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Opportunities for Cooperation in Removing Prohibitive Trade Barriers

DAVID R. DEREMER

INSTITUTE OF ECONOMICS, CENTRE FOR ECONOMIC AND REGIONAL STUDIES,
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Author:

David R. DeRemer
research fellow
Institute of Economics, Centre for Economic and Regional Studies,
Hungarian Academy of Sciences
E-mail: david.deremer@krtk.mta.hu

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Abstract

Much potential for trade liberalization exists in industries and markets with trade barriers that are prohibitive for all or many firms. In standard political economic theories of trade policy, observed prohibitive barriers must be globally optimal according to static government preferences, leaving no possibility for a trade agreement. This paper shows that for prohibitive policies in imperfectly competitive markets, a trade agreement can still play a role even without any changes in governments' policy preferences. Theory can then further identify market characteristics for which liberalization is most likely to be feasible. To illustrate the simplest case, we consider a two-country model with firms engaged in Cournot competition in segmented markets. For plausible ranges of political weights on firm profits, there is a role for a trade agreement in eliminating prohibitive trade barriers. We then consider how the potential for cooperation varies with trade costs and competition. Industries with more firm heterogeneity have greater potential for cooperation, provided that the lower productivity firms are sufficiently competitive. The implications of these results are discussed for negotiations involving either developing country exporters or services trade, two areas in which prohibitive trade barriers remain important.

JEL: F12, F13, F15

Keywords: trade agreements, Cournot competition, political economy of trade policy

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A prohibitív vámok megszüntetésére irányuló együttműködés lehetőségei

David R. DeRemer

Összefoglaló

Sok lehetőség nyílik a külkereskedelmi liberalizációra az olyan iparágakban és piacokon, amelyekben a külkereskedelemi korlátok prohibitívek az összes vagy sok vállalat számára. A külkereskedelmi politika sztenderd politikai gazdaságtani modelljeiben a megfigyelt prohibitív korlátozásoknak globálisan optimálisaknak kell lenniük statikus kormányzati preferenciák mellett, és ezért nincs lehetőség külkereskedelmi megállapodásra. Ez a tanulmány bemutatja, hogy tökéletlen verseny mellett viszont fontos szerepet játszhatnak a külkereskedelmi megállapodások a prohibitív korlátozások megszüntetésében még változatlan kormányzati preferenciák mellett is. Az elmélet alapján az is előre jelezhető, hogy milyen típusú piacokon lehetséges legnagyobb valószínűséggel a liberalizáció. A legegyszerűbb eset bemutatására egy kétországos modellt használunk, amelyben szegmentált piacokon Cournot-versenyt folytatnak egymással a vállalatok. Megmutatjuk, hogy sok olyan – a vállalati profit kormányzati célfüggvényben kapott súlyára vonatkozó – plauzibilis paraméterérték van, amelyek mellett ebben a keretben fontos szerepet játszhat a külkereskedelemi megállapodás. Ezután megvizsgáljuk, hogyan alakul az együttműködés lehetősége a szállítási költségek és a verseny erősségének függvényében. A nagyobb vállalati heterogenitással jellemezhető iparágakban több lehetőség van az együttműködésre, feltéve, hogy a legkevésbé termelékeny vállalatok is eléggé versenyképesek. Ezeknek az eredményeknek a jelentőségét két olyan területen érzékeltetjük, amelyeken fontos szerepet játszanak a prohibitív külkereskedelmi korlátozások: ezek a fejlődő országok exportja vagy a szolgáltatások külkereskedelmét érintő tárgyalások.

JEL: F12, F13, F15

Tárgyszavak: külkereskedelmi megállapodások, Cournot-verseny, a külkereskedelmi politika politikai gazdaságtana

Opportunities for Cooperation in Removing Prohibitive Trade Barriers

David R. DeRemer*
Institute of Economics, Hungarian Academy of Sciences

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*E-mail: david.deremer@krtk.mta.hu. Address: MTA KRTK KTI, Budaörsi út 45, 1112 Budapest, Hungary. The author is grateful to Paola Conconi, Alan Deardorff, W. Walker Hanlon, and Balázs Muraközy for helpful discussion and participants at the March 2015 DISSETTLE Warsaw workshop, the VSVK seminar at the Hungarian Academy of Sciences, and the First Middle East and North Africa Trade Workshop for valuable comments. This paper has evolved from the author's doctoral dissertation at Columbia University, research as an exchange scholar at Stanford University, and postdoctoral research at the Université Libre de Bruxelles (ECARES). This paper is produced as part of the MTA Lendület program, the 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.

1 Introduction

Trade liberalization can be important for industries in countries for which little exporting has previously existed. This is true for both the past and the present of trade negotiations. In the era of the General Agreement on Tariffs and Trade (GATT), expanding market access for developing countries with high barriers for trade was a significant focus (Lamp, 2014), and overall the experience of developing countries in the World Trade Organization (WTO) continues to be disappointing (Bagwell and Staiger, 2014). Another frontier of trade expansion is in services trade. The General Agreement on Trade in Services (GATS) has made progress, but success has been limited relative to the GATT rounds in reducing manufacturing barriers to trade (Francois and Hoekman, 2010). In services trade in particular, barriers can take the form of domestic restrictions that limit market access (Crozet, Milet, and Mirza, 2013). Trade barriers in other sectors can also take a prohibitive form, e.g., local content requirements in manufacturing like "Buy American" that crept up in the aftermath of the 2008 financial crisis (Larch and Lechthaler, 2011) or regulation and standards that WTO law considers to be unnecessarily discriminatory due to the lack of international recognition or scientific justification (WTO, 2012).[1]

Despite the potential importance of such prohibitive trade barriers, much of the formal research on the purpose of trade agreements focuses exclusively on cooperation over nonprohibitive trade barriers. Bagwell and Staiger (2002, 2010) consider the prisoner's dilemma resulting when nations manipulate relative world prices, i.e. terms-of-trade manipulation, in goods for which trade already exists.[2] The theoretical underpinnings of the principle of reciprocity rely on tariff reductions based on changes in prices when there is existing trade volume (e.g. Bagwell and Staiger, 1999, 2002).[3] Such theories of trade agreements explain the great successes of the GATT thus far, but the computational evidence suggests that future gains from reducing manufacturing tariffs among developed countries are limited (Ossa, 2014). And one prominent survey of services trade argues that terms-of-trade manipulation is of limited relevance in explaining the value of services trade agreements (Francois and Hoekman, 2010). The potential importance of prohibitive trade barriers and the limited focus of existing research in this area then motivate further exploration.

[1] Standards could also be nonprohibitive, resulting in an increased cost of compliance. Such policies are always inferior to nonprohibitive trade taxes, all else equal, so we focus on trade taxes among nonprohibitive policies in this paper. Nonetheless, larger exogenous costs to administering tariffs could cause non-tariff barriers to be preferable.

[2] Much of the trade dispute literature (e.g. Maggi and Staiger, 2011) has focused on discrete barriers to trade, though the microfoundations are not specified.

[3] Ossa (2011) considers a definition of reciprocity involving changes in manufacturing trade balance, but from nonprohibitive levels.

This paper proposes a theory of how governments would impose prohibitive trade barriers noncooperatively but would still be willing to sign a cooperative agreement, even holding fixed the political motives that led to the prohibitive barriers in the first place. The results contrast with the existing theory that would argue that agreements over prohibitive barriers cannot be achieved without changes in government preferences over policies.[4] Aside from the positive explanation of prohibitive policies, the theory can then help to identify market characteristics for which trade cooperation is more likely to be feasible. To see why such predictions are useful, consider an additional simple model of trade talks in which governments can pick a finite number of industries to discuss potential cooperation over removing prohibitive policies, but the extent of the governments' motives to protect domestic profits in each industry are unknown. For some industries, the preferences supporting protection are so strong that any agreement is infeasible without changes in preferences, but for others, governments can agree to move from noncooperative to cooperative policies if they use the scarce resource of trade talks.[5] There is then value in identifying for which industries the trade talks could be effective.

To develop a positive theory in which governments could form prohibitive trade barriers unilaterally and then agree to eliminate those barriers, the following must be true:

1. The mutual elimination of the prohibitive trade barriers is preferable to the maintenance of the trade barriers from the perspective of the negotiating governments, and

2. Prohibitive trade barriers must be unilaterally preferable to all possible nonprohibitive trade barriers (including unilateral free trade).

