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Abstract

This paper constructs a three-country partial equilibrium model to examine the effects of the most favored nation (MFN) clause on equilibrium tariffs and welfare when exporting countries are asymmetric with respect to market structure as well as production costs. In the model, firms sell differentiated goods and compete in prices. We contrast two policy scenarios: one where the importing country is free to tariff discriminate among exporters and another where it must treat them the same (MFN). Relative to tariff discrimination, MFN benefits low cost (more concentrated) exporters and hurts high cost (less concentrated) ones. While MFN is generally preferable to discrimination from a global welfare perspective, such need not be the case when high cost exporters enjoy greater market power (because they are merged into a single unit) than low cost ones. Under such a situation, if cost differences between exporters are not too large then tariff discrimination favors low cost producers and is welfare preferred to MFN.

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1 Introduction

The most favored nation (MFN) clause is widely recognized as one of the central pillars of the multilateral trading system.[1] MFN constitutes the very first article of the General Agreement on Tariffs and Trade (GATT) and occupies an important place in all multilateral trade agreements. GATT Article I states that "... any advantage, favor, privilege, or immunity granted by any contracting party to any product originating in or destined for any other country shall be accorded immediately and unconditionally to the like product originating in or destined for the territories of all other contracting parties." In other words, at the heart of MFN is the principle of *non-discrimination*. But in a tariff-ridden (second best) world, is non-discrimination a reasonable principle to follow? In fact, there exists no general argument in favor of non-discrimination in trade policy and the economic case for MFN is hardly obvious (see Caplin and Krishna, 1988, Staiger, 1995 and Horn and Mavroidis, 2001). The goal of this paper is to contrast MFN with tariff discrimination in an environment where firms possess market power in order to determine whether or not under such circumstances MFN is welfare-preferred to tariff discrimination. A novel feature of the model is that it provides a comparison of MFN and tariff discrimination in an environment where market structure differs across countries.[2]

[1] See Hoekman and Kostecki (2001) for a detailed discussion of the various multilateral trade agreements of the WTO.

[2] Our model considers a rather well-defined question and ignores several important aspects of MFN. For example, Ethier (1999, 2002) emphasizes that MFN helps prevent concession diversion (or bilateral opportunism as per Bagwell and Staiger, 2003) while McCalman (2002) analyzes the impact of MFN on trade negotiations under private information. Bagwell and Staiger (1999) show how MFN and reciprocity help achieve Pareto efficiency in trade agreements. See Ederington and McCalman (2003) and Saggi (2003) for

The model is partial equilibrium in nature and considers a world comprised of two exporting countries and a single importing country. In each exporting country, there is a single industry consisting of two firms that produce symmetrically differentiated goods. The importing country is assumed to have no local production of these goods. The following two-stage game is analyzed under tariff discrimination and MFN. In the first stage, the importing country chooses its optimal tariffs to maximize its welfare (these tariffs depend upon whether the underlying policy regime permits or prohibits tariff discrimination). Next, firms compete in the product market by choosing their prices.

While the model permits exporting countries to be asymmetric along two dimensions (production costs and market structure), to highlight the role played by each type of asymmetry we initially consider each in isolation. In the model, differences in production cost refer to marginal cost differences whereas market structure asymmetries refer to situations where firms in only one of the exporting countries are merged into a single unit.[3] We find that when market structure is symmetric across exporting countries and the importing country is free to tariff discriminate, it imposes higher tariffs on low cost exporters relative to high cost ones.[4] Similarly, when all exporters have the same cost, higher tariffs are levied on the merged firm relative to competing ones. The preceding results obtain because the importing country has

the role MFN and tariff discrimination play in sustaining multilateral tariff cooperation.

[3] Alternatively, one can assume that one of the exporting countries allows its firms to collude. In essence, we are interested in situations where differences in merger and/or antitrust policies across countries result in differences in pricing behavior of firms.

[4] This result also obtains in oligopoly models with Cournot competition – see Gatsios (1990), Hwang and Mai (1991), Choi (1995), and Saggi (2004).

a stronger incentive to extract rents from firms that charge higher mark-ups (both low cost firms and those that are merged enjoy higher mark-ups). If the importing country switches from tariff discrimination to MFN, it lowers its tariff on low cost (or merged) firms while raising it on high cost (or competing) ones. As a result, MFN adoption has distributional implications – it benefits one exporting country while hurting the other.

