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Do industrial and trade policy lead to excess entry and social inefficiency?

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ABSTRACT

This paper analyzes the welfare effects of industrial and trade policy instruments (output subsidies or/and import tariffs) in an international Cournot oligopoly and compares the social efficiency of specific policy instrument or dual policy instruments (output subsidies-cum-import tariffs) with free entry of domestic firms. It first demonstrates that free entry of domestic firms is always socially excessive irrespective of the policy regimes rate in an open economy. It then shows that optimal tariff rate and output subsidy rate under free entry of domestic firms will be lower than the one at regulated entry when the scale of domestic market is moderate; for dual policy regime, the optimal output subsidy rate at free entry is lower than the one at regulated entry, while the optimal tariff rate at free entry is higher than the one at regulated entry. Furthermore, even though the need of dual policy for welfare improvement is degenerate to be suboptimal with the free entry of domestic firms, but it is still superior to the subsidy policy.

1. Introduction

When a developing country transforms its industrial structure, it is concurrently facing the pressure of opening its home market for foreign competitors. The common wisdom suggests that free entry enhances social welfare through increasing total output in a closed economy, while free entry tends to decrease social welfare by contracting the outputs of incumbent firms. This result often called "business stealing effect".[1] In an open economy, we observed that imperfect competition exists between domestic firms and foreign firms, and it has been shown that free entry of domestic firms and/or foreign firms in the home market will influence the coordinated choice of industrial and trade policy.

Why Japan economy is stagnating for the decades? It remains as a "puzzle" for the industry observers and academic researchers. It has been pointed out that the Japanese industrial policy was mainly focused on cost-inefficient agricultural and mining, which do not have international competitiveness. Industrial policy was chosen politically, but it lacks of private initiative which is harmful because it shifts the resource away from the competitive sector. Reviewing the real Japan economy scenario, all the government should be cared about the coordination of industrial, trade and competition policies in an era of globalization. Hence, it is pertinent to seriously consider whether anti-competition entry-regulation policies should be enforced when both import tariff and output subsidy instruments are adopted or either one instrument is used.

From both real-world economy and theoretical concerns, we in this paper mainly analyze the welfare effects of strategic industrial and trade policy instruments (output subsidies or/and import tariffs) in an international Cournot oligopoly and for doing that,

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[1] The business-stealing effect indicates that a new entrant will and can acquire the market share from the incumbents making the incumbents reduce their outputs. See, Mankiw and Whinston (1986); Okuno-Fujiwara and Suzumura (1993); Suzumura and Kiyono (1987); von Weizsäcker (1980) for other works on excessive entry in the presence of scale economies.

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we fist need to compare the social efficiency of specific policy instrument or dual policy instruments (output subsidies-cum-import tariffs) with free entry of domestic firms. We show that free entry of domestic firms is always socially excessive irrespective of the policy regimes rate in an open economy. In particular, even though the need of dual policy for welfare improvement is degenerate to be suboptimal with the free entry of domestic firms, but it is still superior to the subsidy policy.

In the literature of general equilibrium analysis of import tariff and output subsidy, Bhagwati and Ramaswami (1963) explored that a tariff policy is also necessarily inferior to an optimal tax-cum-subsidy policy. They argued that an optimal subsidy (or a tax-cum-subsidy equivalent) is necessarily superior to any tariff when the distortion is domestic. From the strategic trade aspect in the context of oligopolistic competition, Brander and Spencer (1984) showed that government could improve its terms of trade through tariffs in an oligopoly market and take a leading position to transfer a foreign firm's revenue to a domestic firm by using tariff as a strategic instrument. Eaton and Grossman (1986) analyzed the welfare effects of trade and industrial policy under oligopoly, and characterize optimal intervention under a variety of assumptions about market structure and conduct. With domestic consumption, intervention can raise national welfare by reducing the deviation of price from marginal cost. Collie (2006) extended the Brander and Spencer (1985) model of profit-shifting export subsidies to analyze the welfare effects of ad valorem and specific trade policy instruments (import tariffs and output subsidies) and further compared the efficiency of ad valorem with specific instruments.[2]

