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Working Paper

The principle of reciprocity in the 21st century

IEHAS Discussion Papers, No. MT-DP - 2016/13

Provided in Cooperation with:

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Suggested Citation: DeRemer, David R. (2016) : The principle of reciprocity in the 21st century, IEHAS Discussion Papers, No. MT-DP - 2016/13, ISBN 978-615-5594-47-2, Hungarian Academy of Sciences, Institute of Economics, Budapest

This Version is available at:

<https://hdl.handle.net/10419/190437>

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MŰHELYTANULMÁNYOK

DISCUSSION PAPERS

MT-DP – 2016/13

**The Principle of Reciprocity
in the 21st Century**

DAVID R. DEREMER

Discussion papers
MT-DP – 2016/13

Institute of Economics, Centre for Economic and Regional Studies,
Hungarian Academy of Sciences

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The Principle of Reciprocity in the 21st Century

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June 2016

ISBN 978-615-5594-47-2
ISSN 1785 377X

The Principle of Reciprocity in the 21st Century

David R. DeRemer

Abstract

The principle of reciprocity is central to trade cooperation. Economic theory characterizes reciprocal policy changes that guide nations from noncooperative policies to the Pareto efficiency frontier. This paper extends the theory of reciprocity to a wide range of settings relevant for 21st century trade negotiations. Global value chains and rigid institutional constraints can lead to nations lacking the policy space necessary to influence relevant local prices abroad. Trade agreements then have a role in addressing these local price externalities in addition to the usual terms-of-trade externality. Yet we show that the standard concept of reciprocity---policy changes that equally increase net export value at world prices---can nonetheless guide nations toward the efficiency frontier. The crucial condition for reciprocity's application is that the policy changes which undo the terms-of-trade inefficiencies also undo the other inefficiencies. We find a set of policies such that no nation can gain from any reciprocal unwinding of trade commitments, and we show that these policies are globally efficient. Such stable policies are then a suitable prediction for trade negotiation outcomes when local price externalities matter. We derive the new predicted outcome and explore its relevance for existing theory and empirics of trade cooperation, including settings with imperfect competition, political economy, and global value chains.

JEL: F12, F13, F15, L24

Keywords: trade agreements, principle of reciprocity, GATT/WTO, global value chains

Acknowledgement

Seminar participants at Trier University provided valuable comments. Essential financial support was provided by the MTA Lendület program, the Columbia NSF-IGERT International Globalization and Development Program, and the project "Dispute Settlement in Trade: Training in Law and Economics" (DISSETTLE), a Marie Curie Initial Training Networks (ITN) Funded under the EU's Seventh Framework Programme, Grant Agreement No. FP7-PEOPLE-2010-ITN_264633.

A kölcsönösség elve a 21. században

David R. DeRemer

Összefoglaló

A kölcsönösség elve központi szerepet játszik a kereskedelmi együttműködésben. A közgazdasági elmélet leírja azokat a kölcsönös gazdaságpolitikai lépéseket, amelyek a kooperáció hiányától a Pareto-hatékony állapotok felé vezetik az országokat. Ez a tanulmány kiterjeszti a kölcsönösség elméletét a 21. századi kereskedelmi tárgyalások szempontjából releváns helyzetek széles körére.

A globális értékláncok és a merev intézményi korlátok miatt lehetséges, hogy egyes országok nem rendelkeznek kellő gazdaságpolitikai mozgástérrel ahhoz, hogy befolyásolják a releváns külföldi árakat. Ilyenkor – a szokásos cserearány-externáliák mellett – a kereskedelmi egyezmények feladata lesz a helyi árakkal kapcsolatos externáliák kezelése is. A tanulmány azonban megmutatja, hogy a kölcsönösség szokásos értelmezése (vagyis olyan szakpolitikai változtatások, amelyek azonos mértékben növelik a nettó export értékét világszintű árakon) is elvezetheti az országokat a hatékony kimenetekhez. A kölcsönösség alkalmazásának elengedhetetlen feltétele, hogy a cserearány-hatékonyságvesztéseket korrigáló beavatkozások más típusú hatékonyságvesztéseket is kezeljenek.

A szerző azonosít egy olyan szakpolitikai csomagot, amely mellett egyik ország sem tud nyerni a kereskedelmi megállapodásokban foglalt kötelezettségeik kölcsönös lazításával, és megmutatja, hogy ezek globálisan hatékonyak. Ezek a stabil szakpolitikák tehát a kereskedelmi tárgyalások kimenetelét megfelelően jelzik előre az olyan esetekben, amelyekben számítanak a helyi árakkal kapcsolatos externáliák. A tanulmány levezeti az új kimenet jellemzőit, és megvizsgálja ennek elméleti és empirikus jelentőségét a kereskedelmi együttműködések szempontjából, tárgyalva a nem tökéletes versenyt, a politikai gazdaságtani szempontokat és a globális értékláncokat is.

JEL: F12, F13, F15, L24

Tárgyszavak: kereskedelmi egyezmények, kölcsönösség elve, GATT/WTO, globális értékláncok

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1 Introduction

The principles of the General Agreement on Tariffs and Trade (GATT) receive substantial credit for post-World War II trade cooperation. Economists provide rigorous support for GATT’s role with theory in which reciprocity guides nations toward Pareto-improving policies (Bagwell and Staiger, 1999) and empirical support for this theory (Maggi, 2014, Section 2.5.1). Such theory focuses primarily on tariffs for final goods, as is appropriate for mid-20th century trade. Yet the focus of trade negotiations lately has shifted to reducing barriers for intermediate goods in global supply chains (Baldwin, 2013) and cooperation over non-tariff issues (Baldwin, 2016). The shift is evident in the various non-tariff agreements within the World Trade Organization (WTO) since 1995 and preferential trade agreements more recently (Bagwell, Bown, Staiger, forthcoming). This new era of trade cooperation raises the question of whether the usual notions of reciprocity can still apply.

A significant challenge for reciprocity in these 21st century trade settings arises when nations have limited policy space to affect relevant prices in local markets abroad, so there is a role for trade agreements to address *local price externalities*. Per the survey of Bagwell and Staiger (2016), reciprocity demonstrably works well when the only fundamental purpose for trade agreements is to address *terms-of-trade externalities*, which arise when policies reflects nations’ unilateral motives to manipulate world prices. But when local price externalities matter for trade agreements, reciprocity’s application is an open question.

A growing literature details empirically-relevant causes of local price externalities that matter for trade agreements. One cause in offshoring settings is final good producers who do not internalize the benefits of higher final good prices flowing upstream to intermediate producers abroad.¹ Another cause is rigid institutional constraints such as the WTO’s prohibition of export subsidies, in which case local prices abroad will affect the rents accruing to exporters through trade volumes.² Motivated by such examples, this paper provides new results on reciprocity that apply across a wide variety of policies and market structures.³

This paper shows how the standard form of reciprocity—policy changes that equally

¹The offshoring model requires additional structure for local price externalities to matter. One possibility is that intermediate exporters are politically powerful and bilateral bargaining determines intermediate prices (Antràs and Staiger, 2012a, 2012b). Another possibility is the absence of any direct trade taxes on the intermediates (Blanchard, Bown, and Johnson, 2016).

²The relevance of local price externalities absent export policies applies to the three-sector model with perfect competition and political economy (Bagwell and Staiger, 2001), profit-shifting models (Mrázová, 2011; Bagwell and Staiger, 2012), and delocation models (Ossa, 2011; Bagwell and Staiger, 2015).

³In the offshoring example, relevant local price externalities arise from agents’ behavior, while in the case of the export subsidy ban, they arise from the international institution itself. So only the offshoring example describes a fundamental problem for the institution, per Bagwell and Staiger (2016). Given the practical relevance of institutional rigidities, this paper focuses on trade agreement principles that address relevant local price externalities whether or not they arise fundamentally.

increase net export value at world prices—can still be relevant when local price externalities matter. The key result involves the endpoint of reciprocal negotiations. As is standard, we consider a set of policies such that no nation can gain from any reciprocal unwinding of trade commitments. When local price externalities matter, such policies can still exist, and when they exist, they lie on the efficiency frontier. At the relevant efficient policies, the individual policy changes still cause local price externalities, but the reciprocal policy changes balance all local price effects so there are no-first order welfare effects. Such stable policies are then a suitable prediction for trade negotiation outcomes when local price externalities matter.

