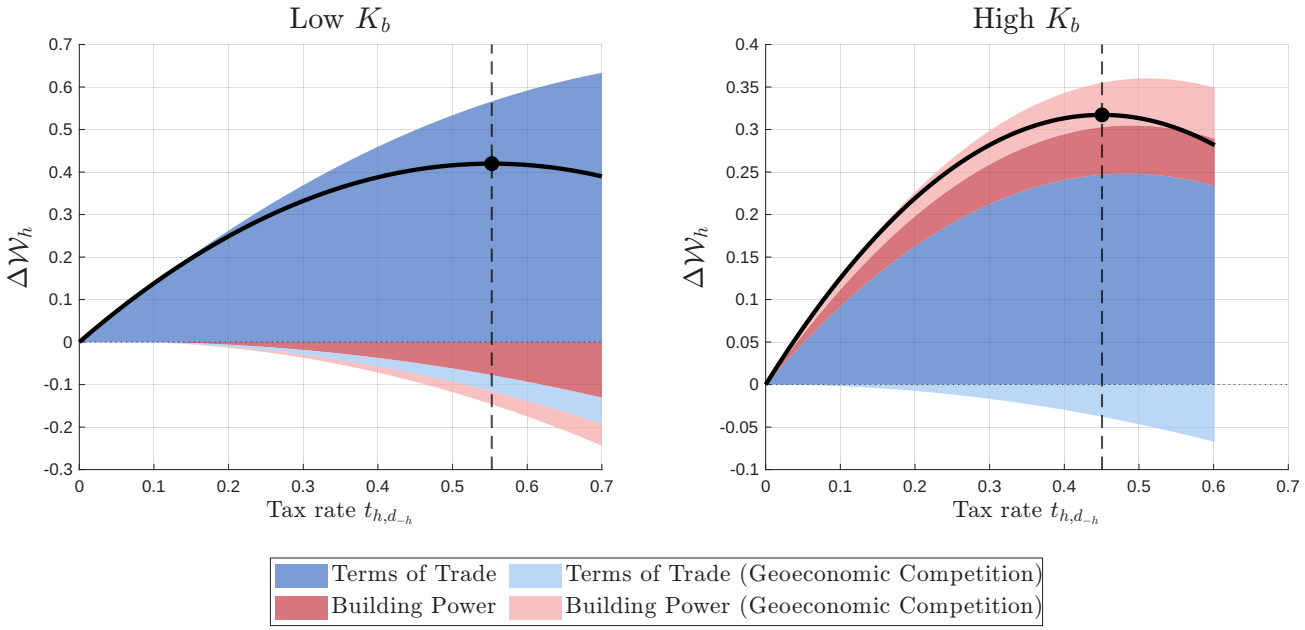
Notes: The figure is a contour plot of total containment. White regions in the top-left and bottom-right are parameter regions in which allocations are not interior.

takes the form of hegemon h using its power over the nonaligned countries to demand that they use less of the rival hegemon's goods. The hegemon here aims to further lower the productivity of the rival hegemon by shrinking the demand for its products. As an example, this captures US demands that countries in its sphere of influence rely less on Chinese AI models and more on US models.

Substitutability is a force that moves containment policy monotonically and symmetrically between the two hegemons. As substitutability increases both hegemons switch from accommodating to containing each other. On the contrary, the relative baseline attractiveness of each hegemon for the nonaligned countries has an asymmetric effect on containment policy. Figure 4 explores a comparative static in which hegemon h becomes relatively more attractive than hegemon $-h$, in the precise sense that the productivity ($\uparrow \theta_{bd_h}$) of using hegemon h downstream good increases for nonaligned countries compared to the productivity of using the rival hegemon input ($\downarrow \theta_{bd_{-h}}$).

Let us start from an equilibrium in which equal productivities correspond to symmetric zero containment policies (the point $\mathcal{X}$ in the figure). As productivity of using hegemon h inputs increases relative to using the rival hegemon inputs, as we move to the lower right half of the figure (point

Figure 5: Export Wedges When the Two Hegemons Compete: Variation in Substitutability



$\mathcal{Y}$), hegemon h moves to contain the rival hegemon more and more. On the contrary, the other hegemon moves further into accommodation (to point $\mathcal{Z}$ from the other hegemon's perspective).[18] The asymmetric response is due to the non-linearity of power we highlighted in Section 3.1. As hegemon h becomes relatively more attractive to nonaligned countries and the rival hegemon shrinks, the value of further shrinking the rival increases more than proportionally. The dominant force becomes further decreasing the rival hegemon as an outside option for the nonaligned countries, even at the cost of decreasing the inside option value or losing some rents from the rival hegemon's downstream sector. Hegemon $-h$, instead, switches to accommodate since its geoeconomic power is limited to begin with and it is more profitable to focus on building an economically profitable relationship with the rival hegemon downstream sector.

Inspecting the Mechanism. To understand how the various motives to pursue containment or accommodation (e.g. the motives in equation 17) shape the equilibrium outcomes discussed above, we illustrate how the welfare of hegemon h is shaped by these motives.

Figure 5 plots how hegemon h's welfare varies with the export wedge it sets in the Beginning, holding fixed the export wedge set by the rival hegemon. Each panel plots in the solid black line how the hegemon's welfare varies in its export wedge (relative to the baseline of an export wedge equal to zero). The optimal export wedge is pinned down by the maximum of this curve (recall the

[18] Since the two hegemon are here calibrated to be symmetric other than in the productivities θ's, the hegemon $-h$ policies can be read in the figure by considering the mirror points in the upper left half of the graph.

optimization problem is convex) and denoted by a black dot. The Figure also decomposes how the four subcomponents of equation 17 contribute to changes in the hegemon h's welfare. These areas are the integrals over each of the terms in equation 17. The two panels focus on variation in the parameter K_b governing the substitutability of the hegemons' downstream goods in the nonaligned country's production function.

The blue area labeled "Terms of Trade" focuses on the effect of the hegemon's export wedge on the export price of its upstream good to the rival hegemon. A higher export wedge raises the price at which the upstream good is sold to d_{-h}, increasing per unit revenue on sales of the upstream good, but decreasing the total amount exported. The two opposing forces pin down the optimal tariff or export tax in the classic argument for taxation of imports and exports.

The red area labeled "Building Power" focuses on the effect of the hegemon's export wedge on the price of the rival hegemon's downstream good for the nonaligned country. A higher export wedge leads to an increase in the rival hegemon's downstream sector good price, since the sector passes through the higher input cost to preserve its profitability (zero profit). Recall that from the perspective of hegemon h the outside option of the nonaligned country depends on how attractive the rival hegemon $-h$'s inputs are. A higher price of exports by hegemon $-h$ to the nonaligned country makes this outside option less attractive. On the other hand, hegemon h might have incentives to use its power over the nonaligned country to induce it to buy more of the rival hegemon's good in order to boost demand by the rival hegemon of its upstream good. Hence whether the red area is positive or negative in terms of its contribution to the optimal export wedge is ambiguous and depends on whether the hegemon is accommodating or containing the rival hegemon. Indeed, recall that the term labeled Building Power in equation 17 has the same sign as the total containment policy t_h^{tot}. Whenever the dark red area in Figure 5 is increasing, then hegemon h is pursuing containment policy.

The two areas above focused on the effects of an export wedge taking as given the costly actions demanded by the rival hegemon in the Middle part of the game. These effects would be present even if the rival hegemon was simply another country that could not exert any geoeconomic power. Equation 17, however, shows that in the case of two hegemons competing there are additional effects. The light blue area labeled "Terms of Trade (Geoeconomic Competition)" arises from the effect of the export wedge on how the rival hegemon uses its power and the resulting terms of trade effect. The effect of the higher export wedge is ambiguous and depends on whether it induces the rival hegemon $-h$ to shade or increase its demands to the nonaligned country that it buys more of hegemon $-h$ goods. Whenever it leads to a shading of the demands, this in turn reduces the demand of the rival hegemon's downstream sector for the upstream exports of hegemon h. Facing lower demand for its upstream exports reduces the hegemon h profits in its upstream sector.

The light red area labeled "Building Power (Geoeconomic Competition)" arises from the effect of the export wedge on whether the rival hegemon $-h$ uses its power on the margin to accommodate

or contain hegemon h. The positive (negative) effect arises when the rival hegemon reacts to the export wedge by decreasing (increasing) the containment effort, that is decreasing the demands it makes to the nonaligned country not to buy hegemon h good. Therefore the area is ambiguous. A second force is whether the rival hegemon shades or increases the demands to the nonaligned country that it buys its own goods interacted with hegemon h policy of containment or accommodation. All else equal, the effect is positive whenever the rival hegemon reaction lines up with the objective of hegemon h. For example, when hegemon h aims to contain the rival, and the rival reacts by shading the demand to the nonaligned country that it buys more of its own good.