Is free entry desirable for social efficiency in an open economy? This important question has been studied extensively in a closed economy. In an influential work, Mankiw and Whinston (1986) showed that free entry in oligopolistic markets is socially excessive in the presence of scale economies, thus providing the rationale for anti-competitive entry-regulation in certain markets. This result, which is often referred as "excess-entry theorem" has created significant interest in analyzing the welfare effects of free entry in oligopolistic markets (see, Anderson, de Palma, & Nesterov, 1995; Fudenberg & Tirole, 2000; Okuno-Fujiwara & Suzumura, 1993; Suzumura & Kiyono, 1987, to name a few).[3] From the political-economy angle, Amir and Burr (2015) interestingly investigated the effects of corruption in the entry-certifying process on market structure and social welfare for a Cournot industry with linear demand and costs. They showed that a socially optimal number of firms in the market may be reached by choosing the right number of pre-existing firms or by having exactly two licensing authorities.

In an open economy, Ghosh et al. (2010) and Marjit and Mukherjee (2013) showed that free entry can be socially insufficient in the presence of foreign competition even though it is in a slightly different framework.[4] Hence, the anti-competitive entry-regulation policy may not be justified in an industry facing foreign competition, and it may depend on the transportation cost, the marginal cost difference between the firms and the domestic labor market structure. Wang et al. (2014) examined privatization policy and entry regulation in a mixed oligopoly market with foreign competitors and free entry of private firms. They demonstrated that if the number of domestic private firms is small, an import subsidy may be chosen and the optimal privatization policy is full privatization. However, if the number of domestic private firms is large, an import tariff is imposed and the optimal privatization policy is partial privatization. Furthermore, as long as the entry cost is relatively lower, domestic free entry is socially excessive whether it is free trade or the domestic government imposes the tariff policy.[5] Hence, whether free entry is socially insufficient or excessive in an open economy hinges on the types of domestic distortion and the presence of domestic public firm, in particular.

In the literature, many works have already pointed out that welfare implications of public policies in free entry markets are in sharp contrast with those in entry-regulated markets.[6] From the paper reviewed above, no paper seems explored the dual policy instrument of output subsidy and import tariff, and the welfare effects under free entry of domestic firms. In this paper, it first shows that free entry of domestic firms is always socially excessive irrespective of the policy regimes rate in an open economy. It then demonstrates that both optimal import tariff rate and output subsidy rate under free entry of domestic firms is lower than the one at regulated entry when the scale of domestic market is moderate; for dual policy regime, the optimal output subsidy rate at free entry equilibrium is lower than the one at regulated entry, while the optimal tariff rate at free entry equilibrium is higher than the one at regulated entry. Even though the need of dual policy for welfare improvement is degenerate to be suboptimal with the free entry of domestic firms, but it is still superior to the subsidy policy. Accordingly, anti-competitive regulation policy is justified coupled with import tariff and output subsidy.[7]

The remainder of this paper is organized as follows. Basic modeling is provided in Section 2. Section 3 contains the analysis of import tariffs, output subsidies and dual policy under free entry vs. regulated entry of firms. Section 4 explores policy regimes and its welfare comparisons. Section 5 concludes the paper.

[2] It is a well-established proposition of trade theory that in the absence of directly trade-related distortions or policy goals, subsidies are superior to tariffs for achieving any economic or noneconomic objective. Rodrik (1986) showed that once the endogeneity of the distortion or noneconomic distortions is allowed for, the welfare-ranking of various policies can be reversed.

[3] In a closed economy, for example, Ghosh and Morita (2007a,b); Matsumura and Okamura (2006); Mukherjee and Mukherjee (2008), and Mukherjee (2012) showed that free entry can be insufficient in an oligopolistic market. These works pointed out that along with business stealing effects, free entry creates further effects by either affecting the input prices, technologies, increasing the elasticity of demand or market leadership.

[4] For example, Tanaka (1991) used the Nash bargaining approach to analyze the negotiation of tariffs between two countries in free-entry oligopolies under integrated markets. Tanaka (1992) further examined the welfare effects of tariffs in international free-entry oligopolies under integrated markets in a two-country world model.

[5] Please see the works on privatization neutrality theorem (PNT) that discussed free entry and multiply policy tools (Cato & Matsumura, 2013) and that discussed international competition (Matsumura & Tomaru, 2012)

[6] See for example, Matsumura and Okumura (2014).