We begin by detailing the general trade environment. For two nations, Home and Foreign, we specify reduced-form government objectives as functions of domestic local prices, local prices abroad, and world prices. Each nation has a set of policies which uniquely determine the prices. We define the noncooperative equilibrium and cooperative equilibrium in this environment according to the appropriate first-order conditions.

We then detail the axioms that a reciprocity rule should satisfy in our general environment. One axiom is that nations mutually benefit from reciprocal policy changes starting from the noncooperative equilibrium. The other axiom is the existence of a point on the efficiency frontier such that no nation benefits from undoing reciprocal policy changes (Bagwell and Staiger, 2016). Throughout we then consider the standard reciprocity rule which involves policy changes that equally increase net export value at world prices.

To further motivate our extended theory of reciprocity, we detail general conditions in which local price externalities matter for trade agreements, guided by the existing literature. First, there must be some limitation in policy space that prevents nations have achieving a first-best allocation of production according to the government’s preferences. Second, there must be at least some imbalance in policies that directly influence a single local price, which is of mutual interest because of the intersectoral misallocation.⁴ If either of these conditions fails to hold—either because the space of domestic policies is sufficiently rich or trade policies match—then the efficient point robust to reciprocal renegotiations is the same as identified by Bagwell and Staiger (2016), the *political optimum* in which nations act as if they did not value their ability to manipulate their terms of trade. But when both conditions are satisfied, the political optimum is inefficient, and we require a new prediction for the end point of reciprocal trade negotiations.

Given such a limited policy environment in which local price externalities matter for trade agreements, we maintain the standard definition of reciprocal policies, but ask whether

⁴If governments have the domestic policy space to equate markups across sectors, then Lerner symmetry holds (Epifani and Gancia, 2011). The equivalence of import and export policy implies that governments have the complete set of trade policies that implies the irrelevance of local price externalities for trade agreements, as in Bagwell and Staiger (2012, 2016).

there is another efficient point in the policy space that is an appropriate target for reciprocal negotiations. We consider the point such that for each nation's objective, there are zero first-order joint effects from Home and Foreign policy changes satisfying reciprocity. This point is then robust to reciprocal policy renegotiations, such that if one nation changed its policy, and the other responded reciprocally, then neither nation would benefit. The new, nontrivial result is that this point lies on the efficiency frontier, even when local price externalities matter. A limitation is that such points do not always exist. We can confirm existence when nations engage in reciprocal negotiations over single policies (possibly distinct) such that policy changes which undo the global inefficiency in local prices also undo the global inefficiency from terms-of-trade manipulation.

We highlight the key differences between the new proposed efficient point and the previous political optimum when local price externalities matter for trade agreements. In the standard theory, every government is at its preferred trade volume among reciprocal policy changes, while at all other efficient points there could be renegotiations such that one nation could benefit from reciprocal tariff increases. In our current framework and proposed efficient point, local price effects are nonzero, and governments will want to increase or decrease trade volume in certain industries. But any combination of reciprocal trade negotiations will lead to a mixture of changes in trade volumes that leave governments indifferent to the policy changes.

Another key difference involves both the level and the nature of predicted trade cooperation. In the standard theory, trade agreements eliminate the portion of tariff increases due to terms-of-trade manipulation and leave the portion of tariffs due to political economy concerns in place. This result is the foundation of criticism by practitioners, who claim that trade agreements do not always leave such protection in place (e.g. Regan, 2015). In contrast, the new predicted outcome can reflect nations pursuing deeper liberalization to the detriment of import-competing sectors and the benefit of exporting sectors. The theory also allows for the possibility of trade cooperation for small countries with no market power in world markets and no time-inconsistent government preferences.⁵

Having derived the proposed equilibrium, we apply it to key examples. The first we consider is the simple partial equilibrium model of Bagwell and Staiger (2001, 2016) with a numeraire good, two other goods, politically organized exporters, and only import taxes. This model satisfies our criteria for limited policy space, because (1) there are no export

⁵The political economy theory of Maggi and Rodriguez-Clare (2007) also allows the possibility that trade agreements immediately reduce tariffs related to terms-of-trade manipulation and then gradually reduce tariffs further due to domestic commitment motives, resulting because political pressure causes governments to have time-inconsistent preferences. With local price externalities, there can be immediate cooperation for such deeper liberalization when governments have stable preferences.

policies such that governments could eliminate all Home and Foreign local price effects of policies, and (2) there are no domestic policies that allow governments to correct the perceived intersectoral misallocation between the freely traded sector and other goods which collect political economy rents. We confirm that the stable outcome for reciprocity is efficient.

Interestingly at this stable efficient point in the simple partial equilibrium model with limited instruments, nations prefer a higher price in the import-competing sector, while the exporter prefers a higher local price. This leads to a number of new consequences that cannot occur in settings when only terms-of-trade externalities matter for trade agreements, in which case the stable efficient point is the political optimum with zero local price effects. At this point, rules to restrict export subsidies are potentially mutually beneficial if the negative local price effect from subsidized products dominates the terms-of-trade effect of an export subsidy. Another observation is that one source of efficiency improvement at this point (from the governments' perspective) is that the cooperative policies increase political gains for exporters at the expense of importers.

Our second example is a limited-instrument version of the offshoring model of Antràs and Staiger (2012b), in which the nation Home is a final good producer and Foreign politically values its intermediate export industry in excess of national income. We require a few additional restrictions for our efficient point to exist: (1) the reciprocal negotiations concern only the Home policy affecting the price of the final good and the Foreign export policy for the intermediate, and (2) the Home policy that increases the final good price also improves Foreign's terms-of-trade for the intermediate. At the noncooperative equilibrium, Home sets the local price of the final good too low for Foreign, and Foreign sets trade volume in the intermediate too low for Home. At the stable outcome of reciprocal negotiations, (1) Home sets the final good price higher than it would like, so there is negative effect of the final good price on Home, while Foreign would still prefer a higher final good price. and (2) Foreign sets a higher export subsidy than it would like, while Home would still prefer a lower price of the intermediate within its borders. All these local price effects balance out, and the outcome is efficient.

At times the efficient point we consider does not exist in the offshoring model, but we can interpret these failures. One possibility that leads to failure is when the final good price increase also improves Home's terms of trade or has no effect. The implied broader prediction then is that the standard reciprocity works well when policy changes that correct terms-of-trade inefficiencies also correct the other inefficiencies. Otherwise, nations might need to resort to specific restrictions rather than relying on reciprocal policy changes. Another source of failure is attempting reciprocal negotiations over both the Home final good policy and Home's policy affecting the intermediate. The problem is that it is generally not possible for

Foreign to maintain robustness to renegotiations simultaneously for each of the Home policies when these local price externalities matter. The framework implies that for reciprocity to work better, narrowing the set of policies for reciprocal negotiations to one each and imposing more stringent restrictions elsewhere, which hints toward a rationale for the tariffication that occurred at the dawn of the GATT. And even if the efficient point does exist, it may result from a shift in world prices that is not possible to achieve directly through reciprocal negotiations, and it could even leave one country worse off than in the Nash equilibrium.⁶

The last example we consider is a symmetric version of the offshoring model from Antràs and Staiger (2012b) with free trade in intermediates, and reciprocal negotiations over the final good tariff. The policy space here is then similar to the global supply chain theory and empirics in Blanchard, Bown, and Johnson (2016). Our results imply that there are relevant local price externalities from the final good tariffs, so our model’s prediction for the outcome of bilateral negotiations has more desirable properties than the political optimum, which is neither efficient nor robust to renegotiations. We can then suggest what empirical measures can be used to test the theory in this global supply chain setting.

Other papers which consider reciprocity over international externalities aside from terms-of-trade manipulation are Ossa (2011) and Mrázová (2011). They both consider specific trade environments absent export subsidies. Ossa shows that preserving trade balance within single sectors is an appropriate reciprocity rule in a monopolistically competitive setting with an outside sector. Preserving the trade balance within each sector preserves the number of firms in each country, which then implies the preservation of each nation’s export price index. So Ossa’s reciprocity rule is in fact equivalent to a typical terms-of-trade preserving reciprocity rule in his environment, once we define terms of trade as the price of the export bundle, as other recent theoretical work would suggest is appropriate.⁷ The cooperative equilibrium in Ossa is a corner solution of free trade. Mrázová, in an oligopolistic setting, proposes a reciprocity rule that preserves the balance of profits, which has some potential advantages and clear disadvantages, which we discuss further in the conclusion. The efficient equilibrium between symmetric countries in Mrázová is an example of the equilibrium that we derive here.

