Geopolitics and the World Trading System*

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Abstract

Until the beginning of this century, the GATT/WTO system worked. Economic research provided a compelling explanation. It showed that if governments maximize the well-being of their own countries broadly defined, GATT/WTO principles would facilitate mutually beneficial cooperation over their trade policy choices. Now heightened geopolitical rivalry seems to have undermined the WTO. A simple transposition of the previous rationalization suggests that geopolitics and trade cooperation are not compatible. We show that this is only true if rivalry eclipses any consideration of own-country well-being. In all other circumstances, there are gains from trade cooperation even with geopolitics. Furthermore, the WTO's relevance is in question only if it adheres too rigidly to its existing rules and norms. Through measured adaptation to the geopolitical imperative, the WTO can continue to thrive as a forum for multilateral trade cooperation in the age of geopolitics.

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1 Introduction

The two largest trading economies in the world, the United States and China, increasingly see each other as geopolitical rivals. For both the US administration and the Chinese government, this great-power rivalry is central to their foreign and national security strategy (Wolff, 2023). While other reasons contributed to the surge in trade policy activism on both sides of the Pacific in recent years, geopolitical considerations are increasingly cited as a driver of new trade and industrial policy. For instance, data from the New Industrial Policy Observatory show that a significant number of measures imposed by China and the United States in 2023 and the first half of 2024 are motivated by geopolitical and national security concerns (Evenett et al., 2024). Irrespective of the validity of these concerns and the efficacy of new trade measures to achieve the intended goals, an increasingly commonly held view is that US-China rivalry, and the change in policies that it generates, could reshape trade flows and fragment the world trading system and the global economy more generally (Aiyar et al., 2023 and Gopinath et al., 2024).

In this paper, we study the implications of geopolitical rivalry for trade cooperation and for the purpose and design of the rules-based multilateral trading system. Our work builds from an understanding of the logic of the multilateral trading system that comes from the literature on the economics of trade agreements (see Bagwell and Staiger, 1999, for an initial statement of the framework that provides this logic, and Bagwell et al., 2016, for a review of this literature). The key findings of this body of work can be simply stated. The first is that the fundamental source of inefficiency associated with the unilateral trade policy choices of governments is the presence of cross border spillover effects in the form of a terms-of-trade externality. Second, the primary purpose of a trade agreement is to mitigate these externalities, meaning that countries agree to limit their protectionist policies thus preventing them from manipulating trade prices to their advantage at the expense of other countries. Third, the rules of the world trading system initially negotiated through the General Agreement on Tariffs and Trade (GATT) and later embedded into the Agreements under the auspices of the World Trade Organization (what we will refer to as the GATT/WTO rules) provided a governance system that allowed countries to escape from the trap of non-cooperative protectionist trade policy and promoted mutually beneficial trade cooperation.

While rich in insights, the framework underpinning this body of work has been developed without explicit consideration of issues related to geopolitics. To introduce geopolitics into this framework, we turn to the literature on international relations. In particular, the so called "realist school" emphasizes the importance of rivalry among countries to improve their power, and assumes that in their rivalry governments are concerned with *relative* rather than absolute power, in the sense that they aim to increase their power *at the expense* of their rivals. The following quote from Mearsheimer (2003) is illuminating:

> Saying that states are power maximizers is tantamount to saying that they care about relative power, not absolute power. There is an important distinction here, because states concerned about relative power behave differently than do states interested in absolute power. ... Thus states motivated by relative power concerns are likely to forgo large gains in their own power, if such gains give rival states even greater power, for smaller national gains that nevertheless provide them with a power advantage over

> their rivals. States that maximize absolute power, on the other hand, care only about the size of their own gains, not those of other states. ... They would jump at the opportunity for large gains, even if a rival gained more in the deal. (Mearsheimer, 2003, page 36)

The focus on relative as opposed to absolute power emphasized by the realist school of international relations has important implications for the way we think about governments' goals in setting trade policy.

We can think of a country's absolute power as related broadly to its overall size in terms of population and real income as well as its ability to maintain production in "strategic sectors" (however defined). Importantly, concern about the attributes that determine a country's absolute power can be mapped into the country's concerns about its own local prices (as well as its terms of trade with the world). Since the framework developed by Bagwell and Staiger (1999) specifies government objectives as a function of the country's terms of trade and its own local prices in a way that places no restrictions on how a government assesses the attractiveness of different levels of its own local prices, these government objective functions are general enough to include the possibility that governments have concerns about their absolute power. It then follows that all the results of that literature would apply without qualification if geopolitical rivalry were about absolute power.

The focus on *relative* power emphasized by the realist school of international relations changes things. According to this focus the absolute power levels of *both* rivals enter into the objectives of *each* rival. And this implies that the objective function for a country that is engaged in geopolitical rivalry will also include its *rival's* local prices, which (along with the rival's terms of trade with the world) determine the *rival's* absolute power. Thus, for example, if each government sought to ensure that its country dominated the world ship building industry, then each government would be concerned not only about the incentives to build ships implied by the prices in its own economy, but also the incentives to build ships in the rival's economy implied by the prices there.

Government objective functions of the form implied by the international relations literature on geopolitical rivalry therefore fall outside the framework developed by Bagwell and Staiger (1999). Hence, from the perspective of the literature on the economics of trade agreements, the impact of geopolitical rivalry is an open question. This is the focus of our paper.

We work within a two-good general equilibrium neoclassical trade model, first in a two-country world where the two countries are assumed to be geopolitical rivals, and then in a three-country world where the third country remains neutral. As in the original Bagwell and Staiger (1999) paper, we limit our focus to tariffs. We introduce rivalry between the governments by augmenting government objective functions of the form introduced by Bagwell and Staiger with a term that is increasing in the *difference* between the degree to which a government achieves its underlying objectives – its underlying "welfare" – and the degree to which its rival does. And we represent the rise of geopolitical rivalry by changing the weight on this term from zero to a strictly positive value in each of the rival's objective functions.

In the two-country version of the model, we first consider whether trade cooperation is possible between geopolitical rivals. The answer is not self-evident, because as Mearsheimer (2003) notes, rival countries vying for dominance and concerned about their relative gains will behave differently than other countries, and in particular they may not see the mutual

gains that comprise the traditional selling point of trade cooperation as in their interests.[1]

We show that, in all but the most extreme circumstances, the case for trade cooperation remains intact when geopolitical rivalry erupts. We do this in three steps. Our first result is that the rise of geopolitical rivalry increases the best-response (noncooperative) tariff of each rival. Intuitively, this reflects the fact that, beginning from the noncooperative Nash tariffs in the absence of rivalry, where each country's tariff is set so that a small further increase in its tariff would leave its own welfare unchanged, rivalry makes a small increase in the tariff attractive for each country because it *hurts the rival*. Our second result is that, except in a limiting case where each country cares *only* about dominating its rival and cares nothing about achieving its underlying objectives for their own sake, the set of globally efficient tariffs is *unchanged* by geopolitical rivalry. Intuitively, even if the rival countries care about the relative success with which they achieve their underlying objectives, as long as each also cares about the absolute success with which it achieves its own underlying objectives the rivals can engineer pareto gains by changing their tariffs unless their tariff choices place them on the efficiency frontier with respect to these underlying objectives. Our third result follows quickly from the first two results: Unless domination becomes the sole objective of each rival, a role for mutually benefical trade policy cooperation persists in the presence of geopolitical rivalry. In other words, just as when governments care only about their own welfare, in a geopolitical world too enlightened self-interest is the driver of trade cooperation.[2]

The two-country setting also illuminates a tension that is created in the world trading system by the rise of geopolitics. As our first set of results indicates, with the rise of geopolitical rivalry the status quo (pre-rivalry) cooperative tariff pair will continue to be efficient, as will every other tariff pair on the original efficiency frontier; but generically the status quo will no longer be the outcome of efficient (Nash) tariff bargaining, because the Nash threat point will change. Therefore, to maintain cooperation once geopolitical rivalry erupts, countries must find a way to move *along the international efficiency frontier* and implement tariff changes that are neither reciprocal nor mutually beneficial relative to the

[1] In the context of trade policy, Mearsheimer (2003) quotes from Adam Smith's *The Wealth of Nations* to provide an illustration of how states behave when forced to choose between wealth and relative power:

> In 1651, England put into effect the famous Navigation Act, protectionist legislation designed to damage Holland's commerce and ultimately cripple the Dutch economy. The legislation mandated that all goods imported into England be carried either in English ships or ships owned by the country that originally produced the goods. Since the Dutch produced few goods themselves, this measure would badly damage their shipping, the central ingredient in their economic success. Of course, the Navigation Act would hurt England's economy as well, mainly because it would rob England of the benefits of free trade. "The act of navigation," Smith wrote, "is not favorable to foreign commerce, or to the growth of that opulence that can arise from it." Nevertheless, Smith considered the legislation "the wisest of all the commercial regulations of England" because it did more damage to the Dutch economy than to the English economy, and in the mid-seventeenth century Holland was "the only naval power which could endanger the security of England." (Mearsheimer, 2003, page 48)

[2] Hence, according to our findings the quote from Bill Clinton cited in Mearsheimer (2003, page 23) that "Enlightened self-interest, as well as shared values, will compel countries to define their greatness in more constructive ways... and will compel us to cooperate" continues to be valid when the eruption of geopolitical rivalry disrupts trade cooperation.

status quo. And as we argue, this will confront the world trading system with a choice between two uncomfortable alternatives. In particular, adjustment to the new cooperative outcome in the presence of geopolitics requires either a temporary unraveling of existing liberal trade policies as countries move to the new Nash threat point, so that reciprocal and mutually beneficial trade liberalization can then occur from that starting point in line with the traditional features of tariff liberalization over GATT's history; or it requires a departure from GATT/WTO's core principle of reciprocity in negotiated tariff changes, so that countries can move in a non-pareto improving way along the efficiency frontier.

Our three-country version of the model extends the analysis to a setting where geopolitical rivalry erupts between two countries in a multilateral world. In addition to showing that our results from the two-country model extend without qualification to the three-country setting, the three-country model allows us to identify a further issue implied by the rise of geopolitics for the existing multilateral world trading system, this time related to the GATT/WTO's core principle of nondiscrimination as embodied in the most-favored-nation (MFN) rule. The issue arises when a movement along the international efficiency frontier is desired, as our results indicate would be the case when geopolitical rivalry erupts. Such movements would naturally be facilitated if bilateral transfers between countries can be orchestrated. And if international lump sum transfer instruments are not available, tariff adjustments may provide a practical alternative. But as we observe, it is not possible for the two rival countries to make non-discriminatory MFN tariff adjustments that transfer surplus between them without also altering the surplus of the neutral third country, while this *would* be possible if the rival countries could make use of *discriminatory* tariff adjustments.

This leads to our final result. As we argue, the rise of geopolitical rivalry in a multilateral world will confront the world trading system with an additional choice between two uncomfortable alternatives. Adjustment to the new cooperative outcome in the presence of geopolitics requires either a temporary unraveling of existing liberal trade policies as countries move to the new Nash threat point and begin again the process of reciprocal MFN tariff liberalization; or it requires that an orderly departure from both reciprocity *and* the MFN principle must be achieved, so that the rivals can move in a non-pareto improving way along the efficiency frontier with minimal disruption to third parties.

While the discussion above, and the modeling framework of our paper, presents geopolitics as a quest for *dominance over one's rival*, we believe that the framework also captures certain aspects of geopolitical concerns about *dependence on one's rival* (e.g. Hirschman, 1945; Becko and O'Connor, 2024; Clayton et al., 2024).[3] First, as long as dependence is gauged by the degree to which a country relies on imports from its rival, the country's concerns can be

[3]In his 1945 book on *National Power and the Structure of Foreign Trade*, Albert Hirschman notes that:

> Foreign trade would lead to relationships of dependence and influence between nations. Let us call this the influence effect of foreign trade... Every sovereign nation has some influence of this kind, since through the control of its frontiers and the power over its citizens it can at any time interrupt its own export and import trade, which is at the same time the import and export trade of some other countries. The stoppage of this trade obliges the other country to find alternative markets and sources of supply and, should this prove impossible, it forces upon them economic adjustment and lasting impoverishment." (Hirschman, 1945, pages 15-16)

mapped into the prices that prevail within its own borders, that is, its *own local prices*. This mapping follows because the country can choose the degree of dependence on its geopolitical rival by adopting policies that alter local prices in its economy to give the desired incentives for production and consumption within its borders. Alternatively, a government may seek to make *its rival more dependent* on *it*, in order to be in a position in the future to coerce its rival into behaviors that are more acceptable to it. These goals give a reason for the country to be concerned about its *rival's local prices*. The goal of diminishing own dependence through the manipulation of own prices is consistent with the quest for absolute power and included in the Bagwell and Staiger (1999) framework. And as we will show, the goal of increasing the rival's dependence by influencing the rival's local prices can be thought of as a reflection of the quest for relative power, which we address in this paper. These features of our modeling framework allow us to comment on the robustness of our key findings to broader interpretations of geopolitics that include government concerns about dependence in addition to the quest for dominance.

Taken together, our findings indicate that the rise of geopolitics does not obviate the need for international cooperation over trade policy. But our findings also suggest that the WTO's relevance may be severely compromised if it adheres too rigidly to its existing rules and norms when applying those rules and norms to geopolitical rivals. In this light, it may only be through measured adaptation to the geopolitical imperative that the WTO can continue to thrive as a forum for multilateral trade cooperation in the age of geopolitics.

Our paper contributes to four branches of the economics literature. First, as discussed above, our model augments the framework used to study the purpose and design of trade agreements (especially, Bagwell and Staiger, 1999, and Bagwell and Staiger, 2005) to account for geopolitical rivalry between countries. Second, our paper relates to a literature that explores the reasons for the current crisis faced by the rules-based trading system, such as Mattoo and Staiger (2020), Staiger (2022) and Carvalho et al. (2024). Third, our paper relates to the growing literature in economics that builds on the seminal work by Hirschman (1945) on how governments can exploit trade (and, more broadly, international economic) relations to achieve geopolitical goals. Recent studies in this area include Clayton et al. (2023), Thoenig (2023), Becko and O'Connor (2024), Broner et al. (2024), Clayton et al. (2024) and Pflueger and Yared (2024). Finally, our paper relates to the literature on geoeconomic fragmentation, which studies how the recent surge in trade restrictions and return of industrial policies are impacting trade and investment flows and quantifies the costs of a breakup of the global economy into separate geopolitical blocs (Aiyar et al., 2023; Alfaro and Chor, 2023; Fajgelbaum et al., 2024; Freund et al., 2024; Gopinath et al., 2024). We contribute to these branches of the economics literature by investigating the conditions under which there are continuing gains from trade cooperation in the presence of geopolitical rivalry, and by analyzing the design feature of a world trading system that could allow such cooperation to persist.

The rest of the paper proceeds as follows. In section 2 we lay out our two-country model and derive our basic results on the possiblity of trade cooperation between geopolitical rivals. Section 3 then explores the implications of these findings for trade bargaining. In section 4 we lay out our three-country model, show that our two-country results extend without qualification to this setting, and explore new issues that arise in a multilateral world. Section 5 explores the implications of our results for the core institutional features of the world

trading system governed by the GATT/WTO. Finally, section 6 concludes. An Appendix provides further exploration of the generality of our results.

2 Geopolitical Rivalry and Trade Cooperation

In this section we consider a two-country two-good general equilibrium neoclassical trade model where governments utilize tariffs to achieve their objectives. In section 4 we will extend the analysis to more than two countries.

2.1 The model world economy

We adopt the textbook two-good two-country neoclassical trade model that Bagwell and Staiger (1999) employed to consider the purpose and design of GATT. This model has two countries, home (no *) and foreign (*), and two goods, x the natural import good of the home country and y the natural import good of the foreign country. The two goods are normal in consumption and produced in perfectly competitive markets. We define $p \equiv p_x/p_y$ and $p^* \equiv p_x^*/p_y^*$ as the local relative price in the home and foreign market and τ and τ^* the home-country and the foreign-country import tariff (each expressed in ad valorem terms), respectively. It follows that $p = (1+\tau)p^w \equiv p(\tau, p^w)$ and $p^* = p^w/(1+\tau^*) \equiv p^*(\tau^*, p^w)$, where $p^w \equiv p_x^*/p_y$ is the "world" (i.e., untaxed) relative price. The foreign terms of trade is then given by p^w while the home terms of trade is given by $(1/p^w)$.

Production in a country occurs at the point on the production possibilities frontier, denoted by Q for the home country and Q^* for the foreign country, where the marginal rate of transformation between x and y is equal to the local relative price, allowing home and foreign production functions to be represented as $Q_i = Q_i(p)$ and $Q_i^* = Q_i^*(p^*)$ for $i = \{x, y\}$. Consumption depends on both the local relative price and on tariff revenue, which is distributed lump-sum back to consumers. We denote by R the tariff revenue collected in the home country, and by R^* the tariff revenue collected in the foreign country. National consumption in the home and foreign country can then be written as $D_i = D_i(p, R)$ and $D_i^* = D_i^*(p^*, R^*)$ for $i = \{x, y\}$, where tariff revenue is defined implicitly by $R = [D_x(p, R) - Q_x(p)][p - p^w]$ or $R = R(p, p^w)$ for the home country and by $R^* = [D_y^*(p^*, R^*) - Q_y^*(p^*)][1/p^* - 1/p^w]$ or $R^* = R^*(p^*, p^w)$ for the foreign country, and where each country's tariff revenue is an increasing function of its terms of trade under the normal-goods assumption. This allows national consumption to be written as $C_i(p, p^w) \equiv D_i(p, R(p, p^w))$ and $C_i^*(p^*, p^w) \equiv D_i^*(p^*, R^*(p^*, p^w))$ for $i = \{x, y\}$, with C_i decreasing in p^w and C_i^* increasing in p^w.