[7] Fisman and Allende (2010) studied the distortions of industrial organization caused by entry regulation. They found that the effect of entry regulation on industry share is not related to differences in natural barriers. Regarding industry dynamics, they found that in countries with high entry regulation, industries respond to growth opportunities through the expansion of existing firms, while in countries with low entry regulation, growth opportunities lead to the creation of new firms.

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2. Basic model

Consider a domestic market for a homogeneous good produced by n domestic firms and m foreign firms. The linear demand function is $P=a-Q$. The supply equation is given by $Q=\sum_{i=1}^{n} q_i+\sum_{j=1+n}^{n+m} q_j$, where q_i and q_j denote, respectively, domestic firm's and foreign firm's outputs. The marginal costs for the domestic firms and foreign firms arec_i andc_j, respectively. We assume that $c_i \geq c_j > 0$, which means that the production efficiency of domestic firms is lower than that of foreign firms.

The profits of domestic firms and foreign firms are given by:

$$\pi_i = \left(a-nq_i-mq_j-c_i+s\right)q_i \tag{1}$$

$$\pi_j = \left(a-nq_i-mq_j-c_j-t\right)q_j \tag{2}$$

where s and t are the unit output subsidy rate and import tariff rate, respectively.

The social welfare under entry restriction is defined as,

$$SW = CS + n\pi_i + tmq_j - snq_i \tag{3}$$

where the consumer surplus is given by $CS=Q^2/2$.

Following the framework of Brander and Spencer (1985) at regulated entry, international trade is modeled as a two-stage game involving domestic government and competing firms as follows: In the first stage, the domestic government decides industrial and trade policies. In the second stage, the firms are engaging Cournot competition in the domestic market. Permitting free entry of domestic firms, we have a three stage game as follows: In the first stage, the government strategically decide industrial and trade policies. In the second stage, the domestic firms decide to entry or not and in the third stage, the firms are engaging Cournot competition in the domestic market. For the purpose of exposition and show the important results, we first consider the desirability policy interventions at free entry equilibrium, and then use the results to contrast the well-known findings under entry-regulated equilibrium.[8] The backward induction is used to derive the sub-game perfect Nash equilibrium (SPNE).

3. Optimal policies at free entry vs. regulated entry

In the case of free entry, firm's decisions are analyzed in order to see what would be the equilibrium value of subsidy rate and tariff rate. In the 3rd stage, the $n+m$ firms maximize their profits. From the first-order conditions, we have

$$q_i = \frac{a-c_i+s-\left[(c_i-s)-\left(c_j+t\right)\right]m}{1+n+m} \tag{4}$$

$$q_j = \frac{a-c_j-t+\left[(c_i-s)-\left(c_j+t\right)\right]n}{1+n+m}. \tag{5}$$

From Eq. (5), when $t \geq \frac{a-c_j+[(c_i-c_j)-s]n}{1+n}$, $q_j=0$ under prohibitive tariff.

We consider the following three policy scenarios: 1) dual policy (tariff-cam-subsidy); 2) subsidy policy only and 3) tariff policy only. In the 1st stage, the domestic government maximizes social welfare.

3.1. Dual policy regime

In this section, we want to see whether the free entry of domestic firms will influence the choice of optimal output subsidy and import tariff rates. Consider the case where free entry of domestic firms occurs in the home market. The net profit of the ith firms is:

$$\pi_i = \frac{\left[a-c_i+s-\left(c_i-s-t-c_j\right)m\right]^2}{(1+n+m)^2} - F^2 \tag{6}$$

which means that the free-entry number of domestic firms needs to satisfy the following condition:

$$\frac{\left[a-c_i+s-\left(c_i-s-t-c_j\right)m\right]^2}{(1+n+m)^2} = F^2 \tag{7}$$

where F^2 is the entry cost.

[8] We appreciate both referees making such constructive suggestions and it really makes the paper more readable and understandable.

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Postulating that all i firms' profits are driven to zero, we attempt to explore the long-run equilibrium where free entry and exit prevails; that is, the number of domestic firms n is endogenously determined. To illustrate how the endogenous variables are determined, we set Eq. (6) to zero for long-run equilibrium and the endogenous number of domestic firms is derived as

$$n^{FD} = \frac{a-c_i+s-\left[(c_i-s)-\left(c_j+t\right)\right]m}{F}-(1+m)$$

where the superscript "*FD*" denotes the free entry equilibrium under dual policy regime.

