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Abstract

Trade barriers can exist variably and are not just limited to tariffs. Based on a bilateral trade model under international oligopolistic competition, we show that governments endogenously determine red-tape barriers (RTBs), which are trade barriers caused by wasteful administrative procedures. We also find that RTBs can have the opposite reaction to tariffs. Particularly, we find that the fall in the RTB level can be larger than the rise in tariffs (backlash effects). Finally, in the case of a coordinated tariff rate increase under a free trade agreement between the two countries, it is shown that an increase in tariffs can improve consumer surplus, producer surplus, and government income and expenditure.

Keywords: red-tape barriers(RTBs), oligopolistic competition, tariff, backlash, welfare analysis.

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1 Introducrtion

In recent years, empirical studies have shown that cumbersome administrative procedures at customs and other border agencies are known to hinder international trade; according to a survey by the International Trade Center (ITC) (2016), a large amount of time is wasted in customs, import licensing, and product certification, which is considered a non-negligible trade cost. The 2012 WTO Trade Report shows that 76.5% of non-tariff barriers are procedural obstacles.

Djankov et al. (2010) indicate that 75% of transport delays are due to customs procedures and their inspections. The ITC (2016) also explains that such RTBs exist not only in developing countries but also in developed countries. This kind of non-tariff barriers are called "red-tape barriers (RTBs)" and have attracted much attention in recent years.

Maggi et al. (2022) are, to the best of our knowledge, the first theoretical study to explicitly examine the relationship between international trade and RTBs. They constructed a small open economy model based on the simplified Grossman and Helpman (1994) political economy model, which they considered as a trade barrier intentionally set by the government, and found that RTBs can occur endogenously in the presence of rent-seeking against producer surpluses. They also show that lower tariffs can encourage RTBs to increase and raise overall total trade costs, and thus the presence of RTBs can have important implications for tariff policy.

In contrast to Maggi et al. (2022), which is based on a perfect competition model, we construct an international oligopolistic competition model that explicitly introduces RTBs and clarify the following three points (1) Governments can choose RTBs even if rent-seeking does not exist. (2) Explicitly assuming rent-seeking to the government and RTBs costs imposed on the government can lead to non-prohibitive RTBs. (3) There is a case in which the total cost of trade falls (backlash) due to a large drop in the level of RTBs caused by an increase in tariff

rates. (4) Under the free trade agreement, there is a case in which consumer surplus, producer surplus, and government income of expenditure improve when endogenous changes in RTBs are considered.

The remainder of this paper is organized as follows. In Section 2, we construct an international oligopolistic competition model with RTBs. In Section 3, we derive the equilibrium of the model and show the range of existence of positive RTBs. In Section 4, we examine the effects on consumer surplus, producer surplus, and government income and expenditure when tariffs increase marginally from a state with the free trade agreement, that is, from zero tariffs. Section 5 concludes.

2 The model

The world is divided by two countries ($i, j = H, F; j \neq i$). Markets exist in both countries. Each country has one firm, and each firm produces a homogeneous good. The two countries trade with each other, and the price of the good p_i in country i is determined through Cournot competition. The marginal costs of all firms are assumed to be the same and are normalized to 0. Country i imposes ad-valorem tariff, denoted by t_i.

In this paper, we consider RTBs as trade restrictive policies other than tariffs. In other words, governments can impose additional trade costs on exporters by complicating import procedures. The imposition of RTBs also incurs a cost of $\delta\theta_i^2$ on the government side where $\delta > 0$ is a positive parameter.[1)] Imposing red tape does not generate direct revenue for the gov-

1) Christensen et al. (2016) state that "Government staff time to receive and assess required forms, undertake inspections follow up with firms etc." It implies the costs on the part of the government imposing red tape. Next, in the context of public administration, George et al. (2021), based on 25 research papers, conducted a meta-analysis of the impact of red tape on government performance and found the following two results. (1) The negative effects of red tape are widespread, regardless of departments or administrative traditions. (2) It has negative impacts on both employee outcomes and organizational performance. These results indicate that imposing RTBs can incur costs on the part of the government that imposes them.

ernment; red-tape only has the effect of increasing the marginal cost to the exporting country's firms of trade. Let $\theta_i \geq 0$ be this additional trade cost for the import of one unit of the good imposed by the i country government. As discussed below, suppose that each country government can choose θ_i so as to maximize the government's objective function. By considering this type of RTBs, this paper examines the effects of trade restriction policies that are "wasteful" in the sense that they do not generate tariff revenues but incur costs on the government side.