As might be expected, the importing country has no unilateral incentive to adopt MFN since MFN constrains its choice set without conferring any benefit in return. But, is MFN adoption desirable from the perspective of aggregate world welfare? Here the answer is subtle: MFN does improve world welfare when exporters are asymmetric along only one dimension (i.e. either they differ only with respect to costs or their merger status). However, when exporters are asymmetric along both dimensions, MFN can actually *lower* world welfare relative to tariff discrimination. This happens when a merged unit is relatively high cost but its cost disadvantage is not too large. The logic of this result is as follows. The importing country's incentive to charge a higher tariff on a merged firm can create a situation where a *high cost merged firm actually faces a higher tariff under tariff discrimination relative to a low cost competing firm because of its greater market power.* Such tariff discrimination is desirable from a world-welfare perspective since it diverts output toward relatively low cost producers. MFN adoption can eliminate such socially desirable discrimination and thereby lower world welfare. To the best of our knowledge, ours is the only model that provides a demonstration of the claim that MFN does not always welfare dominate tariff discrimination. Since market structure differences are pervasive across countries, this result

is relevant for assessing the practical desirability of MFN. However, it is worth emphasizing, that this negative MFN result obtains only under certain conditions. Even when high cost firms merge, MFN improves world welfare relative to tariff discrimination if the greater market power of the merged unit is offset by its higher production cost in that the importing countries imposes higher tariffs on low cost competing firms under tariff discrimination.

Like Saggi (2004), the present paper uses an oligopoly model to examine the implications of MFN. However, we differ from Saggi (2004) in two significant ways. First, in addition to exploring the role played by cost differences across countries, we also allow market structure to differ across countries. Second, we examine price competition among firms rather than quantity competition and thereby contribute to the literature on MFN under oligopoly all of which focuses on quantity competition – see Gatsios (1990), Hwang and Mai (1991), Choi (1995), and Saggi (2004).

The rest of the paper is organized as follows. The theoretical model is described in section 2. Section 3 contrasts tariff discrimination with MFN. Section 4 concludes while section 5 constitutes the appendix.

2 Model

We consider a world comprised of three countries: home country (H), foreign country (F), and importing country (I). In both countries H and F, local industry comprises of two firms each of which produces a symmetrically differentiated good that is exported to country I. Let firms be indexed by i where $i = 1, 2, 3, 4$. Firms 1 and 2 are home firms while 3 and 4 are foreign firms. Let c_i denote the marginal cost of firm i where $c_i = c_h$ for $i = 1, 2$ and

$c_i = c_f$ for $i = 3, 4$.

Following Shubik (1980), the demand function facing firm i is given by:

$$q_i(p_1, ..., p_N) = \frac{1}{N}(\alpha - p_i - \gamma(p_i - \frac{1}{N}\sum_{j=1}^{N} p_j)) \tag{1}$$

where p_i is the price charged by firm i, q_i its sales and N denotes the total number of firms in the market. The parameter $\gamma \geq 0$ measures the degree of substitutability between different goods. When $\gamma \simeq 0$, goods become unrelated and as it approaches infinity they become perfect substitutes.[5]

Firm i faces a specific tariff t_i when exporting to country I where $t_i = t_h$ for $i = 1, 2$ and $t_i = t_f$ for firms 3 and 4. We study the following two-stage game under tariff discrimination and MFN. In the first stage, the importing country chooses its optimal tariffs to maximize its welfare (these tariffs depend upon whether the underlying policy regime is one of tariff discrimination or MFN). Next, firms compete in the product market by choosing their prices.

To examine the effects of asymmetries of market structure and technology between exporting countries on the importing country's trade policy, we study the above policy game under four different market structures: (i) international duopoly with one firm in each country (D) (ii) international triopoly with a single home firm and two foreign firms (HM); (iii) international triopoly with a single foreign firm and two home firms (FM); and (iv) international oligopoly with two firms in each country (O). Implicitly, we view asymmetries in market structure across countries to be a consequence

[5]Note that the degree of differentiation between any two goods is the same and that the term containing γ drops out when there is only one firm in the market.

of differences in national merger and/or antitrust policies. For example, under market structure HM, home firms act as a single merged unit while those in the foreign country as competitors.[6] International market structure is denoted by S where $S = D$, HM, FM, and O.