Finding a trade model satisfying both of the preceding statements is a nontrivial exercise. In the standard theory of trade agreements under perfect competition, there is no first-order effect on global welfare from a reduction in trade barriers from prohibitive levels. As the government preferences under consideration are typically globally concave, these prohibitive

[4] See Bagwell and Staiger (2002, 2010) and Maggi (2014) for surveys of trade agreement models in which government preferences over policy can be represented by a static utility function. In the standard models, a change in government preferences would be necessary to achieve any reduction in trade barriers. An alternative theory of trade agreements is that they allow governments to make commitments to avoid pressure from domestic lobbies (e.g. Maggi and Rodriguez-Clare 2007), so the trade agreement then allows government to maintain preferences over policy that would not be feasible in the absence of the agreement.

[5] An additional reason why governments would fail to achieve cooperative policies is that the agreement fails to be self-enforcing. Like much of the literature, this paper abstracts from the enforcement issue, though several papers model the enforcement dimension explicitly (see e.g. Ch. 6 of Bagwell and Staiger, 2002). Much of the literature also does not model explicitly how nations progress from cooperative to noncooperative policies, though an exception is the gradualism literature (ibid.) For the current paper, the most relevant model of cooperation is one where trade agreements are incomplete contracts and some contracting cost must be paid to achieve the cooperative policy (Horn, Maggi, and Staiger, 2010).

policies must then be globally optimal. Liberalization can then not be achieved unless the government preferences change. The survey of Bagwell, Bown, and Staiger (2014) describes this feature of prohibitive unilateral protection:

> In this case of extreme [prohibitive] protection, and with its trade volume driven to zero, the importing government does not enjoy a cost-shifting benefit from the reduction in world prices that its protection has caused (because it imports no volume at these lower world prices), and so according to the terms-of-trade theory this Nash tariff choice must in fact reflect underlying features of the government's preferences rather than inefficient cost-shifting motives. And for this reason, the terms-of-trade theory implies that autarkic Nash trade policy choices are internationally efficient, and as a consequence implies that there is nothing for a trade agreement to accomplish in the presence of such choices.

The dearth of theory here may also be surprising considering that typical computational exercises in trade policy will often find that there are benefits from reducing certain prohibitive trade barriers. Typically the welfare evaluation is done from the perspective of the standard national-income maximizing preferences rather than the policy preferences of the negotiating governments.[6] These exercises then tell us the value of liberalization, but they do not tell us whether the agreements are politically feasible. Finding such feasible agreements is the focus of the current paper.

This paper proposes a simple model that can rationalize both the unilateral imposition of prohibitive trade barriers and cooperation from prohibitive trade barriers. We show that in a set of models with competing Cournot firms in segmented markets, there is a rationale for trade agreements removing prohibitive trade barriers. Prohibitive trade barriers prevent firms from selling above marginal cost when exporting, so a unilateral prohibitive trade barrier leads to a profit-shifting externality, the kind of imperfect competition externality shown by Venables (1985) for various trade and domestic policies.[7]

The baseline model considers a single Cournot firm in each of two countries. Demand is linear, so there is a choke point at which tariffs can be prohibitive, and governments maximize the standard national income plus an additional political economic weight on firm profits. We first consider the case in which marginal costs of production are equal across

[6] For an example, Ossa (2014) uses government preferences to calculate optimal unilateral policy and then evaluates welfare from the standard national-income maximizing perspective, and these are the appropriate choices for the purpose of his exercise. See also Deardorff and Stern (2008) for a survey on the estimates of the effects of removing barriers to service trade.

[7] For an example of profit-shifting through a unilateral barrier to entry, see Figure 5.3 of Deardorff and Stern (2008).

firms and destinations. In this setting, prohibitive policies are not optimal if governments maximize national income, but governments will impose a prohibitive policy if they assign an additional 50 percent weight on firm profits. We must still verify that such political preferences do not also imply that barriers are jointly preferable to no barriers. We find that cooperation is desirable as long as political preferences are not considerably larger.

With a baseline model in place for which governments could agree to remove prohibitive policies, we can then extend the model to consider how other market characteristics affect incentives for noncooperation and cooperation. We can use these extensions to derive testable predictions for when trade cooperation is feasible. The model allows for three possible outcomes which would be realized as the governments' political weight on firm profit increases: (1) nonprohibitive policies under either noncooperation or cooperation, (2) prohibitive policies under noncooperation and free trade under cooperation, and (3) nonprohibitive policies regardless of the level of cooperation. The model can then help us identify the relative likelihood of being in state (2) conditional on observing that we are in state (2) and (3), i.e., the relative likelihood of cooperation given that we are currently observing nonprohibitive policies conditional on market characteristics. Such predictions can be of value since market characteristics are likely to be more transparent and measurable than the parameters of an individual government's objective function.[8]

The first extension that we consider is symmetric trade costs. When trade costs are higher, a lower tariff barrier is necessary to be prohibitive. Trade costs lower the cutoff of the political economy parameter necessary to rationalize the imposition of prohibitive trade barriers. The larger the trade cost, the narrower the parameter range for which cooperation is feasible conditional on having observed prohibitive policies. Though trade costs make a potential agreement less harmful to domestic profits, they make the agreement less appealing both in terms of consumer welfare and export profits. The extension suggests why more distant countries may have more difficulty achieving trade cooperation.

Next we consider asymmetry in the trade costs for each country, reflecting possibly that one nation may have better technology for exporting than another. For a sufficiently inferior firm, cooperation is possible only for a smaller range of political economic parameters. Though the nations with the inferior firms have a larger scope for gains in consumer welfare, the increased competition for the inferior firms makes an agreement relatively less appealing for most parameters. Meanwhile, the nation with the superior firm faces a larger benefit from an agreement in terms of exporting and less threat of foreign competition from the

[8] Ossa (2014) does indeed estimate such parameters, fixed over his sample period, for a wide range of industries and major trading governments. Goldberg and Maggi (1999) is the first attempt to estimate the parameters for the government objectives in Grossman and Helpman (1994).

agreement.

A simple extension to consider beyond trade costs is mirror-image differences in productivity with two countries and two imperfectly competitive industries. For small differences in productivity, the political economy necessary for a prohibitive tariff increases. In contrast, a small difference in productivity leads to little effect on the difference in payoffs between free trade and autarky, so a small difference in productivity from the symmetric case leads to less cooperation conditional on observing autarky. But for large enough differences in productivity, industry profits flatten or even increase following liberalization. When profits increase from liberalization, free trade is always preferable to autarky regardless of the political economy parameter, and prohibitive unilateral policies are still possible, so cooperation is more likely under such circumstances.

We then consider the level of competition in each country, parameterized by the number of symmetric Cournot firms in each nation. We first consider a symmetric increase in the competition in each country. This narrows the range of the political economy parameter for which cooperation is possible. When markets are already competitive, there are limited pro-competitive gains from trade, so governments prefer to maintain protection relative to the case when both nations have limited competition. The results generalize for n firms the intuition from observing that cooperation is possible for national monopolies but impossible for perfect competition. We also consider the potential for cooperation between a nation with limited competition and a nation with high competition. In the limiting case as the number of firms in the latter nation approaches infinity, the potential for cooperation conditional on observing noncooperative trade barriers approaches zero, so the impossibility of cooperation is the same as in the perfectly competitive case.

Lastly, we consider the case of within-country firm heterogeneity in productivity among symmetric countries. We focus on the simple yet rich case of asymmetry in productivity among two firms in each country. With a small asymmetry, the results approach those from competing duopolies, and with a large asymmetry, the results approach those from competing monopolies. The interesting case of firm heterogeneity occurs when liberalization leads to the contraction or exit of firms that are sufficiently competitive but not too competitive. In this case, both consumer surplus and industry profits can increase upon cooperation, so joint cooperation is always preferable to joint autarky regardless of political economy considerations. And if industry profits decrease somewhat, very strong political economy considerations are still necessary to rule out the possibility of cooperation. The results suggest that industries with such an intermediate level of heterogeneity are suitable targets for achieving cooperation.