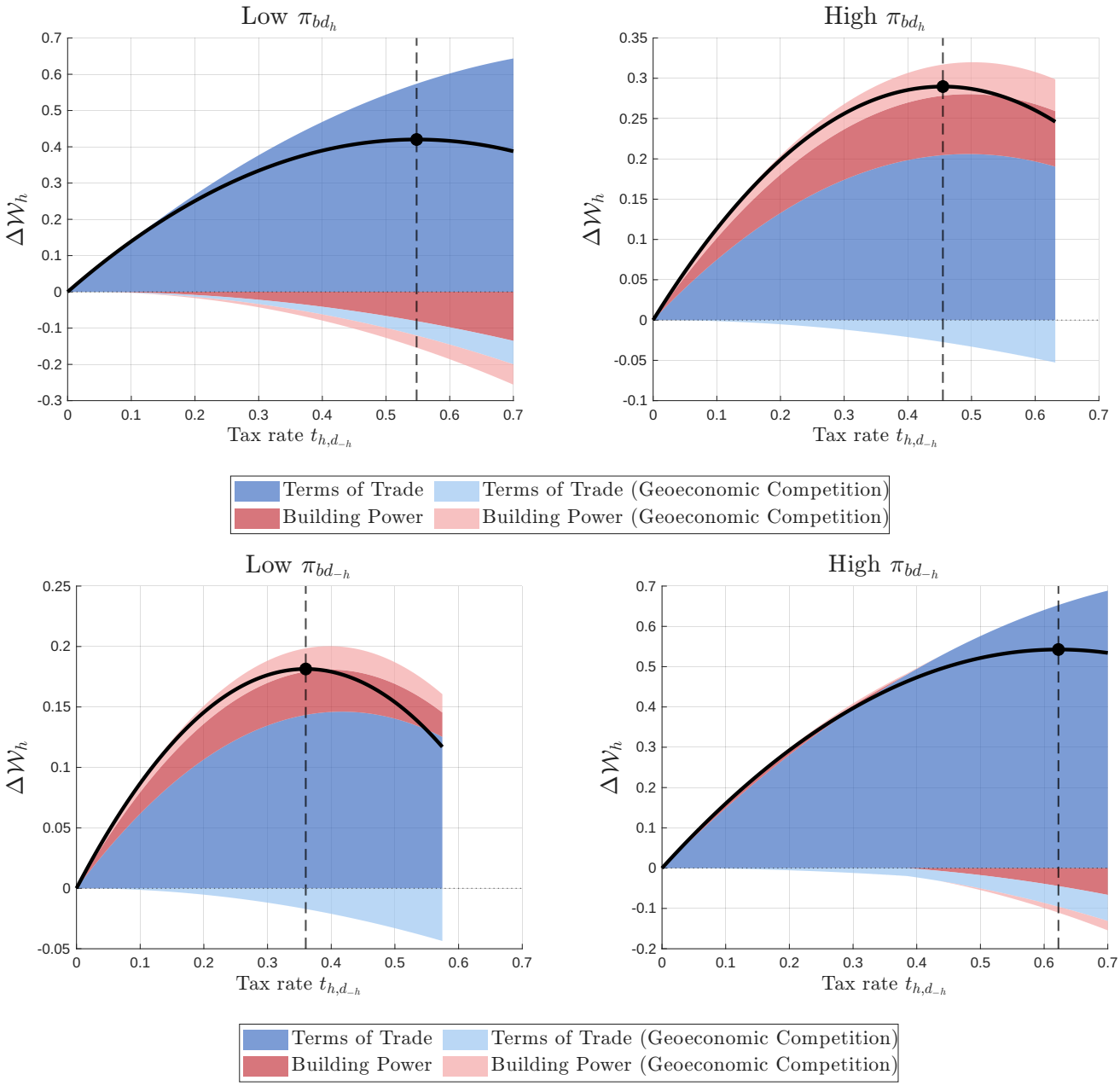
The left panel of Figure 5 presents the decomposition for a low (but positive) value of K_b, that is for the case in which the two hegemon's downstream goods are close to separable in the production function of the nonaligned country. The optimal export wedge is positive, with the positive loading coming from the terms-of-trade channel. All other components are negative, and hegemon h is accommodating. Intuitively, when the two hegemons sell goods that are almost separable in the production function of the nonaligned country, hegemon h has incentives to accommodate the rival hegemon in order to maximize the revenue from terms of trade manipulation as in the bottom left corner of Figure 3. Once the two hegemons are accommodating each other, a higher export wedge destroys some of the implicit coordination and the rival hegemon reaction destroys some of the revenue extraction.

The right panel of Figure 5 shows how hegemon h's incentives shift from accommodation towards containment when the two hegemons are economic competitors downstream, that is when $K_b > 0$ is sufficiently large. The terms of trade channel still pushes for positive export wedges as before, but now the Building Power motives both add to the incentives to impose higher export wedges. The reason is that hegemon h now wants to restrict its exports to hurt the rival hegemon by both making it less attractive as a competitor (outside option) and in order to induce it to lower its containment policies as in the top left corner of Figure 3.

The higher substitutability all else equal pushes for a lower optimal wedge for terms-of-trade manipulation reasons. This echoes the classic result from optimal trade policy, see Appendix A.1.5, that as the two inputs become more substitutable, the exporters face a more elastic foreign import demand curve and the optimal export tax falls. The geoeconomic power building and competition motives instead are heightened by the higher substitutability since the rival hegemon is now a better outside option, pushing for a higher export wedge.

Figure 6 repeats the exercise of Figure 5, but instead considers in the top Panel the variation in the profitability for the nonaligned country of using h's downstream good, π_{bd_h}. The top left panel shows that when profitability is low, the positive export wedge arises from a positive loading on the terms-of-trade channel. Interestingly, the Building Power channels are negative. Intuitively, when the nonaligned country has low profitability from using d_h, the value to hegemon h is dominated by terms of trade manipulation, since the low profitability limits exports of hegemon h's down-

Figure 6: Export Wedges When the Two Hegemons Compete: Variation in Profitability



stream good to the nonaligned country and therefore limits its ability to build power and compete geoeconomically in the Middle period. Hegemon h optimally accommodates the rival.

The right top panel shows that at higher profitability (and given the parametrization has a relatively high substitutability K_b), Building Power becomes an increasing contributor to the value to the hegemon from its export wedge. The higher profitability of hegemon h's good for the nonaligned country incentivizes hegemon h to pursue containment policies toward the other hegemon to build power.

The bottom panels of Figure 6 instead illustrate the variation in the profitability for the nonaligned country of using the rival hegemon $-h$'s downstream good, $\pi_{bd_{-h}}$. The decomposition reflects the opposite pattern as for π_{bd_h} in the top Panel. The left bottom panel shows that the forces at low profitability of d_{-h} mirror those for high profitability of d_h, with positive loadings on the Building Power component representing an incentive towards containment. By contrast, the right bottom panel shows that at high profitability of the rival hegemon's good for the nonaligned country, much as in the case of low profitability of h's own good, incentives tilt towards the terms of trade manipulation.

Taking all four panels of Figure 6 together illustrates the core force behind the equilibrium results in Figure 4. When hegemon h is more baseline profitable for the nonaligned countries compared to its rival (as in the top right half of Figure 6), hegemon h faces higher motives to contain the rival since further shrinking it leads to a higher marginal build-up of power. By contrast, when hegemon h is less baseline profitable for the nonaligned countries compared to its rival (as in the bottom right half of Figure 6), hegemon h faces higher motives to accommodate the rival and focus on pure export manipulation.

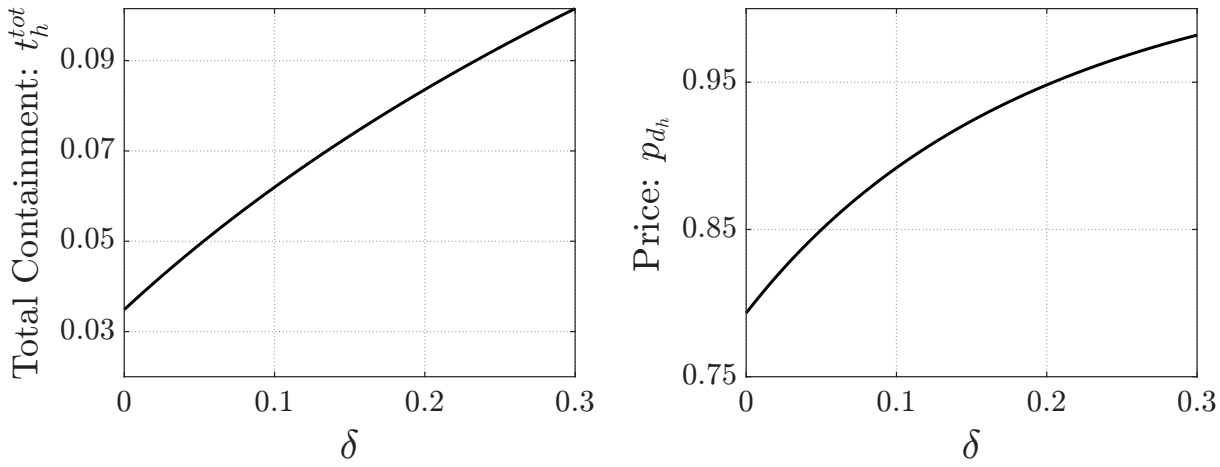
4.1 The Role of Geopolitical Rivalry

In this subsection we explore the role of direct geopolitical rivalry between the two hegemons. We do so by studying objective functions of the hegemons' governments that directly put negative weight on the economic might of the rival hegemon. In particular, we specify $v_h(z) = -\delta(w_{-h}+T_{-h,a_{-h}}+T_{-h,b})$ from Section 2, with $\delta \geq 0$. Therefore, each hegemon's government now maximizes an objective function that has both the domestic consumer welfare and the geopolitical rivalry,

$$U_h(C_{he_h}, C_{hf}) + v_h(z) = \tilde{p}_{e_h} C_{he_h} + C_{hf} - \delta(w_{-h} + T_{-h,a_{-h}} + T_{-h,b}).$$

While the term $v_h(z)$ is reduced-form and ad-hoc, it helps us capture a direct element of geopolitical rivalry (e.g., Mattoo, Ruta and Staiger (2024)). In our chosen specification, each hegemon has direct disutility from the wealth of the rival (w_{-h}) and from the transfers that nonaligned and aligned countries make to the rival hegemon ($T_{-h,a_{-h}} + T_{-h,b}$). The negative loading on wealth captures disutility arising from the resources available to the rival hegemon, perhaps because (outside the

Figure 7: Effect of Geopolitical Rivalry



(a) Total Containment: t_h^{tot}

(b) Price of Downstream Good: p_{d_h}

model) they could be used in a military or political confrontation. The negative loading on the transfers to the rival hegemon emphasizes the notion of transfers as stand-ins for political concessions (e.g. Clayton et al. (2026)).

Figure 7 panel (a) shows the effect on containment policy incentives as direct geopolitical rivalry increases. As δ increases, the hegemon has a direct incentive to shrink its rival's wealth and geoeconomic power, and it does so by increasing containment. However, there is a countervailing force, since the rival hegemon $-h$'s ability to extract transfers depends on the mirror power, the gap between the rival hegemon $-h$ as the inside option and hegemon h as the outside option. In this illustrative calibration, panel (b) shows that the price of the hegemon's downstream good d_h increases as delta increases.