To obtain a subgame perfect Nash equilibrium, we solve the model backwards and begin with the product market stage. The maximization problem of firm i under international oligopoly is given by:

$$\max_{\{p_i\}} \Pi_i(.) = \frac{1}{4}(p_i - c_i - t_i)(\alpha - p_i - \gamma(p_i - \overline{P_j})) \tag{2}$$

where $\overline{P_j}$ denotes the average price in the market and it equals:

$$\overline{P_j} \equiv \frac{\sum_{j=1}^{4} p_j}{4}$$

The first order condition for the above problem yields firm i's reaction function under international oligopoly:

$$p_i = \frac{4\alpha + (3\gamma + 4)(c_i + t_i) + \gamma P_{-i}}{2(4 + 3\gamma)} \tag{3}$$

where P_{-i} denotes the sum of prices of firm i's competitors and it equals:

$$P_{-i} = \sum_{j \neq i} p_j$$

The equilibrium price charged by firm i under oligopoly is found by solving the reaction functions of all firms simultaneously (the relevant expression is in the appendix). In general, we will denote equilibrium price of firm i under market structure S by p_i^S.

[6] In fact, in our model, a merger of two firms is equivalent to perfect collusion between them.

As might be expected, when international market structure is asymmetric ($S = HM$ or FM), reaction functions of firms are also asymmetric. We discuss only the market structure HM since reaction functions under FM are completely analogous. If home firms are merged, they internalize price competition between themselves and solve:

$$\max_{\{p_1,p_2\}} \Pi_h(.) = \sum_{i=1}^{2} \frac{1}{4}(p_i - c_i - t_i)(\alpha - p_i - \gamma(p_i - \overline{P_j})) \tag{4}$$

whereas the problem facing a typical foreign firm is analogous to that under oligopoly. The merged home firm's (common) reaction function for both products at the price competition stage is as follows:

$$p_i = \frac{4\alpha + (2\gamma + 4)(c_i + t_i) + \gamma P_{-i}}{4(2 + \gamma)} \tag{5}$$

whereas a typical foreign firm's reaction function is:

$$p_j = \frac{4\alpha + (3\gamma + 4)(c_j + t_j) + 2\gamma p_i + \gamma p_{\tilde{}j}}{2(4 + 3\gamma)} \tag{6}$$

where $\tilde{}j$ denotes the other foreign firm. Note from the above reaction function that a unit increase in the price of the merged home firm induces a greater price increase by a foreign firm than does a unit price increase by the other foreign firm:

$$\frac{\partial p_j}{\partial p_i} = 2\gamma > \gamma = \frac{\partial p_j}{\partial p_{\tilde{}j}}$$

In other words, the home merger not only internalizes price competition between home firms, it also makes competing foreign firms more sensitive to price increases by the merged home firm. The intuition is simple: an increase in the price of the merged home firm *applies to both goods* exported by the home country whereas that of a competing foreign firm applies only

to one good. Similarly, a comparison of the reaction function of the merged firm to that of a typical firm under oligopoly shows that the merged firm is more responsive to price increases by rival firms (due to internalization of competition). The equilibrium prices charged by the merged home firm and competing foreign firms under market structure HM are reported in the appendix (where we also prove the following lemma).

Lemma 1: *Let h denote the merged home firm and f a competing foreign firm. The following hold: (i)* $\frac{\partial p_h^{HM}}{\partial t_h} < \frac{\partial p_f^{HM}}{\partial t_f}$ *and (ii)* $\frac{\partial p_h^{HM}}{\partial t_f} > \frac{\partial p_f^{HM}}{\partial t_h}$.

In other words, the merged firm's price increase in response to an increase on own tariff is weaker than the corresponding response of a typical competing firm. On the other hand, the cross-tariff effect is weaker for competing firms relative to the merged firm. These results are useful for explaining the effects of MFN when international market structure is asymmetric (see section 3.2).

Now consider market competition under international duopoly. The maximization problems and the reaction functions of home and foreign mergers under international duopoly (D) are the same as in (4) and (5) respectively. As expected, the equilibrium price under D is the highest among all possible market structures (relevant expression is in the appendix).

Having solved for the market equilibrium under all possible market structures, we are now ready to consider the trade policy stage. In the next section, we contrast two scenarios: one where the importing country is free to discriminate among exporters and another where it must treat them symmetrically (MFN treatment).

3 MFN versus tariff discrimination

At the trade policy stage, there are two main issues that deserve examination. First, the linkages between tariffs, production costs, and market concentration levels are of interest. Second, the effects of MFN on equilibrium tariffs and welfare deserve investigation. For this purpose, it is useful to separately consider the two types of asymmetries (market structure and production costs).

