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Manipulable behavior in international trade

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ABSTRACT

In this paper, we present a Cournot duopoly model to analyze the manipulated behavior in international trade. The WTO is assumed as an arbitrator for the exchange in an oligopolistic industry and sets tariff rules according to the SDT principles; a firm's cost is private information both for the WTO and the foreign rivalries. Subsequent to our analysis of several cases we find that a firm may misreport to the WTO for more production revenue and the government may collude with a firm for higher welfare. It is shown that the misreporting and collusion incentives are related to the WTO tariff rule, the misreported cost and market size. Furthermore, a strategy proof tariff rule has been designed in which firms can never make his revenue better off by misreporting production cost.

1. Introduction

Considering the trade and development problems of the developing countries, the principles of special and differential treatment (SDT) have been gradually imbedded into many agreements of the WTO/GATT in the last fifty years. Under the SDT, the developed countries are prohibited to set higher tariff and required to provide more favorable market access to developing ones, while the tariff policy can be used by the developing ones in a flexible way for protecting an infant industry or maintaining financial balance.[1] But until now, there is still no official definition for a "developing country". In addition, membership of the WTO called developing country is based on self-selection.[2] Therefore, it is not surprising to find the existence of manipulable behavior in international trade, such as a developed country pretends to be a developing one for higher tariff protection or a developing country misbehaves as a developed one for some market attentions.

Since the special and differential provisions under the WTO are rather new and changeable, thus far, little attention has been paid to the topic of the manipulated behaviors in international trade. We nevertheless draw on two strands of the literature. The first strand of literature comes from the much larger field of international trade. Brander and Spencer (1984, 1985), Dixit (1984), Brander and Krugman (1983), Krugman (1984), De Meza (1986), Eaton and Grossman (1986), Brainard and Martimort (1996,1997), Maggi (1999), Matschke (2003) and Zigic (2008) have studied the impact of trade policies on the exchange in the oligopolisitic market structure. In most of their papers, the government commits to a trade policy in advance, and then the firms compete with each other as the Cournot duopolists under the complete or incomplete information structure. The second strand is the literature on the signaling effect of the trade policy, wherein a government delivers the signals about the cost, demand and market size by using different trade policy in order to improve the social welfare. Collie and Hviid (1993) assumed that the foreign firm cost is common knowledge while the home firm cost is observed by the government, but not by the foreign firm. Given this information structure, the home government uses an output subsidy not only to shift profit, but also to signal home firm cost to the foreign one. Collie shows that the signaling effects cause the government to use export subsidy in the separating equilibrium that is larger than the optimal export subsidy under complete information. In Qiu's model (1994), signaling and screening are combined in a model where the domestic firm is either low-cost or high-cost but this is not observed by the domestic government or the foreign firm. He shows that there is a separating equilibrium where the domestic government chooses a menu of

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[1] Developing countries have greater flexibility in proving protection to domestic industry is through the provisions of GATT Article XVIII, which give developing countries freedom to be able to grant the tariff protection required for establishment of a particular industry.

[2] Michalopoulos (2000) shows that even if the WTO agreements contain a very extensive set of provisions addressing the rights and obligations of developing and least developed countries, there is no official definition of what constitutes "developing country". So Singapore with a per capita income of $32,810 in 1997 and Ghana with a per capita $390 (World bank, 1999) are both supposed to benefit from the same provisions.

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export subsidies under Cournot duopoly and a pooling equilibrium where the domestic government chooses a uniform export tax under Bertrand duopoly. Wright (1998) makes an extension to the Collie and Hviid (1993) that the home firm cost is private information, then neither the home policymaker nor foreign firm have access to them. It is shown that the high-cost home firm has an incentive to misrepresent itself as a low-cost firm. As a result, the first-period optimal subsidy to the home firm is less than what it would be if the home firm output was not a signal of the home firm cost. Collie and Hviid (1999) reconsider the signal effect of the trade policy, yet unlike before, they presume two firms compete as Cournot duopolists in the domestic market, the marginal cost of domestic is known by the domestic firm and government, but is not known by the foreign firm. Thus, the foreign firm tries to infer the costs of the domestic firm from the tariff set by the informed domestic government. They find that the domestic government will actually want to signal the uncompetitiveness of the domestic firm and it will do this by setting a tariff that is smaller than the optimal tariff under complete information. Herander and Kamp (1999) examine the effects of import tariff policy within a standard two-period model of entry where the costs of the domestic firm are proprietary information. Particularly, they assume that the domestic government might be less informed about the domestic costs than domestic firm, and no more informed than the foreign firm. Consequently, the foreign firm is able to respond to the signals provided by the domestic firm better than the government. Under this information structure, they find that the effects of tariff policy differed significantly from the usual effects under complete information and uninformed policy makers would not be able to predict the qualitative effects of tariff policy.