5 Welfare of Nonaligned Countries

The welfare of the nonaligned country is affected by competition between the two hegemons. We characterize how changes in exogenous parameters and in the hegemons' wedges affect the welfare of the nonaligned country.

Using the participation constraint of hegemon h, we can write that the welfare of a nonaligned country is given by its outside option in its contracting relationship with h, that is $\mathcal{W}_b = V_b^{-h}(\tau_{-h,b}) - T_{-h,b}$. Importantly, this outside option depends on the contract being offered by hegemon $-h$, including the transfer extracted. Using the participation constraint of the nonaligned country in its contracting relationship with hegemon $-h$ to substitute out $-T_{-h,b} = V_b^{-(-h)}(\tau_{h,b}) - V_b(\overline{\tau}_b)$,

we can finally write the nonaligned country's welfare as

$$\mathcal{W}_b = \sum_{h \in \mathcal{H}} V_b^{-h}(\tau_{-h,b}) - V_b(\overline{\tau}_b). \tag{19}$$

Equation 19 shows that the nonaligned country's welfare is the sum of its two outside options (one with respect to each hegemon), net of its inside option. Intuitively, the welfare of the nonaligned country increases with the value of its outside options, and the inside option is subtracted to account for transfers that each hegemon extracts. We formalize this intuition in the following Proposition.

Proposition 3 *The welfare effect on the nonaligned country b of a perturbation in an exogenous parameter e in the Beginning is*

$$\begin{aligned}\frac{d\mathcal{W}_b}{de} = &\sum_{h \in \mathcal{H}} \frac{\partial V_b^{-h}(\tau_{-h,b})}{\partial e} - \frac{\partial V_b(\overline{\tau}_b)}{\partial e} \\ &\underbrace{- \sum_{h \in \mathcal{H}} \frac{d[p_{d_{-h}} + \tau_{-h,bd_{-h}}]}{de}(x_{bd_{-h}}^{-h} - x_{bd_{-h}}) - \sum_{h \in \mathcal{H}} \frac{d\tau_{h,bd_{-h}}}{de}(0 - x_{bd_{-h}})}_{\textit{Reduction in Hegemonic Power (Prices and Wedges)}}. \end{aligned} \tag{20}$$

The first line of equation 20 tracks the direct impact of the change in parameter e on the welfare of the nonaligned country. The second line tracks the indirect welfare effects that occur via the reduction in the power that each of the two hegemons has over country b, here arising from changes in each hegemons' wedges and the price of their goods.

For illustrative purposes, consider a comparative static for an increase in the geopolitical rivalry ($\uparrow \delta$) from Section 4.1. Then the terms in the first line of equation 20 are all zero since the welfare does not depend directly on δ. Focusing on the second line, there are two opposing effects when an increase in δ increases the attempts by each hegemon to contain the rival. Suppose that an increase in δ led each hegemon to use its power to further subsidize usage of its own good and shrink usage of the rival's good, a configuration given by:

$$\frac{d\tau_{h,bd_h}}{d\delta} < 0; \qquad \frac{d\tau_{h,bd_{-h}}}{d\delta} > 0,$$

then the impact of these changes in wedges on the welfare of the nonaligned country is all else equal positive. The intuition is that each hegemon is imposing wedges that move in opposite direction and therefore offset from the perspective of the nonaligned country, but each demanded wedge change depletes the power of each hegemon, leaving the nonaligned country with relatively higher outside options. This captures the notion that hegemons waste some of their power in demanding opposing actions to the benefit of nonaligned countries. Recent examples, include the US and China competing over mineral resources in Africa, with each hegemon demanding that the minerals be sold preferentially to itself and not the rival (e.g. the Lobito Corridor US-driven project to secure

minerals from Africa's Copper Belt, and the competing Lazara railway project from China with similar aims). Historically, this also captures the benefits to Nasser's Egypt of offsetting demands and competition between the US and the USSR during the Cold war.

However, as in Figure 7 panel(b), the increased geopolitical rivalry might induce a loss in efficiency of the hegemons as each rival tries to shrink the other. The loss in efficiency manifests in a higher price of the goods that the hegemon sell: $\frac{dp_{d_h}}{d\delta} > 0$. The higher prices lower the welfare of the nonaligned countries by increasing the cost of production.

The more general insight is that the nonaligned country can benefit from hegemonic containment as the rival hegemons use their power to impose offsetting demand, thus leaving the nonaligned country in a better bargaining position. However, containment policy can also shift the production frontier to the inside by making the world economy less efficient. To the extent that the nonaligned country welfare loads on this latter effect, containment policy can lower its welfare.

In this subsection we focused on a supply-side notion of production efficiency so that the inefficiency manifests as higher prices. The model can easily be extended to have a Keynesian demand-side inefficiency. For example, the countries in the rest of the world might have industries the output of which is demand-determined by exporting. If containment policy of the hegemon generates a fall in world demand, then the rest of the world would suffer from lower exports and output. This could capture, for example, the case of countries that are commodity exporters and exposed to world demand cycles.

6 Extensions

Bargaining and Threats Between Hegemons. One interesting extension of our model is to allow for bargaining and threats between the two hegemons. We sketch here an illustrative extension. We assume that in the Beginning before setting export wedges, the two hegemons can bargain over three terms: (i) the export wedges set in the Beginning; (ii) the contracts offered in the Middle; and, (iii) a side payment $T_{US,CH}$ from CH to US, with $T_{US,CH} < 0$ capturing a side payment from US to CH. We assume that bargaining takes the form of Nash bargaining and that the two hegemons have equal bargaining power, so that the bargaining solution solves

$$\max_{\{t_{h,d_{-h}},\tau_h,T_h\}_h,T_{US,CH}} (\mathcal{W}_{US} + T_{US,CH} - \mathcal{W}^O_{US}(t^O)) \cdot (\mathcal{W}_{CH} - T_{US,CH} - \mathcal{W}^O_{CH}(t^O))$$

subject to the participation constraints of nonaligned and aligned countries, and where we have defined $\mathcal{W}^O_h(t^O)$ as the outside option of each hegemon when bargaining breaks down. We think of the outside option $\mathcal{W}^O_h$ as being a function of the threats $t^O = \{t^O_{h,d_{-h}}\}_{h\in\mathcal{H}}$ made by each hegemon, where $t^O_{h,d_{-h}}$ is the export wedge that h will set if bargaining breaks down (after which the hegemons will offer contracts in the Middle as in the baseline setup).

Given this bargaining structure, fixing the threats t^O, bargaining between the two hegemons results in a "grand coalition" in which the two hegemons effectively collude to become a single hegemon that maximizes their total surplus. That is, the two hegemons implicitly solve

$$\max_{\{t_h,\tau_h,T_h\}} \sum_{h\in\mathcal{H}} \mathcal{W}_h.$$

subject to the participation constraints. There are a few interesting consequences of the grand coalition structure. First, the incentive to manipulate the terms of trade with respect to the rival hegemon's downstream sector is eliminated, since that manipulation is at best zero sum and can be replaced with shifts in transfers and domestic wedges. Second, the hegemons' motivations to build power become more nuanced. The two hegemons still have incentives to build power in each of their relationships with the nonaligned country, maximizing the gap between the inside and outside options of the target in each relationship so that they can extract transfers in relationships with both the nonaligned and aligned countries. As a consequence, the hegemons still have to balance the desire to make each good more attractive to increase power in one relationship, against the fact that that good serves as the outside option in the other relationship.[19] However, the motives to contain each other are muted given the ability to make transfers as part of the grand bargain.

Finally, we sketch the hegemons' motivations in their choice of threats $t^O_{h,d_{-h}}$. Given Nash bargaining, the transfer from China to the US is given by

$$T_{US,CH} = \frac{\mathcal{W}_{CH} - \mathcal{W}^O_{CH}(t^O)}{2} - \frac{\mathcal{W}_{US} - \mathcal{W}^O_{US}(t^O)}{2}.$$

The US benefits from economic threats that are asymmetrically costly to China, that is that lower China's outside option relative to the US's outside option. It is also interesting to note that the threats employed shift the surplus between the two hegemons, but do not alter the resulting allocation. That is, hegemonic threats are a mechanism to improve the bargaining position, but in the end each hegemon backs down on its threats once the bargain is resolved. These types of asymmetric threats are consistent with the observed patters of the U.S. using threats in semiconductors toward China, while China uses threats in rare-earths towards the U.S. to bargain (Clayton et al. (2025a)).

Anticoercion and Economic Security. A second important extension is to allow for countries to pursue economic security policies. We sketch how to extend the model first to incorporate economic security by the targets of coercion. We then sketch an extension in which the hegemons pursue economic security vis-a-vis each other.

To capture economic security policies by the aligned and nonaligned countries, we could extend

[19] If the two hegemons as a bargaining unit can also consolidate their threats, that is offer the target the choice to accept both hegemons' contracts or lose access to both hegemons' goods, then the outside option would be zero and incentives would orient around lifting the nonaligned country's inside option.

the setup by assuming that each of these countries can in the Beginning choose investment between hegemon-reliant technologies or home alternatives. We could assume that there is a fixed factor that can be allocated between a nontradeable production sector and the country's tradeable sector, with a greater factor allocation increasing the productivity of that sector. Building from the welfare results of Proposition 3, the nonaligned country would be motivated to allocate its factor in ways that reduce each hegemon's power over it. Aligned countries, being held to their outside option, would have an incentive to fragment away from their hegemon and invest more in home production, which can motivate each hegemon to set commitments to limit their coercion.

To capture economic security policies between the two hegemons, we could extend the model by assuming that each hegemon can allocate a local factor between producing its own upstream good and producing an alternative to the upstream good of its rival. Assuming each hegemon is relatively less efficient at producing the alternative, each hegemon has an incentive to rely on purchases of its rival's good for economic reasons, but would also have an incentive to invest in its home alternative to circumvent its rival's export wedge or to influence its rival's offered contracts in the Middle. Even if the two hegemons are bargaining as sketched above, each hegemon might have an incentive to invest in its home alternative in order to increase its bargaining power vis-a-vis its rival by blunting its rival's economic threat. For example, this might capture Chinese incentives to develop its own advanced semiconductor industry if the U.S. imposes a high export wedge to China in that industry for geoeconomic competition reasons.