3.1 MFN under cost asymmetry

Let $\mathbf{t} = (t_h, t_f)$ denotes the importing country's tariff vector under tariff discrimination. The basis for tariff discrimination is the asymmetry in production costs of exporters (i.e. $c_h \neq c_f$). We assume that the importing country chooses its tariff schedule to maximize its own welfare. Since no production takes place in the importing country, local welfare is the sum of the consumer surplus and tariff revenue. Given international market structure S, the importing country solves:

$$\max_{\mathbf{t}} W(\mathbf{t}) \equiv CS(\mathbf{t}) + t_h \sum_{i=1}^{2} q_i(\mathbf{t}) + t_f \sum_{i=3}^{4} q_i(\mathbf{t}). \tag{7}$$

where consumer surplus equals

$$CS(\mathbf{t}) \equiv \frac{\sum_{i=1}^{4}(\alpha - p_i(\mathbf{t}))q_i(\mathbf{t})}{2} \tag{8}$$

Let t_i^S denote the importing country's optimal discriminatory tariff on firm i under market structure S. The following result is easy to show:

Proposition 1: *Under symmetric market structures ($S = O$ or D), the importing country's optimal discriminatory tariff schedule has the following features: (i) The tariff imposed on the foreign country is higher than that imposed on the home country if and only if the foreign country's production cost is lower than that of the home country: $t_f^S \geq t_h^S$ iff $c_f \leq c_h$; (ii) The true efficiency ranking of countries is preserved under tariff discrimination: $c_f + t_f^S \leq c_h + t_h^S$ iff $c_f \leq c_h$; and (iii) as international market structure becomes more concentrated, tariffs increase: $t_i^O < t_i^D$.*

Under symmetric market structures, the importing country imposes a higher tariff on low cost producers since they enjoy higher mark-ups and the importing country can extract more rents from them. Furthermore, the bigger the technology gap between the two exporting countries, the stronger is the degree of tariff discrimination.[7] Part (ii) of proposition 1 states that the higher tariff on the low cost exporter does not reverse the true efficiency ranking of firms. It is clear that such a reversal can never be optimal from the importing country's perspective: if the tariff on relatively low cost exporters was high enough to actually make them relatively high cost (i.e. their tariff included costs exceed those of 'truly' high cost producers), the volume of their exports would be lower as would be the per unit revenue raised from them relative to that raised from the 'truly' high cost firms. As a result, the importing country could improve its welfare by lowering its tariffs on the low cost firms to levels where they would actually be exporting more (which happens when the true cost ranking of exporters holds).

Now consider the importing country's optimal MFN tariff. Under MFN,

[7] This result also obtains under quantity competition (see, for example, Gatsios 1990).

it solves the following problem:

$$\max_t W^I(t) \equiv CS(t) + t\sum_{i=1}^{4} q_i(t). \tag{9}$$

The problem in (9) differs from the problem in (7) in only one respect: now the importing country imposes the same tariff on all exporters irrespective of their costs. Define the optimal MFN tariff under market structure S as:

$$t^S = Arg\max W^I(t) \tag{10}$$

The following result is shown in the appendix:

Proposition 2: *Under symmetric market structures ($S = O$ or D), the importing country's optimal MFN tariff t^S has the following features: (i) it is lower (higher) than the optimal discriminatory tariff on low (high) cost exporters: $t_f^S \geq t^S \geq t_h^S$ iff $c_f \leq c_h$; (ii) the importing country's average tariff is the same under MFN and tariff discrimination: $t_h^S + t_f^S = 2t^S$; and (iii) as the market structure becomes more concentrated, the optimal MFN tariff increases: $t^O < t^D$.*

Part (i) of the above proposition informs us that MFN adoption by a country has distributional implications for its trading partners: the low cost exporters gain while high cost ones lose. Part (ii) of the proposition shows that MFN is indeed distinct from trade liberalization – MFN adoption by the importing country does not alter its average tariff.[8] Finally, part (iii) shows that an increase in the degree of market concentration leads the importing country to raise its MFN tariff.

[8]Interestingly, this result also holds true in linear models of quantity competition. See Saggi (2004), Choi (1995), Hwang and Mai (1991), and Gatsios (1990).