Bagwell and Staiger (2016) also consider reciprocity when local price externalities matter in the limited-instrument version of Bagwell and Staiger (2001) and the political economy

⁶The shift between world prices between the Nash equilibrium and the efficient point is also necessary in the standard theory under asymmetry (e.g. Bagwell and Staiger, 1999). How such a shift would occur remains an open question in the theory of reciprocity.

⁷See, for example, DeRemer (2013), Bergin and Corsetti (2013), Costinot, Rodriguez-Clare, and Werning (2016), who all argue that the price index of the traded bundle is the appropriate definition of terms of trade in these differentiated product settings.

version of Antràs and Staiger (2012b). They observe that the political optimal is neither efficient nor robust to renegotiation in either case. They find no reciprocity-robust point exists on the efficiency frontier in Antràs and Staiger (2012b). We discuss the general reasons for this existence failure in the current paper.

We proceed as follows. Section 2 defines the general reduced-form trade framework and the axiomatic properties for a suitable reciprocity rule. Section 3 introduces the standard theory of reciprocity and when it may fail. Section 4 determines an outcome that is robust to renegotiations and derives its global efficiency. Section 5 applies the new theory to recent theoretical and empirical work. Section 6 concludes.

2 Modeling Trade Agreements and Reciprocity

2.1 A General Model of Trade Agreements

Consider two countries, Home and Foreign, with respective reduced-form government objectives of $W(p, p^*, p^w)$ and $W^*(p, p^*, p^w)$ where p is a vector of local prices in Home's market, p^* is a vector of local prices in Foreign's market, and p^w is a vector of world prices between borders. These vectors could include prices for factors of production, intermediate goods, final goods, or composite goods. Let there be at least one factor of production that is mobile between sectors in each country, and designate the Home wage for this factor as the numeraire.

Home and Foreign have respective policy vectors Λ and Λ^* which could consist of trade policies and domestic policies. All objectives and prices above can be written as continuous and differentiable functions of all policies. The objectives are globally concave within the policy space. The Jacobian row matrices for the effect of one's own policies on one's own objective are

$$\begin{aligned} \frac{dW}{d\Lambda} &= \frac{dW}{dp} \frac{dp}{d\Lambda} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda} + \frac{dW}{dp^w} \frac{dp^w}{d\Lambda}, \text{ and} \\ \frac{dW^*}{d\Lambda^*} &= \frac{dW^*}{dp} \frac{dp}{d\Lambda^*} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda^*} + \frac{dW^*}{dp^w} \frac{dp^w}{d\Lambda^*}, \end{aligned} \tag{1}$$

and the Jacobians for the effects of trading partner's policies on one's own objective are

$$\begin{aligned}\frac{dW}{d\Lambda^*} &= \frac{dW}{dp} \frac{dp}{d\Lambda^*} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda^*} + \frac{dW}{dp^w} \frac{dp^w}{d\Lambda^*}, \text{ and} \\ \frac{dW^*}{d\Lambda} &= \frac{dW^*}{dp} \frac{dp}{d\Lambda} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda} + \frac{dW^*}{dp^w} \frac{dp^w}{d\Lambda}.\end{aligned}\tag{2}$$

We define the *noncooperative equilibrium* according to *Nash equilibrium policies* Λ^N and Λ^{*N} which satisfy the $|\Lambda| + |\Lambda^*|$ first-order conditions

$$\frac{dW}{d\Lambda} = 0 \text{ and } \frac{dW^*}{d\Lambda^*} = 0.\tag{3}$$

We define the set of *cooperative equilibria* on the *global efficiency frontier* for policies maximizing the objective $W + \lambda W^*$ for some positive multiplier λ . Define the optimal point on the frontier corresponding to multiplier λ as policies $\Lambda^{\lambda E}$ and $\Lambda^{*\lambda E}$, which satisfy the first-order conditions

$$\frac{dW}{d\Lambda} + \lambda \frac{dW^*}{d\Lambda} = 0 \text{ and } \frac{dW}{d\Lambda^*} + \lambda \frac{dW^*}{d\Lambda^*} = 0.\tag{4}$$

The efficiency conditions can also be written as

$$\frac{dW}{d\Lambda_1} / \frac{dW^*}{d\Lambda_1} = \frac{dW}{d\Lambda_2} / \frac{dW^*}{d\Lambda_2}\tag{5}$$

for all policies pairs Λ_1 and Λ_2 in $\{\Lambda, \Lambda^*\}$.

The setting is general enough to encompass most static two-country models of trade agreements.⁸ We do impose one more restriction that leads to somewhat less generality than the reduced-form model of Bagwell and Staiger (1999) but still permits us to nest most fully specified trade models. The specific dependence of the welfare functions on changes in the world price vector takes the form,

⁸The framework does not encompass models in which the relevant equilibria involve corner solutions, such as Ossa (2011), in which the baseline model lacks tariff revenue and the cooperative equilibrium is free trade. The current framework can encompass the Krugman (1980) monopolistic competition framework used by Ossa, but with tariff revenue, as in Campolmi, Fadinger, and Forlati (2014). Another exception is DeRemer (2015), in which the noncooperative policies are autarky and the cooperative policies are free trade. The framework also does not encompass dynamic models such as Maggi and Rodriguez-Clare (1998, 2007) in which trade agreements solve a commitment problem for governments with time-inconsistent preferences due to lobbying pressure.

$$\begin{aligned}\frac{dW}{dp^w} dp^w &= M dp^w \\ \frac{dW^*}{dp^w} dp^w &= -M dp^w\end{aligned}\tag{6}$$

where M is a row vector of net trade volumes for each traded item, in which export items for Home enter positively and import items for Home enter negatively. The column vector dp^w is the differential effect of world price changes. This again encompasses most models, though there are exceptions in terms of multinational ownership (e.g. Blanchard, 2010), in which case the vector M could be modified to reflect ownership rather than location of production.

To show that the Nash equilibrium is inefficient, we generally need additional structure, such as ruling out Metzler and Lerner paradoxes, as in Bagwell and Staiger (2016). The Nash equilibrium will be inefficient in all examples we consider in Section 5.

2.2 Modeling Reciprocity Rules

At prevailing policies Λ and Λ^* , we define the reciprocity rule to restrict the column vectors of differential policy changes $d\Lambda$ and $d\Lambda^*$. The two conditions that the reciprocity rule must satisfy are

1. Mutual gains starting from the Nash equilibrium policies.
2. The existence of a point on the efficiency frontier such that no gains are possible from reciprocal policy changes.

Formally, the first condition can be written as

$$\begin{aligned}\frac{dW}{d\Lambda} d\Lambda + \frac{dW}{d\Lambda^*} d\Lambda^* &> 0, \text{ and} \\ \frac{dW^*}{d\Lambda^*} d\Lambda^* + \frac{dW^*}{d\Lambda} d\Lambda &> 0\end{aligned}\tag{7}$$

when evaluated at noncooperative policies Λ^N and Λ^{*N} . In other words, a positive reciprocal action is mutually beneficial.

Throughout the paper, we will focus more on the second condition that specifies the existence of policies such that

$$\begin{aligned}\frac{dW}{d\Lambda}d\Lambda + \frac{dW}{d\Lambda^*}d\Lambda^* &= 0, \text{ and} \\ \frac{dW^*}{d\Lambda^*}d\Lambda^* + \frac{dW^*}{d\Lambda}d\Lambda &= 0.\end{aligned}\tag{8}$$

when evaluated at some set of efficient policies $\Lambda^{\lambda E}$ and $\Lambda^{*\lambda E}$ on the efficiency frontier. So a viable reciprocity rule must have an efficient point that is stable with respect to reciprocal policy changes. Bagwell and Staiger (1999, 2016) fully specify a model in which we can interpret such policies as being robust to renegotiations. Any attempt to deviate from this efficient point subject to reciprocal retaliation will not be beneficial to the deviating party. Hence we use the terms reciprocity-robust and renegotiation-robust interchangeably throughout this paper.