Like other papers we still presume the Cournot duopoly competition happens in an international oligopolistic industry. Yet in this paper, the WTO acts as an arbitrator for the exchange in international trade and sets the tariff rule according to the SDT principles. Furthermore, a firm's cost is assumed to be private information both for the WTO and foreign rivalries. Under this information structure, then we discuss the misreporting and collusion incentives in different cases. At first, we consider the conditions of the misreporting and collusion incentives when the home country is a large developed or developing country. Secondly, we assume both countries have the same market size and analyze whether the government and the firm in developed or developing country will misreport its cost to the WTO. Thirdly, the home country has been assumed as a small country, and then we derive the condition that a high cost firm pretends as a low cost one in an export-oriented industry. It turns out that the misreporting and collusion incentives are determined by the WTO tariff rule, the misreported cost and the different market size. Finally, we designed a strategy proof tariff rule in which firms can never make their revenue better off by misreporting production cost.

The paper is organized as follows. After the introduction, the model is presented in Section 2. We abstract the self-selection problem under the SDT provisions into a reporting problem under the WTO tariff rule. In Section 3, we derive the conditions that a firm misreports its cost to the WTO for higher revenue and that the government colludes with the firm to misreport for larger social welfare. A strategy proof tariff rule has been derived in Section 4 and concluding remarks are contains in Section 5.

2. The model

We examine an international economy with two countries, which are called home country h and foreign country f, respectively. There is one firm in each country, producing a homogeneous product and selling it in both countries. The marginal costs of both firms are constant, and either high c_H or low c_L. The inverse demand function in these two countries are assumed to be linear and given by $p_i = a - b_i(x_i + y_i), i = h,f$, where $p_i$denotes the price in country i, x_i and y_i denote domestic and foreign outputs sold in country i, respectively. The parameters a and b_i are strictly positive and $1/b_i$ measures the market size of country i.

The government in each country wants to optimize its social welfare, and there is an arbitrator, called WTO, for international trade. We assume that both the firm and the government of country i know their production cost c_i^* while the WTO and the rivals can't observe it directly. The Cournot-duopoly competition happening in both markets is common knowledge for the WTO, the governments and the firms. According to the SDT principles, the WTO grants developing countries permission to set higher tariffs for protection and prohibits developed ones do it. Since there is a single firm in each country, a country with a high cost firm can be treated as a developing one, and a country with a low cost firm can be regarded as a developed one. Therefore, we assume that the WTO assigns the high (or low) specific tariff t_H(or t_L) to the country according to the reported cost. Briefly, the detailed tariff rule can be written as:

$$\begin{cases} c_L \rightarrow t_L \\ c_H \rightarrow t_H, \end{cases}$$

where $t_H > t_L \geq 0$. We also assume that the WTO tariff rule is common knowledge for all governments and firms. Since the WTO can make an inference about the production cost through observing the Cournot outputs and market shares at final, it can judge whether the cost of a country matches a developing country (or developed country) type. Under the given WTO tariff rule, a country with a low cost firm may pretend as a developing country by constraining its own output intentionally to obtain higher tariff protection. On the contrary, a developing country may misrepresent as a developed one to get more market shares.

Under the above assumptions, it is ready to show that the real international trade problem of ours is equivalent to an abstract trading rule given below:

(1) The domestic and foreign firms report their product costs c_h and $c_f (= c_L \text{or } c_H)$ to the WTO simultaneously.[3]
(2) The WTO assigns the relevant tariff $t_i (= t_L \text{or } t_H)$ to each country i based on the WTO tariff rule and the reported costs $c_i$of firm i.
(3) For the WTO, according to the reported costs and the relevant tariffs, assigns the Cournot outputs and market shares to the countries as the equations below:

$$x_h = \frac{a + c_f - 2c_h + t_h}{3b_h}, \quad x_f = \frac{a + c_f - 2c_h - 2t_f}{3b_f};$$

$$y_h = \frac{a + c_h - 2c_f - 2t_h}{3b_h}, \quad y_f = \frac{a + c_h - 2c_f + t_f}{3b_f};$$

where x_h, x_f, y_h, y_f denote the assigned output of domestic and foreign firm in bilateral markets. Under the trade rule mentioned above, as the reported costs are c_h and c_f, the price p_i, the firm revenue Π_i and government welfare W_i in country i should be:

$$p_i = a - b_i(x_i + y_i) = \frac{a + c_i + c_j + t_i}{3}, \tag{1}$$

[3] In most cases, the firms report their costs to the governments, and later the governments report the costs of the firms to the WTO respectively. Since the government know the production cost of its own firm, so it is equivalent to the firms report their costs to the WTO under the condition that the governments permit, or prohibit, or encourage them to report untruthful costs.