As might be expected, the importing country has no unilateral incentive to adopt MFN. But is MFN adoption socially desirable? Since MFN does not result in trade liberalization, the answer to this question is not immediately obvious.[9] In order to understand the implications of MFN adoption from the viewpoint of world welfare, define world welfare as the sum of welfare in each country. Given the importing country's tariff vector $\mathbf{t}$, world welfare equals:

$$WW(\mathbf{t}) = W^H(\mathbf{t}) + W^F(\mathbf{t}) + W^I(\mathbf{t}) \tag{11}$$

Substituting $\mathbf{t} = (t_h^S, t_f^S)$ yields world welfare under tariff discrimination while setting $\mathbf{t} = (t^S, t^S)$ yields world welfare under MFN.

Due to the market segmentation, it is sufficient to consider the sum of the welfare of the importing country and the profit of home and foreign exporters in the importing country. As a result, under market structure S, MFN adoption by the importing country improves world welfare if and only if:

$$W^I(t^S) + \sum_{i=1}^{4} \Pi_i(t^S) \geq W^I(t_h^S, t_f^S) + \sum_{i=1}^{4} \Pi_i(t_h^S, t_f^S) \tag{12}$$

The following is shown in the appendix:

Proposition 3: *Under symmetric market structures ($S = O$ or D) world welfare under MFN is higher than that under tariff discrimination:* $WW(t^S) \geq WW(t_h^S, t_f^S)$.

The above result shows that MFN adoption contributes to world welfare even though it is *not* accompanied by any trade liberalization. The reason is that tariff discrimination is biased against low cost exporters. As a result,

[9] One thing is clear from part (i) of the above proposition: MFN is not Pareto-improving over tariff discrimination.

under MFN, world output is produced at lower total cost relative to tariff discrimination. Alternatively, tariff discrimination diverts trade away from low cost exporters to high cost ones and MFN eliminates this inefficiency.

Next, we consider the impact of MFN when international market structure is asymmetric.

3.2 MFN under market structure asymmetry

To isolate the effect of market structure asymmetry on the tariff response of the importing country and world welfare, assume that cost structure is symmetric across countries ($c_h = c_f = c$). As before, we discuss only the market structure HM wherein home firms are merged into a single unit whereas foreign firms compete (the results under market structure FM are completely analogous). Let t_h^{HM} and t_f^{HM} denote the optimal discriminatory tariffs on home and foreign firms under the market structure HM. Similarly, let t^{HM} denote the MFN tariff under market structure HM. The following result is shown in the appendix:

Proposition 4: *Suppose costs are symmetric across exporting countries* ($c_h = c_f = c$). *Then the following hold: (i) Under tariff discrimination, the importing country imposes a higher tariff on merging firms relative to independent firms:* $t_h^{HM} \geqslant t_f^{HM}$*; (ii) the MFN tariff is bound by these two discriminatory tariffs:* $t_h^{HM} \geqslant t^{HM} \geqslant t_f^{HM}$*; (iii) the average tariff level is higher under discrimination relative to MFN:* $t_h^{HM} + t_f^{HM} \geqslant 2t^{HM}$*; and (iv) world welfare is higher under MFN than under tariff discrimination.*

Part (i) of the above result can be explained as follows. First, note that when free to discriminate, the importing country has incentive to impose a

higher rent extracting tariff on the merged firms since its mark-up is higher than that of competing firms. Second, Lemma 1 states that the harmful effect of a unit tariff increase on local consumer surplus is lower when the increase applies to the merged unit relative to when it applies to a competing firm. The weaker price response of the merged firm to a tariff increase gives the importing country an additional incentive (besides the higher mark-up charged by the merged firm) to impose a higher tariff on the merged unit under tariff discrimination.

One implication of part (*ii*) is that the incentives of firms to merge under MFN are higher relative to tariff discrimination since the merged firm faces a lower tariff under MFN. Part (*iii*) of the above proposition shows that when international market structure is asymmetric, *MFN adoption by the importing country results in some trade liberalization since the average tariff level is lower under MFN relative to discrimination.* This result can be understood as follows. By definition, under MFN, the importing country cannot treat the merged firm any worse than a typical competing firm. As a result, relative to tariff discrimination, the tariff imposed on the merged unit is lower under MFN while that on a typical competing firm is higher. To compensate consumers for the relatively higher tariff on competing firms, the home country lowers its average tariff under MFN relative to discrimination (i.e. unilateral MFN adoption is accompanied by some degree of trade liberalization). Were the average level of tariff protection to remain the same under MFN and tariff discrimination, local consumers would be strictly worse off under MFN due to the relatively stronger price response of a competing firm to a tariff increase (Lemma 1).