The inverse demand function for country i is $p_i = a - Y_i\,(i, j = H, F; i \neq j)$. Let Y_i be the aggregate demand of consumers in country i and a be a positive parameter. Firms in country i supply goods to the market in country i and export goods to country j. The firm profits in country i are as follows:

$$\pi_i = [a - q_{ii} - q_{ji}]q_{ii} + [(a - q_{ij} - q_{jj}) - (t_j + \theta_j)]q_{ij}, \tag{1}$$

where let q_{ii} be the domestic supply for country i and q_{ij} be the exports to country j.

Define the social surplus of country i as $W_i = CS_i + PS_i + G_i$, where CS_i and PS_i are consumer and producer surpluses in country i. Furthermore, the government income and expenditure in country i is defined as $G_i = t_i q_{ji} - \delta\theta_i^2$.

Next, define the objective function V_i for country i as follows:

$$V_i = CS_i + (1 + e_i)PS_i + G_i,, \tag{2}$$

where, $e_i > 0$ reflects the weight of political influence of domestic producers in country i. This type of government objective function is used in Hilman (1982), Baldwin (1987), and Grossman and Helpman (1994).

3 Equilibrium

Let us seek for an equilibrium. For simplicity, we consider the perfectly symmetric case between the two countries. We can find θ_i^* such that the government's objective function maximizes V_i as follows:

$$\theta_i^*(=\theta^*) = \frac{2e(a+t)-3t}{18\delta-3-2e} \tag{3}$$

where, $a > 2t$, $\delta > \frac{a+2t}{6(a+t)}$, $\frac{3t}{2(a+t)} < e < \frac{-a+4t+6a\delta-12t\delta}{2a}$. Furthermore, under the condition that (3) holds,

$$\frac{\partial\theta^*}{\partial\delta} < 0, \qquad \frac{\partial\theta^*}{\partial e} > 0 \tag{4}$$

which implies that an increase in δ promotes a decrease in RTBs, while an increase in e promotes an increase in RTBs.

In the following discussion, we assume that a free trade agreement ($t = 0$) is reached between the two countries. Then, we obtain the following propositions.

Proposition 1. *Whenever two countries have a free trade agreement ($t = 0$), the governments of both countries impose RTBs if (a) $0 \le \delta \le 1/6$ and $e \ge 0$, or (b) $1/6 < \delta$ and $e > 0$.*

A graphical representation of the correspondence between the parameter ranges of δ and e and the possible values of θ^* can be depicted as in Figure 1.

It is evident from Figure 1 that RTBs can be prohibitive levels of trade even under $\delta = 0$ and $e = 0$. In Maggi et al. (2022), based on a perfectly competitive market, e had to be sufficiently large for RTBs to occur, but in the oligopolistic competition model in this paper, RTBs occur even when e is zero. However, as we will discuss later, we will focus on the interior point

solution of θ^*, in which the levels of e and δ play an important role in obtaining the interior point solution.

4 Tarriff Effect

In this section, we focus on the case where θ^* is non-prohibitive ($0 < \theta^* < a/2$) and analyze the comparative statics when both countries increase their tariffs (t). This corresponds to both countries increasing their tariffs in a cooperative effort. Throughout this section, it is shown that an increase in the tariff t can cause the level of RTBs θ^* to fall, which in turn causes a decline in total trade costs that is referred to as the "backlash" in this paper. We focus on the effects of tariff increases on consumer surplus, producer surplus, government income and expenditure, and social surplus under free trade agreements, i.e., when $t = 0$ and backlash occurs.

First, we obtain the following propositions about backlash:

Proposition 2. *(Backlash) When* $0 < e$, $1/6(1+2e) < \delta < 1/3$, *the increase in tariffs causes total trade costs to fall.*

Even if tariffs increase, total trade costs can fall as RTBs fall substantially. Since total trade costs are $(t+\theta)$, backlash occurs when $\frac{\partial \theta^*}{\partial t} < -1$.

Here, we immediately obtain the following proposition.

Proposition 3. *When backlash occurs, higher tariffs necessarily increase the consumer surplus and the government income and expenditure.*

The consumer surplus is $CS^* = (2a - t - \theta^*(t))^2/18$, and differentiating this by t shows that the positive effect of tariff t on CS^* corresponds to the positive sign of $-1 - \frac{\partial \theta^*}{\partial t}$. This means that consumer surplus improves with each backlash. Additionally, since the government bal-

ance is $t_i q_{ji} - \delta\theta^2$, when the backlash occurs, the government balance always improves because q_{ji} increases and θ decreases due to tariff increases.