The social welfare with both subsidy and tariff policies is:

$$SW^{FD} = \frac{\left[(a-c_i+s)n+\left(a-c_j-t\right)m\right]^2}{2(1+n+m)^2}+\frac{\left[a-c_i+s-\left(c_i-c_j-s-t\right)m\right]^2 n}{(1+n+m)^2}-\frac{\left[a-c_i+s-\left(c_i-c_j-s-t\right)m\right]ns}{1+n+m}+\frac{\left[a-c_j-t+\left(c_i-c_j-s-t\right)n\right]mt}{1+n+m}-nF^2.$$

The first-order derivation of SW^F with respect to n is:

$$\frac{\partial SW^{FD}}{\partial n} = \left[a-c_i+s-\left(c_i-s-t-c_j\right)m\right]\left[(1+2m)(a-c_i)+\left(c_i-c_j\right)(n-m)m-2(s+t)nm-mt-ns\right]/(1+n+m)^3-F^2 \tag{8}$$

which means that the number of domestic firms needs to satisfy the following condition for maximizing the social welfare:

$$\left[a-c_i+s-\left(c_i-s-t-c_j\right)m\right]\left[(1+2m)(a-c_i)+\left(c_i-c_j\right)(n-m)m-2(s+t)nm-ns-mt\right]/(1+n+m)^3 = F^2. \tag{9}$$

Comparing Eqs. (7) and (9) and letting Δ = [LHS of Eq. (9) − LHS of Eq. (7)], we can obtain:

$$\Delta^{FD} = -\left\{\frac{\left[a-c_i+s-\left(c_i-c_j-s-t\right)m\right]}{(1+n+m)^3}\left[c_j m-c_i n+(1+2n)s+a(n-m)+\left(m^2+2m+3nm\right)(s+t)\right]-2\left(c_i-c_j\right)nm\right\}<0. \tag{10}$$

In Eq. (10), $\Delta^{FD}<0$ implies that the endogenously determined profit-maximizing n is larger than the maximizing social welfare one, which makes the social welfare worse according to Eq. (10), and free entry of domestic firms is socially excessive in an open economy.

In a closed economy without strategic policy intervention, Mankiw and Whinston (1986) argued that, on the one hand, free entry tends to increase social welfare through its gross profit, but, on the other hand, free entry tends to reduce social welfare by contracting outputs of all the existing firms due to the business stealing effect. At the free entry equilibrium, the gross profits of all firms are equal to the entry costs. Hence, at the free entry equilibrium, the first effect does not play any role, and the second effect creates socially excessive entry. In an open economy, free entry also creates a rent extraction effect which is pointed out by Ghosh et al. (2010). As the number of domestic firms increases, it extracts more rents from the foreign firm, which creates a positive effect on the domestic welfare. This rent extraction effect in an open economy may create insufficient free entry for the domestic country in their model-setting.

From the above analysis of policy choice in the long-run equilibrium, we have the following Lemma.

Lemma 1. *The free entry number of domestic firms is greater than the number of firms in the welfare-maximizing equilibrium. Domestic free entry is always socially excessive with government interventions in an open economy.*

In the 1st stage with free entry of domestic firms, the domestic government maximizes social welfare. We obtain:

$$\begin{aligned}
s^{FD} &= 0\\
t^{FD} &= \frac{\left(c_i-c_j\right)+F}{2}\\
q_i^{FD} &= F\\
q_j^{FD} &= \frac{1}{2}\left[\left(c_i-c_j\right)+F\right]\\
n^{FD} &= \frac{2(a-c_i)+\left(c_i-c_j\right)m}{2F}-\frac{2+m}{2}\\
SW^{FD} &= \frac{(a-c_i-F)^2}{2}+\frac{\left[\left(c_i-c_j\right)+F\right]^2 m}{4}.
\end{aligned} \tag{11}$$