Thus far, we have analyzed the two types of asymmetries (cost and market structure) in isolation and found that MFN adoption is world welfare improving under both cases. But what if both asymmetries co-exist? This question is examined next.

3.3 MFN under both asymmetries

Let $\Delta c \equiv c_h - c_f$ be the technology gap between firms. When both types of asymmetries are present, there are two distinct scenarios to examine: (i) merging firms are low cost relative to competing firms (i.e. $\Delta c < 0$) and (ii) merging firms are high cost relative to competing firms (i.e. $\Delta c > 0$).

Following the results obtained from Proposition 1 and Proposition 4, it is easy to see that under scenario (i), the importing country's optimal discriminatory tariff on the (low cost) merging firms is higher than that on high cost (competing) ones and that the MFN tariff is bound by the two discriminatory tariffs. Furthermore, combining the world welfare ranking in Proposition 3 and Proposition 4, it is straightforward to argue that MFN adoption by the importing country necessarily improves world welfare under scenario (i).

But what if merging firms are high cost? Under this scenario, there are two contradictory effects that determine the comparison of MFN and tariff discrimination. On the one hand, the fact that the high cost firms have more market power calls for a higher discriminatory tariff on them. On the other hand, precisely because they are high cost the importing country has an incentive to impose higher tariffs on competing firms. These two effects cancel out at some critical technology gap between merging and independent firms:

Proposition 5: *Suppose merging firms are high cost (i.e. $\Delta c > 0$). Then, under tariff discrimination, the merged unit faces a higher tariff relative to that under MFN iff the technology gap between firms falls below a critical threshold (i.e. $\Delta c \leq \Delta c^*$). Furthermore, tariff discrimination yields higher global welfare than MFN.*

Let $\Delta WW^{HM} \equiv WW(t^{HM}) - WW(t_h^{HM}, t_f^{HM})$ denote the difference between world welfare under MFN and discrimination under market structure HM. We show in the appendix that $\Delta WW^{HM} > 0$ iff $\Delta c > \Delta c^*$. When the cost difference between firms is higher than the critical level Δc^*, discrimination is biased against low cost firms and MFN adoption is welfare improving since it removes this bias. On the other hand, when the cost difference is lower than the critical level Δc^*, discrimination can be socially desirable since it is biased against the high cost firm. Under such a situation, MFN adoption actually lowers aggregate world welfare.

Furthermore, either when the products become independent ($\gamma \to 0$) or when they become perfect substitutes ($\gamma \to \infty$), the critical threshold Δc^* approaches zero. Intuitively, at these extreme substitutability levels, a merger has no affect on world welfare since market structure is either perfectly competitive (for $\gamma \to \infty$) or perfectly monopolistic (for $\gamma \to 0$) to begin with. Under either of these scenarios, only the technological gap between firms (i.e. Δc) matters and we know from Proposition 3 that MFN improves world welfare when countries are asymmetric only with respect to production costs.

The following insight emerges from the above analysis: from a welfare viewpoint, world interest regarding unilateral MFN adoption may actually

coincide with that of the importing country – when production costs and market structure are asymmetric across countries, MFN adoption reduces not only the importing country's welfare but may also adversely affect world welfare.

4 Conclusion

This paper develops a simple three-country oligopoly model of trade to shed light on the economics of the MFN principle. We contrast two scenarios: one where the importing country is free to discriminate among exporters and another where it must treat them symmetrically (MFN treatment). The focus has been on two underlying asymmetries (production cost and market structure) that generate a rationale for tariff discrimination.

When market structure is symmetric across countries, it is found that MFN adoption leads to an increase in the output of low cost producers relative to high cost ones. In other words, switching from a discriminatory tariff schedule to MFN benefits low cost exporters and hurts high cost ones. This result confirms a key insight provided by several quantity competition models: MFN improves world welfare by eliminating trade diversion that results from tariff discrimination. This is reassuring since there are few, if any, general policy conclusions that emerge from oligopolistic models.

When firms are symmetric with respect to costs, under tariff discrimination, the importing country levies a higher tariff on a merged firm relative to competing ones. An implication of this result is that firms have stronger incentives to merge under MFN relative to tariff discrimination. When both types of asymmetries exist simultaneously, the welfare effects of MFN are

ambiguous. In particular, if merging firms are high cost, MFN can deliver lower world welfare than tariff discrimination. This result is important since it points out that market structure asymmetries (that may result from international differences in antitrust and/or merger policies) can be an important determinant of the desirability of MFN.