3 The Standard Reciprocity Rule

This section introduces the standard reciprocity rule common in the literature, in which the policy changes increase trade volumes when valued at world prices. First, we define reciprocal policies according to the standard rule. We then consider whether the efficient and renegotiation-robust point is still the political optimum from the previous literature. We consider cases in which the political optimum might fail, so local price externalities would matter for trade agreements.

3.1 Definition

Generalizing further from Bagwell and Staiger (2016), the terms-of-trade reciprocity rule is satisfied for differential policy changes such that

$$\left(\frac{dM_H}{d\Lambda}d\Lambda + \frac{dM_H}{d\Lambda^*}d\Lambda^*\right)p^w = -\left(\frac{dM_F}{d\Lambda}d\Lambda + \frac{dM_F}{d\Lambda^*}d\Lambda^*\right)p^w > 0\tag{9}$$

where M_H (M_F) is the partition of Home (Foreign) export goods and p^w is the column vector of world prices. The definition implies that reciprocal policy changes increase trade equally when valued at world prices.⁹ We can also rewrite the first equality simply as

$$\left(\frac{dM}{d\Lambda}d\Lambda + \frac{dM}{d\Lambda^*}d\Lambda^*\right)p^w = 0.\tag{10}$$

⁹Bagwell and Staiger (2016) further identify that a reciprocity rule satisfying market clearing cannot have unequal weights on the export trade values for each nation.

Notice that balanced trade conditions imply $Mp^w = 0$ so it must also be true that

$$\frac{d(Mp^w)}{d\Lambda}d\Lambda + \frac{d(Mp^w)}{d\Lambda^*}d\Lambda^* = 0. \quad (11)$$

Through product rule differentiation and subtracting the previous equation, we find that

$$M \left(\frac{dp^w}{d\Lambda}d\Lambda + \frac{dp^w}{d\Lambda^*}d\Lambda^* \right)^T = 0. \quad (12)$$

These conditions are most clearly satisfied if policies are neutral with respect to world prices. They also can be satisfied if policy changes are trade tax neutral. These are two ways in which we can interpret reciprocal policies as preserving the terms of trade.

3.2 Conditions for Inefficiency of the Political Optimum

This subsection details under which circumstances the political optimum would fail to be efficient. We describe the limitations on policy space which cause local price externalities to be relevant for trade agreements, and we discuss illustrations.

1. *There must exist at least one trade policy that lacks a "dual" instrument, so there is a "missing" trade instrument.* Notice that if we have dual instruments, we have the efficiency and renegotiation robustness of the political optimum, regardless of any limitations on the domestic policy space. Consider the case in which nations have only trade policies. Observe that the renegotiation-robust point must satisfy

$$\begin{aligned} \left(\frac{dW}{dp} \frac{dp}{d\Lambda} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda} \right) d\Lambda + \left(\frac{dW}{dp} \frac{dp}{d\Lambda^*} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda^*} \right) d\Lambda^* &= 0, \text{ and} \\ \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda^*} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda^*} \right) d\Lambda^* + \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda} \right) d\Lambda &= 0. \end{aligned} \quad (13)$$

because all the terms-of-trade related terms drop out.

Contrast this with the conditions for the political optimum

$$\frac{dW}{dp} \frac{dp}{d\Lambda} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda} = \frac{dW^*}{dp} \frac{dp}{d\Lambda^*} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda^*} = 0. \quad (14)$$

We can then prove the following proposition about dual policies:

Proposition 1 *Suppose there exists an invertible matrix A such that $\frac{dp}{d\Lambda} = \frac{dp}{d\Lambda^*}A$ and $\frac{dp^*}{d\Lambda} = \frac{dp^*}{d\Lambda^*}A$. Then renegotiation-robust and politically optimal points are equivalent and efficient.*

Proof. First consider a point that is renegotiation-robust. Then any differential policy changes at this point must satisfy (13). This and the mapping A between the price derivatives implies

$$\begin{aligned} \left(\frac{dW}{dp} \frac{dp}{d\Lambda} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda} \right) (d\Lambda + Ad\Lambda^*) &= 0, \text{ and} \\ \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda^*} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda^*} \right) (d\Lambda^* + A^{-1}d\Lambda) &= 0. \end{aligned} \quad (15)$$

So the first parenthesisals must be zero, and the politically optimal conditions in (14) are satisfied. The politically optimal conditions and (13) then imply

$$\begin{aligned} \left(\frac{dW}{dp} \frac{dp}{d\Lambda^*} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda^*} \right) d\Lambda^* &= 0, \text{ and} \\ \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda} \right) d\Lambda &= 0. \end{aligned} \quad (16)$$

So the local price externalities of the politically optimal policies are then zero, and efficiency conditions are therefore satisfied.¹⁰ For the reverse direction, if we assume the politically optimal conditions are satisfied, then they and the mapping A imply

$$\begin{aligned} \left(\frac{dW}{dp} \frac{dp}{d\Lambda^*} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda^*} \right) Ad\Lambda^* &= 0, \text{ and} \\ \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda} \right) A^{-1}d\Lambda &= 0. \end{aligned} \quad (17)$$

So again these policies have zero externalities through local prices, so the politically optimal policies are efficient. These equations and the politically optimal conditions imply (13), so the political optimum is renegotiation robust. ■

Notice that this argument holds regardless of what domestic inefficiencies may exist, as Bagwell and Staiger (2012, 2015) emphasize.

For examples of such dual policies, one possibility is import and export policies for every good, as in the models of Bagwell and Staiger (2012, 2015). Another example is import-tariff-only models when Lerner symmetry holds as in the two-good general equilibrium model of Bagwell and Staiger (1999), in which case import and export taxes are equivalent. For Lerner symmetry to fail, there must be some failure to equate markups across sectors (Epifani and Gancia, 2011).

¹⁰If the politically optimal conditions are satisfied, and these policies imply no local policy externalities, then the only remaining first-order effects are through zero-sum changes in world prices. Given (6), the efficiency conditions (5) are satisfied for all policy pairs.

Consequently, an example for which dual policies fail to exist is an economy with imperfect competition, a freely-traded outside sector, no domestic policies, and no export policies (e.g. Bagwell and Staiger, 2012, 2015). Here there is no Lerner symmetry since the markups between the outside sector and imperfectly competitive sector are not corrected.

Another example in which dual policies do not exist is the offshoring model of Antràs and Staiger (2012b), in which case there is a final good policy and the intermediate exporter lacks any trade policy that is the dual in affecting the final good price. This model does have an import policy and export policy for the intermediate, however, so absent the final good policy, the political optimum is still efficient.

A corollary of the previous proposition also holds for the case in which nations have any domestic policies (within the paper's framework that rules out nonpecuniary externalities) and the "full set" of dual trade policies. The above proof trivially holds for the subset of dual trade policies, and then the renegotiation-robustness and political optimum equivalence extend to domestic policies provided that the dual trade policies affect all prices in p and p^* .

2. Nations must lack the policy space to achieve a first-best allocation of production from the perspective of the governments' objectives.

This statement is a straightforward application of the targeting principle (Bhagwati and Ramaswami, 1963; Dixit, 1985). Targeting suggests first-best policy involves direct targeting of distortions. Here we consider the distortions from the perspective of government objectives, so correcting distortions could mean not only correcting market failure, but also satisfying political motives (while actually amplifying distortions). If there is then no value for governments in addressing domestic distortions with either trade policies or through cross-border effects of domestic policies, then it is natural that terms-of-trade manipulation would be the only problem for trade agreements. Yet governments have long turned to trade policy to address fundamentally domestic issues—for example, Alexander Hamilton's 1791 proposal for promoting U.S. manufacturing involved significant "bounties" (e.g. domestic subsidies) but the United States instead turned to trade policy to support manufacturing (Irwin, 2004).