To my knowledge this is the first paper to present a class of models and parameters

for which (1) prohibitive policies are unilaterally preferable relative to nonprohibitive policies and (2) nonprohibitive policies are jointly preferable to prohibitive policies. While the profit-shifting externalities we consider are also the focus of a large literature of the 1980s (surveyed in Brander, 1995), that literature focuses on static national-income maximizing objectives, whereas the current paper finds that political economic preferences are necessary for cooperation from noncooperative prohibitive policies. The initial literature to consider political economic preferences (e.g. Grossman and Helpman, 1994; Bagwell and Staiger, 1999) considers perfect competition, in which case there is no room for cooperation from the prohibitive policies, so authors instead focus on settings for which unilaterally optimal policies have interior solutions. The current paper focuses instead on the corner solutions, and in that sense it has some similarity to the emphasis of Romer (1994) on the importance of expanding trade in new goods versus trade in existing goods.

A more recent literature on imperfect competition in trade agreements begins with Ossa (2011), but he does not consider agreements over prohibitive policies—in his setting of CES demand and no fixed costs of exporting, there is no possibility of prohibitive trade policies.[9] More recent literature on imperfect competition and trade agreements does not focus on prohibitive import policies. One argument against the relevance of imperfect competition externalities for trade agreements (from Bagwell and Staiger, 2012a, 2012b, 2015) is that such externalities disappear when governments have both import and export policies, but that argument depends on interior solutions for the noncooperative policies, so that argument cannot apply here.[10] Such trade policy externalities would also cease to be relevant if governments were to equate markups across sectors by using domestic subsidies, but empirical evidence of interindustry markup heterogeneity refutes this possibility (see e.g. Epifani and Gancia, 2011).[11]

Other authors aside from Bagwell and Staiger have considered trade agreements in the context of Cournot competition. Mrazova (2011) is the first to rationalize GATT principles in a Cournot setting. Horn and Levinsohn (2001) consider nations choosing the number of Cournot firms to model coordination over competition policy. Fiorini and Lebrand (2014)

[9] Bagwell and Lee (2015) consider trade policy in a setting with linear demand and heterogeneous firms. Abel-Koch (2013) also considers profit-shifting in a heterogeneous firm setting, in which trade policies could be prohibitive, though the focus is different from here.

[10] The results here, however, do not meet the Bagwell and Staiger (2010) criteria for deriving a "fundamental" trade agreement problem because like Ossa (2011) we only consider import tariffs among the set of trade policies. To meet their criteria would require us to prove that our results hold even if governments can subsidize trade through import and export policies. Optimal joint policies would then involve subsidizing trade, but it is not immediately obvious that we would fail to obtain similar qualitative results.

[11] We do not provide a microfoundation for why governments do not use such domestic subsidies, though this is the case for almost all of the literature on trade policy under imperfect competition (see Bown, Bagwell, and Staiger, 2014).

consider agreements over a foreign direct investment (FDI) restriction on the number of identical Cournot firms allowed to operate abroad in an intermediate good sector. The focus of their results is on the existence of a commitment motive for FDI agreements and on how the balance of domestic and foreign lobbying influences whether an agreement is desirable based on the standard measure of national welfare. The paper also relates to the findings of papers considering product standards in the presence of consumption externalities, such as Fischer and Serra (2000) and Essaji (2010), but the focus is different from the current paper.

The rest of the paper proceeds as follows. Section 2 briefly presents the model and then derives the parameter restrictions for the baseline case. Section 3 explores how various market characteristics affect the potential for trade cooperation. Section 4 then concludes by discussing applications of the framework.

2 Model of Prohibitive Trade Policies

This section develops the simplest setting under which countries impose prohibitive trade policies noncooperatively but nonetheless can benefit from trade cooperation. The baseline model is partial equilibrium with two countries, one firm in each country, and Cournot competition with segmented markets. Governments maximize national income except they assign to firm profits a political economy weight $\alpha \geq 1$ following Baldwin (1987), and such preferences can be derived from government preferences over national income and political contributions, following Grossman and Helpman (1994). We call the nations Home and Foreign, with asterisks (*) denoting foreign variables. Consumer demand is linear with prices determined by $P(Q) = 1 - Q$ and $P^*(Q) = 1 - Q^*$ for aggregate domestic quantity Q and foreign quantity Q^*. The home tariff is τ and the foreign tariff is τ^*, and we restrict these to be nonnegative. The firm in each nation produces with constant marginal cost c and trade cost ϕ. For the baseline model, we assume $\phi = 0$.

Using standard results and definitions from Cournot competition, we have the following outcomes in the home market under autarky (the usual monopoly case), free trade (the usual duopoly case), and a nonprohibitive tariff.

Outcome \ Policy Choice	Autarky	Free Trade	Tariff
Home domestic sales per firm q_h	$\frac{1}{2}(1-c)$	$\frac{1}{3}(1-c)$	$\frac{1}{3}(1-c+\tau)$
Foreign exports per firm q_f	0	$\frac{1}{3}(1-c)$	$\frac{1}{3}(1-c-2\tau)$
Home exports per firm q_h^*	0	$\frac{1}{3}(1-c)$	$\frac{1}{3}(1-c-2\tau^*)$
Market quantity Q	$\frac{1}{2}(1-c)$	$\frac{2}{3}(1-c)$	$\frac{1}{3}(2(1-c)-\tau)$
Market Price P	$\frac{1}{2}(1+c)$	$\frac{1}{3}(1+2c)$	$\frac{1}{3}(1+2c+\tau)$
Consumer Surplus CS	$\frac{1}{8}(1-c)^2$	$\frac{2}{9}(1-c)^2$	$\frac{1}{2}\left(\frac{2(1-c)-\tau}{3}\right)^2$
Profits (domestic sales) π_h	$\frac{1}{4}(1-c)^2$	$\frac{1}{9}(1-c)^2$	$\left(\frac{1-c+\tau}{3}\right)^2$
Profits (sales abroad) π_f	0	$\frac{1}{9}(1-c)^2$	$\left(\frac{1-c-2\tau^*}{3}\right)^2$
Tariff revenue TR	0	0	$\tau\left(\frac{1-c-2\tau}{3}\right)$
Government Objective G	$\left(\frac{1+2\alpha}{8}\right)(1-c)^2$	$\left(\frac{2+2\alpha}{9}\right)(1-c)^2$	(Given below)

Under standard national-income maximizing preferences with $\alpha = 1$, duopoly yields the payoff of $\frac{4}{9}(1-c)^2$ which is preferable to $\frac{3}{8}(1-c)^2$. So here we obtain a typical outcome of trade under imperfect competition: pro-competitive gains from trade can result through the reduction in markups.

Under more general political economic preferences with $\alpha \geq 1$, the difference between the free trade payoff and the monopoly payoff is

$$\left(\frac{2+2\alpha}{9}\right)(1-c)^2 - \left(\frac{1+2\alpha}{8}\right)(1-c)^2 = \frac{7-2a}{72}(1-c)^2,$$

so the governments strictly prefer free trade to autarky as long as $\alpha < \frac{7}{2}$. If autarky is the noncooperative outcome, then governments benefit from a trade agreement under this restriction on α. Because tariffs serve to contract joint production in the sector distorted by imperfection competition and political economy, it is immediately clear that either autarky or free trade is the optimal joint outcome depending on whether is α is above or below the cutoff. It then remains to be shown under what circumstances autarky is the noncooperative outcome.

To define the government objective as a function of the tariff τ, we must define it piecewise with a cutoff at the prohibitive tariff level. The tariff is prohibitive when $\frac{1}{3}(1-c-2\tau) \leq 0$, i.e. $\tau \geq \frac{1}{2}(1-c)$. The government objective as a function of the tariff τ is

$$G(\tau;\alpha) = \begin{cases} \frac{1}{2}\left(\frac{2(1-c)-\tau}{3}\right)^2 + \alpha\left(\frac{1-c+\tau}{3}\right)^2 + \alpha\pi_f + \frac{\tau(1-c-2\tau)}{3}, & \text{if } \tau \leq \frac{1}{2}(1-c), \\ \left(\frac{1+2\alpha}{8}\right)(1-c)^2 + \alpha\pi_f, & \text{if } \tau \geq \frac{1}{2}(1-c). \end{cases}$$

Observe that in this segmented market, partial equilibrium case, the profits abroad do not depend on the home tariff.