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For the dual policy regime, the equilibrium values under entry restriction are that

$$\begin{aligned} s^{RD} &= \frac{2(a-c_i)+\left(c_i-c_j\right)m}{2n} \\ t^{RD} &= \frac{1}{2}\left(c_i-c_j\right) \\ q_i^{RD} &= \frac{2(a-c_i)-\left(c_i-c_j\right)m}{2n} \\ q_j^{RD} &= \frac{1}{2}\left(c_i-c_j\right) \\ P^{RD} &= c_i \\ Q^{RD} &= a-c_i \\ SW^{RD} &= \frac{(a-c_i)^2}{2}+\frac{\left(c_i-c_j\right)^2 m}{4} \end{aligned} \tag{12}$$

where the superscript "*RD*" denotes the dual policy scenario at regulated entry equilibrium. This dual policy regime under entry restriction is the first-best choice because $p^{RD}=c_i$. The reasoning for zero subsidy rate goes as follows: optimal subsidy rate is zero under free entry of domestic firms is because the domestic entry is socially excessive and the subsidy amount becomes huge, and the government could reduce subsidy rate to zero and raise the tariff rate to improve social welfare.[9]

Comparing Eqs. (11) and (12), we find that

$$s^{RD}-s^{FD}=\frac{2(a-c_i)+m\left(c_i-c_j\right)}{2n}>0$$

$$t^{RD}-t^{FD}=-\frac{F}{2}<0.$$

We have the following proposition.

Proposition 1. *Under free entry of domestic firms with dual policy regime, the optimal subsidy rate at free entry is lower than the one at regulated entry, while the optimal tariff rate at free entry is higher than the one at regulated entry.*

Due to domestic free entry is socially excessive, the optimal output subsidy should reduce to deter the excess entry; but, the domestic government will need to raise the import tariff helping the domestic firms to extract the rent from foreign firms. This new finding is different from Han (2012) in mixed oligopoly setting with dual policy: the social welfare is higher when the government simultaneously adopts two trade instruments of subsidy and tariff than when it only adopts a single-trade instrument whether it is subsidy or tariff. We show that because domestic free entry is always socially excessive, the dual subsidy-tariff policy is suboptimal.

3.2. Subsidy policy

The social welfare with subsidy policy in the long-run equilibrium is defined as

$$SW^{FS}=\frac{a^2(1+2m)+(1+m)^2c_i^2+m^2c_j^2-2c_i\left(a+2am+c_jm^2\right)}{2(1+2m)}-nF^2 \tag{13}$$

where the superscript "*FS*" denotes the output subsidy policy scenario at free entry equilibrium.

In this case,

$$\Delta^{FS}=-\left\{\frac{\left[a-c_i+s-\left[\left(c_i-c_j\right)-s\right]m\right]}{(1+n+m)^3}\left[c_jm-c_in+(1+2n)s+(n-m)a-2\left(c_i-c_j\right)nm+\left(m^2+2m+3nm\right)s\right]\right\}<0$$

implying socially excessive of domestic free entry.

When the domestic government provides the output subsidy to the domestic firms, the free entry number of domestic firms is socially excessive and the smaller number of the domestic firms is better from social efficiency point of view. The reasoning behind this result is that in a free-trade open economy, the marginal domestic firm enters the market without receiving subsidy is not able to steal the profit from foreign rivals and is also not having the incentive to take the surplus-creating effect via lowering

[9] Subsidy rate could be negative under dual policy regime for welfare improvement and the government may impose output tax rather than output subsidy. In fact, our result is not derived from the assumption of non-negative subsidy rate. We appreciate the referee pointing out this possibility and providing the intuition.

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the product price into consideration. The output subsidy received will stimulate the domestic firm to enter the market, and the strong subsidy-transfer effect will then create the "excessive entry" outcome.

In the 1st stage with free entry of domestic firms, the domestic government maximizes social welfare. From Eq. (11), we obtain that

$$\begin{aligned} s^{FS} &= \frac{\left[\left(c_i - c_j\right) + F\right]m}{1+2m} \\ q_i^{FS} &= F \\ q_j^{FS} &= \frac{(1+m)\left[\left(c_i - c_j\right) + F\right]}{1+2m} \\ n^{FS} &= \frac{(1+2m)(a-c_i) - \left(c_i - c_j\right)m^2 - (1+m)^2 F}{(1+2m)\mathrm{F}} \\ SW^{FS} &= \frac{2m\left[\left(c_i - c_j\right) + F\right]\left[(F-a+c_i)(1+2m) + \left[\left(c_i - c_j\right) + F\right]m^2\right]}{2(1+2m)^2} + \frac{\left[(F-a+c_i)(1+m) - \left(a-c_j\right)m\right]^2}{2(1+2m)^2}. \end{aligned} \tag{14}$$