Proposition 4. *When backlash occurs, higher tariffs can improve the producer surplus.*

Tariff increases directly improve domestic firms' profits because they discourage exports by rival firms. However, because of endogenous changes in RTBs, a backlash can reduce firm profits. (1) It reduces profits by lowering market prices in each country. (2) It increases profits by lowering the marginal cost of exports. When the effect of (2) dominates the effect of (1), PS improves.

Proposition 5. *When backlash occurs, higher tariffs necessarily increase the social surplus.*

When backlash occurs, higher tariff rates increase consumer surplus and government income and expenditure, and although they can decrease with respect to producer surplus, the aggregate effect is always an increase in social surplus.

5 Conclusion

We developed a model of international oligopolistic competition with RTBs. We found that RTBs occur endogenously over a wide range when free trade agreements are implemented between two countries. In particular, a non-prohibitive level of RTBs is chosen in equilibrium by assuming the cost of implementing RTBs by the government. Furthermore, under these conditions, we could also identify the existence of a backlash, that is, a large decline in RTBs due to an increase in the tariff rate, which leads to a fall in total trade costs. Under the backlash effect, we found that there is a parameter region in which the consumer surplus, producer surplus, government income and expenditure, and social surplus improve with a coordinated increase in tariffs.

In conclusion, endogenous changes in RTBs can significantly alter the consequences of tariffs; therefore, it is necessary to pay attention to the effects on RTBs when considering trade policy.

Appendix

A.1 Proof of Proposition. 1

We assume that $t_i = t_j = 0$ below.

First, let us assume that (i) The condition for the first derivative of V_i with respect to θ_i to be positive is

$$\begin{aligned} \frac{\partial V_i}{\partial \theta_i} > 0 \quad &\Leftrightarrow \quad (\theta^* =) \frac{2ea}{18\delta - 2e - 3} > \theta, \\ &\Leftrightarrow \quad 18\delta - 2e - 3 < 0 \quad \text{for } e > 0, \\ &\Leftrightarrow \quad \frac{e}{9} + \frac{1}{6} < \delta \end{aligned} \tag{A.1}$$

In this case, e can take any positive value, so that $\frac{1}{6} < \delta$ when $e \to 0$

(ii) Next, the condition that the second derivative of V_i is negative is

$$\begin{aligned} \frac{\partial^2 V_i}{\partial \theta_i^2} &= \frac{1 + 2(1 + e_i)}{9} - 2\delta < 0, \\ \Leftrightarrow \quad &\frac{e}{9} + \frac{1}{6} < \delta, \end{aligned} \tag{A.2}$$

This is equivalent to the condition that the first derivative is positive.

Under the conditions (i) and (ii), V_i is concave with respect to θ_i. Similarly, under the sign-reversed condition V_i is convex.

Note that when $\theta = 0$, V_i takes a positive value regardless of the value of δ ：

$$\frac{\partial V_i}{\partial \theta_i}|_{\theta=0} = \frac{2ae}{9} > 0. \tag{A.3}$$

From here, it turns out that the optimal level of RTBs is positive at all times, regardless of the

functional form. Also, from the equilibrium quantity of trade $q_{ij} = \frac{a-2\theta_j}{3}$, the trade-prohibitive level of RTBs is $\bar{\theta}_i = \frac{a}{2}$. Thus, the optimal RTB level $\hat{\theta}$ can be divided into the following cases.

$$V_i \text{ is convex} \quad \Rightarrow \quad \hat{\theta} = \bar{\theta}_i, \tag{A.4}$$

$$V_i \text{ is concave and } \theta^* \geq \bar{\theta} \quad \Rightarrow \quad \hat{\theta} = \bar{\theta}_i, \tag{A.5}$$

$$V_i \text{ is concave and } \theta^* < \bar{\theta} \quad \Rightarrow \quad \hat{\theta} = \theta^* \tag{A.6}$$

A.2 Proof of Proposition. 2

From the conditions $\partial\theta^*/\partial t = (3-2e)/(3+2e-18\delta)$ and $0 < \theta^* < a/2$ when $t = 0$, the condition $\partial\theta^*/\partial t < -1$ for backlash is $0 < e$, $1/6(1+2e) < \delta < 1/3$.

A.3 Proof of Proposition. 3

From $CS^* = 2(a(1+e-6\delta)+t(-1+3\delta))^2/(3+2e-18\delta)^2$, $\partial CS^*/\partial t|_{t=0} = 4(3\delta-1)(a(1+e-6\delta))/(3+2e-18\delta)^2$, the condition that backlash occurs and $\partial CS^*/\partial t|_{t=0} > 0$ is satisfied is $0 < e$, $(1+2e)/6 < \delta < 1/3$, which corresponds to the condition that backlash occurs.