For commonly-used frameworks with insufficient policy space to implement efficient targeting, consider the partial equilibrium model with one freely traded outside sector and another sector with either imperfect competition (Ossa, 2011; Mrázová, 2011; Bagwell and Staiger, 2012, 2015) or even perfect competition with political economy such that Lerner symmetry fails (Bagwell and Staiger, 2016). In all these models, governments have no domestic policy that could equate what the government would perceive as misallocation between sectors. Local price externalities than arise when governments lack export policies that are the dual instruments of the import policies.

Another important example is the offshoring model in Antràs and Staiger (2012b). For governments to lack the policy space to achieve the first-best, they require both political economy and bilateral bargaining. With no political economy, there is enough policy space for the price of the intermediate export to equal its marginal cost, and then the intermediate exporter has no interest in its trade volume. With no bilateral bargaining, only the prices of the intermediate matter for determining trade volume, not the price of the final good, and again governments can achieve an efficient allocation. But with both, governments distort the price of the intermediate above its marginal cost, and the final good price matters for determining intermediate trade volume. Given the political economy distortion and the absence of any dual instrument for the final good tariff in affecting the relevant final good price, there is a local price externality that matters to the intermediate exporter in trade negotiations.

4 The Target for Reciprocal Negotiations

This section derives the efficient point that should be the target for reciprocal negotiations. The stable point which we derive can be efficient even when externalities other than terms of trade matter for trade negotiations. We first show that if this point exists, then it is efficient. Existence is not assured, however, and we discuss necessary conditions for existence. We then compare the results to the previous literature.

4.1 Derivation

We propose the following conditions to identify an appropriate target for reciprocal trade negotiations. For differential policy changes $d\Lambda$ and $d\Lambda^*$ satisfying the reciprocity condition (12), we write the reciprocity-robustness conditions as

$$\begin{aligned} \left(\frac{dW}{dp} \frac{dp}{d\Lambda} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda} \right) d\Lambda + \left(\frac{dW}{dp} \frac{dp}{d\Lambda^*} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda^*} \right) d\Lambda^* &= 0, \text{ and} \\ \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda^*} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda^*} \right) d\Lambda^* + \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda} \right) d\Lambda &= 0. \end{aligned} \quad (18)$$

The conditions ensure that no nation can gain from any policy changes satisfying reciprocity, and Bagwell and Staiger (1999, 2016) show how such conditions can be interpreted as implying a robustness to renegotiations.

To interpret the equation, first observe that the reciprocal policies neutralize any joint terms-of-trade impacts on welfare. The condition implies that the remaining effects of recip-

rocal policies have no net effect on welfare. As noted in the previous section, when terms-of-trade manipulation is the only problem for trade agreements, then the standard political optimum is efficient and renegotiation-robust.

The case of interest is when the political optimum is inefficient. Then for the equations above, policies such that the first bracketed terms are zero (thus satisfying the politically optimal conditions), imply that the second bracketed terms (the cross-border externalities of the politically optimal policies) are non-zero.

What makes the reciprocity-robust point interesting is its general efficiency properties, even when the political optimum is inefficient. We derive the following proposition:

Proposition 2 *Suppose there exists a point $(\Lambda^R, \Lambda^{*R}) \in \Lambda \times \Lambda^*$, such that the joint effect of any policy changes satisfying our definition of reciprocity leads to no first-order changes in either government's objective, i.e. equations (18) are satisfied when evaluated at $(\Lambda^R, \Lambda^{*R})$ for any $(d\Lambda, d\Lambda^*)$ satisfying (12). Then this point is efficient.*

Proof. Consider $(\Lambda^R, \Lambda^{*R})$. We have already assumed at these policies that there is no Pareto improvement from policy changes satisfying reciprocity. What remains to be shown is that no policy changes of any sort can lead to Pareto improvement. By (5), if the point is inefficient, then there must exist at least two policies Λ_1 and Λ_2 such that

$$\frac{dW}{d\Lambda_1} / \frac{dW^*}{d\Lambda_1} \neq \frac{dW}{d\Lambda_2} / \frac{dW^*}{d\Lambda_2}. \quad (19)$$

We show no such point can exist. Let $\frac{d\Lambda_2}{d\Lambda_1}$ be the factor such that the changes in Λ_1 and Λ_2 satisfy reciprocity:

$$\frac{d\Lambda_2}{d\Lambda_1} \equiv \frac{-M \frac{dp^w}{d\Lambda_1}}{M \frac{dp^w}{d\Lambda_2}}. \quad (20)$$

Implicit here is that both policies have terms-of-trade effects at $(\Lambda^R, \Lambda^{*R})$. If a policy has no terms-of-trade effects at $(\Lambda^R, \Lambda^{*R})$, then for (18) to be satisfied, this policy must have no first-order effect on either country's welfare at $(\Lambda^R, \Lambda^{*R})$. The conditions in (18) can be written as

$$\begin{aligned} \frac{dW}{dp} \frac{dp}{d\Lambda_1} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda_1} + \left(\frac{dW}{dp} \frac{dp}{d\Lambda_2} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda_2} \right) \frac{d\Lambda_2}{d\Lambda_1} &= 0, \text{ and} \\ \frac{dW^*}{dp} \frac{dp}{d\Lambda_1} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda_1} + \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda_2} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda_2} \right) \frac{d\Lambda_2}{d\Lambda_1} &= 0. \end{aligned} \quad (21)$$

Adding in terms from world price changes, which are zero by (20), we have

$$\begin{aligned}
0 &= \left(\frac{dW}{dp} \frac{dp}{d\Lambda_1} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda_1} + M \frac{dp^w}{d\Lambda_1} \right) + \\
&\quad \left(\frac{dW}{dp} \frac{dp}{d\Lambda_2} + \frac{dW}{dp^*} \frac{dp^*}{d\Lambda_2} + M \frac{dp^w}{d\Lambda_2} \right) \frac{d\Lambda_2}{d\Lambda_1}, \text{ and} \\
0 &= \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda_1} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda_1} + M \frac{dp^w}{d\Lambda_1} \right) + \\
&\quad \left(\frac{dW^*}{dp} \frac{dp}{d\Lambda_2} + \frac{dW^*}{dp^*} \frac{dp^*}{d\Lambda_2} + M \frac{dp^w}{d\Lambda_2} \right) \frac{d\Lambda_2}{d\Lambda_1},
\end{aligned} \tag{22}$$

which then equals a simple weighted sum of total derivatives by (1) and (6)

$$\frac{dW}{d\Lambda_1} + \frac{dW}{d\Lambda_2} \frac{d\Lambda_2}{d\Lambda_1} = 0, \text{ and } \frac{dW^*}{d\Lambda_1} + \frac{dW^*}{d\Lambda_2} \frac{d\Lambda_2}{d\Lambda_1} = 0, \tag{23}$$

and it then follows that

$$\frac{dW}{d\Lambda_1} / \frac{dW^*}{d\Lambda_1} = \frac{dW}{d\Lambda_2} / \frac{dW^*}{d\Lambda_2}. \tag{24}$$

So for any arbitrary pair of policies, the relevant tangency condition is satisfied. The robust point must then lie on the efficiency frontier. ■

4.2 Existence

We discuss some necessary conditions for existence, which is far from guaranteed.

First, as mentioned in the previous proof, if a policy never has terms-of-trade effects, then we require that it has no cross-border welfare implications for either nation. So, for example, efficient cooperation over a cross-border pollution externality with no effect on trade could not be achieved with the standard reciprocity rule in this framework. A specific example from the trade literature is Antràs and Staiger (2012b) when the production function of final goods from intermediates takes the specific form $y(x) = x^\mu/\mu$ for $\mu \in (0, 1)$, in which case various forces balance such that the final good tariff has no terms-of-trade effects.

Second, observe that the conditions (18) require that trade-tax preserving policy changes preserve both welfares at the point in question. If nations have multiple policies without a dual policy (e.g. missing instruments) such that externalities from these policies travel through both local prices and the terms of trade, then this is a demanding condition.

Notice that there are $2|\Lambda| |\Lambda^*|$ potential reciprocity conditions that must be satisfied of the form in (21) and only $|\Lambda| + |\Lambda^*|$ policies, so there must be some way of reducing the number of conditions, unless each nation has just one policy. This could be interpreted as a partial rationale for tariffication in the GATT, as limiting negotiations to one policy in

separable sectors would be one way to ensure that reciprocity guides nations to a desirable outcome.