The equilibrium world price is determined by the market clearing conditions. We define the home-country imports of x and exports of y by $M_x(p, p^w) \equiv C_x(p, p^w) - Q_x(p)$ and $E_y(p, p^w) \equiv Q_y(p) - C_y(p, p^w)$, and the foreign-country imports of y and exports of x by $M_y^*(p^*, p^w) \equiv C_y(p^*, p^w) - Q_y^*(p^*)$ and $E_x^*(p^*, p^w) \equiv Q_x^*(p^*) - C_x^*(p^*, p^w)$, respectively. For any world price, we also have the following balanced trade conditions

$$p^w M_x(p(\tau, p^w), p^w) = E_y(p(\tau, p^w), p^w) \text{ and} \tag{1}$$

$$M_y^*(p^*(\tau^*, p^w), p^w) = p^w E_x^*(p^*(\tau^*, p^w), p^w). \tag{2}$$

The equilibrium world price, $\widetilde{p}^w(\tau, \tau^*)$, is thus determined by the requirement of market-clearing for good y:

$$E_y(p(\tau, \widetilde{p}^w), \widetilde{p}^w) = M_y^*(p^*(\tau^*, \widetilde{p}^w), \widetilde{p}^w), \tag{3}$$

with market clearing for good x implied by (1), (2) and (3).

In this world economy, given any pair of tariffs, the equilibrium world price is determined by (3), and this price and the tariffs then determine the local prices and, in turn, the production, consumption, import, export and tariff revenue levels. In the rest of this paper, we focus on the standard case where the Lerner and Metzler paradoxes are ruled out, so that

$$\frac{\partial \widetilde{p}^w(\tau, \tau^*)}{\partial \tau} < 0 < \frac{\partial \widetilde{p}^w(\tau, \tau^*)}{\partial \tau^*} \text{ and } \frac{dp(\tau, \widetilde{p}^w(\tau, \tau^*))}{d\tau} > 0 > \frac{dp^*(\tau^*, \widetilde{p}^w(\tau, \tau^*))}{d\tau^*}. \tag{4}$$

2.2 Geopolitics

As discussed in the Introduction, we follow the international relations literature and model geopolitical rivalry as a quest for dominance over one's rival as gauged by the relative success in achieving one's underlying objectives. To formalize the quest for dominance, we adopt the following specification of government objective functions:

$$\begin{aligned} G(\tau, \tau^*) &= W(\tau, \tau^*) + \rho \times [W(\tau, \tau^*) - W^*(\tau^*, \tau)] \\ G^*(\tau^*, \tau) &= W^*(\tau^*, \tau) + \rho^* \times [W^*(\tau^*, \tau) - W(\tau, \tau^*)] \end{aligned} \tag{5}$$

where $\rho \geq 0$ and $\rho^* \geq 0$ and where both ρ and ρ^* are finite.[4] We interpret the presence of geopolitical rivalry as corresponding to the case where government objectives are characterized by (5) with $\rho > 0$ and $\rho^* > 0$.[5] We interpret the absence of geopolitical rivalry as corresponding to the case where government objectives are characterized by (5) with $\rho = 0 = \rho^*$, so that the home government objective function would be $W(\tau, \tau^*)$ and the foreign government objective function would be $W^*(\tau^*, \tau)$.

In the Appendix, we consider a more general structure for government objectives and show that our results are not driven by the particular functional form that we have adopted in (5) to capture geopolitical rivalry. Instead, the key feature of (5) that underlies our results is that the rivalry between the two governments can be couched in terms of the *relative* success in achieving their underlying goals. This is the same feature that the international relations literature typically adopts in its formalization of geopolitical rivalry between governments (see, for example, Snidal, 1991).

In adopting the government objective functions specified in (5) we take a reduced-form approach to the reason that governments who are engaged in rivalry would care about their relative success. But micro-founding these government preferences would be straightforward. For example, following Powell (1991), who observes that "states are concerned about relative gains when the possible use of force is at issue,"we could add a second period to our model

[4]Later in this section we will also consider the limiting case where $\rho \to \infty$ and $\rho^* \to \infty$. And in a later section we will comment on how the issue of dependence can also be captured by our modeling framework.

[5]To minimize taxonomy, we are ignoring the case where only one of these inequalities holds strictly. But as will become clear below, that case yields results that are qualitatively identical to the case where both inequalities are strict, so we feel justified in ignoring it in our exposition.

in which there is some probability of war, with a bad payoff for the loser and a less-bad payoff for the winner, and with the probability of winning rising in the relative success that a country has in achieving its first-period objectives.[6] Our reduced-form approach has the advantage of simplicity and maintains a level of generality that would not otherwise be possible.[7] Of course a more explicit formalization could reveal insights beyond those captured by our reduced-form framework, a point we return to in the Conclusion.

We introduce some minimal structure on $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$. In particular, we assume that W is strictly decreasing and convex in τ^* when evaluated in the relevant range of τ and that W^* is strictly decreasing and convex in τ when evaluated in the relevant range of τ^* as long as there is strictly positive trade between the two countries, owing to the adverse terms-of trade implications that would be experienced by a country under the standard conditions in (4) when its trading partner raises its tariff.[8] We also assume that W is concave in τ and that W^* is concave in τ^*, with each function reaching a maximum level at an interior value of its own tariff. In the absence of geopolitical rivalry when $G = W$ and $G^* = W^*$, this latter assumption ensures that each government's best-response tariff schedule is uniquely defined; we will confirm that this property is also inherited by G and G^* in the presence of geopolitical rivalry when both of these assumptions are satisfied.

To keep things simple, our default interpretation will be that W is real national income in the home country and W^* is real national income in the foreign country, but the minimal stucture we impose on $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$ allows for a broad range of possible interpretations. For example, this structure is consistent with the specification of government objectives proposed by Bagwell and Staiger (1999), where $W(\tau, \tau^*) \equiv W(p(\tau, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))$ with $W_{p^w} < 0$ but where W_p is unrestricted and $W^*(\tau^*, \tau) \equiv W^*(p^*(\tau^*, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))$ with $W^*_{p^w} > 0$ but where $W^*_{p^*}$ is unrestricted. Because government objective functions of this form do not place restrictions on how each government feels about changes in its local relative price, these objective functions are consistent with a wide range of industrial policy goals, where governments intervene to favor a certain sector. And as Bagwell and Staiger note, these objective functions are also consistent with governments that have general distributional goals as well as political preferences that include all of the major models of political economy of trade policy.

How should we interpret the rivalry between the home and foreign governments embodied in (5)? The minimal structure we place on $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$ can be viewed as a selling point of our model, because this allows the specification of geopolitical rivalry in (5) to capture several important possibilities.

If $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$ are interpreted as real national income, then absent geopolitics each government maximizes its real national income with its tariff choice and (5) can be

[6] One could also allow the probability of war itself to be a function of the relative success that each country has in achieving its first-period objectives, with this probability at its lowest when the difference in success of the two countries is highest, making one country so dominant that the other would never challenge it. We return to this possibility in the Conclusion when we discuss potential reasons why the outbreak of geopolitical rivalry is intensifying at this moment in time.

[7] In this regard, Powell (1991)'s formulation has been criticized by proponents of the realist school of international relations for its inability to capture additional reasons beyond issues of military security that states may have concerns over their relative gains (see, for example, Grieco, 1993).

[8] See Bagwell and Staiger (2005) on why these restrictions are relatively benign.

interpreted as a rivalry over "potential power" in the form of economic size and influence (Mearsheimer, 2003; Viner, 1948). If $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$ are interpreted as national social welfare functions, then absent geopolitics each government maximizes its national social welfare with its tariff choice and (5) can be interpreted as a rivalry over "competing ideologies or political systems"(Mearsheimer, 2003; Lynch III and Hoffman, 2020).[9] And if $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$ are interpreted as industry-level government objective functions (e.g., the size of the shipbuilding industry) in a partial equilibrium setting, then absent geopolitics each government makes use of an industry-level tariff to achieve an industrial policy goal and (5) can be given a partial equilibrium interpretation as rivalry over "actual military power"(Mearsheimer, 2003).[10] In this last case for example, prior to the rise of geopolitical rivalry the two governments might each be using tariffs to protect their shipbuilding industry. The rise of geopolitical rivalry according to (5) would then lead the home government to seek not only the expansion of its own shipbuilding industry (raising $W(\tau, \tau^*)$), but also the demise of the shipbuilding industry of its foreign rival (reducing $W^*(\tau^*, \tau)$), with an analogous incentive arising for the foreign government.

In this sense, our modeling of geopolitical rivalry is very general. But this feature also carries with it a potential caveat: whatever the underlying goals governments are using their tariffs to achieve, according to our specification those same goals define the essence of their rivalry. Whether that is sensible in a given situation will depend on the nature of geopolitical rivalry itself, and in particular on whether these goals can be seen as contributing to the strengthening of relative power in the international arena. Our formal analysis is premised on the assumption that this is the case.[11]

[9]For example, the Biden Administration's 2021 Interim National Security Guidance states: "The most effective way for America to out-compete a more assertive and authoritarian China over the long-term is to invest in our people, our economy, and our democracy." (Biden, 2021) Rivalry over competing ideologies or political systems can also be interpreted as rivalry over potential power in the sense of Mearsheimer (2003) if the rivalry represents an attempt to achieve an edge in terms of domestic political support so as to be in a better position to ask for the national sacrifice that would be needed in the event of war. For example, in his October 1 *The Morning* Newsletter for the New York Times on the geopolitical tensions between Iran and Israel, David Leonhardt includes the following quote from Alissa Rubin, a senior Middle East correspondent for The Times: "You cannot win a war in the long run without popular support from your own people." (New York Times, 2024)

[10]More specifically, if we were to adopt a partial equilibrium perspective on the purpose and design of trade agreements as in Bagwell and Staiger (2001b), then the government objectives in (5) could be interpreted as applying to an industry over which rivalry was relevant (e.g., advanced microchips). All industries where rivalry was not present (e.g., basic consumer goods) could then be included in a second and additively separable term representing the nonrivalrous objectives of each government (e.g., the real value of consumer goods that could be afforded by its citizens) which each government cared about only in absolute terms. With this partial equilibrium setting generating tariff choice problems that are separable across industries, it is straightforward to show that the general equilibrium results we report below carry over to a partial equilibrium setting of this kind.

[11]In this regard, Lynch III and Hoffman (2020) (Table 2.2) list five categories of issues over which great-power rivalry is typically thought to occur: political and diplomatic, ideological, informational, military and economic. Of these, they cite rivalry over economic issues as the category most frequently emphasized in the major academic works on great-power competition. Arguably, our modeling of government objectives can be interpreted as capturing aspects of many, though not all, of these categories.

2.3 Nash

We first consider the impact of geopolitical rivalry in a world without trade cooperation. To this end, we solve for Nash tariffs as a function of ρ and ρ^*. These tariffs, which we denote by τ^N and τ^{*N}, are defined by the two first-order conditions

$$\begin{aligned} G_\tau &= W_\tau + \rho \times [W_\tau - W_\tau^*] = 0 \\ G_{\tau^*}^* &= W_{\tau^*}^* + \rho^* \times [W_{\tau^*}^* - W_{\tau^*}] = 0 \end{aligned} \tag{6}$$

where subscripts denote partial derivatives. The top first-order condition in (6) defines the home-government tariff reaction curve $\tau^R(\tau^*)$ while the bottom first-order condition defines the foreign-government tariff reaction curve $\tau^{*R}(\tau)$, with the joint solution defining the Nash tariffs τ^N and τ^{*N}. It is easy to confirm that these reaction curves are uniquely defined given the structure we have placed on $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$. The reaction curves may be either upward sloping or downward sloping (see Dixit, 1987), and we place no restrictions on their slopes other than standard restrictions that ensure that reaction curve "stability" conditions are met.

The first-order conditions in (6) can be rewritten in the equivalent form

$$\begin{aligned} W_\tau &= \frac{\rho}{(1+\rho)} \times W_\tau^* \\ W_{\tau^*}^* &= \frac{\rho^*}{(1+\rho^*)} \times W_{\tau^*}, \end{aligned} \tag{7}$$

which, using $W_\tau^* < 0$ and $W_{\tau^*} < 0$, imply that $\tau^R(\tau^*)$ is increasing in ρ while $\tau^{*R}(\tau)$ is increasing in ρ^*. Intuitively, this reflects the fact that, beginning from the noncooperative Nash tariffs in the absence of rivalry, where each country's tariff is set so that a small further increase in its tariff would leave its own welfare unchanged, rivalry makes a small increase in the tariff attractive for each country because it *hurts the rival*.

Under our imposed reaction-curve stability conditions, this then means that τ^N is increasing in ρ while τ^{*N} is increasing in ρ^*, and if tariff reaction curves are upward sloping it then follows that both Nash tariffs are increasing in both ρ and ρ^*. However, if tariff reaction curves are downward sloping, then τ^N will be decreasing in ρ^* while τ^{*N} will be decreasing in ρ, and it is then possible that a rise in both ρ and ρ^* could increase the Nash tariff of one country while reducing the Nash tariff of the other.

With the rise of geopolitics captured by an increase in ρ and ρ^* above the levels $\rho = 0 = \rho^*$, we may therefore state:

Proposition 1 *The rise of geopolitical rivalry raises the Nash tariff of at least one of the rivals. If tariff reaction curves are upward sloping, the rise of geopolitical rivalry raises the Nash tariffs of both rivals; but if tariff reaction curves are downward sloping, the rise of geopolitical rivalry may raise the Nash tariff of one country while lowering the Nash tariff of its rival.*

2.4 International Efficiency Frontier

Next we characterize the internationally efficient combinations of tariffs, where efficiency is judged in light of the objectives of the governments as defined by (5).

The Absence of Geopolitical Rivalry To serve as a benchmark with which to compare the impacts of rivalry, we begin by reviewing the case of *no rivalry*, which is captured with (5) under the assumption that $\rho = 0$ and $\rho^* = 0$ implying

$$\begin{aligned} G(\tau, \tau^*) &= W(\tau, \tau^*) \\ G^*(\tau^*, \tau) &= W^*(\tau^*, \tau). \end{aligned} \tag{8}$$

For this case, a pair of internationally efficiency tariffs τ^E and τ^{*E} must solve the following program:

$$\begin{aligned} &\max_{\tau, \tau^*} \quad W(\tau, \tau^*) \\ &s.t. \\ &W^*(\tau^*, \tau) \geq W^{*E} \end{aligned} \tag{9}$$

where W^{*E} is a fixed and feasible level of W^*. The international efficiency frontier is characterized by the locus of tariff pairs that solve (9) for all feasible levels of W^{*E}. The portion of that locus describing internationally efficient tariff pairs that would deliver at least the Nash level of welfare to each government can then be characterized by solving (9) for all values of W^{*E} between the Nash level $W^*(\tau^{*N}, \tau^N)$ and the level of of W^{*E} that would yield τ^E and τ^{*E} satisfying $W(\tau^E, \tau^{*E}) = W(\tau^N, \tau^{*N})$.

The Lagrangian associated with (9) is given by

$$\mathcal{L} = W(\tau, \tau^*) + \lambda[W^*(\tau^*, \tau) - W^{*E}]$$

where λ is the Lagrange multiplier. The first-order necessary conditions for the solution to (9) are given by

$$\begin{aligned} W_\tau + \lambda W^*_\tau &= 0 \Longrightarrow \lambda = \frac{-W_\tau}{W^*_\tau} \\ W_{\tau^*} + \lambda W^*_{\tau^*} &= 0 \Longrightarrow \lambda = \frac{-W_{\tau^*}}{W^*_{\tau^*}}. \end{aligned}$$

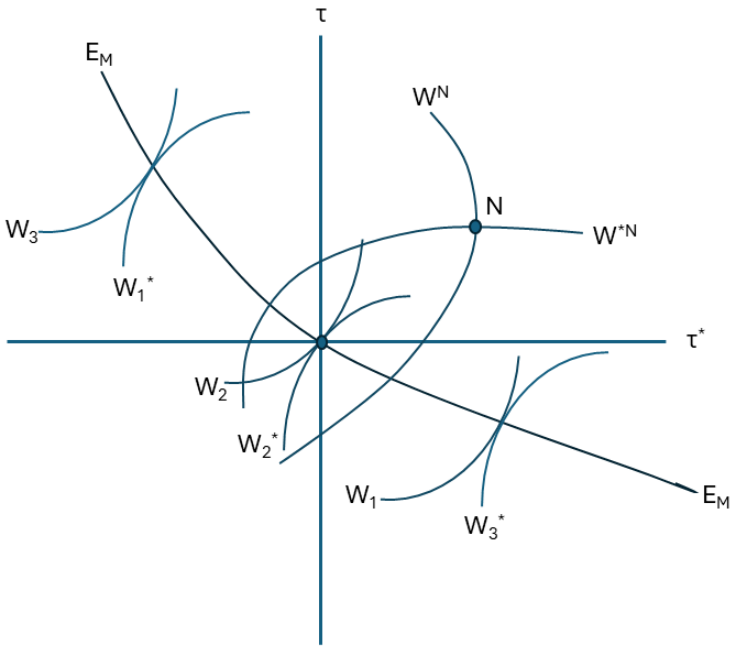
Equating the two expressions for λ implied by the two first-order conditions yields the characterization of internationally efficient tariffs

$$\frac{-W_{\tau^*}}{W_\tau} = \frac{-W^*_{\tau^*}}{W^*_\tau}. \tag{10}$$

The left-hand side of (10) is the slope of a home-government indifference curve in a graph with τ on the vertical axis and τ^* on the horizontal axis, while the right-hand side of (10) is the slope of a foreign-government indifference curve in the same graph. The condition in (10) states the familiar requirement that, when evaluated at any pair of internationally efficient tariffs, these slopes must be the same so that the home-government and foreign-government indifference curves passing through this point are tangent.