Similarly, $G^* = (1/(3+2e-18\delta)^2)(-(3t-2e(a+t))^2\delta + t(3+2e-18\delta)(a+2ae-4t-6a\delta+12t\delta))$, so $\partial G^*/\partial t|_{t=0} = a(3+8e+4e^2-4(3+e)(3+2e)\delta+108\delta^2)/(3+2e-18\delta)^2$. Here, the conditions that backlash occurs and $\partial G^*/\partial t|_{t=0} > 0$ are $0 < e$, $(1+2e)/6 < \delta < 1/3$. This condition is consistent with the condition for backlash to occur.

A.4 Proof of Proposition. 4

Since $PS^* = (1/9) \times (2a^2+t^2-2a(t+(6t-4e(a+t))/(3+2e-18\delta)) + (16(ae-3t+9t\delta)^2)/(3+2e-18\delta)^2)$, we get $\partial PS^*/\partial t|_{t=0} = (4(-1+3\delta)(a+4ae-10t-6a\delta+30t\delta))/(3+$

$2e-18\delta)^2$ is derived. Here, the conditions that backlash occurs and $\partial PS^*/\partial t|_{t=0} > 0$ are satisfied are $e > 0$, $(1+4e)/6 < \delta < 1/3$.

A.5 Proof of Proposition. 5

$W^* = (1/((3+2e-18\delta)^2))(a^2(e(8-48\delta)+4(1-6\delta)^2+e^2(6-4\delta))+at(-5+4(-3+e)e+36\delta-8(-3+e)e\delta-36\delta^2)-t^2(-10+8e+33\delta+4(-9+e)e\delta+18\delta^2))$ from $\partial W^*/\partial t|_{t=0} = (a(-5+4(-3+e)e+36\delta-8(-3+e)e\delta-36\delta^2))/(3+2e-18\delta)^2$ is derived. Here, the conditions that backlash occurs and $\partial W^*/\partial t|_{t=0} > 0$ are $0 < e$, $(1+2e)/6 < \delta < 1/3$. This condition is consistent with the condition for backlash to occur.

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6 Figures

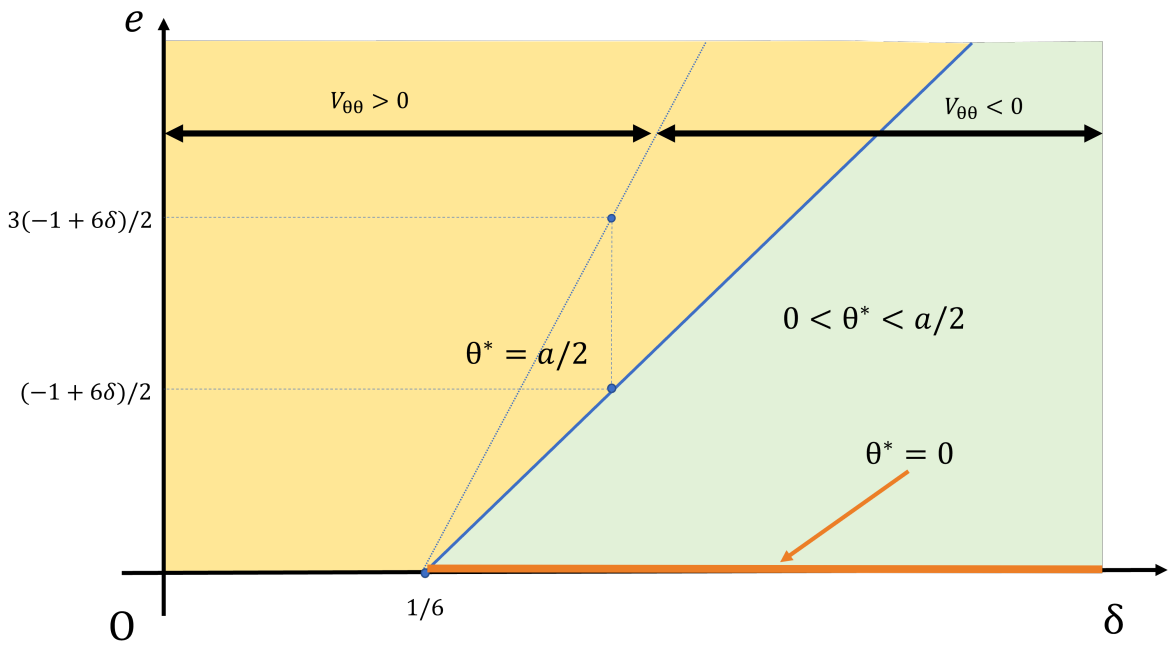

Figure 1: The correspondence of δ and e with respect to θ^*