Commitment. In models with a single hegemon, the hegemon can benefit from commitments to limit its own behavior in order to deter economic security policies by its targets (Clayton et al. (2024)). It would be interesting to extend our setup to allow for economic security policies and commitments by the hegemons over their coercion. We conjecture that the prospect of a rising competitor might mute the incentives of an incumbent hegemon to commit itself to more limited coercion. Intuitively, if a rising competitor will erode the rents that the incumbent can earn from its geoeconomic power, the incumbent's motivation to preserve these rents by adhering to rules will be lowered, and the incumbent might start turning more extractive even towards its aligned countries. It is also interesting to consider the relative incentives of the two hegemons to structure rules, as well as when rules are adopted globally (e.g., commitment to limit coercion of all countries) versus within a more contained area (e.g., commitment only over aligned countries, over whom the rival hegemon cannot easily compete).

7 Conclusion

In this paper we introduce a model of geoeconomic competition in which two hegemons both have a profitable trading relationship with each other and compete with each other in exerting power

over the rest of the world. Hegemons trade off the economic rents they can earn from selling upstream goods to their rival, against the fact that more efficient production enables their rival to better compete in geoeconomic power over countries in the rest of the world. We show that the model gives rise to regimes of containment, in which a hegemon tries to weaken its rival through a combination of export wedges and demands that countries in the rest of the world buy less of the rival's goods, or accommodation, in which a hegemon promotes its rival and focuses on economic profits. An hegemon is more likely to contain its rival when the goods they use to form economic threats against the rest of the world are more substitutable in the rest of world countries' production. An hegemon is also more likely to contain its rival when its goods are more baseline profitable for the rest of the world. We characterize how geoeconomic rivalry affects the welfare of the rest of the world. Rest of world countries can experience a partial equilibrium benefit as each hegemon serves as an outside option to the other, and so the competing hegemons partially squander their power with offsetting demands. On the other hand, containment policies can also worsen global economic efficiency, which can make the rest of the world worse off in equilibrium. We relate the model to both the current U.S.-China rivalry and to previous episodes of great power competition.

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Online Appendix for
"The Great Game: A Model of Geoeconomic Competition"

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A.1 Proofs

A.1.1 Proof of Proposition 1

The utility of hegemon h can be written as

$$\mathcal{W}_h = p_{e_h}\overline{e}_h + t_{h,d_{-h}}y_{d_{-h}} + \Pi_{d_h} + T_{h,a_h} + T_{h,b}$$

which uses that $t_{h,d_{-h}} = \theta_{-h}^{-1}\alpha_{-h,h}t_{h,d_{-h}e_h}$. We begin by simplifying. We have that

$$\Pi_{d_h} = \left(p_{d_h} - \tilde{p}_{d_h} - t_{-h,d_h} + \xi y_{d_h}^*\right)y_{d_h}$$

where we have defined $\tilde{p}_{d_h} = \theta_h^{-1}\sum_{k\in\mathcal{H}}\alpha_{hk}p_{e_k}$.

Because the optimization problem of a_h is convex and h has a complete set of wedges on a_h, we re-represent h's problem under the primal approach of choosing $x_{a_hd_h}$ directly, with the implementing wedge given from the FOC,

$$x_{a_hd_h} = \frac{\theta_{a_hd_h} - p_{d_h} - \tau_{h,a_hd_h}}{\kappa_a}$$

Under the primal approach, the participation constraint of a_h is given by

$$\Pi_a(x_{a_hd_h}) - T_{h,a_h} \geq 0$$

Analogously, the optimization problem of B is convex and h has a complete set of wedges, so we again employ the primal approach, with h's wedges satisfying

$$\tau_{h,bd_k} = \theta_{bd_k} - p_{d_k} - \tau_{-h,bd_k} - \kappa_b x_{bd_k} - K_b x_{bd_{-k}}, \quad k \in \mathcal{H}$$

while the primal representation of the participation constraint is

$$\Pi_b(x_b) - \tau_{-h,b}x_b - T_{h,b} + r_{-h,b} \geq V_b^{-h}(\tau_{-h,b})$$

Note that if either participation constraint is slack, the hegemon can strictly increase its objective by increasing its demanded transfer. Therefore, both participation constraints bind, and we have

$$T_{h,a_h} = \Pi_a(x_{a_hd_h})$$

$$T_{h,b} = \Pi_b(x_b) - \tau_{-h,b}x_b - V_b^{-h}(\tau_{-h,b}) - r_{-h,b}$$

so that internalizing,

$$\mathcal{W}_h = p_{e_h}\overline{e}_h + t_{h,d_{-h}}y_{d_{-h}} + \Pi_{d_h} + \Pi_a(x_{a_hd_h}) + \Pi_b(x_b) - \tau_{-h,b}x_b - V_b^{-h}(\tau_{-h,b}) - r_{-h,b}$$

where equilibrium prices satisfy

$$p_{d_k} = \tilde{p}_{d_k} + t_{-k,d_k} - \xi y_{d_k}$$

and market clearing implies

$$y_{d_{-h}} = x_{a_{-h}d_{-h}} + x_{bd_{-h}}$$

$$y_{d_h} = x_{a_h d_h} + x_{bd_h}$$

and finally demand of $-h$'s aligned countries is

$$x_{a_{-h}d_{-h}} = \frac{\theta_{a_{-h}d_{-h}} - p_{d_{-h}} - \tau_{-h,a_{-h}d_{-h}}}{\kappa_a}$$

We can now take FOCs. First, the FOC in $x_{a_h d_h}$ is

$$0 = \left(\frac{\partial p_{d_h}}{\partial x_{a_h d_h}} + \xi\right) y_{d_h} + \frac{\partial \Pi_a(x_{a_h d_h})}{\partial x_{a_h d_h}} + \left(\frac{\partial \Pi_a}{\partial p_{d_h}} + \frac{\partial \Pi_b}{\partial p_{d_h}}\right)\frac{\partial p_{d_h}}{\partial x_{a_h d_h}}$$

By Envelope Theorem, $\frac{\partial \Pi_a}{\partial p_{d_h}} + \frac{\partial \Pi_b}{\partial p_{d_h}} = -x_{a_h d_h} - x_{bd_h} = -y_{d_h}$. By construction, $\frac{\partial \Pi_a(x_{a_h d_h})}{\partial x_{a_h d_h}} = \tau_{h,a_h d_h}$. Therefore, we have

$$\tau_{h,a_h d_h} = -\xi y_{d_h}$$

Second, the FOC in x_{bd_h} is

$$0 = \left(\frac{\partial p_{d_h}}{\partial x_{bd_h}} + \xi\right) y_{d_h} + \frac{\partial \Pi_b}{\partial x_{bd_h}} - \tau_{-h,bd_h} + \left(\frac{\partial \Pi_a}{\partial p_{d_h}} + \frac{\partial \Pi_b}{\partial p_{d_h}}\right)\frac{\partial p_{d_h}}{\partial x_{bd_h}}$$

Applying Envelope Theorem and market clearing as before and using that $\tau_{h,bd_h} = \frac{\partial \Pi_b}{\partial x_{bd_h}} - \tau_{-h,bd_h}$, we obtain

$$\tau_{h,bd_h} = -\xi y_{d_h}$$

Finally, we take the FOC in $x_{bd_{-h}}$, given by

$$0 = t_{h,d_{-h}}\left(1 + \frac{\partial x_{a_{-h}d_{-h}}}{\partial p_{d_{-h}}}\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}}\right) + \frac{\partial \Pi_b}{\partial x_{bd_{-h}}} - \tau_{-h,bd_{-h}} + \frac{\partial \Pi_b(x_b)}{\partial p_{d_{-h}}}\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}} - \frac{\partial V_b^{-h}(\tau_{-h,b})}{\partial p_{d_{-h}}}\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}}$$

Using $\frac{\partial x_{a_{-h}d_{-h}}}{\partial p_{d_{-h}}} = -\frac{1}{\kappa_a}$, $\frac{\partial \Pi_b}{\partial x_{bd_{-h}}} - \tau_{-h,bd_{-h}} = \tau_{h,bd_{-h}}$, $\frac{\partial \Pi_b(x_b)}{\partial p_{d_{-h}}} = -x_{bd_{-h}}$, and (by Envelope Theorem) $\frac{\partial V_b^{-h}(\tau_{-h,b})}{\partial p_{d_{-h}}} = -x_{bd_{-h}}^{-h}$, we have

$$\tau_{h,bd_{-h}} = -t_{h,d_{-h}}\left(1 - \frac{1}{\kappa_a}\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}}\right) + (x_{bd_{-h}} - x_{bd_{-h}}^{-h})\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}}$$

Now to evaluate $\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}}$, we have

$$p_{d_{-h}} = \tilde{p}_{d_{-h}} + t_{h,d_{-h}} - \xi(x_{a_{-h}d_{-h}} + x_{bd_{-h}})$$

and so substituting in demand $x_{a_{-h}d_{-h}} = \frac{\theta_{a_{-h}d_{-h}} - p_{d_{-h}} - \tau_{-h,a_{-h}d_{-h}}}{\kappa_a}$ and rearranging, we obtain

$$p_{d_{-h}} = \frac{\kappa_a}{\kappa_a - \xi}\tilde{p}_{d_{-h}} + \frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} - \frac{\xi}{\kappa_a - \xi}(\theta_{a_{-h}d_{-h}} - \tau_{-h,a_{-h}d_{-h}}) - \frac{\kappa_a \xi}{\kappa_a - \xi}x_{bd_{-h}}$$

$$\frac{\partial p_{d_{-h}}}{\partial x_{bd_{-h}}} = -\frac{\kappa_a \xi}{\kappa_a - \xi}$$

and so then we obtain

$$\tau_{h,bd_{-h}} = -\frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} - \frac{\kappa_a \xi}{\kappa_a - \xi}(x_{bd_{-h}} - x^{-h}_{bd_{-h}})$$