Interpreting W and W^* as real national income for the home and foreign country, respectively, we can be more explicit about the conditions that internationally efficient tariffs must

Figure 1: Internationally Efficient Tariffs in the Absence of Geopolitics



satisfy, by appealing to the results of Mayer (1981). Mayer showed that in this case the locus of internationally efficient tariffs is defined as

$$(1+\tau) \times (1+\tau^*) = 1 \tag{11}$$

and thereby consists of tariff combinations that equate the home-country relative price p with the foreign-country relative price p^*.[12]

Figure 1 depicts the locus of internationally efficient tariffs in the absence of rivalry under the interpretation that W and W^* are the real national income levels for the home and foreign country, respectively. This locus is labeled $E_M - E_M$, because it reflects the particular position of the efficiency locus that, as Mayer (1981) showed, arises when both countries are national-income maximizers. As noted, with τ on the vertical axis and τ^* on the horizontal axis, the efficient tariffs correspond to the locus of tangencies between a home-government and a foreign-government indifference curve (the indifference curves in Figure 1 have the curvature properties depicted as a result of the minimal structure we have placed on W and W^*). And as the Mayer locus in (11) implies, the efficiency locus passes through the reciprocal free trade point ($\tau = 0, \tau^* = 0$) but also includes combinations of an import tariff in one country ($\tau > 0$ or $\tau^* > 0$) combined with an import subsidy in the other country ($\tau^* < 0$ or $\tau < 0$). These different combinations of import tariffs and import subsidies maintain the equality of local prices across the two countries, while shifting tariff revenue between the two countries, with the country imposing an import tariff receiving a transfer of tariff revenue from the country imposing the import subsidy.

[12]That the tariff combinations in (11) equate p and p^* can be seen by observing that by the arbitrage conditions $p = (1+\tau)p^w$ and $p^* = p^w/(1+\tau^*)$ we must have $\frac{p}{p^*} = (1+\tau) \times (1+\tau^*)$.

Figure 1 also depicts the Nash combination of tariffs in the absence of rivalry, labeled as N in the figure. By the Nash first-order conditions in (6) evaluated at $\rho = 0$ and $\rho^* = 0$, the home-country indifference curve must be vertical as it passes through the Nash point in Figure 1, while the foreign-country indifference curve must be horizontal as it passes through the Nash point. As Figure 1 depicts, given our curvature assumptions, the Nash point must lie to the northeast of the locus of internationally efficient tariffs, with the downward lens created by the two indifference curves passing through the Nash point then indicating the possibility of mutually beneficial reciprocal tariff liberalization beginning from Nash tariffs. The portion of the efficiency locus that lies inside this lens is then the set of internationally efficient tariffs that would yield mutual benefits to each government over its Nash payoff in the absence of rivalry. As depicted, the reciprocal free trade point lies inside this lens, but that need not be the case if countries are sufficiently asymmetric (see, for example, Kennan and Riezman, 1988).

Finally, while our default interpretation of the W and W^* functions is that they represent real national income for the home and foreign country, respectively, it is worth noting that, with the exception of one difference, everything depicted in Figure 1 would also apply if we were to interpret these functions as do Bagwell and Staiger (1999), namely as $W(\tau, \tau^*) \equiv W(p(\tau, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))$ with $W_{p^w} < 0$ but where W_p is unrestricted and $W^*(\tau^*, \tau) \equiv W^*(p^*(\tau^*, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))$ with $W^*_{p^w} > 0$ but where $W^*_{p^*}$ is unrestricted. As we have noted above, because government objective functions of this form do not place restrictions on how each government feels about changes in its local relative price, such objective functions are consistent with a wide range of industrial policy goals and general distributional goals as well as political preferences. With these government objective functions, the efficiency locus depicted in Figure 1 need not pass through the reciprocal free trade point ($\tau = 0, \tau^* = 0$) as the Mayer locus does when governments are assumed to maximize real national income with their tariff choices. But beyond that difference, Figure 1 would look qualitatively identical under these more general interpretations of the government objective functions W and W^*.

Geopolitical Rivalry We now allow for the presence of geopolitical rivalry, where $\rho > 0$ and $\rho^* > 0$ and government objectives are given by (5), which for convenience we reproduce here:

$$\begin{aligned} G(\tau, \tau^*) &= W(\tau, \tau^*) + \rho \times [W(\tau, \tau^*) - W^*(\tau^*, \tau)] \\ G^*(\tau^*, \tau) &= W^*(\tau^*, \tau) + \rho^* \times [W^*(\tau^*, \tau) - W(\tau, \tau^*)]. \end{aligned}$$

For this case, a pair of internationally efficiency tariffs τ^E and τ^{*E} must solve the following program:

$$\begin{aligned} \max_{\tau, \tau^*} \quad & W(\tau, \tau^*) + \rho \times [W(\tau, \tau^*) - W^*(\tau^*, \tau)] \qquad (12) \\ & s.t. \\ & W^*(\tau^*, \tau) + \rho^* \times [W^*(\tau^*, \tau) - W(\tau, \tau^*)] \geq G^{*E} \end{aligned}$$

where G^{*E} is a fixed and feasible level of G^*. Similar to the case with no geopolitical rivarly, here the portion of the international efficiency frontier that would deliver at least the Nash level of welfare to each government can then be characterized by solving (12) for all values

of G^{*E} between the Nash level $G^*(\tau^{*N}, \tau^N)$ and the level of G^{*E} that would yield τ^E and τ^{*E} satisfying $G(\tau^E, \tau^{*E}) = G(\tau^N, \tau^{*N})$.

The Lagrangian associated with (12) is given by

$$\mathcal{L} = W(\tau, \tau^*) + \rho \times [W(\tau, \tau^*) - W^*(\tau^*, \tau)] + \lambda \left\{ W^*(\tau^*, \tau) + \rho^* \times [W^*(\tau^*, \tau) - W(\tau, \tau^*)] - G^{*E} \right\}$$

where λ is again the Lagrange multiplier. The first-order necessary conditions for the solution to (12) are given by

$$\begin{aligned} (1+\rho)W_\tau - \rho W^*_\tau + \lambda[(1+\rho^*)W^*_\tau - \rho^* W_\tau] &= 0 \\ (1+\rho)W_{\tau^*} - \rho W^*_{\tau^*} + \lambda[(1+\rho^*)W^*_{\tau^*} - \rho^* W_{\tau^*}] &= 0. \end{aligned}$$

Equating the two expressions for λ implied by these two first-order conditions yields

$$\frac{-[(1+\rho)W_\tau - \rho W^*_\tau]}{(1+\rho^*)W^*_\tau - \rho^* W_\tau} = \frac{-[(1+\rho)W_{\tau^*} - \rho W^*_{\tau^*}]}{(1+\rho^*)W^*_{\tau^*} - \rho^* W_{\tau^*}}$$

which simplifies to

$$\frac{-W_{\tau^*}}{W_\tau} = \frac{-W^*_{\tau^*}}{W^*_\tau},$$

the exact same characterization of internationally efficient tariffs as in (10).

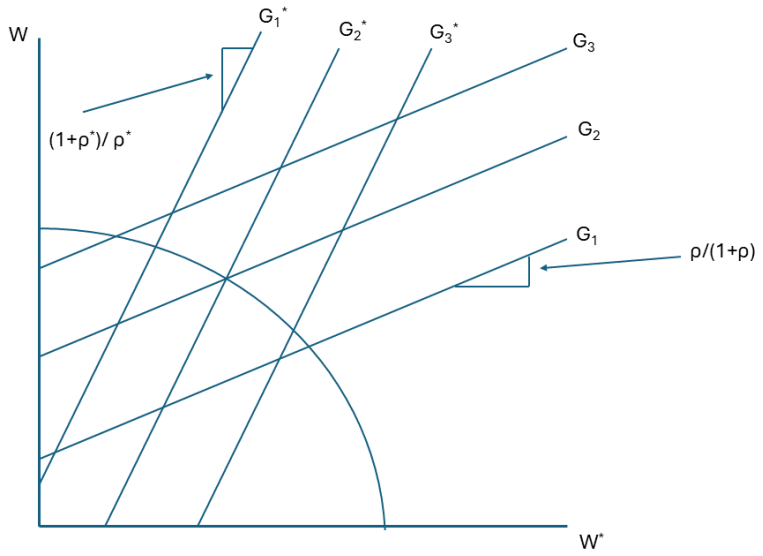
Again interpreting an increase in ρ and ρ^* above the levels $\rho = 0 = \rho^*$ as a rise in geopolitical rivalry, we may therefore state:

Proposition 2 *The rise of geopolitical rivalry leaves the set of internationally efficient tariff pairs unchanged.*

The implication of Proposition 2 is striking. It says that if governments have negotiated to an internationally efficient pair of tariffs in the absence of geopolitical rivalry, the rise of geopolitics necessitates *no new tariff negotiation in order to remain on the international efficiency frontier*. Intuitively, this reflects the fact that as long as each government continues to value increases in its own underlying objectives more than it values diminishing the ability of the other government to achieve its underlying objectives, efficiency in these underlying objectives is necessary (and sufficient) for the two governments to achieve efficiency in the presence of their rivalry.

Figure 2 provides some further intuition. With W on the vertical axis and W^* on the horizontal axis, Figure 2 plots the combinations of W and W^* that are implied by the efficient pairs of tariffs in the absence of geopolitical rivalry, namely, those tariff pairs that satisfy (10). We plot these combinations as tracing out a concave frontier in Figure 2 (as would be the case if the W and W^* functions exhibit diminishing marginal utility), and this frontier gives the outer boundary of the feasible combinations of W and W^*. Also depicted in Figure 2 is a family of iso-G lines, each with slope $\frac{\rho}{1+\rho}$ and with $G_1 < G_2 < G_3$, and a family of iso-G^* lines, each with slope $\frac{1+\rho^*}{\rho^*}$ and with $G^*_1 < G^*_2 < G^*_3$. Clearly the iso-G lines must be flatter than the iso-G^* lines, as Figure 2 depicts. But it is now immediate from Figure 2 that, for any level of G^*, the maximum attainable level of G (corresponding to the highest attainable iso-G line) – and hence the level of G that solves (12) – will correspond to a point on the frontier of W and W^* combinations that are implied by the efficient sets of tariffs that satisfy (10). And by varying the level of G^*, the entire frontier can be traced out.

Figure 2: The International Efficiency Frontier



2.5 A Role for Trade Policy Cooperation

With our characterizations of Nash and efficient tariffs in hand, we can now ask a basic question: Is there any role for cooperation over trade policy between geopolitical rivals? The answer is yes if and only if, when $\rho > 0$ and $\rho^* > 0$, the noncooperative Nash tariff choices characterized by (7) do not rest on the efficiency frontier characterized by (10). Plugging the Nash expressions for W_τ and $W^*_{\tau^*}$ given by (7) into the conditions for efficient tariffs given by (10) implies that Nash tariffs are efficient if and only if

$$\frac{-W_{\tau^*}}{\frac{\rho}{(1+\rho)}W^*_\tau} = \frac{-\frac{\rho^*}{(1+\rho^*)}W_{\tau^*}}{W^*_\tau} \iff \frac{(1+\rho)}{\rho} = \frac{\rho^*}{(1+\rho^*)} \iff \rho \to \infty \text{ and } \rho^* \to \infty. \tag{13}$$

We may conclude from (13) that Nash tariffs are inefficient as judged by the governments' objectives, and therefore that a role for cooperation over trade policy continues to exist for geopolitical rivals, except in the limiting case where $\rho \to \infty$ and $\rho^* \to \infty$.

To interpret this limiting case, note that we can represent the government objectives in (5) in the limit as $\rho \to \infty$ and $\rho^* \to \infty$ by the functions

$$\begin{aligned} \Gamma(\tau, \tau^*) &= W(\tau, \tau^*) - W^*(\tau^*, \tau) \\ \Gamma^*(\tau^*, \tau) &= W^*(\tau^*, \tau) - W(\tau, \tau^*), \end{aligned} \tag{14}$$

where Γ is a monotonic transformation of G with $\Gamma \equiv \frac{G}{\rho}$ and Γ^* is a monotonic transformation of G^* with $\Gamma^* \equiv \frac{G^*}{\rho^*}$. According to (14), in this limiting case each government cares only about dominating its rival, and cares nothing about achieving its underlying objectives for their own sake. And with each rival's objective then diametrically opposed to the other, *any* pair of tariffs will be efficient, including the Nash tariffs.[13]

[13] This can also be seen in terms of Figure 2, where in the limiting case the slopes of the iso-G and iso-G^* lines converge to 1 and these lines would lie on top of each other.

We may therefore state:

Proposition 3 *A role for trade policy cooperation persists in the presence of geopolitical rivalry unless domination becomes the sole objective of each rival.*

According to Proposition 3, it is indeed the case that the rise of geopolitics could preclude the possibility of trade cooperation between the rivals. But what is most notable about this case is the extreme assumption about the nature of geopolitical rivalry that is required to generate it. And unless one is willing to take this extreme position, Proposition 3 implies that the rise of geopolitical rivalry leaves the case for cooperation over trade policy intact.[14] Intuitively, as long as the rival governments' objective functions exhibit "enlightened self-interest" – i.e. as long as governments care more about promoting their own national objectives, however defined, than they do about frustrating the objectives of their rival – there is a continuing case for trade cooperation under geopolitical rivalry, as governments continue to value the gains that such cooperation delivers.

Of course, our focus in Proposition 3 on the possible role for trade policy cooperation in the presence of geopolitical rivalry does not weigh in on the potential implications of rivalry for *achieving* cooperative outcomes. This is a question we turn to in the next section.

3 Implications for Trade Cooperation and Negotiations

Having established in Proposition 3 that trade policy cooperation is possible in all but the most extreme situations of geopolitical rivalry, we now turn to a second question: Can tariff negotiations as traditionally conceived succeed in allowing countries to maintain cooperative trade relations when geopolitical rivalry erupts or intensifies *after countries have already bargained to the international efficiency frontier*? We argue here that the answer is likely to be no, because the rise of geopolitical rivalry will require that governments find a way to make tariff adjustments that can move them *along* the efficiency frontier, not from a position off the efficiency frontier *toward* the frontier; and as we will argue, traditional negotiations driven by reciprocal tariff concessions that generate mutual benefits for the negotiating parties are not well-suited to facilitate such tariff adjustments in an efficient manner.[15]

We develop this argument below maintaining our focus on great-power rivalry as defined by a quest for dominance, as emphasized by the realist school of the international relations literature. We then pause to consider the robustness of our basic conclusions along an important dimension, namely, to a broader understanding of geopolitics that includes government concerns about dependence in addition to concerns over dominance.

[14]Proposition 3 is related to a result reported by Snidal (1991), who among other things analyzes how the payoffs from cooperation and defection in a prisoner's dilemma problem are impacted when governments place increasing weight on relative as opposed to absolute payoffs. However, Snidal's focus when analyzing the prisoner's dilemma setting is on how an emphasis on relative gains impacts enforcement issues in a cooperative agreement, which is not our focus here.

[15]In this sense, our conclusions echo those of the realist school of international relations that geopolitical rivalry makes international cooperation harder. But we focus on the challenges rivalry creates for the institutional features of the rules-based multilateral trading system, while the focus of the international relations literature in this regard is on the narrowing of possible bargaining outcomes and the enforcement problems that rivalry can induce (see, for example, Grieco, 1993; Powell, 1993; and Snidal, 1993).

3.1 Dominance

To see that the rise of geopolitical rivalry will require that governments move along the international efficiency frontier — and hence, beginning from the status quo cooperative tariffs that prevailed before the rivalry erupted, require tariff adjustments that are not pareto preferred — it is helpful to consider what Propositions 1 and 2 imply about how the rise of geopolitics would impact the outcome of efficient tariff bargaining as characterized by the Nash Bargaining Solution.

By Proposition 1 we know that Nash tariffs will be altered by geopolitical rivalry, and by Proposition 2 we know that the original status quo cooperative tariff pair will continue to be efficient after the rivalry has erupted, as will every other tariff pair on the original efficiency frontier defined by (12). This latter property allows us to recast the Nash Bargaining Problem in terms of choices over W and W^*, regardless of the values of ρ and ρ^*.