To derive the optimal unilateral policy, first observe that

$$\frac{dG(\tau;\alpha)}{d\tau} = \tau\left(\frac{2\alpha-11}{9}\right) + \left(\frac{2\alpha+1}{9}\right)(1-c), \text{ if } \tau < \frac{1}{2}(1-c).$$

Substituting the cutoff τ for the prohibitive tariff into the first-order condition, we can easily derive that for $\alpha < \frac{3}{2}$, there is an optimal nonprohibitive tariff satisfying $\frac{dG(\tau)}{d\tau} = 0$ (the second-order condition is satisfied for $\alpha < \frac{11}{2}$). For $\alpha \in [\frac{3}{2}, \frac{11}{2})$, $\frac{dG(\tau)}{d\tau} > 0$ for all nonprohibitive tariffs, and the optimal unilateral trade policy is prohibitive. So the optimal unilateral policy satisfies

$$\tau^N(\alpha) = \begin{cases} \left(\frac{2\alpha+1}{11-2\alpha}\right)(1-c), & \text{if } \alpha < \frac{3}{2}, \\ \text{prohibitive} & \text{if } \alpha \in [\frac{3}{2}, \frac{11}{2}). \end{cases}$$

The following table summarizes the optimal unilateral policies and optimal joint policies for the government.

α range	Optimal unilateral policy	Optimal joint policy
$[1, \frac{3}{2})$	Nonprohibitive tariff	Free trade
$[\frac{3}{2}, \frac{7}{2})$	Prohibitive trade policy	Free trade
$[\frac{7}{2}, \frac{11}{2})$	Prohibitive trade policy	Prohibitive trade policies

The following proposition highlights the range of interest:

Proposition 1 *For our baseline model, if governments assign a weight $\alpha \in [\frac{3}{2}, \frac{7}{2})$ to firm profits, then the Nash equilibrium trade policies are prohibitive, free trade is globally optimal, and governments can benefit from a trade agreement.*

We argue that political economy parameters in the range of interest are plausible based on past empirical work. Ossa (2014) scales the political economy weight to average 1 across industries, so we consider an estimate of 1.5 in his setting to be analogous to a weight of 1.5 in our partial equilibrium setting in which the industry under consideration is too small to affect factor markets. Ossa estimates parameters above 1.5 for Europe, Japan, and China in both the wheat and rice industries. Moreover, all of the relevant α cutoffs will decline to more empirically relevant levels as we extend the model in the next section.

3 How Market Characteristics Affect Cooperation

This section extends the model to illustrate how various market characteristics can affect the potential for cooperation. The extensions we consider are symmetric trade costs, asymmetric trade costs, mirror-image differences in productivity for two industries, increases in competition for symmetric nations, asymmetry in competition across nations, and firm heterogeneity in productivity for symmetric nations. As detailed in the introduction, these extensions can be useful to identify when cooperation is feasible starting from observing prohibitive policies, assuming government preferences are static. We will characterize how the extensions reflect the probability of cooperation, based on whether the changes in parameters expand or narrow the range of α for which cooperation is feasible.[12]

3.1 Trade Costs

We introduce symmetric trade costs $\phi > 0$ into the model. The autarky case is the same as above, while free trade and tariffs now have the following payoffs

Outcome	Free Trade (duopoly)	Tariff
Home domestic sales per firm q_h	$\frac{1}{3}(1-c+\phi)$	$\frac{1}{3}(1-c+\phi+\tau)$
Foreign exports per firm q_f	$\frac{1}{3}(1-c-2\phi)$	$\frac{1}{3}(1-c-2\phi-2\tau)$
Home exports per firm q_h^*	$\frac{1}{3}(1-c-2\phi)$	$\frac{1}{3}(1-c-2\phi-2\tau^*)$
Market quantity Q	$\frac{1}{3}(2(1-c)-\phi)$	$\frac{1}{3}(2(1-c)-\phi-\tau)$
Market Price P	$\frac{1}{3}(1+2c+\phi)$	$\frac{1}{3}(1+2c+\phi+\tau)$
Consumer Surplus CS	$\frac{1}{2}\left(\frac{2(1-c)-\phi}{3}\right)^2$	$\frac{1}{2}\left(\frac{2(1-c)-\phi-\tau}{3}\right)^2$
Profits (domestic sales) π_h	$\left(\frac{1-c+\phi}{3}\right)^2$	$\left(\frac{1-c+\phi+\tau}{3}\right)^2$
Profits (sales abroad) π_f	$\left(\frac{1-c-2\phi}{3}\right)^2$	$\left(\frac{1-c-2\phi-2\tau^*}{3}\right)^2$
Tariff revenue	0	$\tau(\frac{1-c-2\phi-2\tau}{3})$

For the standard case for which $\alpha = 1$, free trade is welfare improving when $\frac{\phi}{1-c} < \frac{5}{22}$, while for $\frac{\phi}{1-c} \in (\frac{5}{22}, \frac{1}{2})$ competition from trade is detrimental to welfare.[13] We focus throughout on the $\frac{\phi}{1-c} \in [0, \frac{5}{22})$ case.

More generally, the difference between the free trade payoff and the monopoly payoff is

[12] The model's prediction of whether cooperation is more or less likely would ultimately depend on our prior for the distribution of α, however.

[13] To see this, consider the difference between the free trade payoff and the monopoly payoff when $\alpha = 1$. The resulting polynomial in the scaled trade cost, rescaled by $\frac{72}{(1-c)^2}$, is $5 - 32(\frac{\phi}{1-c}) + 44(\frac{\phi}{1-c})^2$. The polynomial is negative between the two roots of $\frac{5}{22}$ and $\frac{1}{2}$.

$$\frac{7-2a}{72}(1-c)^2 - \left(\frac{2}{9}+\frac{2}{9}\alpha\right)(1-c)\phi + \left(\frac{1}{18}+\frac{5}{9}\alpha\right)\phi^2, \tag{1}$$

so free trade is preferable provided that

$$\alpha \leq \frac{7(1-c)^2 - 16(1-c)\phi + 4\phi^2}{2(1-c)^2 + 16(1-c)\phi - 40\phi^2}. \tag{2}$$

It then remains to be shown under what circumstances autarky is the noncooperative outcome.

We first derive the government objective as a function of the tariff τ. Now the tariff is prohibitive if $\tau \geq \frac{1}{2}(1-c) - \phi$.

$$G(\tau;\alpha) = \begin{cases} \frac{1}{2}\left(\frac{2-2c-\phi-\tau}{3}\right)^2 + \alpha\left(\frac{1-c+\phi+\tau}{3}\right)^2 + \alpha\pi_f + \frac{\tau(1-c-2\tau-2\phi)}{3}, & \text{if } \tau \leq \frac{1}{2}(1-c) - \phi., \\ \left(\frac{1+2\alpha}{8}\right)(1-c)^2 + \alpha\pi_f, & \text{if } \tau \geq \frac{1}{2}(1-c) - \phi. \end{cases}$$

The derivative for non-prohibitive tariff values is

$$\frac{dG(\tau)}{d\tau} = \tau\left(\frac{2\alpha-11}{9}\right) + \left(\frac{2\alpha-1}{9}\right)(1-c) + (2\alpha-5)\phi, \text{ if } \tau < \frac{1}{2}(1-c) - \phi.$$

Finally we derive the optimal unilateral policy conditional on α

$$\tau^N(\alpha) = \begin{cases} \frac{(1+2\alpha)(1-c)+(2\alpha-5)\phi}{11-2\alpha}, & \text{if } \alpha < \frac{3}{2} - \frac{2\phi}{1-c}, \\ \text{prohibitive} & \text{if } \alpha \in [\frac{3}{2} - \frac{2\phi}{1-c}, \frac{11}{2}). \end{cases}$$