We can therefore consolidate our three key FOCs of hegemon h,

$$\tau_{h,a_h d_h} = -\xi y_{d_h}$$

$$\tau_{h,bd_h} = -\xi y_{d_h}$$

$$\tau_{h,bd_{-h}} = -\frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} - \frac{\kappa_a \xi}{\kappa_a - \xi}(x_{bd_{-h}} - x^{-h}_{bd_{-h}})$$

and proceed from here to solve the system, in conjunction with the three key implementability conditions (FOCs of a_h and B),

$$\tau_{h,a_h d_h} = \theta_{a_h d_h} - p_{d_h} - \kappa_a x_{a_h d_h}$$

$$\tau_{h,bd_k} = \theta_{bd_k} - p_{d_k} - \tau_{-h,bd_k} - \kappa_b x_{bd_k} - K_b x_{bd_{-k}}, \quad k \in \mathcal{H}$$

To solve for the equilibrium, we start by reducing the system of equations. We first substitute out $\tau_{h,a_h d_h} = \tau_{h,bd_h}$ to obtain

$$\tau_{h,bd_h} = -\xi y_{d_h}$$

$$\tau_{h,bd_{-h}} = -\frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} - \frac{\kappa_a \xi}{\kappa_a - \xi}(x_{bd_{-h}} - x^{-h}_{bd_{-h}})$$

$$\tau_{h,bd_h} = \theta_{a_h d_h} - p_{d_h} - \kappa_a x_{a_h d_h}$$

$$\tau_{h,bd_k} = \theta_{bd_k} - p_{d_k} - \tau_{-h,bd_k} - \kappa_b x_{bd_k} - K_b x_{bd_{-k}}, \quad k \in \mathcal{H}$$

We then use $x_{a_h d_h} = \frac{\theta_{a_h d_h} - p_{d_h} - \tau_{h,bd_h}}{\kappa_a}$ (the third equation), $x^{-h}_{bd_{-h}} = \frac{\theta_{bd_{-h}} - p_{d_{-h}} - \tau_{-h,bd_{-h}}}{\kappa_b}$, and market clearing $y_{d_h} = x_{a_h d_h} + x_{bd_h}$ to obtain

$$\tau_{h,bd_h} = -\xi\frac{\theta_{a_h d_h} - p_{d_h} - \tau_{h,bd_h}}{\kappa_a} - \xi x_{bd_h}$$

$$\tau_{h,bd_{-h}} + \frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} = -\frac{\kappa_a \xi}{\kappa_a - \xi}x_{bd_{-h}} + \frac{\kappa_a \xi}{\kappa_a - \xi}\frac{\theta_{bd_{-h}} - p_{d_{-h}} - \tau_{-h,bd_{-h}}}{\kappa_b}$$

$$\tau_{h,bd_k} = \theta_{bd_k} - p_{d_k} - \tau_{-h,bd_k} - \kappa_b x_{bd_k} - K_b x_{bd_{-k}}, \quad k \in \mathcal{H}$$

We next use the equilibrium relationship $\tau_{h,bd_h} = -\xi y_{d_h}$ and the pricing equation $p_{d_h} = \tilde{p}_{d_h} +$

$t_{-h,d_h} - \xi y_{d_h} = \tilde{p}_{d_h} + t_{-h,d_h} + \tau_{h,bd_h}$ to obtain for each $h \in \mathcal{H}$

$$\frac{\kappa_a - 2\xi}{\kappa_a}\tau_{h,bd_h} = -\xi\frac{(\pi_{a_h d_h} - t_{-h,d_h})}{\kappa_a} - \xi x_{bd_h}$$

$$\tau_{h,bd_{-h}} + \frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} = -\frac{\kappa_a\xi}{\kappa_a - \xi}x_{bd_{-h}} + \frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a - \xi}(\pi_{bd_{-h}} - t_{h,d_{-h}}) - \frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a - \xi}2\tau_{-h,bd_{-h}}$$

$$2\tau_{h,bd_h} = (\pi_{bd_h} - t_{-h,d_h}) - \tau_{-h,bd_h} - \kappa_b x_{bd_h} - K_b x_{bd_{-h}}$$

where we have defined $\pi_{a_h d_h} = \theta_{a_h d_h} - \tilde{p}_{d_h}$ and $\pi_{bd_h} = \theta_{bd_h} - \tilde{p}_{d_h}$. Next, we use the two versions of the first equation for each $h \in \mathcal{H}$ to substitute out for x_b,

$$x_{bd_h} = -\frac{1}{\kappa_a}(\pi_{a_h d_h} - t_{-h,d_h}) - \frac{\kappa_a - 2\xi}{\kappa_a\xi}\tau_{h,bd_h}$$

$$x_{bd_{-h}} = -\frac{1}{\kappa_a}(\pi_{a_{-h} d_{-h}} - t_{h,d_{-h}}) - \frac{\kappa_a - 2\xi}{\kappa_a\xi}\tau_{-h,bd_{-h}}$$

and obtain the system for $h \in \mathcal{H}$

$$\tau_{h,bd_{-h}} = -\frac{\kappa_a}{\kappa_a - \xi}t_{h,d_{-h}} + \frac{\xi}{\kappa_a - \xi}(\pi_{a_{-h} d_{-h}} - t_{h,d_{-h}}) + \frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a - \xi}(\pi_{bd_{-h}} - t_{h,d_{-h}}) + \frac{\kappa_a\kappa_b - 2(\kappa_a + \kappa_b)\xi}{\kappa_b(\kappa_a - \xi)}\tau_{-h,bd_{-h}}$$

$$\begin{aligned}\Big(\kappa_a\kappa_b - 2(\kappa_a + \kappa_b)\xi\Big)\tau_{h,bd_h} = &-\kappa_b\xi(\pi_{a_h d_h} - t_{-h,d_h}) - \kappa_a\xi(\pi_{bd_h} - t_{-h,d_h}) - K_b\xi(\pi_{a_{-h} d_{-h}} - t_{h,d_{-h}}) \\ &- K_b(\kappa_a - 2\xi)\tau_{-h,bd_{-h}} + \kappa_a\xi\tau_{-h,bd_h}\end{aligned}$$

We can then use the pair of the first two equations to substitute out for $\tau_{h,bd_{-h}}$ and τ_{-h,bd_h}, obtaining for $h \in \mathcal{H}$

$$\begin{aligned}\Big(\kappa_a\kappa_b - 2(\kappa_a + \kappa_b)\xi\Big)\tau_{h,bd_h} = &-\kappa_b\xi(\pi_{a_h d_h} - t_{-h,d_h}) - \kappa_a\xi(\pi_{bd_h} - t_{-h,d_h}) \\ &- K_b\frac{\kappa_b\xi(\kappa_a - \xi)}{\Big(\kappa_a\kappa_b - (\kappa_a + \kappa_b)\xi\Big)}(\pi_{a_{-h} d_{-h}} - t_{h,d_{-h}}) - \frac{\kappa_b\kappa_a^2\xi}{\Big(\kappa_a\kappa_b - (\kappa_a + \kappa_b)\xi\Big)}t_{-h,d_h} \\ &- K_b\frac{\kappa_b(\kappa_a - \xi)(\kappa_a - 2\xi)}{\Big(\kappa_a\kappa_b - (\kappa_a + \kappa_b)\xi\Big)}\tau_{-h,bd_{-h}}\end{aligned}$$

Finally, we use the version of this equation for $-h$,

$$\begin{aligned}\Big(\kappa_a\kappa_b - 2(\kappa_a+\kappa_b)\xi\Big)\tau_{-h,bd_{-h}} =& -\kappa_b\xi(\pi_{a_{-h}d_{-h}} - t_{h,d_{-h}}) - \kappa_a\xi(\pi_{bd_{-h}} - t_{h,d_{-h}}) \\ &- K_b\frac{\kappa_b\xi(\kappa_a-\xi)}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}(\pi_{a_hd_h} - t_{-h,d_h}) - \frac{\kappa_b\kappa_a^2\xi}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}t_{h,d_{-h}} \\ &- K_b\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}\tau_{h,bd_h}\end{aligned}$$

to substitute into the equation for h to obtain the solution,

$$\begin{aligned}\tau_{h,bd_h} =& -\vartheta^{-1}\kappa_b\xi\left[1 - K_b^2\kappa_b\left(\frac{\kappa_a-\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\right)^2\frac{\kappa_a-2\xi}{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}\right](\pi_{a_hd_h} - t_{-h,d_h}) \\ &- \vartheta^{-1}\kappa_a\xi(\pi_{bd_h} - t_{-h,d_h}) \\ &+ \vartheta^{-1}K_b\frac{\kappa_b(\kappa_a-\xi)\xi}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}\frac{2\kappa_a\xi}{\Big(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\Big)}(\pi_{a_{-h}d_{-h}} - t_{h,d_{-h}}) \\ &+ \vartheta^{-1}K_b\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)\Big(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\Big)}\kappa_a\xi(\pi_{bd_{-h}} - t_{h,d_{-h}}) \\ &- \vartheta^{-1}\frac{\kappa_b\kappa_a^2\xi}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}t_{-h,d_h} \\ &+ \vartheta^{-1}K_b\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)\Big(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\Big)}\frac{\kappa_b\kappa_a^2\xi}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}t_{h,d_{-h}}\end{aligned}$$

where we have defined

$$\vartheta = \kappa_a\kappa_b - 2(\kappa_a+\kappa_b)\xi - K_b^2\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)\Big(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\Big)}\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\Big(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\Big)}$$