Due to the socially excessive entry, the government may use an output tax under free entry of domestic firms without the free entry of foreign firms. But with the presence of foreign firms and lower production efficiency of domestic firms coupled with the well-known profit shifting effect and the output substitution effect, the government will still need to provide an output subsidy to reduce the marginal cost of domestic firm making it as the market leader.

Substituting Eqs. (4) and (5) into Eq. (3), and letting $t=0$, we obtain the equilibrium values under entry restriction:

$$\begin{aligned} s^{RS} &= \frac{(1+2a)(a-c_i) + \left(c_i - c_j\right)(n-m)m}{(1+2m)n} \\ q_i^{RS} &= \frac{(1+2m)(a-c_i) - \left(c_i - c_j\right)m^2}{(1+2m)n} \\ q_j^{RS} &= \frac{\left(c_i - c_j\right)(1+m)}{1+2m} \\ P^{RS} &= \frac{c_i + \left(c_i + c_j\right)m}{1+2m} \\ Q^{RS} &= \frac{(1+2a)(a-c_i) - c_j m}{1+2m} \\ SW^{RS} &= \frac{(a-c_i)^2(1+2m) + \left(c_i - c_j\right)^2 m^2}{2(1+2m)} \end{aligned} \tag{15}$$

where the superscript "*RS*" denotes the output subsidy scenario at regulated entry equilibrium.

Comparing Eqs. (14) and (15), we find that

$$s^{FS} - s^{RS} = -\frac{(1+2a)(a-c_i) - \left(c_i - c_j\right)m^2 - nmF}{(1+2m)n} < 0$$

provided that $a > \frac{2c_i - 1 + \sqrt{8(c_i - c_j)m^2 + (2c_i+1) + 8nmF}}{4}$.

We have the following proposition.

Proposition 2. *Under free entry of domestic firms with asymmetric costs, the optimal subsidy rate at free entry equilibrium is highly possible lower than the one at regulated entry.*

Under free entry of domestic firms, the government will lessen the intervention of industrial policy by lowering the subsidy rate when the market scale is sufficiently large. Conventional thinking is that the government should provide more output subsidy to encourage the entry of domestic firms, but it might worsen the problem. Subsidy partially improves the allocative efficiency but it worsen the productive efficiency and the latter dominates. If the domestic firms could enter the market freely and the entry is socially excessive, the government should not provide more output subsidy to protect the domestic firms and the output subsidy could even be negative.

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3.3. Tariff policy

The social welfare with tariff policy in the long-run equilibrium is defined as

$$SW^{FT} = \frac{a^2(2n(2+n)+m) + (2+n)\left(c_i - c_j\right)^2 nm - 2(2+n)(2a-c_i)c_i n - \left(2a-c_j\right)c_j m}{2\left(2(1+n)^2+m\right)} - nF^2$$

where the superscript "*FT*" denotes import tariff scenario at free entry equilibrium.

In this case,

$$\Delta^{FT} = \frac{(1+n)\left[2(a-c_i) - m\left(c_i - c_j\right)\right]^2}{\left(2(1+n)^2+m\right)^2} - \frac{(1+n)^2\left[2(a-c_i) - m\left(c_i - c_j\right)\right]^2}{\left(2(1+n)^2+M\right)^2} = -\frac{n(1+n)\left[2(a-c_i) - m\left(c_i - c_j\right)\right]^2}{\left(2(1+n)^2+m\right)^2} < 0. \tag{16}$$

From Eq. (16), we find that the free entry number of domestic firms is larger than the number of firms in the welfare-maximizing equilibrium, and, so, domestic free entry is socially excessive.