To this end, we define $\hat{G}(W, W^*) \equiv W + \rho \times [W - W^*]$ and $\hat{G}^*(W^*, W) \equiv W^* + \rho^* \times [W^* - W]$, and we define $W^N \equiv W(\tau^N, \tau^{*N})$ and $W^{*N} \equiv W^*(\tau^{*N}, \tau^N)$. We can then express the Nash Bargaining problem as

$$\max_{W, W^*} \quad \left[\hat{G}(W, W^*) - \hat{G}(W^N, W^{*N})\right] \times \left[\hat{G}^*(W^*, W) - \hat{G}^*(W^{*N}, W^N)\right] \tag{15}$$
$$s.t.$$
$$W = W^E(W^*)$$

where $W^E(W^*)$ is the mapping from W^* to W described by the efficiency frontier characterized by the solution to (12), and where the mapping from the efficient levels of W and W^* to the efficient tariffs that implement them is given by (10). Plugging the constraint from (15) into the Nash Bargaining product and manipulating the first order necessary condition for maximization of that product yields the following characterization of the Nash Bargaining Solution in the presence of geopolitical rivalry:

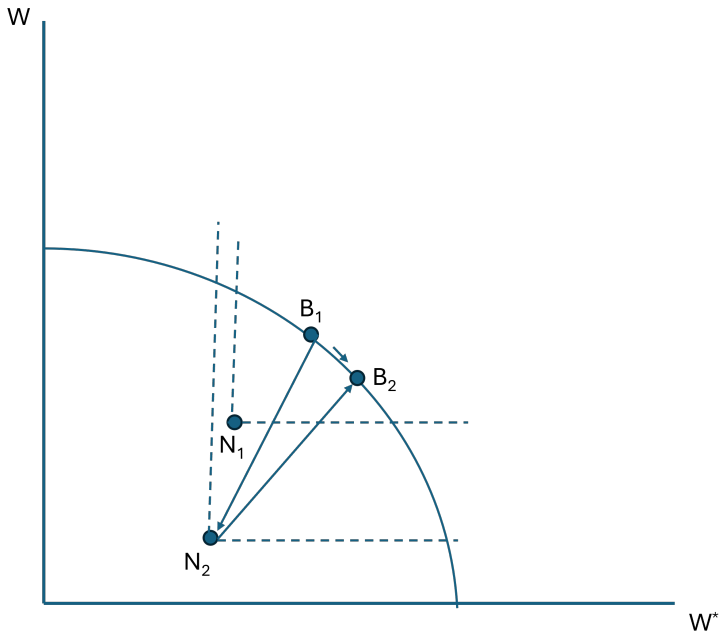
$$\frac{\partial W^E}{\partial W^*} = -\left[\frac{\left(W - W^N\right)}{\left(W^* - W^{*N}\right)}\right] \times \left[\frac{1 - \Theta \times \left[\frac{\left(W^* - W^{*N}\right)}{\left(W - W^N\right)}\right]}{1 - \Theta^* \times \left[\frac{\left(W - W^N\right)}{\left(W^* - W^{*N}\right)}\right]},\right] \tag{16}$$

where

$$\Theta \equiv \frac{2\rho(1+\rho^*)}{(1+\rho^*)(1+\rho) + \rho\rho^*}; \quad \Theta^* \equiv \frac{2\rho^*(1+\rho)}{(1+\rho^*)(1+\rho) + \rho\rho^*}.$$

The characterization of the Nash Bargaining Solution in (16) is easy to interpret. Suppose first that $\rho = 0 = \rho^*$ so that there is no rivalry. In that case, $\Theta = 0 = \Theta^*$ and (16) collapses to the condition that the (negative of the) ratio of the home- to foreign- bargaining surplus $-\left[\frac{\left(W - W^N\right)}{\left(W^* - W^{*N}\right)}\right]$ must be equal to the slope of the efficiency frontier $(\frac{\partial W^E}{\partial W^*})$. In the case of transferable utility the slope of the efficiency frontier would be equal to -1, implying the familiar result that the Nash Bargaining solution splits the bargaining surplus evenly between the two parties; more generally, when the efficiency frontier is concave as we have depicted it in our figures, the Nash Bargaining solution would deviate from an even split of the surplus depending on the slope and curvature properties of the efficiency frontier.

Figure 3: Responding to the Rise of Geopolitics



Now consider how the Nash Bargaining Solution responds to the rise of geopolitical rivalry. One possibility of interest is the case of symmetric rivalry where $\rho = \rho^* > 0$. In this case, we have $\Theta = \Theta^* > 0$, and it therefore follows that (16) will continue to be satisfied by setting $-\left[\frac{(W-W^N)}{(W^*-W^{*N})}\right]$ equal to $\frac{\partial W^E}{\partial W^*}$ if and only if utility is transferable so that $\frac{\partial W^E}{\partial W^*} = -1$. If utility is transferable and if in addition the two countries are more broadly symmetric in the specific sense that W^N and W^{*N} change proportionately with the eruption of their (symmetric) rivalry, then the Nash Bargaining Solution is left completely unaffected by this rivalry and the cooperative tariffs are unchanged. But unless these additional conditions are met, then even when the strength of the geopolitical rivalry is symmetric across the two countries and $\rho = \rho^* > 0$, the Nash Bargaining Solution will identify a new point on the efficiency frontier when the rivalry erupts, and a movement along the efficiency frontier from the original status quo cooperative point to the new cooperative point will be required.

The other possibility to consider is where the rivalry is asymmetric, as when $\rho^* > \rho > 0$ so that the foreign government gives greater weight to the rivalry between the two governments than does the domestic government. In this case, it follows that $\Theta^* > \Theta > 0$, and (16) implies that this gives a boost to the share of the bargaining surplus that the foreign government will receive in the Nash Bargaining Solution relative to its share when the rivalry is symmetric. Again in this case, the Nash Bargaining Solution will identify a new point on the efficiency frontier when the rivalry erupts, though relative to the symmetric rivalry case this new point will tend to favor the foreign government (or more generally, the government that puts more weight on the rivalry).

As these possibilities illustrate, it is only in knife-edge cases that one would *not* expect the rise of geopolitical rivalry to require that governments find a way to move along the

efficiency frontier in order to maintain trade cooperation. Figure 3 depicts how the change in the disagreement points of the governments would impact the Nash tariff bargain. The point labeled N_1 is the Nash equilibrium and the point labeled B_1 the cooperative equilibrium before geopolitical rivalry is present; N_2 and B_2 are respectively the Nash and cooperative equilibrium that would arise once geopolitical rivalry has erupted. In the case depicted by Figure 3, the rivalry has moved the Nash threat point in favor of the foreign government. Importantly, note that in contrast to negotiations that would move countries from their non-cooperative tariff choices to cooperative tariff choices that achieve a point on the international efficiency frontier, the adjustment from B_1 to B_2 along the efficiency frontier that the rise of geopolitical rivalry would necessitate is a non-pareto improving adjustment of the existing cooperative agreement (in the case illustrated, raising G^* while lowering G).[16]

We summarize with:

Proposition 4 *With the rise of geopolitical rivalry, the status quo (pre-rivalry) cooperative tariff pair will continue to be efficient, as will every other tariff pair on the original efficiency frontier, but generically the status quo will no longer be the outcome of efficient (Nash) tariff bargaining. Therefore, to maintain cooperation, governments must find a way to move along the international efficiency frontier and implement tariff changes that are not pareto preferred relative to the status quo.*

At a broad level, Figure 3 suggests two alternative paths that might be taken from the existing efficient bargaining outcome to the new efficient geopolitical bargaining outcome.[17] As we detail further below, in a first path of "(trade) war and redemption," geopolitics initially leads to an unraveling of liberal trade policies and reversion to the new Nash equilibrium (from B_1 to N_2) where welfare is lower for both economies. But starting from the new Nash equilibrium under geopolitical rivalry, governments may then conduct classical trade negotiations involving reciprocal tariff concessions that deliver mutual benefits until the new efficient bargaining outcome (B_2) is reached. Alternatively, countries could avoid the policy disruption and loss of welfare implied by this first path, and instead directly negotiate a transition to the new bargaining outcome on the efficiency locus (from B_1 to B_2).

Clearly, the second path would be preferred to the first path by both governments if they can find a way to implement it.[18] Since this second path would move countries along

[16] While not pictured in Figure 3, we can imagine the family of iso-G lines and the family of (steeper) iso-G^* lines that become relevant once the rivalry has erupted, just as these lines are pictured in Figure 2. There is an iso-G line and an iso-G^* line passing through the status-quo-tariff point B_1 in Figure 3, reflecting the respective payoffs that the home and foreign governments would experience in light of their rivalry if they maintained the status quo cooperative tariffs. And similarly, there is an iso-G line corresponding to a lower value of G and an iso-G^* line corresponding to a higher value of G^* passing through the point B_2, reflecting the respective payoffs that the two governments experience under the tariffs that would be delivered in the presence of this rivalry by the Nash Bargaining solution.

[17] In section 5 we will be more specific about how tariff renegotiations traditionally occur in the GATT/WTO.

[18] In making this comparison, we are leveraging the complete information assumption of our formal analysis. But our findings suggest that rivals would have an incentive to overstate the weight placed on rivalry if these weights were not common knowledge, in order to adopt a "tough" stance in the Nash bargain with their rival. In this light, a difference between the first and the second path that our formal analysis does not capture is that, in the first path where reciprocity (and nondiscrimination) are maintained, these kinds of strategic considerations would in principle not arise (see Bagwell and Staiger, 2018).

the international efficiency frontier, it involves efficient transfers of surplus from (in this case) the home country to the foreign country; and if explicit transfers are not feasible, implicit transfers could be implemented via changes in tariffs, with the surplus-granting country lowering its tariffs and the surplus receiving country raising its tariffs. But at a fundamental level, such tariff changes would go against the essence of the "reciprocal and mutually advantageous" tariff reductions that GATT's Preamble describes, both because the required tariff changes are not reciprocal (one country is cutting its tariffs while the other country is raising its tariffs) and because the outcome of these tariff changes is not mutually advantageous (one country gains relative to the status quo while the other loses).[19]

Below we will argue that the changes in tariffs required to navigate this second path would create significant challenges for the world trading system in its present form. But before doing so, we first pause to consider how our basic conclusions would be impacted by the issue of national-security-related dependence concerns, and we then consider the possibility of bilateral rivalry in a multilateral world.

3.2 Dependence

As discussed in the Introduction, according to the international relations literature (e.g., Mearsheimer, 2003) a hallmark of great-power rivalry is the quest for dominance, where relative power considerations are paramount. To capture this, we have modeled the rise of great-power rivalry as reflecting a change in government preferences, whereby governments have new concerns about the *relative* success with which they achieve their underlying objectives, not just their absolute success.

But geopolitics is multifaceted. An issue often associated with geopolitical concerns, in addition to dominance, relates to national-security-related dependence concerns. Are our basic conclusions robust to the presence of these additional concerns? We now argue that they are.

To establish this, we first note that when it comes to geopolitics and dependence, some subtle issues are introduced. For one thing, the rise of geopolitics does not itself *introduce* dependence concerns where otherwise none would exist. Even governments that are not

[19]For simplicity, we have maintained our focus on the implications of geopolitical rivalry for the outcomes of efficient "power-based" tariff bargaining as characterized by the Nash Bargaining Solution. Bagwell and Staiger (2016) have argued that the design features of the GATT/WTO may lead governments toward a "rules-based" bargaining outcome that Bagwell and Staiger refer to as the "political optimum." As they note, while corresponding to a point on the efficiency frontier, the political optimum itself is not influenced by threats and the possibility of disagreement. And they argue that GATT's reciprocity rule creates a "reciprocity-constrained" bargaining frontier that corresponds to the efficiency frontier at the political optimum but lies inside the efficiency frontier everywhere else. Bargaining on this frontier then has the effect of penalizing governments who attempt to move the bargaining outcome away from the political optimum, and in this way it delivers a rules-based outcome that is closer to the political optimum than would be a power-based Nash bargain. We will show (Proposition 9) that the rise of geopolitical rivalry would leave the position of the political optimum unchanged and that the political optimum would continue to reside on the (unchanged) efficiency frontier. And it is easy to show that the rise of geopolitical rivalry would cause an inward shift of the reciprocity-constrained bargaining frontier at all points other than the political optimum. This implies that, as with the power-based bargains that we have analyzed, moving to the new rules-based bargaining outcome in the presence of geopolitical rivalry would require non-pareto-improving tariff adjustments relative to the status quo.

involved in great-power rivalry typically have concerns about over-dependence on trading partners (hostile or otherwise) regarding certain critical sectors that, in the event of supply cutoff, could hobble a country's ability to defend or feed or immunize itself.[20] It is therefore relevant to recall that, because our modeling of the underlying objectives of governments does not place restrictions on how each government feels about changes in its own local relative price, these objective functions are consistent with a wide range of industrial policy goals where governments intervene to favor a certain sector, and this would include the goal of reducing dependence on one's trading partners by stimulating local production in strategic sectors. So our model already allows for dependence concerns of this kind.

Still, the rise of geopolitics might also *alter existing concerns about dependence* along either of two dimensions. A first dimension is along the extensive margin: the rise of geopolitics may extend a country's dependence concerns to include not only its existing concerns about over-dependence on its trading partners but now also a new desire to *induce a rival to be more dependent on it*. While not our focus, in at least one important case this, too, is captured by our modeling of geopolitics. Suppose, for example, that the foreign government is concerned about over-dependence on the home country because of the greater leverage that the home-country government would have on the foreign country in case of future conflict. This concern would be captured in our model by the underlying objectives of the foreign government as represented by W^*, and in particular by the foreign government's implied preferences over its own local relative price p^*. And suppose further that the rise of geopolitics leads the home government to now desire to induce the foreign country to be more dependent on it for precisely this reason. Our modeling of geopolitical rivalry in (5) would capture this situation, as reflected in the diametrically opposed home-country and foreign-country concerns over the foreign local relative price p^* that would be implied by the relative power term in the home-country geopolitical objective G.[21]

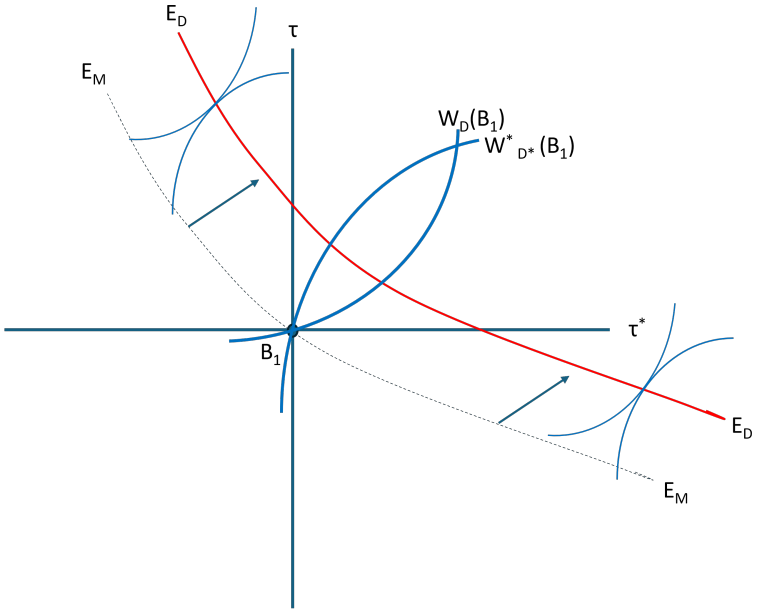
Nevertheless, there is also a second possible dimension along which the rise of great power rivalry could alter national-security-related dependence concerns, and this dimension runs along the intensive margin: in particular, concerns about limiting own-dependence could themselves be *heightened* by the rise of great-power rivalry, giving rise to a *shift in the underlying objectives of each government* with respect to its preferred own local relative price. Our analysis thus far has ruled out this possibility. We now consider how this second dimension would impact our findings above.

To this end, we suppose that the rise of geopolitical rivalry now introduces *two* shocks to the preferences of the home and foreign governments. First, and different from our analysis above, we assume that rivalry creates a desire in each government to be less dependent on imports from its rival, as measured by the ratio of the country's import volume relative to its production of the import-competing good. In our model, this new desire would translate into a shift in the underlying objectives of the home government toward a preference for a

[20] Dependence on a rival is obviously risky for a country, but even dependence on allies could be risky in times of natural disaster or global pandemics, or if the country's adversaries could attack shipping lanes and blow up pipe lines between the country and its allies.

[21] That said, our modeling of geopolitical rivalry cannot account for all circumstances in which this first dimension could be important. For example, our modeling approach cannot capture the possibility that one country wished to induce its rival to be more dependent on it while its rival was simply not concerned with its dependence on the first country.

Figure 4: New Concerns Over Dependence

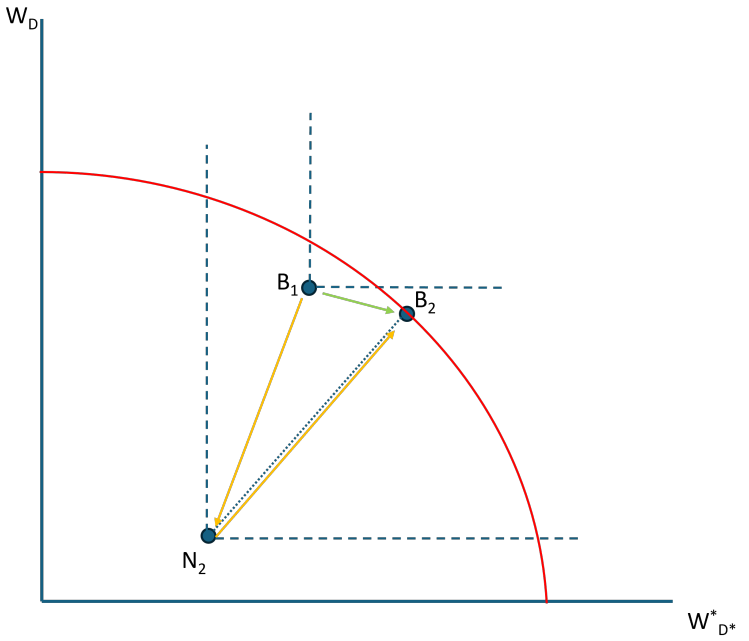


higher home tariff τ and higher local relative price p in the home country, and a shift in the underlying objectives of the foreign government toward a preference for a higher foreign tariff τ^* and a lower local relative price p^* in the foreign country. And second, we assume that the rise of geopolitical rivalry also translates into a quest for dominance over one's rival as gauged by the relative success in achieving one's underlying objectives, just as we have modeled great-power rivalry above.