We can therefore represent this system as

$$\tau_{h,bd_h} = -\beta_a^{own}\pi_{a_hd_h} - \beta_b^{own}\pi_{bd_h} + K_b\beta_a^{rival}\pi_{a_{-h}d_{-h}} + K_b\beta_b^{rival}\pi_{bd_{-h}} + K_b(\kappa_a-\kappa_b)\beta_t^{own}t_{h,d_{-h}} + \beta_t^{rival}t_{-h,d_h}$$

where we have defined

$$\beta_a^{own} = \vartheta^{-1}\kappa_b\xi\left[1 - K_b^2\kappa_b\left(\frac{\kappa_a-\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\right)^2\frac{\kappa_a-2\xi}{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}\right]$$

$$\beta_b^{own} = \vartheta^{-1}\kappa_a\xi$$

$$\beta_a^{rival} = \vartheta^{-1}\frac{\kappa_b(\kappa_a-\xi)\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\frac{\kappa_a}{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}2\xi$$

$$\beta_b^{rival} = \vartheta^{-1}\frac{\kappa_b(\kappa_a-\xi)\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\frac{\kappa_a}{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}(\kappa_a-2\xi)$$

$$\beta_t^{own} = \vartheta^{-1}\frac{\kappa_b(\kappa_a-\xi)\xi}{\left(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\right)}\frac{1}{\left(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\right)}\kappa_a^2\frac{\xi}{\left(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\right)}$$

$$\beta_t^{rival} = \vartheta^{-1}\xi\left[\frac{\kappa_a\kappa_b^2-(\kappa_a+\kappa_b)^2\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}-K_b^2\kappa_b^2\left(\frac{\kappa_a-\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\right)^2\frac{\kappa_a-2\xi}{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}\right]$$

Note that we have $\beta_b^{own}, \beta_a^{rival}, \beta_b^{rival}, \beta_t^{own} \geq 0$ since concavity requires $\kappa_a > \xi$ and $\kappa_a\kappa_b - 2(\kappa_a+\kappa_b)\xi \geq 0$ and from the stability condition $\vartheta > 0$. We also have $\beta_a^{own} \geq 0$ from concavity.

Finally, we can use the equation

$$\tau_{h,bd_{-h}} = -\frac{\kappa_a}{\kappa_a-\xi}t_{h,d_{-h}}+\frac{\xi}{\kappa_a-\xi}(\pi_{a_{-h}d_{-h}}-t_{h,d_{-h}})+\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}(\pi_{bd_{-h}}-t_{h,d_{-h}})+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\tau_{-h,bd_{-h}}$$

and the solution for $\tau_{-h,bd_{-h}}$ to write

$$\tau_{h,bd_{-h}} = K_b\gamma_a^{own}\pi_{a_hd_h}+K_b\gamma_b^{own}\pi_{bd_h}-\gamma_a^{rival}\pi_{a_{-h}d_{-h}}-\gamma_b^{rival}\pi_{bd_{-h}}+\gamma_t^{own}t_{h,d_{-h}}+K_b(\kappa_a-\kappa_b)\gamma_t^{rival}t_{-h,d_h}$$

$$\gamma_a^{own} = \frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_a^{rival}$$

$$\gamma_b^{own} = \frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_b^{rival}$$

$$\gamma_a^{rival} = -\frac{\xi}{\kappa_a-\xi}+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_a^{own}$$

$$\gamma_b^{rival} = -\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_b^{own}$$

$$\gamma_t^{own} = -\frac{\kappa_a\kappa_b+(\kappa_a+\kappa_b)\xi}{\kappa_a-\xi}\frac{1}{\kappa_b}+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_t^{rival}$$

$$\gamma_t^{rival} = \frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_t^{own}$$

We have $\gamma_a^{own}, \gamma_b^{own}, \gamma_t^{rival} \geq 0$ from concavity ($\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi > 0$) and since $\beta_a^{rival}, \beta_b^{rival}, \beta_t^{own} \geq 0$.

We have

$$\begin{aligned}
\gamma_a^{rival} &= -\frac{\xi}{\kappa_a-\xi}+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_a^{own}\\
&= -\frac{\xi}{\kappa_a-\xi}+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\vartheta^{-1}\kappa_b\xi\left[1-K_b^2\kappa_b\left(\frac{\kappa_a-\xi}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\right)^2\frac{\kappa_a-2\xi}{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}\right]\\
&= -\frac{\xi}{\kappa_a-\xi}\left(1-\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\vartheta}\right)-\vartheta^{-1}\kappa_b\xi K_b^2\left(\frac{1}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\right)^2(\kappa_a-\xi)(\kappa_a-2\xi)\\
&= K_b^2\vartheta^{-1}\xi\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)\left(\frac{1}{\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi}\right)^2\frac{2\kappa_a\xi}{\left(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\right)}\\
&\geq 0
\end{aligned}$$

where the last line uses the definition of ϑ.

We have

$$\begin{aligned}
\gamma_b^{rival} &= -\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}+\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\beta_b^{own}\\
&= -\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}\left(1-\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\vartheta}\right)\\
&= K_b^2\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}\frac{\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\left(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\right)\left(\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi\right)}\frac{\kappa_b(\kappa_a-\xi)(\kappa_a-2\xi)}{\left(\kappa_a\kappa_b-(\kappa_a+\kappa_b)\xi\right)}}{\vartheta}\\
&\geq 0
\end{aligned}$$

A.1.2 Proof of Proposition 2

Following the proof of Proposition 1, hegemon h's ex-post optimization problem is

$$\mathcal{W}_h = \max p_{e_h}\bar{e}_h + t_{h,d_{-h}}y_{d_{-h}} + \Pi_{d_h} + \Pi_a(x_{a_hd_h}) + \Pi_b(x_b) - \tau_{-h,b}x_b - V_b^{-h}(\tau_{-h,b}) - r_{-h,b}$$

internalizing the equilibrium relationships

$$p_{d_h} = \tilde{p}_{d_h} + t_{-h,d_h} - \xi y_{d_h}$$

$$y_{d_h} = x_{a_hd_h} + x_{bd_h}$$

$$y_{d_{-h}} = \frac{\theta_{a_{-h}d_{-h}} - p_{d_{-h}} - \tau_{-h,a_{-h}d_{-h}}}{\kappa_a} + x_{bd_{-h}}$$

$$p_{d_{-h}} = \frac{\kappa_a}{\kappa_a-\xi}\tilde{p}_{d_{-h}} + \frac{\kappa_a}{\kappa_a-\xi}t_{h,d_{-h}} - \frac{\xi}{\kappa_a-\xi}(\theta_{a_{-h}d_{-h}} - \tau_{-h,a_{-h}d_{-h}}) - \frac{\kappa_a\xi}{\kappa_a-\xi}x_{bd_{-h}}$$

By Envelope Theorem, we have

$$\frac{\partial\mathcal{W}_h}{\partial t_{h,d_{-h}}} = y_{d_{-h}} + t_{h,d_{-h}}\frac{\partial y_{d_{-h}}}{\partial t_{h,d_{-h}}} + \frac{\partial\Pi_b}{\partial p_{d_{-h}}}\frac{\partial p_{d_{-h}}}{\partial t_{h,d_{-h}}} - \frac{\partial\tau_{-h,b}}{\partial t_{h,d_{-h}}}x_b + \frac{\partial[p_{d_{-h}}+\tau_{-h,bd_{-h}}]}{\partial t_{h,d_{-h}}}x_{bd_{-h}}^{-h}$$

using that $\frac{\partial \Pi_b}{\partial p_{d_{-h}}} = -x_{bd_{-h}}$, we have

$$\frac{\partial \mathcal{W}_h}{\partial t_{h,d_{-h}}} = y_{d_{-h}} - t_{h,d_{-h}} \frac{1}{\kappa_a} \frac{\partial [p_{d_{-h}} + \tau_{-h,a_{-h}d_{-h}}]}{\partial t_{h,d_{-h}}} - \frac{\partial [p_{d_{-h}} + \tau_{-h,bd_{-h}}]}{\partial t_{h,d_{-h}}} (x_{bd_{-h}} - x^{-h}_{bd_{-h}}) - \frac{\partial \tau_{-h,bd_h}}{\partial t_{h,d_{-h}}} x_{bd_h}$$

Finally, we have

$$\frac{\partial [p_{d_{-h}} + \tau_{-h,a_{-h}d_{-h}}]}{\partial t_{h,d_{-h}}} = \frac{\kappa_a}{\kappa_a - \xi} + \left(\frac{\xi}{\kappa_a - \xi} + 1 \right) \frac{\partial \tau_{-h,a_{-h}d_{-h}}}{\partial t_{h,d_{-h}}} = \frac{\kappa_a}{\kappa_a - \xi} \left(1 + \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} \right)$$

and so we obtain

$$\begin{aligned} \frac{\partial \mathcal{W}_h}{\partial t_{h,d_{-h}}} =& y_{d_{-h}} - \frac{1}{\kappa_a - \xi} t_{h,d_{-h}} + \frac{\kappa_a}{\kappa_a - \xi} (x^{-h}_{bd_{-h}} - x_{bd_{-h}}) \\ & - t_{h,d_{-h}} \frac{1}{\kappa_a - \xi} \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} + \frac{\kappa_a}{\kappa_a - \xi} \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} (x^{-h}_{bd_{-h}} - x_{bd_{-h}}) - \frac{\partial \tau_{-h,bd_h}}{\partial t_{h,d_{-h}}} x_{bd_h} \end{aligned}$$

To now solve for the optimal tax, the FOC is

$$0 = y_{d_{-h}} + \frac{\kappa_a}{\kappa_a - \xi} \left(1 + \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} \right) (x^{-h}_{bd_{-h}} - x_{bd_{-h}}) - \frac{1}{\kappa_a - \xi} t_{h,d_{-h}} \left(1 + \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} \right) - \frac{\partial \tau_{-h,bd_h}}{\partial t_{h,d_{-h}}} x_{bd_h}$$

First, we use that

$$x^{-h}_{bd_{-h}} - x_{bd_{-h}} = \frac{\kappa_a - \xi}{\kappa_a \xi} \tau_{h,bd_{-h}} + \frac{1}{\xi} t_{h,d_{-h}}$$

in order to write

$$0 = y_{d_{-h}} + \frac{1}{\xi} \left(1 + \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} \right) \left(\tau_{h,bd_{-h}} + t_{h,d_{-h}} \right) - \frac{\partial \tau_{-h,bd_h}}{\partial t_{h,d_{-h}}} x_{bd_h}$$