For another example of the failure of existence, we return again to offshoring in Antràs and Staiger (2012b), in which case there are two policies for the Home final good producer and one policy for the Foreign intermediate exporter. Then there are four reciprocity conditions and three policies, so existence is not assured. For the Home and Foreign trade policies that directly affect the intermediate good, there must be no effects from the local prices of the intermediate (i.e. the political optimum would be the unique renegotiation-robust point in the model with just these policies). But then if the additional Home policy causes local price externalities (as in the case of Foreign political economy), then no combination of trade policies on the intermediate (for which local price externalities are zero) could then balance the local price effects of the other Home policy. Thus, there is no point satisfying (18). This replicates the finding of Bagwell and Staiger (2016) that there is no such renegotiation-robust point on the efficiency frontier.

In the specific examples from Section 5 in which local price externalities matter, we consider only negotiations with one policy for each nation.

4.3 Discussion and Comparison to Political Optimum

We have derived an efficient point that is an appropriate target for reciprocal trade negotiations, even using the standard terms-of-trade definition of reciprocity, and even when externalities other than terms-of-trade manipulation matter for trade agreements. We now contrast this outcome with the usual political optimum when only terms-of-trade externalities matter for trade agreements (Bagwell and Staiger, 2016).

When terms-of-trade manipulation is the only problem for trade agreements to solve, and governments have trade policies to influence all local prices, then all local price derivatives are zero at the political optimum. Each nation is then at its preferred trade volume, given that the terms of trade are fixed. There is then no gain from renegotiation. For other points on the efficiency frontier, the local price derivative is nonzero, and therefore one nation desires an increase in trade volume and the other desires a decrease. This point then satisfies the conditions (18) for reciprocity-robustness, so reciprocity-robustness and political optimality are equivalent.

The new outcome results when we have relevant local price externalities. Bagwell and Staiger (2016) observe that such a point cannot be robust to renegotiations involving unwinding of reciprocal policy changes. This is indeed true whenever the political optimum is efficient for any policies or subset of policies under negotiation. But what we have shown

here instead is that both nations can remain indifferent from all the net trade volume changes of reciprocal policy changes, and such a reciprocity-robust point can still be efficient when the political optimum is inefficient.

One interesting feature of the renegotiation-robust point as a predicted outcome of trade negotiations is that relative to the Nash equilibrium, it reduces inefficiency from both terms-of-trade manipulation and other international externalities, and this is important in addressing a major "practitioner's" criticism of economic theory (Regan, 2015). One criticism of substance is "trade agreements are about reducing politically motivated protectionism; and getting an agreement depends on political support from exporters." What is later clear from Regan is that the politically-motivated protectionism he has in mind includes that which would persist after trade negotiations under standard theory. The standard theory does allow for welfare of importers to be traded off against welfare of exporters in negotiations—and indeed this observation leads Grossman (2016) to conclude that Regan's criticism is more "semantics than substance." Yet Regan is correct that the standard theory does not allow for negotiation outcomes in which there is a reduction of "politically-motivated protectionism" through trading off importer welfare for exporter welfare, in addition to the tariff reductions attributable to the elimination of terms-of-trade manipulation. When local price externalities matter for trade agreements, this reduction in protectionism that Regan deems to be empirically relevant does indeed happen at the stable reciprocity-robust point, as there is further cooperation beyond the elimination of terms-of-trade manipulation.¹¹ The stable cooperative equilibrium derived here than provides theoretical support for a combination of the Regan view of trade cooperation and the standard terms-of-trade theory. Then it remains an empirical question how important addressing these local price externalities are versus terms-of-trade externalities in practice, though the evidence clearly rejects Regan's claim that terms-of-trade externalities are empirically irrelevant (see e.g. Maggi, 2014; Bagwell, Bown, and Staiger, forthcoming).

5 Applications

This section first applies the new theory to the partial equilibrium, perfectly competitive model of Bagwell and Staiger (2001) with only import tariffs. Second, we consider reciprocity between increasing the final good price and promoting intermediate exports in Antràs and Staiger (2012b). Lastly, we consider reciprocal increases in final good price in a symmetric

¹¹As mentioned in the introduction, such deeper tariff cooperation is also possible if trade agreements solve a commitment problem (Maggi and Rodriguez-Clare, 2007), though the novelty of the reciprocity-robust point here is the possibility of deeper tariff cooperation under stable government preferences.

version of Antràs and Staiger (2012b) in which there are no intermediate trade policies.

5.1 The Partial Equilibrium, Perfectly Competitive Model

This section builds on Bagwell and Staiger (2001, 2016). There is an economy with goods x and y , such that Home imports x and exports y , and there is a freely traded outside good that enters into welfare quasilinearly. The political economy objectives for Home and Foreign (* superscript) are

$$\begin{aligned} W(p_x, p_y, p_x^w, p_y^w) &= CS_x(p_x) + \gamma_M \Pi_x(p_x) + (p_x - p_x^w)M(p_x) \\ &\quad + CS_y(p_y) + \gamma_E \Pi_y(p_y) - (p_y - p_y^w)E(p_y), \text{ and} \\ W^*(p_x^*, p_y^*, p_x^w, p_y^w) &= CS_x^*(p_x^*) + \gamma_M^* \Pi_x^*(p_x^*) + (p_x^* - p_x^w)M(p_x^*) \\ &\quad + CS_y^*(p_y^*) + \gamma_E^* \Pi_y^*(p_y^*) - (p_y^* - p_y^w)E(p_y^*), \end{aligned} \tag{25}$$

under the following notation: CS for consumer surplus, Π for profits, M for imports, E for exports, p for local domestic prices, and p^w for world prices. γ_M and γ_E are standard political economy weights greater than one. Let X and X^* be Home and Foreign production of x and define Y and Y^* similarly for y . We consider the environment in which nations have policy space limited to only import policies τ_H and τ_F .

Notice first that this environment satisfies our conditions for problems other than terms-of-trade manipulation. There are multiple sectors with different markups (due to political economy), a lack of domestic policies to fix these markups, and a lack of dual policy instruments for the import policies.

At noncooperative policies in this environment, both nations set their import tariff too high because of terms-of-trade manipulation. The local price is set so that Home and Foreign would prefer a decrease in the local price of the imported good from the Nash level (i.e. $\frac{dW}{dp_x} < 0$ and $\frac{dW^*}{dp_y^*} < 0$), and such a decrease would benefit consumers and hurt the domestic import-competing sector. Yet, each government still sets the Nash tariff high in pursuit of a terms-of-trade gain.

As Bagwell and Staiger (2016) already discuss, the political optimum is inefficient in this environment. Home lacks any policy instrument to affect p_y , and clearly $\frac{dW}{dp_y} = (\gamma_E - 1)X > 0$ with $\gamma_E > 1$. This implies then that political optimum cannot be efficient. The global effect of Foreign cutting its tariff would be zero-sum terms-of-trade rent-shifting between nations, no first-order effect of the tariff change for Foreign (since $\frac{dW^*}{dp_y} = 0$), but there would still be a non-zero first-order effect through $\frac{dW}{dp_y} > 0$.

The proposed renegotiation-robust efficient point in this setting is the point for which reciprocal policy changes satisfy

$$\begin{aligned} \frac{dW}{dp_x} \frac{dp_x}{d\tau_H} + \frac{dW}{dp_y} \frac{dp_y}{d\tau_F} \frac{d\tau_F}{d\tau_H} &= 0, \text{ and} \\ \frac{dW^*}{dp_y^*} \frac{dp_y^*}{d\tau_F} + \frac{dW^*}{dp_x^*} \frac{dp_x^*}{d\tau_H} \frac{d\tau_H}{d\tau_F} &= 0. \end{aligned} \tag{26}$$

Applying the results of the previous section, this point is efficient and robust to renegotiation.