We assume for purposes of illustration that the pre-rivalry objectives of the two governments are defined as their real national income, so that the pre-rivalry set of internationally efficient tariffs is given by the Mayer locus as illustrated in Figure 1. And we assume further that, prior to the onset of their rivalry, the two governments had previously negotiated to a point on the Mayer locus, which for illustrative purposes we take to be the point of reciprocal free trade. Denoting by $W_D(\tau, \tau^*)$ and $W^*_{D^*}(\tau^*, \tau)$ the new underlying home- and foreign-government objectives respectively that reflect their heightened concern for dependence once rivalry erupts, Figure 4 labels the status quo reciprocal free trade point as B_1 and depicts the upward shift of the efficiency locus in tariff space – from the Mayer locus labeled $E_M - E_M$ to the new efficiency locus labeled $E_D - E_D$ – implied by the points of tangency of the indifference curves associated with these new underlying objectives. As Figure 4 illustrates, the status quo tariffs at B_1 are no long efficient when judged by the underlying objectives of the two governments once their rivalry erupts and these underlying objectives reflect the heightened concern that each government has about dependence on its rival. But given these new underlying objectives, we know from Proposition 2 that the quest for dominance that the rivalry also engenders does not itself alter the set of efficient tariffs from those depicted by $E_D - E_D$.

This underpins the features illustrated in Figure 5, which translates the information from Figure 4 into welfare space with welfare defined by W_D and $W^*_{D^*}$, that is, with reference to the

Figure 5: Responding to the Rise of Geopolitics and Concerns Over Dependence



underlying objectives of the two governments once their rivalry erupts and each government has heightened concern about dependence on its rival. With W_D on the vertical axis and $W^*_{D^*}$ on the horizontal axis, the efficiency frontier in Figure 5 (depicted as concave) depicts the combinations of W_D and $W^*_{D^*}$ that are implied by the tariff combinations resting on the efficiency locus $E_D - E_D$ in Figure 4. Consistent with Figure 4, the status quo point labeled B_1 now lies inside the efficiency frontier in Figure 5, in contrast to the result depicted in Figure 3 where geopolitical rivalry does not give rise to new national-security-related dependence concerns and where the status quo continues to rest on the efficiency frontier after geopolitical rivalry erupts. But this is the only difference between Figures 3 and 5.

Therefore, as Figure 5 illustrates, under this broader understanding of geopolitical rivalry there are again two alternative paths that might be taken from the status quo tariffs associated with the point B_1 in Figure 5 to the new efficient bargaining outcome in the presence of rivalry labeled as B_2. In particular, the path of "(trade) war and redemption" in Figure 5 – from B_1 to N_2 and then from N_2 to B_2 – is qualitatively identical to that in Figure 3, and it shares the same risks. The direct path from B_1 to B_2 in Figure 5 no longer describes a movement along the efficiency frontier as it did in Figure 3. But as illustrated, the essential feature of the direct path in Figure 3 – that it represents tariff changes from the status quo that are neither reciprocal nor mutually beneficial to the two governments – will be preserved in Figure 5 as long as the status quo point B_1 does not lie too far inside the efficiency frontier, which is to say as long as the dependence effect associated with the rise of geopolitical rivalry is not so large as to swamp the dominance effect.

The upshot is that the basic conclusion drawn from Figure 3, where geopolitics is assumed to be about a quest for dominance alone, will apply as well when the understanding of geopolitics is broadened to include heightened government concerns about dependence in

addition to concerns over dominance, provided that the dependence effect is not so large as to swamp the dominance effect.[22]

4 Bilateral Rivalry in a Multilateral World

We next consider the implications for our results when only a subset of countries are engaged in geopolitical rivalry, while others remain neutral. We show that the results of Propositions 1 and 2 apply without qualification in this extended setting. This is true both when countries use policy to discriminate between trading partners and also when their tariffs are constrained to comply with the nondiscrimination principle, i.e not be higher for any trade partner than that imposed on any other partner. We also show that the results of Proposition 3 extend to this setting, and we highlight the new implications of those results in a multilateral world.

To accomplish this, we return to our focus on a quest for dominance as the defining feature of great-power rivalry and extend the two-country model above to a three-country setting, the minimal setting within which these issues can be explored. In particular, we assume that the home country now trades with two foreign countries, whose variables we label with the superscripts *1 and *2. We maintain all of the other features of our two-good general equilibrium model from section 2, so that the home country imports good x from foreign countries *1 and *2 and exports good y to each of these foreign countries. We assume that the two foreign countries do not trade with each other, and as before we focus on nonprohibitive tariffs.[23] Our three-country setting is therefore analogous to that considered by Bagwell and Staiger (2005), and we will build on their analysis in what follows.

The main novelty of the three-country setting relative to the two-country model of section 2 arises if the home country sets discriminatory tariffs against the imports from its two foreign trading partners, τ^1 against imports from foreign country *1 and τ^2 against imports from foreign country *2 with $\tau^1 \neq \tau^2$. In this case, there will be two world relative prices rather than just one, a world relative price for the trade between the home country and foreign country *1, $p^{w1} \equiv p_x^{*1}/p_y$, and a world relative price for the trade between the home country and foreign country *2, $p^{w2} \equiv p_x^{*2}/p_y$; and as before, we can represent each country's local relative price in terms of its tariff and the world price it faces: $p = (1+\tau^i)p^{wi} \equiv p(\tau^i, p^{wi})$ and $p^{*i} = p^{wi}/(1+\tau^{*i}) \equiv p^{*i}(\tau^{*i}, p^{wi})$ for $i = 1, 2$. These world prices are linked across bilateral trading relationships through the home country's local price expression according to

$$p^{wi} = \left(\frac{1+\tau^j}{1+\tau^i}\right) p^{wj}, \tag{17}$$

[22] It is also worth noting that if a country were sufficiently averse to dependence on its rival so as to create a preference for autarky, then as in the original Bagwell and Staiger (1999) setting there is no role for trade cooperation regardless of the strength of the preference for dominance (because there can be no terms-of-trade motive for noncooperative policies if noncooperative trade volumes are zero). This implies in turn that with such extreme dependence aversion, as might perhaps have characterized the US-USSR geopolitical rivalry of the twentieth century, geopolitics itself becomes irrelevant to the question of trade cooperation.

[23] If the home country imposes a non-discriminatory tariff, the two foreign countries have no basis to trade with each other in this two-good general equilibrium setting. If the home country imposes discriminatory tariffs against the two foreign countries, then a basis for trade between these two countries could arise to take advantage of arbitrage opportunities created by the home-country discriminatory tariffs, but not if transport costs between them are sufficiently high.

implying that under nondiscriminatory (MFN) tariffs for the home country $\tau^1 = \tau^2 \equiv \tau$ we have a single world price $p^{w1} = p^{w2} \equiv p^w$.

Imposing standard international market clearing conditions, we can determine the equilibrium world prices for any set of tariffs in this three-country setting. As noted, in the case of discriminatory home-country tariffs there are two world prices, $\widetilde{p}^{w1}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ and $\widetilde{p}^{w2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$, that are determined by a market clearing condition together with the linkage condition in (17). And while in this case the terms of trade for foreign country $*i$ for $i = 1, 2$ is given by the world price $\widetilde{p}^{wi}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ that applies to its trade with the home country, the (multilateral) terms of trade of the home country is a trade-weighted average of these world prices. In the case of nondiscriminatory MFN tariffs, the market clearing condition determines the single equilibrium world price $\widetilde{p}^{w}(\tau, \tau^{*1}, \tau^{*2})$, which is then the terms of trade for all countries.

As we did in section 2, we place minimal structure on the underlying objectives of each country, this time relying explicitly on the structure imposed by Bagwell and Staiger (2005). In particular, letting these objectives be represented by $\tilde{W}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$, $\tilde{W}^{*1}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ and $\tilde{W}^{*2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ when the home government can choose discriminatory tariffs, we follow Bagwell and Staiger and assume that, when evaluated at any set of efficient tariffs, the following conditions hold for $i, j = 1, 2$ and $i \neq j$:

$$\tilde{W}_{\tau^i} > 0 \text{ and } \tilde{W}^{*i}_{\tau^{*i}} > 0; \quad \tilde{W}_{\tau^{*i}} < 0 \text{ and } \tilde{W}^{*i}_{\tau^i} < 0; \quad \tilde{W}^{*i}_{\tau^{*j}} > 0 \text{ and } \tilde{W}^{*i}_{\tau^j} > 0. \tag{18}$$

These restrictions follow directly from the government objective expressed as general functions of a country's local price and its terms of trade, provided that government welfare is sufficiently sensitive to terms-of-trade changes. And alternatively, letting these objectives be represented by $\bar{W}(\tau, \tau^{*1}, \tau^{*2})$, $\bar{W}^{*1}(\tau, \tau^{*1}, \tau^{*2})$ and $\bar{W}^{*2}(\tau, \tau^{*1}, \tau^{*2})$ when the home government is restricted to MFN tariff choices, we again follow Bagwell and Staiger and assume that, when evaluated at any set of efficient tariffs, the following conditions hold for $i, j = 1, 2$ and $i \neq j$:

$$\bar{W}_{\tau} > 0 \text{ and } \bar{W}^{*i}_{\tau^{*i}} > 0; \quad \bar{W}_{\tau^{*i}} < 0 \text{ and } \bar{W}^{*i}_{\tau} < 0; \quad \tilde{W}^{*i}_{\tau^{*j}} > 0. \tag{19}$$

Again, these restrictions follow directly from the government objective expressed as general functions of a country's local price and its terms of trade, as long as the tariffs under consideration are consistent with the nature of GATT bindings.

Following Bagwell and Staiger (1999) and (2002), we also record the derivative properties of the government objectives when evaluated at reaction-curve tariffs, where the signs of these derivatives are determined by the sign of the terms-of-trade movement induced by the tariff change and the following conditions hold for $i, j = 1, 2$ and $i \neq j$:

$$\tilde{W}^{*i}_{\tau^i} < 0, \quad \tilde{W}^{*i}_{\tau^j} > 0 \text{ and } \tilde{W}_{\tau^{*i}} < 0; \quad \bar{W}_{\tau^{*i}} < 0 \text{ and } \bar{W}^{*i}_{\tau} < 0. \tag{20}$$

Beyond these restrictions, we continue to assume curvature properties on these functions that ensure unique tariff reaction curves.

Finally, we assume that the home country and foreign country *1 are the geopolitical rivals, so that $\rho \geq 0$ and $\rho^{*1} \geq 0$, with foreign country *2 assumed to be the neutral country—i.e. not to be involved in such rivalry so that $\rho^{*2} \equiv 0$. This is then reflected in our specification of government objectives, which are the analogs of the government objectives given in (5)

for the two-country setting. When the home country can choose discriminatory tariffs, these objectives are given by

$$\begin{aligned}
\tilde{G}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) &= \tilde{W}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})+\rho\times[\tilde{W}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})-\tilde{W}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})]\\
\tilde{G}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) &= \tilde{W}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})+\rho^{*1}\times[\tilde{W}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})-\tilde{W}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})]\\
\tilde{G}^{*2}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) &= \tilde{W}^{*2}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}).
\end{aligned}\tag{21}$$

And when the home country is restricted to MFN tariffs, these objectives are given by

$$\begin{aligned}
\bar{G}(\tau,\tau^{*1},\tau^{*2}) &= \bar{W}(\tau,\tau^{*1},\tau^{*2})+\rho\times[\bar{W}(\tau,\tau^{*1},\tau^{*2})-\bar{W}^{*1}(\tau,\tau^{*1},\tau^{*2})]\\
\bar{G}^{*1}(\tau,\tau^{*1},\tau^{*2}) &= \bar{W}^{*1}(\tau,\tau^{*1},\tau^{*2})+\rho^{*1}\times[\bar{W}^{*1}(\tau,\tau^{*1},\tau^{*2})-\bar{W}(\tau,\tau^{*1},\tau^{*2})]\\
\bar{G}^{*2}(\tau,\tau^{*1},\tau^{*2}) &= \bar{W}^{*2}(\tau,\tau^{*1},\tau^{*2}).
\end{aligned}\tag{22}$$

4.1 Nash

We first consider the impact of bilateral geopolitical rivalry in a three-country world without trade cooperation, solving for Nash tariffs as a function of ρ and ρ^{*1}. In such a world, we assume that the home country is unconstrained in its ability to choose discriminatory tariffs (extending the Nash results to comply with MFN is straightforward and leads to results that are analogous to what we report below). The noncooperative tariffs, which we denote by τ^{1N}, τ^{2N}, τ^{*1N} and τ^{*2N}, are defined by the four first-order conditions associated with the government objective functions in (21). These first-order conditions can be manipulated to yield

$$\begin{aligned}
\tilde{W}_{\tau^1} &= \frac{\rho}{(1+\rho)}\times\tilde{W}^{*1}_{\tau^1}\\
\tilde{W}_{\tau^2} &= \frac{\rho}{(1+\rho)}\times\tilde{W}^{*1}_{\tau^2}\\
W^{*1}_{\tau^{*1}} &= \frac{\rho^{*1}}{(1+\rho^{*1})}\times\tilde{W}_{\tau^{*1}}\\
\tilde{W}^{*2}_{\tau^{*2}} &= 0,
\end{aligned}\tag{23}$$

which, using the conditions in (20), imply that $\tau^{1R}(\tau^2,\tau^{*1},\tau^{*2})$ is increasing in ρ, $\tau^{2R}(\tau^1,\tau^{*1},\tau^{*2})$ is decreasing in ρ and $\tau^{*1R}(\tau^1,\tau^2,\tau^{*2})$ is increasing in ρ^{*1}, while $\tau^{*2R}(\tau^1,\tau^2,\tau^{*1})$ is independent of ρ and ρ^{*1}. Under our assumed reaction-curve stability conditions, this then means that τ^{1N} is increasing in ρ and τ^{2N} is decreasing in ρ while τ^{*1N} is increasing in ρ^{*1}, and if tariff reaction curves are upward sloping it then follows that the Nash tariffs that the two rivals impose on each other are increasing in both ρ and ρ^{*1} while the Nash tariffs between the home- and third-country may be increasing in ρ^{*1} but decreasing in ρ. However, if tariff reaction curves are downward sloping, then τ^{1N} and τ^{2N} will be decreasing in ρ^{*1} while τ^{*1N} will be decreasing in ρ, and it is then possible that a rise in both ρ and ρ^{*1} could increase the Nash tariff of one of the rivals while reducing the Nash tariff of the other rival and the third country.

With the rise of geopolitics captured by an increase in ρ and ρ^{*1} above the levels $\rho = 0 = \rho^{*1}$, we may therefore state:

Proposition 5 *In a three-country world with two potential rivals, the rise of bilateral geopolitical rivalry raises the Nash tariff of at least one of the rivals. If tariff reaction curves are upward sloping, the rise of bilateral geopolitical rivalry raises the Nash tariffs that the two rivals impose on each other and may lower the Nash tariffs that the home- and the neutral-country impose on each other; while if tariff reaction curves are downward sloping the rise of bilateral geopolitical rivalry may raise the Nash tariff that one country applies to trade with its rival while lowering all other Nash tariffs.*

4.2 International Efficiency Frontier

Next we consider the internationally efficient combinations of tariffs. We divide this characterization into efficient discriminatory tariffs and efficient tariffs when the home country tariffs cannot be discriminatory.

Efficient tariffs when discriminatory tariffs are allowed solve the following program:

$$\max_{\tau^1,\tau^2,\tau^{*1},\tau^{*2}} \tilde{W}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) + \rho \times [\tilde{W}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) - \tilde{W}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})] \tag{24}$$

$$s.t.$$

$$\tilde{W}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) + \rho^{*1} \times [\tilde{W}^{*1}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) - \tilde{W}(\tau^1,\tau^2,\tau^{*1},\tau^{*2})] \geq \tilde{G}^{*1E}$$
$$\tilde{W}^{*2}(\tau^1,\tau^2,\tau^{*1},\tau^{*2}) \geq \tilde{G}^{*2E}$$

where $\tilde{G}^{*1E}$ and $\tilde{G}^{*2E}$ are fixed and feasible levels of $\tilde{G}^{*1}$ and $\tilde{G}^{*1}$ respectively. As before, the portion of the international efficiency frontier that would deliver at least the Nash level of welfare to each government can then be characterized by solving (24) for all values of $\tilde{G}^{*1E}$ and $\tilde{G}^{*2E}$ between the Nash levels $\tilde{G}^{*1}(\tau^{1N},\tau^{2N},\tau^{*1N},\tau^{*2N})$ and $\tilde{G}^{*2}(\tau^{1N},\tau^{2N},\tau^{*1N},\tau^{*2N})$ and the levels of $\tilde{G}^{*1E}$ and $\tilde{G}^{*2E}$ that would yield τ^{1E}, τ^{2E}, τ^{*1E} and τ^{*2E} satisfying $\tilde{G}(\tau^{1E},\tau^{2E},\tau^{*1E},\tau^{*2E}) = \tilde{G}(\tau^{1N},\tau^{2N},\tau^{*1N},\tau^{*2N})$.