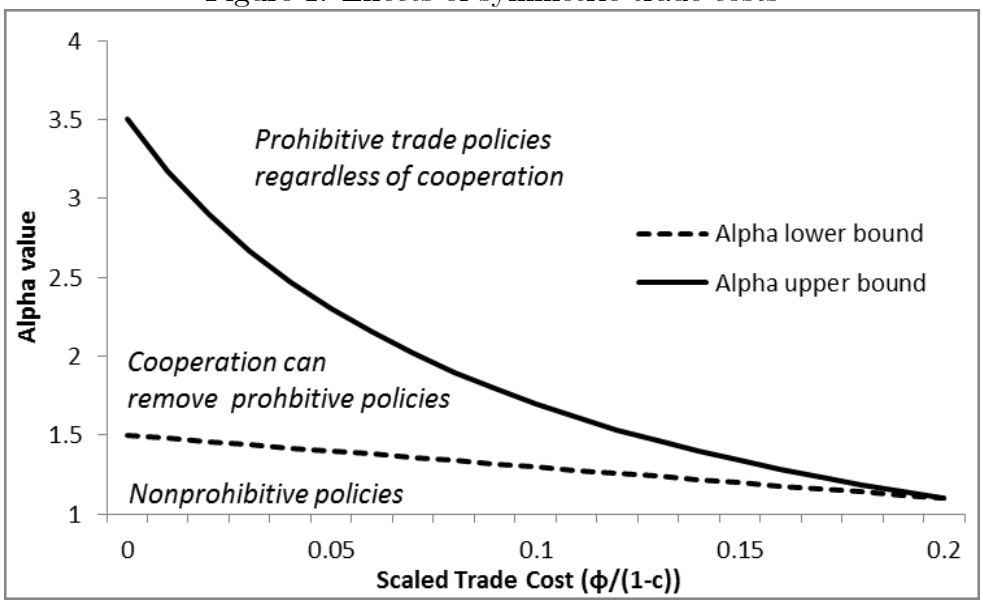
So prohibitive policies are preferable when

$$\alpha \geq \frac{3}{2} - \frac{2\phi}{1-c}. \tag{3}$$

Inequalities (2) and (3) are both uniquely satisfied with equality when $\frac{\phi}{1-c} = \frac{1}{5}$ and $\alpha = \frac{11}{10}$. When $\frac{\phi}{1-c} \in [0, \frac{1}{5}]$, both equalities are satisfied for $\alpha \in \left[\frac{7(1-c)^2-16(1-c)\phi+4\phi^2}{2(1-c)^2+16(1-c)\phi-40\phi^2}, \frac{3}{2} - \frac{2\phi}{1-c}\right]$. As $\frac{\phi}{1-c}$ increases from 0 to $\frac{1}{5}$, the range of α for which cooperation can remove prohibitive policies strictly decreases from 2 to 0. We summarize the result in the following proposition:

Proposition 2 *If we extend the baseline model to allow for symmetric trade costs satisfying $\frac{\phi}{1-c} < \frac{1}{5}$, then there exists a range of α such that governments unilaterally impose prohibitive policies and jointly prefer free trade. This range of α is strictly decreasing in the scaled trade cost $\frac{\phi}{1-c}$.*

Figure 1: Effects of symmetric trade costs



We plot the relevant bounds on α as a function of the scaled trade cost $\frac{\phi}{1-c}$ in Figure 1. With trade costs, the lower bound of α for which prohibitive policies are unilaterally optimal decreases to $\frac{11}{10}$ from $\frac{3}{2}$. To the extent that a $\frac{11}{10}$ parameter is more empirically plausible than a $\frac{3}{2}$ parameter, this finding improves the empirical relevance of the theory. In addition, the exercise provides an explanation for why distant markets could have difficulty achieving trade cooperation, because the range of cooperation over prohibitive policies is ultimately eliminated as the trade costs increase.

To understand the economic intuition for why the range narrows, the key is the $-\left(\frac{2}{9}+\frac{2}{9}\alpha\right)$ term in equation (1) representing the first-order changes in payoffs from an increase in trade costs. The term is negative because the increase in trade costs leads to a reduction in export profits and consumer surplus from an agreement. The trade cost increase also mitigates the fall in domestic profits from an agreement, but this effect is dominated. The agreement as a whole is less appealing as trade costs increase, so the α upper bound in the figure sharply decreases. The lower bound also decreases but at slower rate. This decrease is the consequence of a lower tariff being necessary to achieve prohibitive policies.

3.2 Asymmetric Trade Costs

Next we consider cross-country heterogeneity in trade costs. This could reflect, for example, that developed countries are better able to export than developing countries. Without loss of generality, let $\phi_h > \phi_f$ where ϕ_h is the cost of Foreign supplying the Home market and

ϕ_f is the cost of Home supplying the Foreign market. Applying the results of the previous subsection, we then have that the lower bound on α for prohibitive policies to be preferable to nonprohibitive policies is

$$\alpha_h \geq \frac{3}{2} - \frac{2\phi_h}{1-c} \tag{4}$$

for the Home government and

$$\alpha_f \geq \frac{3}{2} - \frac{2\phi_f}{1-c} \tag{5}$$

for the Foreign government. The more export-proficient Home government will enact prohibitive policies for lower values of α because lower tariffs are necessary to achieve prohibitive policies.

The cutoffs for mutual free trade to be preferable to autarky are somewhat more complicated since they also depend on both Home and Foreign profits, which depend on different trade costs in each country. The cutoff for Home is

$$\alpha_h \leq \frac{7(1-c)^2 - 16(1-c)\phi_h + 4\phi_h^2}{2(1-c)^2 - 16(1-c)\phi_h + 32(1-c)\phi_f - 8\phi_h^2 - 32\phi_f^2}, \tag{6}$$

and the similar expression for Foreign is

$$\alpha_f \leq \frac{7(1-c)^2 - 16(1-c)\phi_f + 4\phi_f^2}{2(1-c)^2 - 16(1-c)\phi_f + 32(1-c)\phi_h - 8\phi_f^2 - 32\phi_h^2}. \tag{7}$$

We plot the cutoffs for α_h and α_f with $\phi_h - \phi_f = .02$ and the average scaled ϕ on the x-axis in Figure 2. As in the case of the symmetric trade costs, the government of the Foreign firm with the higher exporting costs will prefer autarky to free trade for a lower range of alpha because of the weaker export opportunities, even though trade with the more able exporter provides a larger potential advantage in consumer surplus for the importing nation.

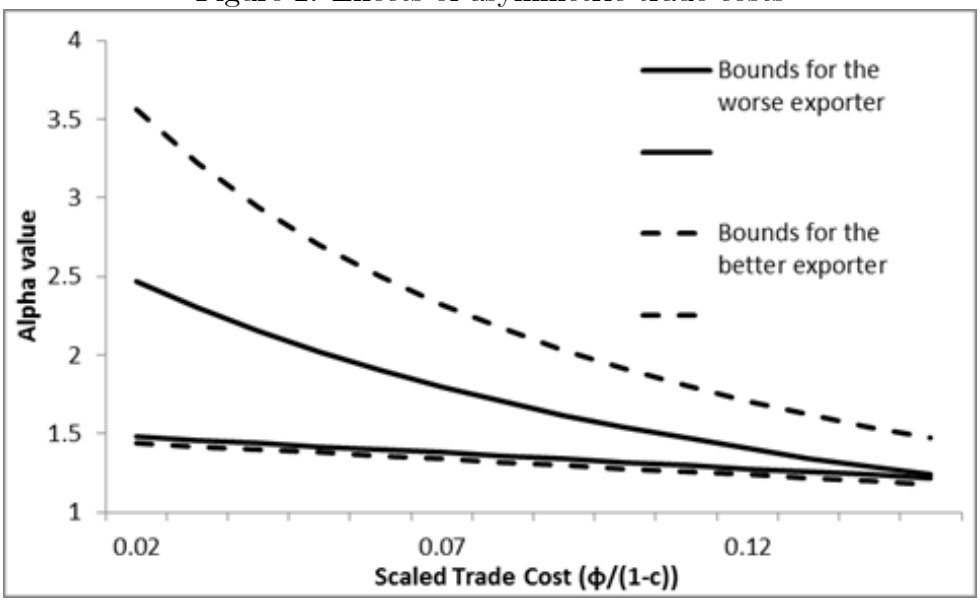
We summarize the results with the following proposition

Proposition 3 *If we extend the baseline model to allow for asymmetric trade costs $\phi_h > \phi_f$ satisfying $\frac{\phi_h}{1-c} < \frac{1}{5}$, then the nation with the lower trade cost will be willing to liberalize from prohibitive policies for a wider range of α than the nation with the higher trade cost.*

3.3 Mirror-Image Differences in Productivity

This section considers two nations and two industries with Cournot competition and additively separable preferences, and a mirror-image asymmetry in productivity across the two industries—that is,each nation produces with cost c in the sector for which it is uniquely

Figure 2: Effects of asymmetric trade costs



more efficient, and cost $c + \psi$ in the other sector, for $\psi \in (0, 1 - c)$. In this setting, aside from the pro-competitive gains from trade, there also exist Ricardian gains from trade.