Our result is significantly different from the most related papers. In a few recent papers, "excessive entry theorem" is reexamined in an open economy. As pointed out by Ghosh et al. (2010), the insufficient entry becomes more likely as exogenous trade cost declines if trade cost is considered as domestic tariff. The reduction of domestic tariff increases consumer surplus which does not arise in the closed economy, and if surplus-transferring effect dominates the business-stealing effect in an open economy, then the number of home firms in the free-entry equilibrium can be socially insufficient. Marjit and Mukherjee (2013) showed that when international trade cost is reduced, free entry in the domestic country may be socially excessive or insufficient under competitive labor markets, but it is always socially insufficient under a domestic labor union because it makes higher consumer surplus.

In the 1st stage with free entry of domestic firms, the domestic government maximizes social welfare. FromSW^{FT}, we obtain that

$$\begin{aligned}
t^{FT} &= \frac{1}{2}\left(c_i - c_j\right) + F \\
q_i^{FT} &= F \\
q_j^{FT} &= \frac{1}{2}\left(c_i - c_j\right) + F \\
n^{FT} &= \frac{2(a-c_i) + \left(c_j - c_i\right)m}{2F} - \frac{2+m}{2} \\
SW^{FT} &= \frac{(a-c_i-F)^2}{2} + \frac{\left[\left(c_i - c_j\right) + F\right]^2 m}{4}
\end{aligned} \tag{17}$$

where the superscript "*FT*"denotes the import tariff scenario at free entry equilibrium.

We assume that $\frac{1}{2}(c_i - c_j) + F > 0$ which ensures the outputs of the foreign firms are positive in the free entry equilibrium. We have $n^{FT} > 0$, if $a > \frac{2c_i + (c_i - c_j)m + (2+m)F}{2} = \bar{a}$, which is assumed to hold.

Substituting Eqs. (4) and (5) into Eq. (3), and letting $s = 0$, we obtain the equilibrium values under entry restriction:

$$\begin{aligned}
t^{RT} &= \frac{(1+2n)\left(a-c_j\right) + \left(c_i - c_j\right)(n-m)n}{2(1+2n)^2 + m} \\
q_i^{RT} &= \frac{\left[2\left(a-c_j\right) - \left(c_i - c_j\right)m\right](1+n)}{2(1+2n)^2 + m} \\
q_j^{RT} &= \frac{a - c_i + \left(c_i - c_j\right)(1+n)^2}{2(1+2n)^2 + m} \\
P^{RT} &= \frac{2(a+c_i n)(1+n) - \left(c_i - c_j\right)mn + c_j m}{2(1+2n)^2 + m} \\
Q^{RT} &= \frac{\left(a-c_j\right)m + 2(a-c_i)(1+n)n + \left(c_i - c_j\right)nm}{2(1+2n)^2 + m} \\
SW^{RT} &= \frac{\left(a-c_j\right)^2 m + 2(2+n)(a-c_i)^2 n + (2+n)\left(c_i - c_j\right)^2 nm}{2\left(2(1+2n)^2 + m\right)}
\end{aligned} \tag{18}$$

where the superscript "*RT*" denotes the import tariff scenario at regulated entry equilibrium.

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Comparing Eqs. (18) and (19), we find that

$$t^{RT}-t^{FT}=F+\frac{(1+2n)\left(c_i-c_j\right)m-2(1+2n)(a-c_i)}{2(1+2n)^2+m}>0$$

provided $a<\frac{(c_i-c_j)(1+2n)m+2(1+2n)c_i+4(1+2n)^2F+mF}{2(1+2n)}=\widetilde{a}$, and $a\in(\bar{a},\widetilde{a})$.

We have the following proposition.

Proposition 3. *The optimal tariff rate under free entry of domestic firms should be lower than the optimal tariff rate at regulated entry.*

Brander and Spencer (1981, 1984) argued that when the tariff is increasing, the marginal cost of foreign firm production is increasing and due to the *profit shifting effect*, the output produced by the domestic firms will increase. In an open economy, free entry of domestic firms creates more rent extraction effect. As the number of domestic firms increases, it extracts more rents from the foreign firm, which creates a positive effect on the domestic welfare and the new consumer surplus effect is also created by the entering foreign firms. Due to the cost efficiency of domestic firms being higher with the higher tariff rate, the number of the domestic firms at free entry is larger. The government may reduce the tariff on the foreign firms to avoid an excessive number of domestic firms instead of directly imposing entry regulations.

Before we conclude this section, we have the following proposition from the above analysis of domestic free entry with policy interventions.