Similarly, efficient tariffs when home-country tariffs must conform to MFN solve the following program:

$$\max_{\tau,\tau^{*1},\tau^{*2}} \bar{W}(\tau,\tau^{*1},\tau^{*2}) + \rho \times [\bar{W}(\tau,\tau^{*1},\tau^{*2}) - \bar{W}^{*1}(\tau,\tau^{*1},\tau^{*2})] \tag{25}$$

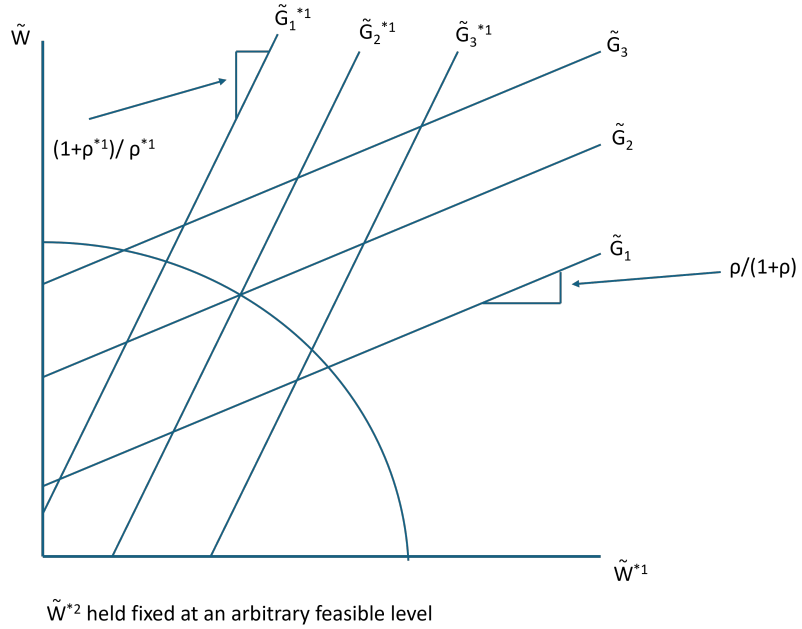
$$s.t.$$

$$\bar{W}^{*1}(\tau,\tau^{*1},\tau^{*2}) + \rho^{*1} \times [\bar{W}^{*1}(\tau,\tau^{*1},\tau^{*2}) - \bar{W}(\tau,\tau^{*1},\tau^{*2})] \geq \bar{G}^{*1E}$$
$$\bar{W}^{*2}(\tau,\tau^{*1},\tau^{*2}) \geq \bar{G}^{*2E}$$

where $\bar{G}^{*1E}$ and $\bar{G}^{*2E}$ are fixed and feasible levels of $\bar{G}^{*1}$ and $\bar{G}^{*1}$ respectively. And as before, the portion of the international efficiency frontier that would deliver at least the Nash level of welfare to each government can then be characterized by solving (25) for all values of $\bar{G}^{*1E}$ and $\bar{G}^{*2E}$ between the Nash levels $\bar{G}^{*1}(\tau^N,\tau^{*1N},\tau^{*2N})$ and $\bar{G}^{*2}(\tau^N,\tau^{*1N},\tau^{*2N})$ and the levels of $\bar{G}^{*1E}$ and $\bar{G}^{*2E}$ that would yield τ^E, τ^{*1E} and τ^{*2E} satisfying $\bar{G}(\tau^E,\tau^{*1E},\tau^{*2E}) = \bar{G}(\tau^N,\tau^{*1N},\tau^{*2N})$.

The efficient tariffs that solve (24) and (25) in the absence of geopolitical rivalry, that is, for $\rho = 0$ and $\rho^{*1} = 0$, are characterized by Bagwell and Staiger (2005, Propositions 4 and 7, respectively). We now argue that, just as in our Proposition 2 for the two-country model,

Figure 6: Internationally Efficiency Frontier



the same set of tariffs that is efficient in the absence of geopolitical rivalry when $\rho = 0$ and $\rho^{*1} = 0$ is also the set of tariffs that is efficient in the presence of bilateral geopolitical rivalry, that is, when $\rho > 0$ and $\rho^{*1} > 0$.

To see this, consider first the efficient tariffs that solve (24) in the absence of geopolitical rivalry. With $\tilde{W}$ on the vertical axis and $\tilde{W}^{*1}$ on the horizontal axis and with $\tilde{W}^{*2}$ held fixed at an arbitrary feasible level, Figure 6 plots the combination of $\tilde{W}$ and $\tilde{W}^{*1}$ that are implied by the efficient sets of tariffs that solve (24) for $\rho = 0$ and $\rho^{*1} = 0$. As we did for Figure 2, we plot these combinations as tracing out a concave frontier, and this frontier gives the outer boundary of the feasible combinations of $\tilde{W}$ and $\tilde{W}^{*1}$ given the fixed $\tilde{W}^{*2}$. Also depicted in Figure 6 is a family of iso-$\tilde{G}$ lines, each with slope $\frac{\rho}{1+\rho}$ and with $\tilde{G}_1 < \tilde{G}_2 < \tilde{G}_3$, and a family of iso-$\tilde{G}^{*1}$ lines, each with slope $\frac{1+\rho^{*1}}{\rho^{*1}}$ and with $\tilde{G}_1^{*1} < \tilde{G}_2^{*1} < \tilde{G}_3^{*1}$. Clearly the iso-$\tilde{G}$ lines in Figure 6 must be flatter than the iso-$\tilde{G}^{*1}$ lines. But it is then immediate from Figure 6 that, for any level of $\tilde{G}^{*1}$ (and the fixed level of $\tilde{G}^{*2} = \tilde{W}^{*2}$), the maximum attainable level of $\tilde{G}$ (corresponding to the highest attainable iso-$\tilde{G}$ line) – and hence the level of $\tilde{G}$ that solves (24) for $\rho > 0$ and $\rho^{*1} > 0$ but finite – will correspond to a point on the frontier of $\tilde{W}$ and $\tilde{W}^{*1}$ combinations that are implied by the efficient sets of tariffs that solve (24) for $\rho = 0$ and $\rho^{*1} = 0$. A completely analogous argument holds for the efficient tariffs that solve (25).

We may therefore state:

Proposition 6 *The rise of bilateral geopolitical rivalry in a multilateral world leaves the set of internationally efficient tariff combinations unchanged, both when tariffs can be discriminatory and when they are constrained to be non-discriminatory.*

We have thus far focused our three-country analysis on the case where $\rho > 0$ and $\rho^{*1} > 0$ and both ρ and ρ^{*1} are finite. But it is now also easy to see from Figure 6 that in the limiting

case where $\rho \to \infty$ and $\rho^{*1} \to \infty$, beginning from *any* tariff combination there can be no pareto improvements for the home government and the government of foreign country *1. This can be seen from Figure 6 by noting that in this case the slopes of the iso-$\tilde{G}$ lines and the slopes of the iso-$\tilde{G}^{*1}$ lines are all the same (and equal to one), so these lines lie on top of one another. Hence, as in our two-country analysis, in the limiting case of bilateral "extreme" geopolitical rivalry the interests of each rival government are diametrically opposed, and beginning from any set of tariffs – including the Nash tariffs – it is impossible to find a new set of tariffs that could deliver a pareto improvement for the governments of the home country and foreign country *1.

Interestingly, beginning from Nash tariffs in the three-country setting, there *would* exist other tariff combinations in the case of bilateral extreme geopolitical rivalry that could increase the welfare of the government of foreign country *2 while holding the welfares of the governments of the home country and foreign country *1 fixed; but the home-country- and foreign-country-*1 governments would have nothing to gain from negotiations that implemented these other tariff combinations.[24] In fact, in the case of bilateral extreme geopolitical rivalry, the only possibility for tariff negotiations to yield strict welfare improvements for the negotiating governments comes if the two rivals are not both present at the negotiating table and the negotiations are instead *bilateral*, between the government of foreign country *2 and *either* the home-country government *or* the government of foreign country *1.

If we restrict attention to tariff negotiations that have the potential to yield strict welfare improvements for the negotiating governments, we may then state:

Proposition 7 *A role for multilateral trade policy cooperation persists in the presence of bilateral geopolitical rivalry unless domination becomes the sole objective of each rival.*

4.3 Implications for Trade Cooperation and Negotiation

Along with reciprocity, non-discrimination is a second pillar of the world trading system. Will the rise of geopolitics create tension with the non-discrimination principle as well? The two-country model of section 2 is of course silent on this issue, but our results from the three-country model suggest that the answer to this question may be yes.

In particular, by Proposition 5 we know that the rise of geopolitical rivalry between the home government and the government of foreign country *1 in our three-country model will impact the noncooperative Nash tariffs and payoffs; but by Proposition 6 we also know that this rivalry will leave unchanged the set of tariff combinations that are internationally efficient, both when tariffs are constrained to conform to MFN and when they are allowed to be discriminatory. These two findings in turn suggest that the pre-rivalry cooperative tariffs can no longer be sustained as the outcome of efficient tariff bargaining once geopolitical rivalry has erupted, and to maintain trade cooperation the three governments must find a way to navigate along the international efficiency frontier, just as in our two-country model.

[24] This is easily confirmed by substituting the Nash tariff conditions (24) into the conditions for efficient discriminatory tariffs derived by Bagwell and Staiger (2005), which by Proposition 6 characterize efficient tariffs for any values of ρ and ρ^{*1}, and noting that even in the limit as $\rho \to \infty$ and $\rho^{*1} \to \infty$, these efficiency conditions are not satisfied by Nash tariffs.

In our two-country analysis we used the Nash Bargaining solution to characterize the outcome of efficient tariff bargaining and formalize this point, but that approach does not extend naturally to a many-country setting.[25] For the discussion of our three-country model we therefore follow Bagwell and Staiger (2005) and do not take a stand on the particular bargaining solution under which the three countries would achieve a point on the frontier. Instead, we focus on the nature of the tariff adjustments that could enable governments to move along the efficiency frontier, and we highlight a basic point: restricting countries to non-discriminatory tariff adjustments could make such movements more cumbersome, by preventing the rivals from adjusting their tariffs in a way that could effect the needed transfer of surplus between them while neutralizing the impacts on the third country.

To see the point, it is useful to first recall the findings of Bagwell and Staiger (2005), who adopting the formalization of reciprocity proposed by Bagwell and Staiger (1999) showed that when the home country and foreign country *1 engage in bilateral tariff negotiations that lead to *reciprocal* tariff changes, it is *only* when the home country's tariff is constrained to be non-discriminatory that the impact on foreign country *2 of the home country's bilateral tariff negotiation with foreign country *1 will be neutralized. As Bagwell and Staiger observe, this is because non-discrimination ensures that there will be a single relative world price $\widetilde{p}^w(\tau, \tau^{*1}, \tau^{*2})$ at which both foreign countries trade with the home country, and because reciprocal changes in τ and τ^{*1} leave the world price unchanged.[26] And with τ^{*2} unchanged, these tariff changes therefore also leave unchanged foreign country $*2$'s local price $p^{*2}(\tau^{*2}, \widetilde{p}^w)$ and hence its government welfare level $\bar{W}^{*2}(\tau, \tau^{*1}, \tau^{*2}) \equiv \bar{W}^{*2}(p^{*2}(\tau^{*2}, \widetilde{p}^w(\tau, \tau^{*1}, \tau^{*2})), \widetilde{p}^w(\tau, \tau^{*1}, \tau^{*2}))$. As Bagwell and Staiger note, the "third-country neutrality" property exhibited by bilateral tariff negotiations that conform to reciprocity and non-discrimination can help governments decentralize the tariff bargaining problem that they face in moving from noncooperative Nash tariffs to cooperative tariffs on the international efficiency frontier in a multilateral world.

But as we have observed, the rise of geopolitical rivalry between the home country and foreign country *1 will require that governments find a way to navigate along the international efficiency frontier. This in turn will require *non*-reciprocal tariff changes for the home country and foreign country *1, the purpose of which is to efficiently shift surplus between them with movements in relative world prices. And with non-discrimination ensuring that there is a single relative world price, any transfer of surplus between the home country and foreign country *1 that comes from a movement in $\widetilde{p}^w(\tau, \tau^{*1}, \tau^{*2})$ *must* spill over to the

[25] See, for example, the discussion in Bagwell et al. (2020) and (2021) and the application of Horn and Wolinsky (1988) "Nash-in-Nash" solution concept to multi-country tariff bargaining.

[26] As formalized by Bagwell and Staiger (1999), tariff changes implemented by the home country and foreign country *1 conform to (multilateral) reciprocity when each of these countries experiences a change in its import volume that is equal to the change in its export volume with all changes valued at the original relative world price. Applying the balanced (multilateral) trade condition for each country that must hold at the original relative world price and at the new relative world price, it follows directly that under this formalization of reciprocity the relative world price will be unchanged by the reciprocal tariff changes of the home and foreign *1 countries.

welfare of foreign country *2.[27]

In fact, in this situation it is only when the home country government is allowed to make *discriminatory* tariff changes in negotiations with the government of foreign country *1 that it would even be *possible* for the two rivals to alter the three tariffs under their control in a way that shifts surplus between them while holding the welfare of foreign country $*2$ fixed. This is because with discriminatory tariffs there are now two relative world prices – $\widetilde{p}^{w1}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ for trade between the home country and foreign country *1 and $\widetilde{p}^{w2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ for trade between the home country and foreign country *2 – and the two rivals can then alter the three tariffs under their control in a way that moves $\widetilde{p}^{w1}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$ to shift surplus between them while holding $\widetilde{p}^{w2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})$, and hence foreign country *2's welfare $\tilde{W}^{*2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2}) \equiv \tilde{W}^{*2}(p^{*2}(\tau^{*2}, \widetilde{p}^{w2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2})), \widetilde{p}^{w2}(\tau^1, \tau^2, \tau^{*1}, \tau^{*2}))$ – fixed.

We record these observations with

Proposition 8 *It is not possible for two rival countries to make non-discriminatory tariff adjustments that transfer surplus between them without altering the surplus of the neutral third country, but this would be possible if the rival countries could make use of discriminatory tariff adjustments.*

With Proposition 8 in hand and in light of the results from Propositions 5 and 6, it is clear that the nondiscrimination principle may create difficulties for countries as they attempt to navigate their way along the international efficiency frontier when geopolitical rivalries erupt. In the next section we explore this point in more depth.

5 Implications of Geopolitics for Trade Rules

What do our findings above mean for the design of the world trading system? In this section we consider this question. We first show that rivalry itself does not change the purpose of a trade agreement, that is, the "problem" that a trade agreement must "solve" in order to eliminate international policy inefficiencies and deliver mutual benefits for its members. With this established, we can then appeal to the results of Bagwell and Staiger (1999) and conclude that, if the design of GATT was effective in helping countries navigate from noncooperative Nash tariffs to the international efficiency frontier in the absence of rivalry as Bagwell and Staiger argue, that same design should also be effective in bringing countries from Nash to the efficiency frontier in the presence of rivalry. But our findings above indicate that the rise of geopolitics will confront the world trading system with a different problem: moving from one point on the international efficiency frontier to another. And as we detail below, it is this imperative that is in tension with GATT's core reciprocity and MFN principles.

[27] With more than two goods, it might become possible to make non-discriminatory tariff adjustments in a way that moved some world prices that were particularly important for a target country while leaving unchanged other world prices that had larger impacts on third countries. But even with many goods, a country's non-discriminatory tariff changes will still imply that any movement in the world price of a good will impact all exporters of the good to that country, and only in knife-edge cases where the trade patterns lined up in just the right way might it be possible to shift surplus with non-discriminatory tariff adjustments between two countries without impacting the surplus of any third countries.

5.1 Geopolitics and the Purpose of Trade Agreements

We begin by demonstrating that the purpose of a trade agreement is not changed by the presence of geopolitical rivalry as we have modeled that rivalry above. We establish this formally in the two-country model of section 2, and then observe how our arguments extend to the three-country model setting of section 4.

Specifying the home government objective function as $W(\tau, \tau^*) \equiv W(p(\tau, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))$ with $W_{p^w} < 0$ but where W_p is unrestricted and the foreign government objective function as $W^*(\tau^*, \tau) \equiv W^*(p^*(\tau^*, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))$ with $W^*_{p^w} > 0$ but where $W^*_{p^*}$ is unrestricted, Bagwell and Staiger (1999) and (2002) define *politically optimal tariffs* as the tariffs τ^{PO} and τ^{*PO} that solve the two equations

$$W_p = 0; \quad W^*_{p*} = 0.$$

They then observe that (i) the home government would choose τ^{PO} and the foreign government would choose τ^{*PO} if the two governments made their tariff choices unilaterally and simultaneously but neither valued the terms-of-trade (world-price) implications of its tariff choice for its welfare (i.e., if the home government acted "as if" $W_{p^w} \equiv 0$ and the foreign government acted "as if" $W^*_{p^w} \equiv 0$), and that (ii) the politically optimal tariff pair (τ^{PO}, τ^{*PO}) is internationally efficient, in the sense that it achieves a point on the international efficiency frontier defined according to the actual government objective functions W and W^*. Since this "politically optimal thought experiment" would bring governments from their inefficient Nash tariff choices to a point on the international efficiency frontier, Bagwell and Staiger conclude that, as long as government objectives take this form, the purpose of a trade agreement is to eliminate terms-of-trade manipulation from the unilateral tariff choices of the governments.

We now extend Bagwell and Staiger's (1999, 2002) definition of politically optimal tariffs to our setting in section 2 where geopolitical rivalry is present, and we show that politically optimal tariffs are still efficient, and hence the purpose of a trade agreement is unchanged by the presence of geopolitical rivalry. In particular, with

$$\begin{aligned} G(\tau, \tau^*) = W(p(\tau, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*)) + \\ \rho \times [W(p(\tau, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*)) - W^*(p^*(\tau^*, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))] \end{aligned}$$

and

$$\begin{aligned} G^*(\tau^*, \tau) = W^*(p^*(\tau^*, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*)) + \\ \rho^* \times [W^*(p^*(\tau^*, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*)) - W(p(\tau, \widetilde{p}^w(\tau, \tau^*)), \widetilde{p}^w(\tau, \tau^*))], \end{aligned}$$

we define the politically optimal tariff choices (τ^{PO}, τ^{*PO}) as the tariffs that would result if the two governments made their tariff choices unilaterally and simultaneously but neither valued the terms-of-trade (world-price) implications of its tariff choice for its welfare (i.e., if the home government acted "as if" $G_{p^w} = W_{p^w} + \rho[W_{p^w} - W^*_{p^w}] \equiv 0$ and the foreign government acted "as if" $G^*_{p^w} = W^*_{p^w} + \rho^*[W^*_{p^w} - W_{p^w}] \equiv 0$).