Based on our baseline results, we can easily derive the value of either government objective in autarky to be

$$\left(\frac{1+2\alpha}{8}\right)(1-c)^2 + \left(\frac{1+2\alpha}{8}\right)(1-(c+\psi))^2$$

given that we have monopoly with cost c in one industry and $c + \psi$ in the other.

The value of the objective under free trade takes a similar form to that of the trade-cost case, with the cost difference ψ playing a similar role as trade cost ϕ, as each market features competition between firms with similar cost differentials. The total payoff is twice that of the trade-cost case, because there are two industries:

$$\left(\frac{2(1-c)-\psi}{3}\right)^2 + \alpha\left(2\left(\frac{1-c+\psi}{3}\right)^2 + 2\left(\frac{1-c-2\psi}{3}\right)^2\right)$$

In comparison to the trade cost case, the difference between the free trade and autarky payoffs is twice the difference in equation (1) (with ψ taking the role of ϕ), except there is an additional positive term (that enters negatively into the autarky payoff) of $(2(1-c)\psi) - \psi^2)\left(\frac{1+2\alpha}{8}\right)$. This term reflects additional Ricardian gains from trade from opening the market with lower costs. The difference between the two payoffs ultimately evaluates to

$$\frac{7-2a}{36}(1-c)^2+\left(\frac{2\alpha-7}{36}\right)(1-c)\psi+\left(\frac{62\alpha-1}{72}\right)\psi^2, \tag{8}$$

and yields the following constraint on α for free trade to be preferable to autarky.

$$\alpha \leq \frac{14-14(\frac{\psi}{1-c})-(\frac{\psi}{1-c})^2}{4-4(\frac{\psi}{1-c})-62(\frac{\psi}{1-c})^2}. \tag{9}$$

Observe that expressed as a function of the scaled productivity difference $\frac{\psi}{1-c}$, the ratio of polynomials is increasing in the argument. The numerator is strictly positive and the denominator is decreasing over the relevant range, with a root at $\frac{3\sqrt{7}-1}{31} \approx .224$. When the scaled productivity exceeds this value, free trade increases total industry profits, so there is no value of α for which autarky would be preferable to free trade.

As for deriving the prohibitive tariffs, first observe that the larger α is necessary to exclude the lower-cost imports rather than the higher-cost imports. The derivation of the prohibitive tariff is the same as equation (3), with $-\psi$ substituting for ϕ. The lower bound on α for prohibitive tariffs is then

$$\alpha \geq \frac{3}{2}+2(\frac{\psi}{1-c}) \tag{10}$$

Figure 3 summarizes the results. Notice that the range of feasible α for cooperation removing prohibitive policies is initially shrinking (the derivative of the upper bound is 0 when the trade cost is 0), as a larger α is necessary for a prohibitive tariff as the productivity difference increases. This reflects in part that consumer gains from trade are smaller when the productivity differences are larger in this setting. For large enough productivity differences, the necessary α to justify cooperative prohibitive tariffs expands as the decrease in total industry profits from free trade disappears.

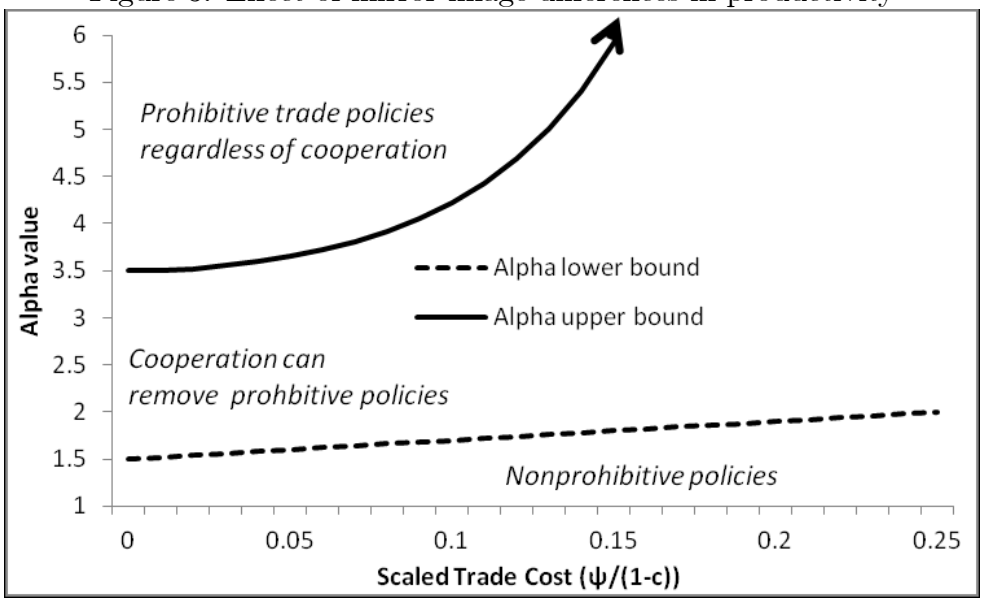
We summarize the results with the following proposition

Proposition 4 *If we extend the baseline model to allow for two industries with mirror-image costs of c and $c+\psi$,asymmetric trade costs such that $\frac{\psi}{1-c}<1$, then for small differences in productivity, cooperation is likely for a narrower range of α given that prohibitive tariffs are observed, but for larger differences in productivity, cooperation is possible for a wider range of α.*

3.4 Competition

The next extension we consider is multiple homogeneous firms in each nation. Increasing the number of symmetric Cournot firms is a reasonable way to model the level of competition

Figure 3: Effect of mirror-image differences in productivity

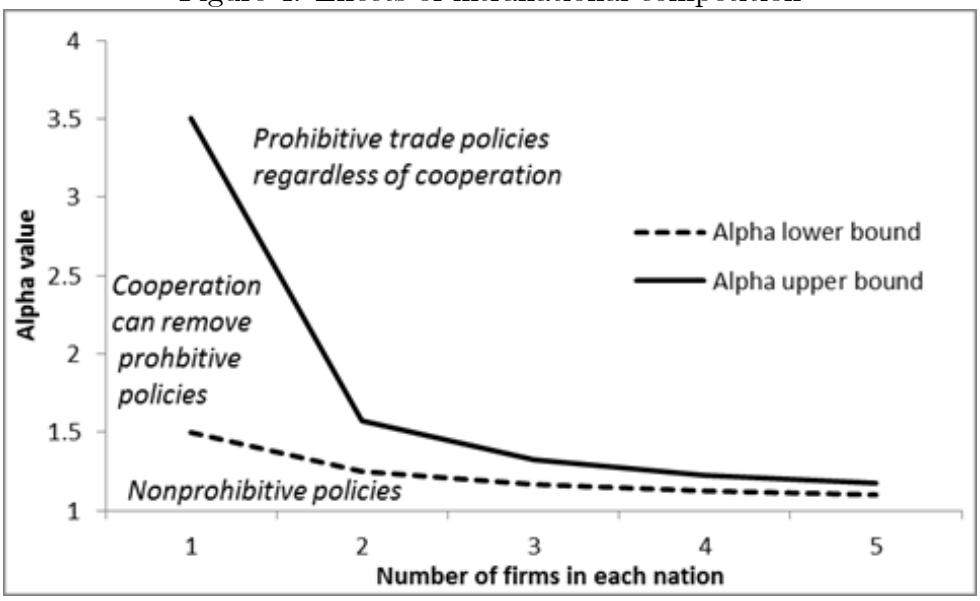


in each nation—this is done in the international competition policy study of Horn and Levinsohn (2001). Let n be the number of Home firms and n^* be the number of Foreign firms. The table gives values of various economic quantities under Cournot competition, with some elements of the tariff column defined from previous rows for the sake of brevity.