We now write out

$$y_{d_{-h}}(t_{h,d_{-h}}, t_{-h,d_h}) = -\frac{1}{\xi} \tau_{-h,bd_{-h}}(t_{h,d_{-h}}, t_{-h,d_h}) = y_{d_{-h}}(0,0) - \frac{1}{\xi} \left[K_b(\kappa_a - \kappa_b) \beta_t^{own} t_{-h,d_h} + \beta_t^{rival} t_{h,d_{-h}} \right]$$

$$\tau_{h,bd_{-h}}(t_{h,d_{-h}}, t_{-h,d_h}) = \tau_{h,bd_{-h}}(0,0) + \gamma_t^{own} t_{h,d_{-h}} + K_b(\kappa_a - \kappa_b) \gamma_t^{rival} t_{-h,d_h}$$

Moreover, from the proof of Proposition 1 we have $x_{bd_h} = -\frac{1}{\kappa_a}(\pi_{a_h d_h} - t_{-h,d_h}) - \frac{\kappa_a - 2\xi}{\kappa_a \xi} \tau_{h,bd_h}$, so that

$$x_{bd_h}(t_{h,d_{-h}}, t_{-h,d_h}) = x_{bd_h}(0,0) + \frac{1}{\kappa_a} t_{-h,d_h} - \frac{\kappa_a - 2\xi}{\kappa_a \xi} \left(K_b(\kappa_a - \kappa_b) \beta_t^{own} t_{h,d_{-h}} + \beta_t^{rival} t_{-h,d_h} \right)$$

Thus substituting in, we have

$$t_{h,d_{-h}} = \frac{1}{\psi} y_{d_{-h}}(0,0) + \frac{1}{\psi} \frac{1}{\xi} \left(1 + \frac{\partial \tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} \right) \tau_{h,bd_{-h}}(0,0) - \frac{1}{\psi} \frac{\partial \tau_{-h,bd_h}}{\partial t_{h,d_{-h}}} x_{bd_h}(0,0) + \frac{1}{\psi} \phi t_{-h,d_h} \quad \text{(A.1)}$$

where

$$\psi = \frac{1}{\xi}\beta_t^{rival} + \frac{1}{\xi}\left(1+\beta_t^{rival}\right)(-\gamma_t^{own}-1) - K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}K_b(\kappa_a-\kappa_b)\beta_t^{own}$$

$$\phi = \frac{1}{\xi}\left(1+\beta_t^{rival}\right)K_b(\kappa_a-\kappa_b)\gamma_t^{rival} - \frac{1}{\xi}K_b(\kappa_a-\kappa_b)\beta_t^{own} - K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\left[\frac{1}{\kappa_a} - \frac{\kappa_a-2\xi}{\kappa_a\xi}\beta_t^{rival}\right]$$

Now we reduce to the loadings. Solving the system of equations from the best response (equation A.1), we have

$$t_{h,d_{-h}} = \frac{\psi}{\psi^2-\phi^2}\zeta_h(0) + \frac{\phi}{\psi^2-\phi^2}\zeta_{-h}(0) \tag{A.2}$$

where we have defined

$$\zeta_h(0) = y_{d_{-h}}(0) + \frac{1}{\xi}\left(1+\frac{\partial\tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}}\right)\tau_{h,bd_{-h}}(0) - \frac{\partial\tau_{-h,bd_h}}{\partial t_{h,d_{-h}}}x_{bd_h}(0).$$

We first have

$$y_{d_{-h}}(0) = -\frac{1}{\xi}\tau_{-h,bd_{-h}}(0)$$

$$\frac{\partial\tau_{-h,bd_{-h}}}{\partial t_{h,d_{-h}}} = \beta_t^{rival}$$

$$\frac{\partial\tau_{-h,bd_h}}{\partial t_{h,d_{-h}}} = K_b(\kappa_a-\kappa_b)\gamma_t^{rival}$$

$$x_{bd_h}(0) = -\frac{1}{\kappa_a}\pi_{a_hd_h} - \frac{\kappa_a-2\xi}{\kappa_a\xi}\tau_{h,bd_h}(0)$$

So then we have

$$\zeta_h(0) = -\frac{1}{\xi}\tau_{-h,bd_{-h}}(0)+\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\tau_{h,bd_{-h}}(0)+K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{1}{\kappa_a}\pi_{a_hd_h}+K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\tau_{h,bd_h}(0)$$

We can also use

$$\tau_{h,bd_{-h}}(0) = \frac{\xi}{\kappa_a-\xi}\pi_{a_{-h}d_{-h}} + \frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}\pi_{bd_{-h}} + \frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\tau_{-h,bd_{-h}}(0)$$

to substitute in and obtain

$$\begin{aligned}\zeta_h(0) =& \frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]\tau_{-h,bd_{-h}}(0) + \frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{\xi}{\kappa_a-\xi}\pi_{a_{-h}d_{-h}}\\ &+\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}\pi_{bd_{-h}} + K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{1}{\kappa_a}\pi_{a_hd_h} + K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\tau_{h,bd_h}(0)\end{aligned}$$

Substituting into equation A.2,

$$
\begin{aligned}
(\psi^2-\phi^2)t_{h,d_{-h}} =& \left\{\psi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\right\}\tau_{-h,bd_{-h}}(0)\\
&+\left\{\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}+\phi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]\right\}\tau_{h,bd_h}(0)\\
&+\left\{\psi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{\xi}{\kappa_a-\xi}+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{1}{\kappa_a}\right\}\pi_{a_{-h}d_{-h}}\\
&+\left\{\phi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{\xi}{\kappa_a-\xi}+\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{1}{\kappa_a}\right\}\pi_{a_hd_h}\\
&+\psi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}\pi_{bd_{-h}}\\
&+\phi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}\pi_{bd_h}
\end{aligned}
$$

We then use

$$\tau_{h,bd_h}(0) = -\beta_a^{own}\pi_{a_hd_h}-\beta_b^{own}\pi_{bd_h}+K_b\beta_a^{rival}\pi_{a_{-h}d_{-h}}+K_b\beta_b^{rival}\pi_{bd_{-h}}$$

From which we obtain

$$t_{h,d_{-h}} = \rho_a^{own}\pi_{a_hd_h}+\rho_b^{own}\pi_{bd_h}+\rho_a^{rival}\pi_{a_{-h}d_{-h}}+\rho_b^{rival}\pi_{bd_{-h}}$$

where we have

$$
\begin{aligned}
(\psi^2-\phi^2)\rho_a^{own} =& \left\{\psi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\right\}K_b\beta_a^{rival}\\
&-\left\{\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}+\phi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]\right\}\beta_a^{own}\\
&+\left\{\phi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{\xi}{\kappa_a-\xi}+\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{1}{\kappa_a}\right\}
\end{aligned}
$$

$$
\begin{aligned}
(\psi^2-\phi^2)\rho_b^{own} =& \left\{\psi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\right\}K_b\beta_b^{rival}\\
&-\left\{\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}+\phi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]\right\}\beta_b^{own}\\
&+\phi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}
\end{aligned}
$$

$$
\begin{aligned}
(\psi^2-\phi^2)\rho_a^{rival} = &-\left\{\psi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\right\}\beta_a^{own}\\
&+\left\{\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}+\phi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]\right\}K_b\beta_a^{rival}\\
&+\left\{\psi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{\xi}{\kappa_a-\xi}+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{1}{\kappa_a}\right\}
\end{aligned}
$$

$$
\begin{aligned}
(\psi^2-\phi^2)\rho_b^{rival} = &-\left\{\psi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]+\phi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}\right\}\beta_b^{own}\\
&+\left\{\psi K_b(\kappa_a-\kappa_b)\gamma_t^{rival}\frac{\kappa_a-2\xi}{\kappa_a\xi}+\phi\frac{1}{\xi}\left[-1+\left(1+\beta_t^{rival}\right)\frac{\kappa_a\kappa_b-2(\kappa_a+\kappa_b)\xi}{\kappa_b(\kappa_a-\xi)}\right]\right\}K_b\beta_b^{rival}\\
&+\psi\frac{1}{\xi}\left(1+\beta_t^{rival}\right)\frac{1}{\kappa_b}\frac{\kappa_a\xi}{\kappa_a-\xi}
\end{aligned}
$$

A.1.3 Proof of Proposition 3

Starting from the nonaligned country's welfare,

$$\mathcal{W}_b=\sum_{h\in\mathcal{H}}V_b^{-h}(\tau_{-h,b})-V_b(\overline{\tau}_b),$$

and using Envelope Theorem, we have

$$\frac{dV_b^{-h}(\tau_{-h,b})}{de}=\frac{\partial V_b^{-h}(\tau_{-h,b})}{\partial e}-\frac{d[p_{d_{-h}}+\tau_{-h,bd_{-h}}]}{de}x_{bd_{-h}}^{-h}+\frac{dr_{-h,b}}{de}$$

$$\frac{dV_b(\overline{\tau}_b)}{de}=\frac{\partial V_b(\overline{\tau}_b)}{\partial e}-\sum_{h\in\mathcal{H}}\frac{d[p_{d_h}+\tau_{h,bd_h}+\tau_{-h,bd_h}]}{de}x_{bd_h}+\sum_{h\in\mathcal{H}}\frac{dr_{h,b}}{de}$$

and so we obtain

$$\frac{d\mathcal{W}_b}{de}=\sum_{h\in\mathcal{H}}\frac{\partial V_b^{-h}(\tau_{-h,b})}{\partial e}-\frac{\partial V_b(\overline{\tau}_b)}{\partial e}-\sum_{h\in\mathcal{H}}\frac{d[p_{d_{-h}}+\tau_{-h,bd_{-h}}]}{de}x_{bd_{-h}}^{-h}-\sum_{h\in\mathcal{H}}\frac{d[p_{d_h}+\tau_{h,bd_h}+\tau_{-h,bd_h}]}{de}(0-x_{bd_h})$$

and so rearranging,

$$\frac{d\mathcal{W}_b}{de}=\sum_{h\in\mathcal{H}}\frac{\partial V_b^{-h}(\tau_{-h,b})}{\partial e}-\frac{\partial V_b(\overline{\tau}_b)}{\partial e}-\sum_{h\in\mathcal{H}}\frac{d[p_{d_{-h}}+\tau_{-h,bd_{-h}}]}{de}(x_{bd_{-h}}^{-h}-x_{bd_{-h}})-\sum_{h\in\mathcal{H}}\frac{d\tau_{-h,bd_h}}{de}(0-x_{bd_h})$$

A.1.4 Cost and Production Functions of d_h.