As defined, in the presence of geopolitical rivalry politically optimal tariffs (τ^{PO}, τ^{*PO}) must then satisfy the following two first-order conditions:

$$\begin{aligned}(1+\rho)W_p\frac{dp}{d\tau} - \rho\frac{1}{\tau^*}W^*_{p^*}\frac{\partial\widetilde{p}^w}{\partial\tau} &= 0\\ (1+\rho^*)W^*_{p^*}\frac{dp^*}{d\tau^*} - \rho^*\tau W_p\frac{\partial\widetilde{p}^w}{\partial\tau^*} &= 0\end{aligned}$$

which simplify to

$$W_p = 0; \quad W^*_{p*} = 0.$$

Hence, the politically optimal tariffs are not altered by the presence of geopolitical rivalry (i.e., by $\rho > 0$ and $\rho^* > 0$). But we know from Bagwell and Staiger (1999) and (2002) that these tariffs are efficient in the absence of geopolitical rivalry, and we know from Proposition 2 that these tariffs are therefore also efficient in the presence of geopolitical rivalry. We may therefore conclude that, as long as government objectives in the presence of geopolitical rivalry take this form, the purpose of a trade agreement is unchanged by this rivalry, and it continues to be to eliminate terms-of-trade manipulation from the unilateral tariff choices of the governments.

Finally, while our argument here has been couched in the two-country model of section 2, analogous arguments deliver the same conclusion in the three-country model of section 4 when tariffs are nondiscriminatory (i.e., conform to MFN). Intuitively, as Bagwell and Staiger (1999) and (2002) observe, politically optimal tariffs are efficient if the externalities countries impose on each other with their tariffs travel only through world prices. In a multicountry world where MFN is respected, the trade policy externalities indeed travel in this way when countries adopt their politically optimal tariffs. Tariff discrimination complicates the transmission of externalities by allowing *bilateral* trade volumes, and hence *local* prices, to transmit externalities across trading partners as well.

We summarize this discussion with:[28]

Proposition 9 *The presence of geopolitical rivalry does not change the purpose of a trade agreement, which remains to eliminate inefficient terms-of-trade manipulation motives from the unilateral tariff choices of governments, just as Bagwell and Staiger (1999) demonstrate is the purpose of a trade agreement in the absence of geopolitical rivalry.*

From Proposition 9, it then follows that the existence of geopolitical rivalry per se does not undercut the attractiveness of GATT's design for helping governments navigate from noncooperative Nash tariffs to a point on the international efficiency frontier, as was the task over much of the GATT era.

5.2 Reciprocity

The GATT/WTO system is designed to allow adjustments to a variety of shocks. As Pauwelyn (2008) observes, GATT market access commitments are structured as *liability rules*, in

[28] See also Maggi (2014) (p 336), who derives a result from which the result we report in Proposition 9 would be an immediate implication in a partial equilibrium two-country tariffs-only setting.

the sense that a government may legally escape for any reason from the market access implied by its tariff commitments, as long as it is willing to pay the "price" implied by the reciprocal actions that its impacted trading partners are then legally allowed to take, namely, the withdrawal of equivalent market access concessions of their own. The purpose of this design was to allow some flexibility in GATT market access commitments while at the same time, in the words of a drafter of the GATT Articles quoted by Jackson (1969, pp 170-71), providing governments with the assurance that in their GATT market access negotiations, "a balance of interests once established, shall be maintained." In this way, GATT is set up to accommodate occasional, *reciprocal*, adjustments to the bargain, either temporarily (through the GATT Article XIX safeguards clause) or permanently (through the GATT Article XXVIII renegotiation provision), where by design these adjustments allow a country to reduce import volumes while preserving the balance established in prior GATT negotiations between its rights to market access in other countries and its obligations to provide market access to other countries. It was expected that such adjustments might be needed when a country faced any of a variety of circumstances that might develop subsequent to the time of its original tariff negotiations, such as substantial injury to import-competing workers or political pressure from the lobbies that represent them, and the flexibilities afforded by this design have been used by governments from time to time throughout GATT's history.[29]

The GATT/WTO design, however, is less-well suited to facilitate the kinds of *non*-reciprocal adjustments that Proposition 4 describes. After all, the movement of the cooperative arrangement from point B_1 to point B_2 depicted in Figure 3 would imply that the home government must respond to an increase in the foreign government's tariff by *reducing* its own tariff to shift surplus from itself to the foreign government, a combination of tariff changes that is fundamentally at odds with the essence of the "reciprocal and mutually advantageous"tariff reductions that GATT's Preamble describes. The problem is not that such movements *couldn't* in principle be accommodated while honoring the reciprocity norms within the GATT/WTO system. The problem is rather that in practice accomplishing the required adjustments in a way that is consistent with GATT/WTO reciprocity norms would carry obvious risks.

More specifically, and referring again to Figure 3, in principle the "war-and-redemption" path described above could be achieved by employing Article XXVIII and GATT Article XXVIII bis (under which tariff liberalizing negotiations occur), allowing countries to navigate from B_1 to B_2 while hewing to the reciprocal flexibilities provided in GATT Articles. In the first phase the foreign country would escape from its tariff binding under Article XXVIII renegotiation. It could move all the way back to its original Nash tariff, with the home country then allowed under Article XXVIII to withdraw equivalent concessions and revert to its original Nash tariff, positioning the two countries at the point N_1. However, with both countries then freed from their original tariff bindings and free to set tariffs in an unconstrained way, their best-response tariffs would not stop at N_1, but would further adjust (now in a non-reciprocal way) to implement the new Nash point labeled N_2 in Figure 3, which reflects the impact of geopolitical rivalry on their noncooperative tariffs and as de-

[29] On the history of GATT negotiations under Article XXVIII bis and renegotiations under Article XXVIII, see Hoda (2001). See Bown and Ruta (2008) for evidence that GATT/WTO members do indeed abide by reciprocity in their retaliatory actions.

picted is more favorable to the foreign country than the original (pre-rivalry) Nash point N_1. This would complete the (trade) war phase. At this point, and recalling from Proposition 9 that the purpose of a trade agreement is not changed by the presence of geopolitical rivalry, the negotiating problem facing the two countries would then conform with the standard negotiating problem that GATT-member governments have successfully addressed repeatedly in the GATT era under Article XXVIII bis negotiations, and the redemption phase could begin, with each country agreeing to reciprocal and mutually beneficial reductions in tariffs that move them from the Nash point to the efficiency frontier (and specifically to the point labeled B_2 in Figure 3 if the bargain delivers the Nash Bargaining solution).

With the logic of the war-and-redemption path fully described, the risks associated with this two-phase approach are now transparent. In reality it took GATT-member governments 50 years to traverse from the non-cooperative (Nash) tariffs of the 1940's to the cooperative tariffs that were implemented at the 1995 culmination of the Uruguay Round, and there is no guarantee that in escaping from their existing market access commitments and attempting to replicate this process countries would not again spend substantial time far away from the cooperative tariffs that their "redemption" phase is meant to deliver. The direct path from the cooperative status quo to the new cooperative outcome in the presence of geopolitical rivalry can avoid this risk, but as we have noted that path requires tariff changes that are fundamentally at odds with GATT/WTO's reciprocity norm.

Hence, according to the results reported in Proposition 4, the rise of geopolitics poses an important and unfamiliar challenge to the traditional GATT/WTO negotiating process, and confronts the world trading system with a difficult choice. Summarizing this discussion, we may state the following Corollary to Proposition 4:

Corollary *The rise of geopolitical rivalry will confront the world trading system with a choice between two uncomfortable alternatives: adjustment to the new cooperative outcome in the presence of geopolitics requires either a temporary unraveling of existing liberal trade policies, or a departure from the principle of reciprocity in negotiated tariff changes.*

A real-world example can offer suggestive insights into the forces at play and the mechanisms captured by the model. The "Economic and Trade Agreement between the Government of the United States and the Government of the People's Republic of China" (henceforth "Phase 1 Agreement") was concluded outside the WTO in January 2020, a year and a half after the US-China trade war began and the countries significantly increased import tariffs on bilateral trade. The Phase 1 Agreement was different from existing Regional Trade Agreements (RTAs) because the focus was not on creating general mutual obligations but on specific actions by China to grant additional market access to US exporters to achieve explicit import targets. China was required over the years 2020 and 2021 to import from the United States specific manufactured goods, agricultural goods, energy products, and services exceeding the corresponding 2017 baseline amount by no less than 200 billion dollars.

Staiger (2022) provides the following description of the initial tariff actions of the Trump Administration in 2018 and the tariff responses of China and other US trading partners that led to the Phase 1 Agreement:[30]

[30]Chad Bown provides the definitive timeline of the US-China trade war up through April 2023 at https://www.piie.com/research/piie-charts/2019/us-china-trade-war-tariffs-date-chart.

> A broad caricature of these trade actions is as follows. The Trump administration took unilateral actions to raise tariffs. Its injured trading partners responded with countermeasures that amounted to reciprocal tariff hikes of their own. In some cases, the Trump administration responded to these countermeasures with further punitive unilateral tariffs, which led to further countermeasures from its trading partners, some of which were reciprocal and some of which were less than reciprocal. In the end, several bilateral deals were struck, some involving the reciprocal removal of tariffs and others the avoidance of threatened further tariff increases by the Trump administration but with most of the already-imposed tariffs remaining in place pending possible further deals. p 113

Broadly speaking, these tariff actions and responses might be understood through the lens of our model as reflecting the consequences of the onset of heightened geopolitical rivalry between the United States and China.

More specifically, under this interpretation, in the new geopolitical environment the United States was not satisfied with the existing bargaining outcome reflected in the terms of China's accession to the WTO in 2001. Frustrated with its inability to adjust the bargain along the efficiency frontier due to the deviation from reciprocity that this adjustment path would entail, the United States unilaterally imposed a first round of "bargaining tariffs" against China, initiating the path toward a new threat point which would reflect the new geopolitical realities. China retaliated, at first moderating its tariff response below its best-response tariffs according to the principle of reciprocity but later finding that even its best-response tariffs fell short of reciprocating the further unilateral tariff increases of the United States, in what may have been a step in the countries' descent to a new non-cooperative equilibrium.[31] The Phase I Agreement could then be seen as an attempt by the two countries to arrest that descent and achieve a new bargaining outcome. China's import commitments under the agreement were a form of import subsidy for US exporters, and in combination with the more significant US tariffs against China that remained in place as stipulated under the agreement, amounted to a transfer of surplus from China to the United States relative to the original terms of China's accession to the WTO in 2001.[32]

5.3 MFN

We saw from Proposition 8 that restricting countries to non-discriminatory tariff adjustments could make any geopolitical rivalry-driven movements along the efficiency frontier

[31] If it is posited that the United States began to feel threatened by the rise of China and that this drove the new geopolitical rivalry between the two countries, then in the language of our model ρ^{US} would have increased from zero, and according to the tariff reaction curves characterized in (7) and Proposition 1 this would move the threat point for tariff negotiations between the United States and China in a direction that favored the United States. Notice, too, that while in principle the United States might have invoked GATT Article XXVIII to achieve its initial tariff increase and in this way maintained consistency with GATT/WTO rules, in fact the United States took this tariff action unilaterally; it was United States' trading partners who hewed to reciprocity in their responses to the US unilateral tariff actions.

[32] To be sure, there were also other motives for US trade policy actions toward China during this period, and US trade policy actions extended to US trading partners beyond China. We choose to emphasize the US-China tariff actions here because they arguably fit most closely our emphasis on the rise of geopolitical tensions as a cause of such actions.

cumbersome. MFN would prevent the rivals from adjusting their tariffs in a way that could effect the needed transfer of surplus between them while neutralizing the impacts of their tariff adjustments on the third country.

The problem is not that such movements could not be accomplished while honoring the MFN rule. As with our discussion of the two-country model, in principle countries could make use of Article XXVIII renegotiations over their MFN tariffs to escape from their current market access commitments, and at their new noncooperative MFN tariffs begin again from scratch with the process of liberalizing their tariffs with reciprocal tariff negotiations under Article XXVIII bis. The problem is rather that in practice navigating this circuitous path from the status quo to the new bargaining equilibrium would carry obvious risks.

Of course, simply freeing countries from their MFN obligations would not do the job either. Without *some* constraints on the tariff adjustments that the home-country government and the government of foreign country *1 are allowed to make, there would be nothing to prevent them from adjusting their tariffs in a way that benefited them at the expense of foreign country *2. Such a maneuver, as we observed above, *would* have been prevented under MFN when combined with reciprocal tariff changes. Multilateral disciplines of some form would therefore still be needed to ensure an "orderly" departure from MFN, so that the MFN exemption in these circumstances is not used for opportunistic purposes.[33] And identifying an effective form that these disciplines might take is not an easy task.

To illustrate the issues at hand, consider again the US-China Phase I agreement. As we described above, China's import commitments under the agreement were a form of import subsidy for US exporters – and in fact they were *discriminatory* import subsidies for US exporters – and in combination with the more significant US tariffs against China that remained in place as stipulated under the agreement, which were also discriminatory, a transfer from China to the United States was achieved. Here the findings of Freund et al. (2020) are illuminating. Using a quantitative trade model to simulate the relevant counterfactuals, they report that the United States and China were both better off under their Phase I Agreement than they would have been if the trade war between them had instead escalated further to its noncooperative equilibrium outcome. However, compared with the policy status quo at the time the Phase I Agreement was signed, the agreement only benefited the United States (and its input-supplying neighbor, Mexico): China and everyone else was made worse off. Specifically, Freund et al. find that, relative to the status quo, real income in the United States would rise by 0.9 percent as a result of the agreement while China's real income would fall by 0.38 percent due to the trade diversion that the agreement caused, with real incomes in the rest of the world also declining by 0.16 percent.

Thus, according to the findings of Freund et al. (2020) this bilateral discriminatory deal, negotiated outside of the WTO and hence unconstrained by WTO rules, achieved a bilateral income transfer from China to the United States, but at a cost to third countries. By keeping such adjustments *within* the WTO system and subject to effective disciplines, the MFN exemption we describe above would be subject to conditions that prevent departures from the multilateral efficiency locus and ensure third countries are not made worse off.

[33] And while our discussion has focused on the possibility of opportunistic discriminatory tariff adjustments made by the two rivals to hurt third parties, it is also clear that in the presence of rivalry there would be new incentives for each rival to negotiate discriminatory tariff arrangements with third countries in order to hurt its rival with trade diversion (see Ruta, 2023).

Like our earlier Corollary to Proposition 4 regarding the tension with GATT's reciprocity norm created by the rise of geopolitical rivalry, Proposition 8 also allows us to summarize our discussion regarding the MFN principle with:

Corollary *The rise of geopolitical rivalry in a multilateral world will confront the world trading system with an additional choice between two uncomfortable alternatives: adjustment to the new cooperative outcome in the presence of geopolitics requires either a temporary unraveling of existing liberal trade policies, or an orderly departure from the MFN principle in negotiated tariff changes.*

The Corollary to Proposition 8 suggests the potential attractiveness of a conditional MFN exemption for geopolitical rivalry. The design of such an exemption could in some respects be inspired by the GATT Article XXIV exemption from MFN for the purpose of forming free trade agreements and custom unions. Whereas the Article XXIV exemption was meant to accommodate greater mutual affinity between a subset of GATT/WTO members, the purpose of a geopolitical exemption from MFN would be to accommodate greater rivalry between a subset of the members. The Article XXIV exemption notably carries a stipulation that the parties not raise their tariffs against third countries.[34] A geopolitical exemption to the GATT/WTO's MFN rule could in principle go further and require that any new bargain negotiated under this exemption leave third countries completely unaffected. Our discussion here suggests that this might be accomplished in practice with a precise and, in principle, observable condition: that any new bargain negotiated under a geopolitical exemption to MFN must leave world prices between the rivals and third countries unchanged.[35]

Finally, it bears emphasis that for both the Corollary to Proposition 4 regarding reciprocity and the Corollary to Proposition 8 regarding MFN, the problem is not the presence of geopolitical rivalry per se. After all, as Proposition 9 confirms, geopolitical rivalry itself does not change the purpose of a trade agreement. Hence, regardless of whether or not such rivalry is present, in principle GATT/WTO's pillars of MFN and reciprocity remain useful in helping countries navigate from noncooperative tariff choices to tariff choices that achieve the international efficiency frontier. The tension with these rules and norms is created only when geopolitical rivalry erupts or intensifies *after countries have already bargained to the efficiency frontier*. Unfortunately for the existing world trading system, that may be a reasonable approximation of the situation the world now confronts.

6 Conclusion

While a growing area of interest, analysis of the interplay between geopolitics and economics is still in its infancy. This paper seeks to contribute to our understanding of this issue

[34] Article XXIV also requires that parties eliminate the tariffs that they apply to each other on "substantially all" of their trade, the latter stipulation included in an attempt to reduce the frequency with which such exemptions might be invoked by putting some "sand in the gears." It was thought that together these two stipulations would effectively discipline the use of the Article XXIV exemption from MFN and prevent it from being used for opportunistic tariff actions against third countries, though in practice the effectiveness of these disciplines is questionable.

[35] This condition is in the spirit of a "Kemp-Wan" rule (Kemp and Wan, 1976) applied in the context of geopolitical exceptions to MFN.

by focusing on the implications of geopolitical rivalry for trade cooperation. To this end, we combine insights from the international relations literature on the nature of geopolitical rivalry with a standard framework used in economics to study trade cooperation.