Outcome \ Policy Choice	Autarky	Free Trade	Tariff
Home domestic sales per firm q_h	$\frac{(1-c)}{n+1}$	$\frac{1-c}{n+n^*+1}$	$\frac{(1-c+\tau n^*)}{n+n^*+1}$
Foreign exports per firm q_f	0	$\frac{1-c}{n+n^*+1}$	$\frac{(1-c-\tau(1+n))}{n+n^*+1}$
Home exports per firm q_h^*	0	$\frac{1-c}{n+n^*+1}$	$\frac{(1-c-\tau^*(1+n))}{n+n^*+1}$
Market quantity Q	$\frac{n(1-c)}{n+1}$	$\frac{(n+n^*)(1-c)}{n+n^*+1}$	$\frac{((n+n^*)(1-c)-\tau n^*)}{n+n^*+1}$
Market Price P	$\frac{(1+nc)}{n+1}$	$\frac{(1+(n+n^*)c)}{n+n^*+1}$	$\frac{(1+(n+n^*)c+\tau n^*)}{n+n^*+1}$
Consumer Surplus CS	$\frac{n^2(1-c)^2}{2(n+1)^2}$	$\frac{(n+n^*)^2(1-c)^2}{2(n+n^*+1)^2}$	$\frac{1}{2}Q^2$
Profits (domestic sales) π_h	$\frac{(1-c)^2}{(n+1)^2}$	$\frac{(1-c)^2}{(n+n^*+1)^2}$	$(P-c)nq_h$
Profits (sales abroad) π_f	0	$\frac{(1-c)^2}{(n+n^*+1)^2}$	$(P-c)nq_h^*$
Tariff revenue TR	0	0	$\tau n^* q_f$
Government Objective G	$\left(\frac{n^2+2\alpha n}{2(n+1)^2}\right)(1-c)^2$	$\frac{((n+n^*)^2+4\alpha n)(1-c)^2}{2(n+n^*+1)^2}$	(omitted)

We consider the case of symmetric firms in each country such that $n = n^*$. First consider the cutoff α for which free trade is preferable to autarky. We find that

Figure 4: Effects of intranational competition



$$a \leq 1 + \frac{3n+2}{4n^2-2}.$$

To solve for the lower α bound at which point prohibitive policies are preferable to nonprohibitive tariffs, notice first the prohibitive tariff is $\tau = \frac{1-c}{1+n}$. The Nash equilibrium tariff equals the prohibitive level when

$$\left(\frac{2\alpha n+1}{2(n+1)(2n+1)-n(1+2n\alpha)}\right)(1-c) \geq \frac{1-c}{n+1},$$

which then simplifies to the relevant cutoff of

$$\alpha \geq 1 + \frac{1}{2n}.$$

We then plot the cutoffs as a function of n in Figure 4. Notice as with trade costs, as n goes to infinity and competition increases in both markets, the range of parameter values for which cooperation can remove prohibitive policies then narrows. The potential pro-competitive gains are smaller as competition increases, so the agreement becomes relatively less appealing for a given value of α. In the extreme case we get that there is no potential for cooperation given the observation of prohibitive trade policies—this result is expected, since Cournot competition approaches perfect competition as n approaches infinity, and we know there is no possibility of cooperation under perfect competition.

Perhaps what is a more surprising result is that cooperation could be more feasible for protected monopolies with large political power than duopolies with less political power. Contrast e.g. $n = 1$ and $\alpha = 2.5$ for which cooperation is feasible with $n > 1$ and $\alpha = 2$. Cooperation is more desirable under the protected monopolies because the pro-competitive gains from trade are so large.

For an additional result, we consider a country with a small number of firms forming a trade agreement with a country with a large amount of competition. In the limiting case as n^* approaches infinity, both the upper and lower bound on α for Home equal $1 + \frac{1}{2n}$, equal to the lower bound in the above figure. So for a government with a protected monopolist, there is no room for cooperation with a fully competitive trading partner if we currently observe prohibitive trade policies.

We summarize the results here.

Proposition 5 *Suppose we extend the baseline model to allow for n identical firms in Home and n^* firms in Foreign. As n and n^* increase symmetrically, there is a narrower parameter range of α for which cooperation is jointly preferable and prohibitive policies are unilaterally preferable. If the number of firms in either nation approaches infinity, then there is no potential for cooperation starting from prohibitive policies.*

3.5 Firm Heterogeneity

The final extension that we consider is firm heterogeneity. We consider a simple kind of heterogeneity—two firms with different productivities in each nation—but the model is still rich in implications. We index the firms in each country as 1 and 2 with costs c_1 and c_2. Without loss of generality we assume $c_1 \leq c_2$. The outcomes for each firm are given below with c_j representing the cost of the other firm. We omit the consumer surplus calculations for brevity.

Outcome \ Policy Choice	Autarky	Free Trade	Tariff
Home domestic sales per firm q_h^i	$\frac{1-2c_i+c_j}{3}$	$\frac{1-3c_i+2c_j}{5}$	$\frac{1-3c_i+2c_j+2\tau}{5}$
Foreign exports per firm q_f^i	0	$\frac{1-3c_i+2c_j}{5}$	$\frac{1-3c_i+2c_j-3\tau}{5}$
Home exports per firm q_h^{i*}	0	$\frac{1-3c_i+2c_j}{5}$	$\frac{1-3c_i+2c_j-3\tau^*}{5}$
Market quantity Q	$\frac{2-2c_1-2c_2}{3}$	$\frac{4-3c_1-3c_2}{5}$	$\frac{4-3c_1-3c_2-3\tau}{5}$
Market Price P	$\frac{(1+c_1+c_2)}{3}$	$\frac{1+2c_1+2c_2}{5}$	$\frac{1+2c_1+2c_2+2\tau}{5}$

To capture simply the firm heterogeneity, we define the parameter $\omega \equiv \frac{1-c_1}{1-c_2}$ which is the ratio of the first-best per-market production level of each firm if it were the sole producer.

We focus on the $\omega \geq 1$ case without loss of generality. Notice that for both firms to be producing in autarky, we require that $\omega < 2$, and for both firms to be producing under free trade, we require that $\omega < \frac{3}{2}$.

We derive the α parameter cutoff for mutual free trade to be preferable to autarky. Notice that when $\omega = 1$ we have the same result as the symmetric two-firm case from the previous subsection, for which the cutoff α is $\frac{11}{7}$. As ω increases from 1, the cutoff α initially increases. Then in the range between $\bar{\omega} \equiv \frac{116-15\sqrt{7}}{109} \approx 1.43$ and $\frac{5}{3}$, liberalization increases industry profits and free trade is preferable to autarky regardless of α. For $\omega \in (\frac{5}{3}, 2)$, the cutoff α declines as ω increases. For $\omega = 2$, the inferior firms are no longer active in autarky, so the model reduces back to the baseline model, for which the cutoff α is $\frac{7}{2}$. The complete cutoff α results are as follows.

1. For $\omega \in [1, \bar{\omega})$, $\alpha \leq \frac{11(1+\omega)^2}{-2(109\omega^2-232\omega+109\omega^2)}$.
2. For $\omega \in [\bar{\omega}, \frac{5}{3}]$, free trade is always jointly preferable to autarky.
3. For $\omega \in (\frac{5}{3}, 2]$, $\alpha \leq \frac{3\omega^2-2\omega-1}{6\omega^2-16\omega+10}$.

Next we derive the cutoff values of α for which a unilateral prohibitive policy is preferable to a unilateral tariff. We first consider that for some values of α, nations may prefer a tariff that is prohibitive for only the trading partner's inferior firm. For the region when both firms are active, we find that the optimal tariff would be

$$\tau^N \equiv \frac{(4\alpha+1)(2-c_1-c_2)}{(56-16\alpha)},$$

and the tariff level that is prohibitive for the inferior firm is $\tau = \frac{1+2c_1-3c_2}{3}$. Solving for the cutoff α,

$$\alpha \geq \frac{10+23c_1-33c_2}{4(2+c_1-3c_2)} = \frac{33-23\omega}{4(3-\omega)}.$$

When $c_1 = c_2$, this reduces to $\alpha \geq \frac{5}{4}$ which is consistent with the cutoff result for the $n = 2$ case from the previous homogeneous-firm subsection. When $\omega \geq \frac{21}{19}$, nations always prefer a tariff that prohibits the inferior firm from exporting.