If we rule out the possibility of Metzler and Lerner paradoxes, as is standard, we have that $\frac{dp_x}{d\tau_H} > 0 > \frac{dp_x^*}{d\tau_H}$ and $\frac{dp_y^*}{d\tau_F} > 0 > \frac{dp_y}{d\tau_F}$. By definition, $\frac{d\tau^*}{d\tau} > 0$, because any reciprocal tariff decrease must be met with another tariff decrease. As already discussed, the derivatives for local prices of exported goods have to be positive: $\frac{dW}{dp_y} > 0$ and $\frac{dW^*}{dp_x^*} > 0$. Consequently, $\frac{dW}{dp_x} > 0$ and $\frac{dW^*}{dp_y^*} > 0$ at the stable efficient point. This is an interesting result because we normally do not see such price derivatives on the liberalization path between Nash equilibrium policies and politically optimal policies in settings where terms-of-trade manipulation is the only problem. The positive $\frac{dW}{dp_x}$ and $\frac{dW^*}{dp_y^*}$ at the stable renegotiation-robust point imply that nations care more about protecting import-competing firms than consumer surplus. In situations where terms-of-trade manipulation is the only problem, the stable equilibrium involves zero local price effects, so the various considerations balance out. And along the whole liberalization path from the Nash equilibrium, nations would prefer to cut import tariffs to help consumers at the expense of the import-competing industry.

So at this efficient point, Home cuts its tariff to benefit Foreign exporters, and Foreign cuts its tariff to benefit Home exporters. But it also must be true that Home and Foreign each dislike these tariff cuts, because of the net negative impact from the loss in profits of import-competing industries despite gains for domestic consumers. This model predicts that if exporters have any organized interests—despite however organized the importing-competing industries might be—both nations will actually liberalize to the point at which they would prefer local price increases that protect their domestic industries and harm their consumers. This also means that nations would prefer to limit small export subsidies if the gains from protecting the import-competing sector would be worth sacrificing consumer surplus and a terms-of-trade gain. Such preferences to limit small export subsidies are impossible at the political optimum, provided that export subsidies imply terms-of-trade gains for importers.

To illustrate, we following Bagwell and Staiger (2001) in considering the specific functional forms such that $CS(p) = .5(1-p)^2$, the profit functions for the export goods are $p^2/2$, and the profit functions for the import-competing sectors are $p^2/4$. Balanced trade then

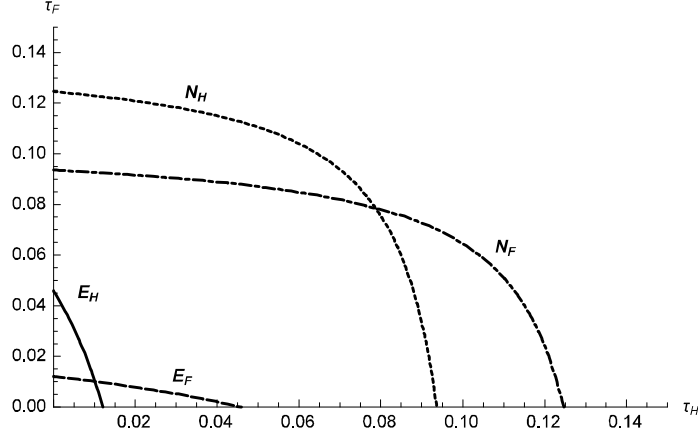


Figure 1: Symmetric Model

implies world prices are $p_x^w(\tau_H) = (4 - 3\tau_H)/7$ and $p_x^w(\tau_F) = (4 - 3\tau_F)/7$.

We can then solve for the equilibrium as a function of the political economy parameters. First we consider the case in which the political parameters are symmetric, so there is one parameter for export industries γ_E and one parameter for import-competing industries γ_M . In this case, the renegotiation-robust point is in fact the same as the symmetric efficient point in the limited-instrument setting. We can derive that the efficient import tariffs are

$$\tau_H = \tau_F = \frac{4(2\gamma_M + 1 - 3\gamma_E)}{59 - 9\gamma_E - 8\gamma_M} \quad (27)$$

which is unsurprisingly the same level of total trade barriers as the political optimum in Bagwell and Staiger (2001) when both import policies and export policies are available, so the same level of welfare is obtained even without the export policies. So here banning export subsidies and import tariffs as the only trade policies has no ill consequences for reciprocity, even though the political optimum is inefficient.

We depict the Nash and stable efficient equilibria graphically in Figure 1, for the case when $\gamma_M = 1.2$ and $\gamma_E = 1.1$, which implies small positive tariffs at the efficient point. The curves here reflect iso-gains for the first-order welfare effects from differential reciprocal policy changes. For the curves E_H and E_F , these are the curves for which Home and Foreign are indifferent to reciprocal policy changes. At the curves N_H and N_F , Home and Foreign get the same welfare from reciprocal policy changes as they do at Nash. The liberalization path then involves the progression between these iso-gain curves until both Home and Foreign gain zero welfare from reciprocal policy changes.

A more interesting case is the asymmetric case. Even without the theory of this paper, one could have predicted the outcome of reciprocal negotiations would be the symmetric

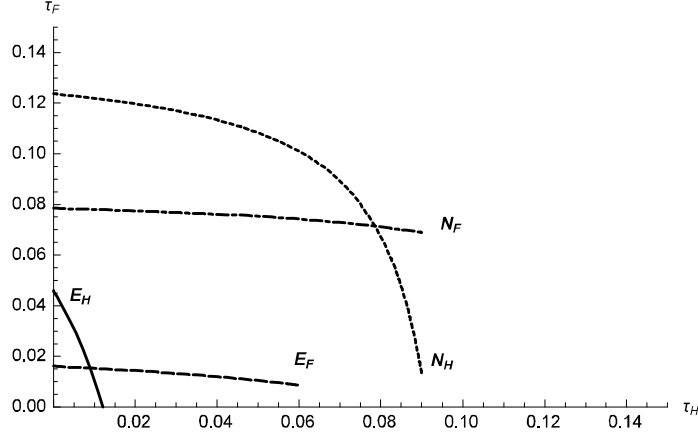


Figure 2: Asymmetric Model

policies on the efficiency frontier. The value of the renegotiation-robust point is that it yields a prediction for the outcome of negotiations even in the asymmetric case.

The plot in Figure 2 is for parameters $\gamma_M = 1.2$, $\gamma_M^* = 1.15$, $\gamma_E = 1.1$, $\gamma_E^* = 1.05$. With these parameters, the efficient point is no longer such that we maximize the global welfare objective with $\lambda = 1$. Instead the reciprocity-robust point maximizes an objective with $\lambda = 1.18$ weight on Foreign. Even though the political economy forces are stronger in Home, the reciprocity concept here is neutral with respect to political economy forces, and the Home tariff is smaller than the Foreign tariff at the stable efficient point.

5.2 The Offshoring Model

The offshoring model of Antràs and Staiger (2012b) considers Foreign, who exports intermediates, and Home, who is the final good producer. Home has a policy τ_1 (either trade or domestic) that determines the final good price of $p_1^H = (1 + \tau_1)$ and Foreign has no direct way to influence that price, leading to the local price externality for the final good price when there is political economy and prices determined by bilateral bargaining. Both nations do have trade policies that influence trade in the intermediate, and they attempt to manipulate their terms of trade through all policies. In the baseline case, neither nation can influence the terms of trade of the final good.

We consider an institutional setup such that the reciprocal negotiations include only the Home final good policy and the Foreign policy that promotes exports in the intermediate. Results in this model hinge on the assumptions about the production function, and we use the function $y = 5 \log(1 + x)$, where y is final good production and x is intermediate production. As Antràs and Staiger (2012b) observe about this production function, the higher final good

tariff worsens the terms of trade of Home in importing the intermediate, whose price rises. Reciprocity here then involves Home increasing the price of the final good (while improving Foreign's terms of trade for the intermediate) and Foreign progressing from an export tax to an export subsidy that leads to more efficient trade in the intermediate (but worsens Foreign's terms of trade for the intermediate). We limit the policy space to the two policies because with all three policies the reciprocity-robust point does not exist, as we discussed in the previous section.

The objectives in terms of prices are $W(p_1, p_F^x, p_w^x)$ and $W^*(p_1, p_F^x, p_w^x)$. Home, when using policy to set p_1 , will then not internalize the benefit of the higher final good price for Foreign, while Foreign will manipulate its terms of trade with the export policy. The reciprocal cooperation then undoes both effects.

We consider the equilibrium for specific parameters and functional forms. We use linear demand of $2 - p$ and bargaining power equally split between both nations ($\alpha = .5$). Home maximizes national income while Foreign has a political economy weight of 1.1 in the intermediate sector profits.