Our findings indicate that the rise of geopolitics does not obviate the need for international cooperation over trade policy. But our findings also suggest that the WTO's relevance may be severely compromised if it adheres too rigidly to its existing rules and norms when applying those rules and norms to geopolitical rivals. This is because, while the GATT/WTO principles of reciprocity and non-discrimination work well to facilitate a movement from non-cooperative trade policies that lie off the international efficiency frontier to internationally efficient policies that lie on the frontier – the central task of GATT over the last half of the twentieth century – our findings indicate that with the rise of geopolitics this is not the problem that countries now face. Rather, we show that the problem is now to find a way to move along the international efficiency frontier to accommodate the change in efficient bargaining outcomes brought about by the rise of geopolitics, and this is a problem that GATT/WTO principles are not well-designed to handle. In this light, it may only be through measured adaptation to the geopolitical imperative that the WTO can continue to thrive as a forum for multilateral trade cooperation in the age of geopolitics.

Of course, in its 75 year history the rules-based multilateral trading system has weathered many shocks to the status quo. But our findings suggest that the contemporary rise of geopolitics poses an especially thorny problem for the world trading system, for two reasons. First, shocks that occurred earlier in the decades-long process of GATT-sponsored tariff negotiations when the world was still far away from the international efficiency frontier would have allowed more room for countries to adjust their path to the efficiency frontier while still ensuring that mutual benefits could be enjoyed along that path; by contrast, contemporary geopolitical tensions between the United States and China have arisen after countries have already arrived at or are at least near the international efficiency frontier, and such path adjustments are now not an option. And second, even beginning from a point on the international efficiency frontier, most shocks (such as changes in government objectives that might arise with shifts in political economy forces or, as we have shown, heightened national security concerns) could be expected to alter the internationally efficient sets of tariffs, thereby making the status quo tariffs inefficient and creating room for mutually beneficial tariff adjustments from the status quo as countries move toward the new efficiency frontier. But as we have demonstrated, the rise of great-power rivalry when interpreted as a quest for dominance does not itself alter the internationally efficient sets of tariffs, and so it does not share this feature.

Our analysis can be extended in at least four directions concerning the set of available policy instruments, the nature of trade and trade agreements, the causes of the rise of geopolitical rivalry, and the nature of that rivalry.

First, we have assumed that with regard to policy instruments governments have only tariffs at their disposal. To the extent that governments have alternative means to make bilateral transfers as part of real-world trade negotiations, the use of such transfers might help them avoid the "uncomfortable choices" that we have highlighted here. Similarly, our analysis could be extended to consider the implications of geopolitics in a richer setting where governments have at their disposal both trade and domestic policy instruments (as in Bagwell and Staiger, 2001a, and Staiger and Sykes, 2011 and 2021) that they might use to

pursue industrial policy goals more generally. Along these lines, extending the model to allow for the analysis of export restrictions would also be important given the recent prominence of these instruments as tools of geopolitical rivalry.[36]

Second, while we have built on a standard framework used in economics to study trade cooperation and trade agreements, Antràs and Staiger (2012a) and (2012b) have shown that important qualifications to the framework can arise in the presence of offshoring, if offshoring alters the nature of international price determination between buyers and sellers. Such qualifications could be particularly relevant in the China-US context that we have used to motivate our results. And there are other approaches to understanding the role of trade agreements that could also be adopted, and that might lead to different conclusions. For example, the commitment theory of trade agreements (Staiger and Tabellini, 1987; Maggi and Rodriguez-Clare, 1998 and 2007; Brou and Ruta, 2013), which holds that trade agreements can be useful to governments as a way to tie their hands against domestic actors, could yield distinct conclusions about the implications of geopolitical rivalry for trade cooperation.

Third, we have taken the onset of geopolitical rivalry to be an exogenous event in our model, leaving the question "Why now?" unanswered. But a possible answer to this question is suggested by the observations of Mearsheimer (2003), who notes that "the desire for more power does not go away, unless a state achieves the ultimate goal of hegemony,"which Mearsheimer observes is rare. If it is accepted that the United States did in fact achieve the status of a hegemon after World War II and maintained that status until the end of the twentieth century, then according to Mearsheimer's observations the intensity of geopolitical rivalry today may be the result of the United States no longer enjoying hegemonic status. Exploring whether this answer could stand up to formal scrutiny seems an important topic for future research.

Finally, as we demonstrate in the Appendix, the analysis in this paper is valid for a wide range of objective functions beyond the explicit form considered in the main body of the paper. However, as shown in other recent studies on geopolitics and international economic relations (especially, Clayton et al., 2023; Becko and O'Connor, 2024; Clayton et al., 2024), there are alternative approaches to capturing the nature of geopolitics that model the specific channel of dependency and how governments can leverage this as a tool to increase their relative power. As we have already discussed, our objective functions are flexible enough to address the essence of these forms of interdependencies in a reduced-form way. But a more explicit formalization may reveal insights beyond those captured by our relatively general approach. Extending our analysis of trade cooperation in the presence of geopolitics in each of these directions would appear to be another fruitful area for future research.

[36]For example, as reported in an October 7 2022 *New York Times* article, "The Biden administration on Friday announced sweeping new limits on the sale of semiconductor technology to China, a step aimed at crippling Beijing's access to critical technologies that are needed for everything from supercomputing to guiding weapons."(New York Times, 2022). Our general equilibrium model does not allow a distinction between an import tariff and an export tax due to Lerner symmetry, but in a partial equilibrium extension of the model with many sectors (see also note 10) such export restrictions could be interpreted through the lens of the model as naturally arising in the context of geopolitical rivalry and the quest for dominance (in this case, over high-end microchips).

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Appendix

In this Appendix we explore the generality of our specification of government objectives in the main body of the paper as given by (5). To this end, here we consider domestic and foreign government objectives of the general form

$$\begin{aligned} G(\tau,\tau^*) &\equiv G(W(\tau,\tau^*),W^*(\tau^*,\tau)) \text{ and} \\ G^*(\tau^*,\tau) &\equiv G^*(W^*(\tau^*,\tau),W(\tau,\tau^*)) \end{aligned} \tag{26}$$

respectively, with each objective increasing in its first argument and weakly decreasing in its second argument. These objective functions include as a special case the additively separable specification of government objectives in (5), but they are far more general.[37] We now show that the result of Proposition 2 continues to hold under these general objective functions.

Given the government objectives in (26), a pair of internationally efficiency tariffs τ^E and τ^{*E} must solve the following program:

$$\begin{gathered} \max_{\tau,\tau^*} \quad G(W(\tau,\tau^*),W^*(\tau^*,\tau)) \\ s.t. \\ G^*(W^*(\tau^*,\tau),W(\tau,\tau^*)) \geq G^{*E} \end{gathered} \tag{27}$$

where G^{*E} is a fixed and feasible level of G^*. Similar to our discussion in the body of the paper, in this case the portion of the international efficiency frontier that would deliver at least the Nash level of welfare to each government can then be characterized by solving (27) for all values of G^{*E} between the Nash level $G^*(\tau^{*N},\tau^N)$ and the level of G^{*E} that would yield τ^E and τ^{*E} satisfying $G(\tau^E,\tau^{*E}) = G(\tau^N,\tau^{*N})$.

The Lagrangian associated with (27) is given by

$$\mathcal{L} = G(W(\tau,\tau^*),W^*(\tau^*,\tau)) + \lambda[G^*(W^*(\tau^*,\tau),W(\tau,\tau^*)) - G^{*E}]$$

where λ is again the Lagrange multiplier. The first-order necessary conditions for the solution to (12) are given by

$$\begin{aligned} G_W W_\tau + G_{W^*} W^*_\tau + \lambda[G^*_{W^*} W^*_\tau + G^*_W W_\tau] &= 0 \\ G_W W_{\tau^*} + G_{W^*} W^*_{\tau^*} + \lambda[G^*_{W^*} W^*_{\tau^*} G^*_W W_{\tau^*}] &= 0. \end{aligned}$$

Equating the two expressions for λ implied by these two first-order conditions yields

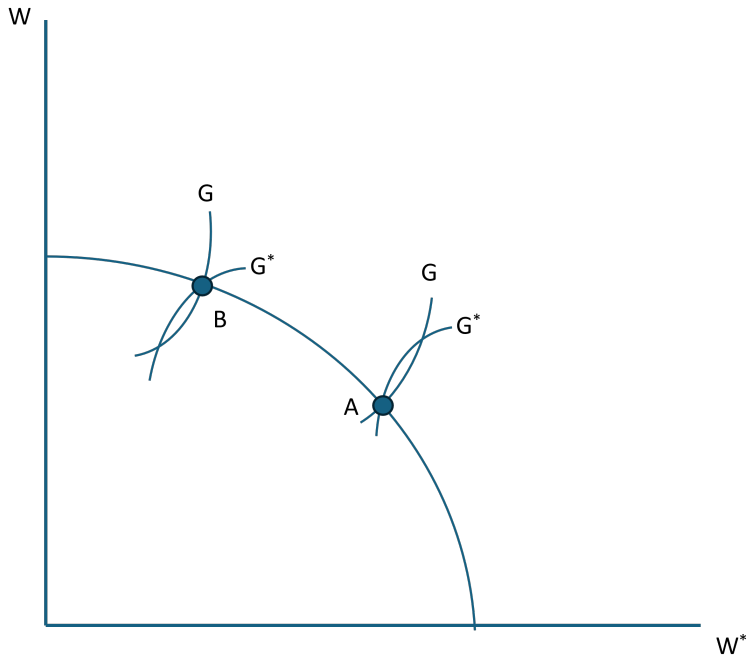
$$\frac{-[G_W W_\tau + G_{W^*} W^*_\tau]}{G^*_{W^*} W^*_\tau + G^*_W W_\tau} = \frac{-[G_W W_{\tau^*} + G_{W^*} W^*_{\tau^*}]}{G^*_{W^*} W^*_{\tau^*} + G^*_W W_{\tau^*}}$$

[37] For example, the objective functions in (26) allow for the possibility that the domestic government objective could take the form

$$G(\overset{(+)}{W},\overset{(-)}{W^*}) \equiv G(\overset{(+)}{W},\overbrace{R(\overset{(+)}{W},\overset{(-)}{W^*})}^{(+)}),$$

where R is any measure of the home government's performance in its rivalry with the foreign government as long as that performance is increasing in W and decreasing in W^*.

Figure A.1: International Efficiency Frontier



which simplifies to

$$\left[\left(\frac{-W^*_{\tau^*}}{W^*_{\tau}}\right) - \left(\frac{-W_{\tau^*}}{W_{\tau}}\right)\right] \times \left[\left(\frac{-G^*_{W^*}}{G^*_{W}}\right) - \left(\frac{-G_{W^*}}{G_{W}}\right)\right] = 0. \tag{28}$$

The necessary condition for efficient tariffs in (28) is illuminating. The first term on the left-hand side of (28) represents the difference between the slope of a $W^*(\tau^*, \tau)$ indifference curve and the slope of a $W(\tau, \tau^*)$ indifference curve in (τ, τ^*) space. Tariffs that set the first term on the left-hand side of (28) to zero are efficient relative to $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$, the underlying objectives of the two governments. In Figure A.1, with W on the vertical axis and W^* on the horizontal axis we plot the efficient combinations of $W(\tau, \tau^*)$ and $W^*(\tau^*, \tau)$ that are defined by $\left(\frac{-W^*_{\tau^*}}{W^*_{\tau}}\right) = \left(\frac{-W_{\tau^*}}{W_{\tau}}\right)$. These combinations are depicted by the concave frontier in Figure A.1 (as would be the case if the W and W^* functions exhibit diminishing marginal utility). All combinations of $W \geq 0$ and $W^* \geq 0$ on or inside the frontier are feasible to achieve with τ and τ^*. The second term on the left-hand side of (28) represents the difference between the slope of a $G^*(W^*, W)$ indifference curve and the slope of a $G(W, W^*)$ indifference curve in (W, W^*) space. If $\left(\frac{-G^*_{W^*}}{G^*_{W}}\right) > \left(\frac{-G_{W^*}}{G_{W}}\right)$ when evaluated at a tariff pair that satisfies $\left(\frac{-W^*_{\tau^*}}{W^*_{\tau}}\right) = \left(\frac{-W_{\tau^*}}{W_{\tau}}\right)$ and hence rests on the frontier in Figure A.1, the foreign- and home-government indifference curves will form an upward lens emanating from this point as depicted in Figure A.1 at the point A. If $\left(\frac{-G^*_{W^*}}{G^*_{W}}\right) < \left(\frac{-G_{W^*}}{G_{W}}\right)$ when evaluated at a tariff pair that satisfies $\left(\frac{-W^*_{\tau^*}}{W^*_{\tau}}\right) = \left(\frac{-W_{\tau^*}}{W_{\tau}}\right)$, the foreign- and home-government indifference curves will form a downward lens emanating from this point as depicted in Figure A.1 at

the point B. Finally, if $\left(\frac{-G^*_{W^*}}{G^*_W}\right) = \left(\frac{-G_{W^*}}{G_W}\right)$ when evaluated at a tariff pair that satisfies $\left(\frac{-W^*_{\tau^*}}{W^*_\tau}\right) = \left(\frac{-W_{\tau^*}}{W_\tau}\right)$, the foreign- and home-government indifference curves will be tangent to each other at this point (not pictured in Figure A.1).

It is now easy to see from Figure A.1 that with the general objective functions given in (26), the result reported in Proposition 2 will be preserved as long as points such as B in Figure A.1 can be ruled out. A point such as B would contradict Proposition 2, because beginning from point B an efficient pair of tariffs could be found inside the frontier at any of the tangencies between a $G^*(W^*, W)$ and $G(W, W^*)$ indifference curve that must exist inside the lens emanating in the downward direction from point B.[38] On the other hand, a point such as point A in Figure A.1 would be perfectly consistent with Proposition 2, because the lens emanating from point A is an upward lens, and while combinations of W and W^* in that lens would be preferable to point A, nothing in that lens is feasible. Finally, a point on the frontier in Figure A1 that corresponds to a tangency between $G^*(W^*, W)$ and $G(W, W^*)$ indifference curves would clearly not cause a problem for Proposition 2 either.

What is needed to rule out points such as B in Figure A.1 and preserve the result of Proposition 2? Formally, from this discussion it is clear that, when evaluated at tariffs that satisfy

$$\left(\frac{-W^*_{\tau^*}}{W^*_\tau}\right) = \left(\frac{-W_{\tau^*}}{W_\tau}\right),$$

we need to rule out the possibility that

$$\left(\frac{-G^*_{W^*}}{G^*_W}\right) < \left(\frac{-G_{W^*}}{G_W}\right). \tag{29}$$

It is direct to confirm that the parameterization of government objectives that we adopt in the main body of the paper rules out this possibility. This can be seen by noting that according to that parameterization we have

$$G_W = 1 + \rho,\ G^*_{W^*} = 1 + \rho^*,\quad G_{W^*} = -\rho \ \text{ and } \ G^*_W = -\rho^*,$$

so that $\left(\frac{-G^*_{W^*}}{G^*_W}\right) = \frac{1+\rho^*}{\rho^*} > \frac{\rho}{1+\rho} = \left(\frac{-G_{W^*}}{G_W}\right)$ for all tariffs. And it is also easy to confirm that this possibility will be ruled out under the more general specification of government objectives that relaxes the assumption of additive separability reflected in (5), namely under the government objectives

$$\begin{aligned} G(\tau, \tau^*) &= \bar{G}(W(\tau, \tau^*), R(\tau, \tau^*)) \\ G^*(\tau^*, \tau) &= \bar{G}^*(W^*(\tau^*, \tau), R(\tau, \tau^*)) \end{aligned}$$

where $R(\tau, \tau^*) \equiv W(\tau, \tau^*) - W^*(\tau^*, \tau)$, and where $\bar{G}$ and $\bar{G}^*$ are each weakly increasing in their first argument and $\bar{G}$ is weakly increasing while $\bar{G}^*$ is weakly decreasing in the geopolitical rivalry variable R.

[38] In the case illustrated by point B, the rise of geopolitics would therefore cause an inward shift of the international efficiency frontier depicted in Figure A.1. The position of the Nash point in Figure A.1 would also shift, and with the exception of the knife-edge possibility that the new Nash point happened to rest on the new international efficiency frontier, cooperation in the presence of geopolitics would still be possible in this case. Interestingly, if the new Nash point were positioned *above* the new international efficiency frontier, cooperation would be about *reducing* the levels of the underlying objectives W and W^*.

More generally, as (29) makes clear, what is required for Proposition 2 is that, when evaluated at any tariff pair satisfying $\left(\frac{-W^*_{\tau^*}}{W^*_{\tau}}\right) = \left(\frac{-W_{\tau^*}}{W_{\tau}}\right)$, it must be that $\left(\frac{G^*_{W^*}}{-G^*_{W}}\right)$, the marginal value that the foreign government derives from raising W^* relative to lowering W, is no less that $\left(\frac{-G_{W^*}}{G_{W}}\right)$, the marginal value that the home government derives from lowering W^* relative to raising W. Given that the absence of geopolitical rivalry implies $\left(\frac{G^*_{W^*}}{-G^*_{W}}\right) = \infty$ and $\left(\frac{-G_{W^*}}{G_{W}}\right) = 0$ for all tariff pairs, it is clear that this condition will be satisfied provided that the impacts of geopolitical rivalry on government objectives are not "too extreme." For example, as long as each government continues to value increases in its own underlying objectives more than it values diminishing the ability of the other government to achieve its underlying objectives, so that $G_W > -G_{W^*}$ and $G^*_{W^*} > -G^*_W$, then we have that $\left(\frac{G^*_{W^*}}{-G^*_{W}}\right) > 1 > \left(\frac{-G_{W^*}}{G_{W}}\right)$ and the results of Proposition 2 apply.