As in the baseline monopoly case, the prohibitive tariff for both of the trading partner's firms is preferable when $\alpha \geq \frac{3}{2}$.

Figure 5: Effects of firm heterogeneity

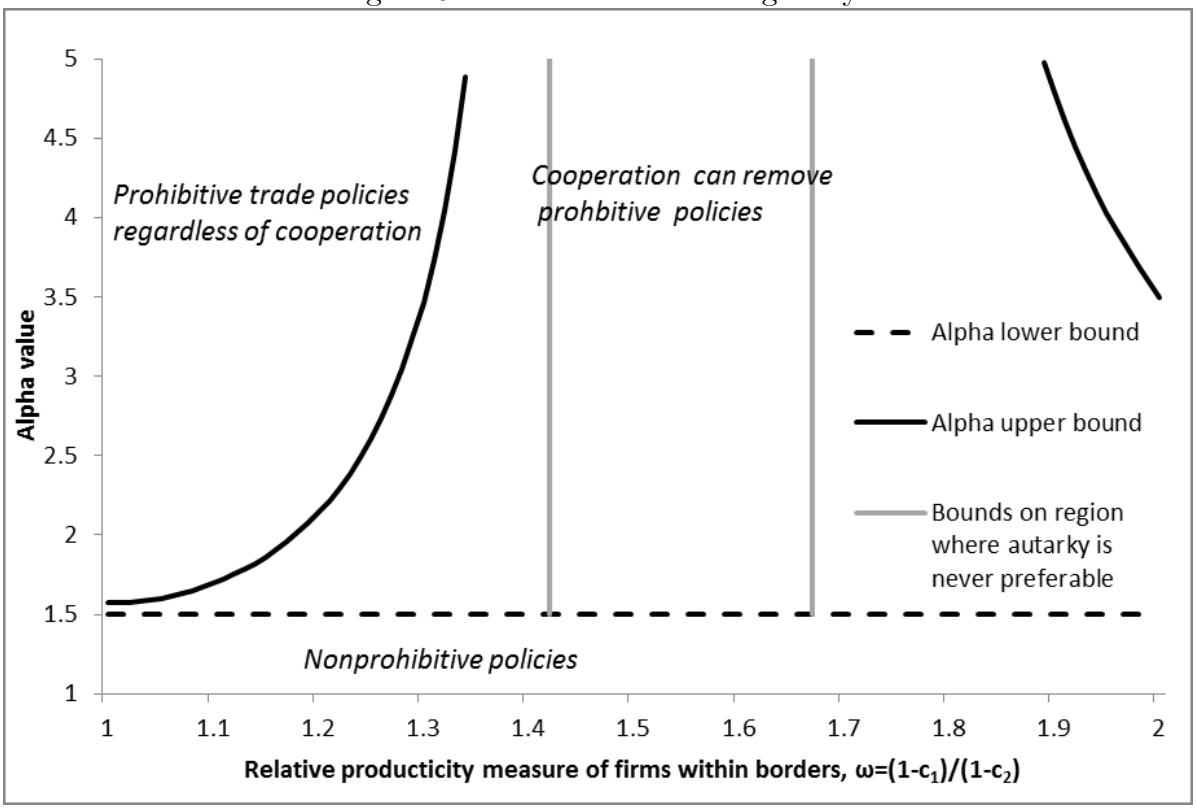


Figure 5.summarizes all the results.[14] To interpret the figure, first observe that when the two firms are homogeneous, there is a narrow range of parameter values $(\frac{3}{2}, \frac{11}{7})$ for which cooperation would be feasible given that noncooperative policies are currently observed. But as the productivity difference between the firms increases, the parameter ranges for which cooperation is possible increases dramatically, and cooperation is possible for all $\alpha \geq \frac{3}{2}$ provided that $\omega \in [\bar{\omega}, \frac{5}{3}]$. The intuition is that when firms are sufficiently heterogeneous, industry profits within each nation can grow. For other parameter ranges, profits fall by a smaller amount than in the homogenous firm case. As ω increases beyond $\frac{5}{3}$, liberalization decreases profits relative to autarky—this is because when the inferior domestic firm is providing sufficiently low competition for the superior firm in autarky, industry profits decrease again once each *de facto* monopoly is exposed to trade. But still the parameter ranges for which liberalization is feasible conditional on observing autarky is much wider than when ω is close to 1.

Proposition 6 *Suppose we extend the baseline model to allow for two firms in each country with asymmetric costs, and we maintain cross-country symmetry. As the firm heterogeneity increases, the parameter range of α for which cooperation is feasible initially expands and then contracts.*

4 Conclusion

The first contribution of this paper is to show that cooperation is possible starting from prohibitive policies, even if government preferences do not change. This is a nontrivial result, because such cooperation with static government preferences is impossible under perfect competition. We then extend a baseline model to determine under which market characteristics cooperation from prohibitive policies is likely to be feasible. We find that cooperation is more likely to be feasible for lower levels of trade costs, weaker levels of intranational competition, and intermediate ranges of firm heterogeneity.

Like any theoretical study, the results here motivate checks of empirical validity and theoretical robustness. Strategic trade models are infamous for lack of robustness for the mode of competition (Brander, 1995). This common critique of strategic trade models is focused on optimal unilateral export policies, however. There is no clear reason in the existing literature to believe that the profit-shifting effects of prohibitive trade policies would be as sensitive

[14] For simplicity, we do not subdivide the nonprohibitive policies portion based on whether policies are prohibitive for the inferior firm. The cutoff would run from $\alpha = \frac{5}{4}$ at $\omega = 1$, to $\alpha = 1$ at $\omega = \frac{21}{19}$, cutting the lower-left corner of the figure. For α or ω above this cutoff, trade policies are prohibitive for the inferior firms

to assumptions about market structure. Still the consideration of such robustness would be worthwhile for future work. Another important check would be to consider prohibitive policies resulting from fixed costs of exporting rather than a choke price in linear demand. As for empirical validity, it would be valuable to test the model's predictions among prohibitive barriers that have later been removed. Ideally, the model could be useful in guiding future efforts in trade cooperation.

The paper concludes with brief arguments for the relevance of these results for WTO negotiations involving developing countries and services trade. Much of the frontier in these respective areas is surveyed by Bagwell and Staiger (2014) for development and Francois and Hoekman (2010) for services trade.

For the case of services trade, Francois and Hoekman (2010) remark,

> We need to deepen our understanding of why trade agreements have attracted less attention and support by firms than has been the case when it comes to trade in goods. A first step here is to improve our understanding of the problem(s) that trade agreements spanning services are meant to solve. It is not clear that for international transactions that involve factor movement (i.e., trade in services) the standard explanations in the literature—first and foremost the terms of trade rationale—necessarily apply.... Given that in services market access and regulation are closely intertwined, in many markets the key need may be to reform regulatory policies that impede contestability.

This comment ties well into the focus of the current paper. Indeed, we find the best potential opportunity for successful cooperation from current prohibitive policies is between state monopolies, even if these monopolies are more politically powerful than protected industries with more domestic competition. Though services trade often involves behind-the-border measures rather than tariffs, the current paper is still relevant in explaining why nations would impose prohibitions rather than, say, licensing fees that discriminate against foreigners.[15]

Much of the focus in Bagwell and Staiger (2014) is on the failure of developing countries to engage in reciprocal tariff reductions, the limits of gains on MFN free-riding, and the "latecomers problem" that exists when developed countries have achieved their politically optimal tariffs and have no desire for further liberalization with developing nations. A different perspective is provided by Lamp (2014) who describes the history of GATT efforts to determine barriers to trade for developing countries in areas where little trade exists, as well as the struggles of developing countries to enter negotiations in industries for which

[15] See Feketekuty (2008) for background on the history of services negotiations.

they were not principal suppliers. For the kind of trade agreement problems described in the current paper, the principal of reciprocity as it has been practiced in the GATT and WTO would not so neatly apply. Though the current paper contributes by identifying market characteristics for which cooperation from prohibitive policies is likely to be feasible, further would work would be necessary to understand what institutional designs can aid in guiding nations from the noncooperative to the cooperative outcome.

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