5 Appendix

All supporting calculations not provided in the text are given below:

Equilibrium prices

Equilibrium price under international oligopoly equals:

$$p_i^O = \frac{4a(7\gamma+8)+(3\gamma+4)((5\gamma+8)(c_i+t_i)+2\gamma(c_{-i}+t_{-i}))}{(3\gamma+8)(7\gamma+8)} \tag{13}$$

When home firms are merged, their (common) price for the two home products equals:

$$p_h^{HM} = \frac{2\alpha(7\gamma+8)+(3\gamma^2+4\gamma)(c_f+t_f)+(5\gamma+8)(\gamma+2)(c_h+t_h)}{4(2\gamma^2+9\gamma+8)} \tag{14}$$

whereas the equilibrium price charged by competing foreign firms equals:

$$p_f^{HM} = \frac{2\alpha(3\gamma+4)+(3\gamma+4)(\gamma+2)(c_f+t_f)+(\gamma^2+2\gamma)(c_h+t_h)}{2(2\gamma^2+9\gamma+8)} \leq p_h^{HM} \tag{15}$$

Under duopoly, we have:

$$p_i^D = \frac{2\alpha(3\gamma+4)+(2\gamma+4)(\gamma+2)(c_i+t_i)+(\gamma^2+2\gamma)(c_{-i}+t_{-i})}{(\gamma+4)(3\gamma+4)} \tag{16}$$

Lemma 1

Using the prices under HM reported above, the following is immediate:

$$\frac{\partial p_h^{HM}}{\partial t_h} - \frac{\partial p_f^{HM}}{\partial t_f} = -\frac{\gamma(\gamma+2)}{4(2\gamma^2+9\gamma+8)} \leq 0$$

and

$$\frac{\partial p_f^{HM}}{\partial t_h} - \frac{\partial p_h^{HM}}{\partial t_f} = -\frac{\gamma^2}{4(2\gamma^2 + 9\gamma + 8)} \leq 0$$

Proposition 1

Under tariff discrimination, we have:

$$\max_{t_h, t_f} W^I(\mathbf{t}) \equiv \frac{\sum_{i=1}^{4}(\alpha - p_i(\mathbf{t}))q_i(\mathbf{t})}{2} + t_h \sum_{i=1}^{2} q_i(\mathbf{t}) + t_f \sum_{j=3}^{4} q_j(\mathbf{t}).$$

where $\mathbf{t} = (t_h, t_f)$ is importing country's tariff vector. Solving this problem under symmetric market structures with cost asymmetry yields the following optimal discriminatory tariffs:

$$t_h^O = \frac{2(3\gamma^2(c_f - c_h) + 24(\alpha - c_h) + \gamma(22\alpha - 26c_h + 4c_f))}{3(11\gamma^2 + 56\gamma + 48)}$$

and

$$t_h^D = \frac{\gamma^2(c_f - c_h) + 12(\alpha - c_h) + \gamma(10\alpha - 12c_h + 2c_f)}{5\gamma^2 + 36\gamma + 36}$$

Switching c_h and c_f yields the tariffs on the foreign firms. To prove part (i) note that

$$t_h^O - t_f^O = \frac{4(c_f - c_h)(\gamma + 1)}{(11\gamma + 12)} \geq 0 \text{ iff } c_h \leq c_f$$

and

$$t_h^D - t_f^D = \frac{2(c_f - c_h)(\gamma + 1)}{(5\gamma + 6)} \geq 0 \text{ iff } c_h \leq c_f$$

Now consider part (ii). We have:

$$(c_h + t_h^O) - (c_f + t_f^O) = \frac{(c_h - c_f)(7\gamma + 8)}{(11\gamma + 12)} \leq 0 \text{ iff } c_h \leq c_f$$

and

$$(c_h + t_h^D) - (c_f + t_f^D) = \frac{(c_h - c_f)(3\gamma + 4)}{(5\gamma + 6)} \leq 0 \text{ iff } c_h \leq c_f$$

Finally, part (iii) follows immediately from the optimal tariff formulae reported above.