The following table then shows the outcomes for the Nash equilibrium, the Pareto efficient renegotiation-robust point, and the efficient point that maximizes the objective $W + W^*$.

	Nash point	Robust point	$\lambda = 1$ efficient point
W_H	1.88	4.88	5.54
W_F	2.13	0.89	0.24
τ_H^1	.03	.30	.21
τ_F^x	.58	-.74	-.84
p_w^x	2.08	.91	.76
p_F^x	1.50	1.65	1.60
x	1.00	4.17	4.24
$\frac{dW}{dp_1}, \frac{dW^*}{dp_1}$	+, +	-, -	+, -
$\frac{dW}{dp_w^x}, \frac{dW^*}{dp_w^x}$	-, -	-, +	-, +
$\frac{dW}{dp_F^x}, \frac{dW^*}{dp_F^x}$	+, +	+, +	+, -

The lambda for the robust point gives two percent more weight for the nominal welfare of the Foreign nation. So at the robust point, there is higher Foreign welfare, a higher import tariff and a smaller export subsidy. As anticipated, cooperation improves efficiency by increasing the final good price and the trade volume in the intermediate.

Notice that the robust point does not lead to welfare gains for both Home and Foreign from the Nash equilibrium. This does not result from the failure of our first axiom of reciprocity, which would be true if Foreign lost from reciprocal policy changes starting from

the Nash equilibrium. Rather, reciprocal negotiations here must follow an iso-world-price curve by (12), but proceeding from the Nash equilibrium to the efficient point involves a significant change in the world price that does not result from reciprocity. This drop in world price of the intermediate from 2.08 to 0.91 implies significant welfare losses for Foreign. The unexplained shifting in world prices necessary to reach the stable efficient point is not just characteristic of this theory but is also a concern of the standard theory when only terms-of-trade externalities matter for trade agreements. As Bagwell and Staiger (2016) note, "the performance of strict adherence to reciprocity... deteriorates with the asymmetry of the environment." Here the asymmetry is fundamental between the final good producers and intermediate exporters, though the world price effects of the policies of each will hinge on properties of the final good production function.

5.3 The Global Supply Chain Model

Blanchard, Bown, and Johnson (2016) detail a model of global supply chains in which trade in intermediates and value-added factors matter, but the only trade instruments available are import tariffs on final goods. In this setting, as in Antràs and Staiger (2012b), there are externalities from local prices abroad. When policymakers set prices of final goods, foreign-value added (or foreign supply of intermediates) matters in the price-setting decision—gains from protection of the final good go to the foreigners, as do losses from liberalizing the final good. This global externality does not show up in either the optimal tariff formula or the formula for the "political optimum" in which terms-of-trade externalities do not matter. As we have discussed, in the presence of these local price externalities, such a political optimum will be inefficient. While it is still a plausible outcome of bilateral negotiations if these externalities are minimal, they may not be the ideal point that theory would predict would be the stable outcome of bilateral negotiations. The empirical implementation in Blanchard, Bown, and Johnson (2016) uses the prediction that the political optimum is the outcome of bilateral negotiations. Our theory here provides an alternative.

The effect of foreign-value added (FVA) on tariffs inside and outside regional trade agreements (RTAs) then offers a simple test of the various theories of cooperation in offshoring. The logic is that higher foreign-value added in import-competing sectors reduces the motive for domestic protection of these sectors. If the political optimum is the correct prediction, despite its inefficiency, we should observe similar impact of FVA inside and outside RTAs. For the new stable point in this paper, the prediction hinges on whether the final good tariffs increase or decrease the terms of trade of the intermediate exporter. If the final good tariff improves the terms-of-trade of the intermediate exporter, then we should observe that final

good producers internalize the upstream effect of tariffs and the effect of FVA is muted inside the RTAs. If the final good tariff worsens the terms-of-trade of the intermediate exporter, then we should observe further cooperation in lowering the final good tariffs and a stronger effect of FVA inside the RTAs. Blanchard, Bown, and Johnson (2016, Table 6) find strongest evidence in support of the last prediction, with a large negative and significant coefficient for the FVA effects inside the RTAs.

As a final illustration of this model in practice, we consider the symmetric extension of the Antràs and Staiger model in which nations engage in reciprocal reductions of the final good tariff and have no trade policies in intermediates. As before, both nations will set the final good prices too low because they do not internalize the benefits of the final good price that flow upstream. The production function is still $y = 5 \log(1 + x)$, in which case higher final good tariffs improve terms of trade of the intermediate exporter.

	Nash point	Robust point	Political optimum
W	4.73	5.53	5.52
W_1	2.79	1.18	1.39
W_x	1.93	4.35	4.13
τ^1	.025	.74	.68
p_w^x	1.54	1.90	1.89
x	1.56	3.35	3.22
$\frac{dW}{dp_1^H}, \frac{dW^*}{dp_1^H}$	+, +	-, +	-, +
$\frac{dW}{dp_1^F}, \frac{dW^*}{dp_1^F}$	+, +	+, -	+, -

Here W_1 is the welfare from each nation's final good sector and W_x is the welfare from each nation's intermediate sector. Cooperation then involves higher final good prices (higher τ^1) and shifting welfare from the final good sector (W_1) to the intermediate production (W_x) while expanding trade volume. With the chosen parameters, the political optimum is only marginally inefficient, but relative to the renegotiation-robust point, it underestimates the final good tariff and the trade volume of the intermediate. The predicted larger expansion of trade is consistent with the previous examples in which local price externalities matter for trade cooperation.

6 Conclusion

This paper has contributed to the theory of trade agreements by identifying the general efficiency properties of a particular stable policy set, such that neither nation would deviate using reciprocal policy changes. These stable policies provide a predictive outcome for trade

negotiations when local price externalities matter for efficiency. While other work considers reciprocity rules and cooperation in trade negotiations when local price externalities matter, this work has typically done so within the context of a specific market structure, while this paper considers more broadly how such rules could function. We then apply the general theory to particular models, and we obtain insightful predictions for trade cooperation in both the standard partial equilibrium model and in the offshoring setting. We next discuss directions for future research.

The standard theory of reciprocity focuses on understanding the starting point and end points of reciprocal liberalization. In more asymmetric environments, the transition between the two can be problematic if, for example, reciprocity falls along an iso-world-price line and the starting point and end point have different world prices. This possibility is illustrated in the negotiations between the final good-producing nation and the intermediate-exporting nation in the current paper's offshoring example. There is need for better understanding about the transition between world prices in these situations.

Another frontier involves alternative reciprocity rules. In a symmetric environment, the reciprocity rule is immaterial if reciprocity is also symmetric and simply proceeds until the end point. In asymmetric environments, one nation could cease to prefer reciprocal policy changes before reaching the efficiency frontier. Reciprocity rules can then differ in how close they get to the efficiency frontier. One alternative reciprocity rule is proposed by Mrázová (2011), who considers trade policy changes that preserve the balance of profits. A potential disadvantage of this rule is that in a broader political economy setting, to ensure mutual gains nations would want to balance the political value of these rents, and not just the economic value, whereas our standard reciprocity rule relies on balancing price changes and quantities that are directly observable in principle. So a worthwhile effort would be to consider whether the potential advantage of such a rule in an asymmetric negotiation outweighs the disadvantage.

Lastly, we discuss the paper's lessons for the debate over the importance of classifying international externalities. Grossman (2016), for example, argues that the literature's effort to "pin labels" on international externalities is of unclear importance, so effort spent instead on questions of trade agreement design would be more productive. The exercises in this paper illustrate the value from classifying externalities appropriately, because this classification matters for trade agreement design. This paper recognizes differences between local price externalities and terms-of-trade externalities, and when local price externalities matter for trade agreement design. Such understanding is what leads one to recognize easily that local price externalities matter for predicting the outcome of bilateral agreements, as we have illustrated with the global value chain model of Blanchard, Bown, and Johnson (2016). The

classification of externalities matters for comparing the reciprocity rules in the literature, so we can understand how the Ossa (2011) and Bagwell and Staiger (1999) rules are equivalent but the Mrázová (2011) rule is not. This paper recognizes that local price externalities can create new design problems, which then motivate new predictions for trade negotiation outcomes.

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