Proposition 4. *Domestic free entry is always socially excessive with the government interventions in an open economy.*

The above proposition justifies the need of government intervention and anti-competition policy.

4. Policy regimes and welfare comparisons

In this section, we will further compare the welfare effect of output subsidy and import tariff at free entry equilibrium. Comparing the social welfare between optimal output subsidy and import tariff, we have

$$SW^{FT}-SW^{FS}=\frac{\left[\left(c_i-c_j\right)+F\right]^2m}{4(1+2m)}>0. \tag{19}$$

We have the following proposition.

Proposition 5. *The social welfare under import tariff is superior to the one under output subsidy at free entry equilibrium.*

The reasoning is that output subsidy increases the number of domestic firm at free entry, and free entry is socially excessive and welfare is deteriorated.

Next, we compare the welfare effect of dual policy regimes with either subsidy or tariff policy regime only at free entry equilibrium:

$$SW^{FD}-SW^{FS}=\frac{\left[\left(c_i-c_j\right)+F\right]^2m}{4(1+2m)}>0 \tag{20}$$

$$SW^{FD}=SW^{FT}.$$

Note that even though the need of dual policy for welfare improvement is degenerate to be suboptimal with the free entry of domestic firms, but it is still superior to the subsidy policy. Accordingly, anti-competitive regulation policy is justified coupled with import tariff policy.

We have the following proposition.

Proposition 6. *The dual subsidy-tariff policy is suboptimal and tariff is superior to subsidy at free entry equilibrium.*

Our Proposition 6 is different from the findings in the general equilibrium literature of import tariff and output subsidy, Bhagwati and Ramaswami (1963) showed that an optimal subsidy (or a tax-cum-subsidy equivalent) is necessarily superior to any tariff when the distortion is domestic. What we are showing here is that under oligopolistic competition, the dual subsidy-tariff policy is suboptimal and tariff is superior to subsidy at free entry equilibrium.

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Industrial policy, which intervenes with the market, can only be justified when a market failure exists according to "basic theorem of welfare economics". Reviewing the decades of stagnating Japan economy, the researchers pointed out that a disproportionate amount of Japanese targeting occurred in low growth sectors and sectors with decreasing returns to scale. Industrial policy was chosen politically, but it lacks of private initiative which is harmful because it shifts the resource away from the competitive sector. According to the findings we obtained, the government should be cared about the coordination of industrial, trade and competition policies in an era of globalization.

5. Conclusions

Is free entry desirable for social efficiency in an open economy? This important question has been studied extensively in a closed economy. It is pertinent to consider whether anti-competition entry regulation policies should be relaxed when both import tariff and output subsidy instruments are adopted or either one instrument is used.

In this paper, we analyzed the welfare effects of industrial and trade policy instruments (output subsidies and import tariffs) under Cournot oligopoly and compared the social efficiency of specific policy instrument or dual policy instruments with free entry of domestic firms. We showed that 1. The free entry number of domestic firms is greater than the number of firms in the welfare-maximizing equilibrium. Free entry is always socially excessive irrespective of the policy regimes, which is different from the results already obtained when domestic distortion is existed; 2. Under free entry of domestic firms with dual policy, the optimal subsidy rate at free entry is lower than the one at regulated entry, while the optimal tariff rate at free entry is higher than the one at regulated entry; 3. Under free entry of domestic firms, the optimal output subsidy rate (tariff rate) at free entry equilibrium is highly possible (should be) lower than at regulated entry. The welfare implications of policies are that 1. The social welfare under import tariff is superior to the one under output subsidy at free entry equilibrium; 2. The dual subsidy-tariff policy is suboptimal and tariff is superior to subsidy at free entry equilibrium. We further claimed that the dual subsidy-tariff policy is suboptimal and tariff is superior to subsidy at free entry equilibrium which is in stark contrast with the policy recommendation from general equilibrium analysis.

Tariff policy is highly prohibited and competition policy is being promoted within the domestic economy following the guidelines of WTO, but many domestic governments are under domestic political pressures to provide subsidies to domestic firms and that creates excess competition and makes the social welfare worse-off. Based on the real-economy observations and our theoretical analysis, we argued that the governments should be carefully coordinate industrial and trade policy with competition policy for improving domestic social welfare.

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