In this appendix, we provide a production function that gives rise to the downstream producer's cost function (equation 3). Production by firm d_h occurs by the following process. Firm d_h's production set is

$$y_{d_h}=\theta_h\min\{\alpha_{hh}^{-1}x_{d_he_h},\alpha_{h,-h}^{-1}x_{d_he_{-h}},\theta_h^{-1}\Xi(y_{d_h}^*)^{-1}\ell_{d_hh}\}$$

where $\ell_{d_h h}$ is d_h's use of a local factor with unit cost 1. This is a simple way to capture the economy of scale. As a result, d_h's production requires that

$$x_{d_h e_k} = \theta_h^{-1} \alpha_{hk} y_{d_h},$$

$$\ell_{d_h h} = \Xi(y^*_{d_h}) y_{d_h}.$$

This gives rise to h's cost function for y_{d_h} given by

$$C_{d_h}(y_{d_h}) = \sum_{k \in \mathcal{H}} p_{e_k} x_{d_h e_k} + \Xi(y^*_{d_h}) y_{d_h} = \left(\theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk} p_{e_k} + \Xi(y^*_{d_h}) \right) y_{d_h}.$$

We let $\Xi(y^*_{d_h}) = \Xi_0 - \xi y^*_{d_h}$. We simplified the exposition in main text by letting $\Xi_0 = 0$, which has the interpretation that d_h is a supplier of the local factor (e.g., bought by the consumer or used by a factor-utilizing final goods producer).

A.1.5 Benchmark of Downstream Monopolist

To build intuition for our results in Section 4, and clarify the relationship with classic results in trade on optimal export taxes and import tariffs to manipulate the terms of trade, we provide here a benchmark in which the downstream sector of each country consists of a single large firm that acts as a monopolist supplier of its good. We further simplify the analysis to remove any monopoly power from the upstream sector, so that the unit cost of production for the downstream sector is constant and given by $\tilde{p}_{d_h} = \theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk}\ p_{e_k}$. To further simplify, we assume that $\xi = 0$ so that there is no external economy of scale. We focus on the price at which the downstream monopolist sells to the unit continuum of nonaligned countries. The optimal unit export tax is then simply the one that replicates the monopolist unit markup.

Nonaligned Demand for Downstream Goods. The final goods producer in each nonaligned country maximizes its profits (equation 2),

$$\max_{x_b}\ \Pi_b(x_b) = \sum_{h \in \mathcal{H}} \left[(\theta_{bd_h} - p_{d_h}) x_{bd_h} - \frac{1}{2} \kappa_b x_{bd_h}^2 \right] - K_b \prod_{h \in \mathcal{H}} x_{bd_h}.$$

The first order condition for good d_h is

$$0 = (\theta_{bd_h} - p_{d_h}) - \kappa_b x_{bd_h} - K_b x_{bd_{-h}}.$$

Combining with the analogous equation for d_{-h}, we obtain

$$\begin{aligned} x_{bd_h} &= \frac{1}{\kappa_b}(\theta_{bd_h} - p_{d_h}) - \frac{K_b}{\kappa_b} x_{bd_{-h}} \\ &= \frac{1}{\kappa_b}(\theta_{bd_h} - p_{d_h}) - \frac{K_b}{\kappa_b} \left(\frac{1}{\kappa_b}(\theta_{bd_{-h}} - p_{d_{-h}}) - \frac{K_b}{\kappa_b} x_{bd_h} \right) \end{aligned}$$

which rearranging yields

$$x_{bd_h}(p_{d_h}, p_{d_{-h}}) = \frac{\kappa_b}{\kappa_b^2 - K_b^2}(\theta_{bd_h} - p_{d_h}) - \frac{K_b}{\kappa_b^2 - K_b^2}(\theta_{bd_{-h}} - p_{d_{-h}}). \tag{A.3}$$

The equation above is the foreign import demand curve.

Downstream Exporter Monopolist's Problem. Consider the Nash equilibrium between the two large downstream firms that populate sectors d_h and d_{-h}. The monopolist supplier d_h takes as given the price $p_{d_{-h}}$ set by supplier d_{-h}, and chooses its own price p_{d_h} in order to maximize its profits,

$$\max_{p_{d_h}} \Pi_d = (p_{d_h} - \tilde{p}_{d_h}) x_{bd_h}(p_{d_h}, p_{d_{-h}})$$

where recall we denote $\tilde{p}_{d_h} = \theta_h^{-1} \sum_{k \in \mathcal{H}} \alpha_{hk}\ p_{e_k}$ the unit cost of production by the downstream monopolist. The familiar first order condition for optimality is

$$0 = x_{bd_h} + (p_{d_h} - \tilde{p}_{d_h}) \frac{\partial x_{bd_h}}{\partial p_{d_h}}$$

which rearranges to the familiar unit markup as inverse to the price semi-elasticity of the import demand function,

$$p_{d_h} - \tilde{p}_{d_h} = \frac{1}{\epsilon},$$

where $\epsilon = -\frac{\partial x_{bd_h}}{\partial p_{d_h}} \frac{1}{x_{bd_h}}$ is the semi-elasticity. If the downstream exporting sector were competitive, then the optimal export tax would replicate the unit mark-up, giving us:

$$t_h = \frac{1}{\epsilon}.$$

This result is the classic benchmark from international trade policy. The optimal markup, i.e. the optimal export tax, is the inverse of the semi-elasticity of the foreign import demand curve.[1]

Substituting in the import demand function in equation A.3, we have

$$\begin{aligned} p_{d_h} - \tilde{p}_{d_h} &= \frac{\kappa_b^2 - K_b^2}{\kappa_b} \left(\frac{\kappa_b}{\kappa_b^2 - K_b^2} (\theta_{bd_h} - p_{d_h}) - \frac{K_b}{\kappa_b^2 - K_b^2} (\theta_{bd_{-h}} - p_{d_{-h}}) \right) \\ &= (\theta_{bd_h} - p_{d_h}) - \frac{K_b}{\kappa_b} (\theta_{bd_{-h}} - p_{d_{-h}}) \end{aligned}$$

which, rearranging, yields

$$p_{d_h} - \tilde{p}_{d_h} = \frac{1}{2} (\theta_{bd_h} - \tilde{p}_{d_h}) - \frac{1}{2} \frac{K_b}{\kappa_b} (\theta_{bd_{-h}} - p_{d_{-h}}). \tag{A.4}$$

We can then characterize the equilibrium prices by solving the pair of linear equations above. Substituting the parallel equation for d_{-h}, $p_{d_{-h}} - \tilde{p}_{d_{-h}} = \frac{1}{2}(\theta_{bd_{-h}} - \tilde{p}_{d_{-h}}) - \frac{1}{2}\frac{K_b}{\kappa_b}(\theta_{bd_h} - p_{d_h})$, into the equation above, we obtain the equilibrium markup,

$$p_{d_h} - \tilde{p}_{d_h} = \frac{\frac{1}{2}\kappa_b^2 - \frac{1}{4}K_b^2}{\kappa_b^2 - \frac{1}{4}K_b^2} \pi_{bd_h} - K_b \frac{\frac{1}{4}\kappa_b}{\kappa_b^2 - \frac{1}{4}K_b^2} \pi_{bd_{-h}} \tag{A.5}$$

[1] By focusing on the unit markup, our results are akin to a unit export tax rather than an ad valorem export tax. In the case of ad valorem the relevant statistic would be the elasticity rather than the semi elasticity of the foreign import demand curve.

where, as in the main text, we have defined $\pi_{bd_h} = \theta_{bd_h} - \tilde{p}_{d_h}$ as measuring the baseline profitability for the nonaligned country of using downstream good d_h in production. These profitabilities and the substitutability K_b are key determinants of the unit markup. As π_{bd_h} rises (e.g., θ_{bd_h} rises) and d_h becomes more baseline profitable for the nonaligned country to use, demand for d_h rises and the semi-elasticity of foreign import demand falls, which induces a larger unit markup by d_h and a smaller markup by d_{-h} when goods are substitutes ($K_b > 0$).

When goods are (weakly) substitutes, that is $K_b \geq 0$, we have that an increase in substitutability generates:

$$\frac{\partial[p_{d_h} - \tilde{p}_{d_h}]}{\partial K_b} = -\frac{1}{4}\frac{K_b\kappa_b^2}{\left(\kappa_b^2 - \frac{1}{4}K_b^2\right)^2}\pi_{bd_h} - \frac{1}{4}\frac{\kappa_b\left(\kappa_b^2 + \frac{1}{4}K_b^2\right)}{\left(\kappa_b^2 - \frac{1}{4}K_b^2\right)^2}\pi_{bd_{-h}} < 0$$

so that the unit markup declines in K_b. Intuitively, an increase in substitutability increases the semi elasticity of the foreign import demand curve and lowers the markup (i.e. lowers the optimal export tax).

Optimal Export Tax with Symmetric Countries. Consider the case in which the two countries h are symmetric, so that $\pi_{bd_h} = \pi_{bd}$. In this case, the optimal export tax that implements the markup simplifies to:

$$t_h = \frac{\kappa_b - K_b}{2\kappa_b - K_b}\pi_{bd}. \tag{A.6}$$

As the two inputs become perfect substitutes, the limit as K_b goes to κ_b from below, the optimal export tax goes to zero since the hegemon faces an infinitely elastic foreign import demand curve ($\epsilon \to \infty$).