Proposition 2

Under MFN the importing country solves:

$$\max_t W^I(t) \equiv \frac{\sum_{i=1}^4 (\alpha - p_i(t)) q_i(t)}{2} + t \sum_{i=1}^4 q_i(t).$$

Solving this problem yields the optimal MFN tariffs:

$$t^O = \frac{2(2\alpha - c_h - c_f)}{3(\gamma + 4)} \text{ and } t^D = \frac{2\alpha - c_h - c_f}{(\gamma + 6)}.$$

To prove parts (i) and (ii) note that

$$t_h^O - t^O = t^O - t_f^O = \frac{2(c_f - c_h)(\gamma + 1)}{(11\gamma + 12)} \geq 0$$

$$t_h^D - t^D = t^D - t_f^D = \frac{(c_f - c_h)(\gamma + 1)}{(5\gamma + 6)} \geq 0$$

For part (iii), we have:

$$t^D - t^O = \frac{\gamma(2\alpha - c_h - c_f)}{3(\gamma + 6)(\gamma + 4)} \geq 0$$

Proposition 3

Under oligopoly, we have:

$$WW(t^O) - WW(t_h^O, t_f^O) = \frac{2(c_h - c_f)^2(\gamma + 1)^3(25\gamma + 28)(3\gamma + 4)}{(7\gamma + 8)^2(11\gamma + 12)^2} > 0$$

Similarly, under duopoly we have:

$$WW(t^D) - WW(t_h^D, t_f^D) = \frac{(c_h - c_f)^2(\gamma + 1)^3(11\gamma + 14)(2 + \gamma)}{2(5\gamma + 6)^2(3\gamma + 4)^2} > 0$$

Proposition 4

We report only tariffs under HM (those under FM are analogous):

$$t_h^{HM} = \frac{2(11\gamma + 12)(\alpha - c)}{13\gamma^2 + 78\gamma + 72} \text{ and } t_f^{HM} = \frac{4(5\gamma + 6)(\alpha - c)}{13\gamma^2 + 78\gamma + 72}$$

and

$$t_h^{HM} - t_f^{HM} = \frac{2\gamma(\alpha - c)}{13\gamma^2 + 78\gamma + 72} \geq 0$$

Under MFN we have:

$$t^{HM} = t^{FM} = \frac{(\alpha - c)(103\gamma^3 + 426\gamma^2 + 576\gamma + 256)}{64\gamma^4 + 575\gamma^3 + 1638\gamma^2 + 1888\gamma + 768}$$

Note that the optimal MFN tariffs under HM and the FM are the same. Now consider part (ii). We have:

$$\Delta_h \equiv t_h^{HM} - t^{HM} = \frac{(\alpha - c)\gamma(3\gamma + 4)(23\gamma^3 + 174\gamma^2 + 336\gamma + 192)}{F(\gamma)} \geq 0$$

and

$$\Delta_f \equiv t^{HM} - t_f^{HM} = \frac{(\alpha - c)\gamma(\gamma + 2)(59\gamma^3 + 418\gamma^2 + 736\gamma + 384)}{F(\gamma)} \geq 0$$

where

$$F(\gamma) \equiv (13\gamma^2 + 78\gamma + 72)(64\gamma^4 + 575\gamma^3 + 1638\gamma^2 + 1888\gamma + 768)$$

To prove part (iii), note that:

$$\Delta_h - \Delta_f = \frac{(\alpha - c)2\gamma^2(\gamma + 1)(5\gamma^2 + 34\gamma + 32)}{F(\gamma)} \geq 0$$

Finally consider part (iv). We have:

$$\Delta WW^{HM} = \frac{\gamma^2(\gamma + 1)(\gamma + 2)^2(3\gamma + 4)G(\gamma)(\alpha - c)}{2(13\gamma^2 + 78\gamma + 72)} \geq 0$$

where

$$G(\gamma) \equiv \frac{(1856\gamma^5 + 18861\gamma^4 + 67366\gamma^3 + 112248\gamma^2 + 89472\gamma + 27648)}{(64\gamma^4 + 575\gamma^3 + 1638\gamma^2 + 1888\gamma + 768)}$$

Proposition 5

Expressions for equilibrium tariffs under MFN and discrimination are contained in proof of proposition 4. From there, we have:

$$t_h^{HM} = t^{HM} = t_f^{HM} \text{ iff } \Delta c = \Delta c^* = \frac{2\gamma(\alpha - c_h)}{5\gamma^2 + 28\gamma + 24}$$

Since tariffs under MFN and tariff discrimination are equal when $\Delta c = \Delta c^*$, it must be that $\Delta WW^{HM} = 0$ iff $\Delta c = \Delta c^*$.

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