

行政院國家科學委員會專題研究計畫 成果報告

出口補貼、技術補貼與扭曲性租稅

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中文摘要

本計畫建立一個類似 Brander and Spencer(1983)策略性貿易雙佔模型分析當出口國政府之補貼受到租稅扭曲之影響時，比較該國最適出口品補貼政策與技術補貼政策之福利效果。研究顯示出口國政府在此二補貼中只能擇一為之，則出口補貼之福利會高於技術補貼之福利。如果出口國政府可同時或先後選擇此二補貼政策時，先採技術補貼再採出口補貼下之福利恆高於同時補貼下之福利。

關鍵詞：出口補貼，技術補貼，租稅扭曲，策略性貿易

English Abstract

In this project, we set up a model *a la* Brander and Spencer (1983) to compare the welfare of export and technology subsidy policies when the subsidy payment is subject to taxation distortion. It is found that if the domestic government can prescribe only one policy to improve its competitiveness in the international market, the export subsidy is superior to the technology subsidy. Moreover, if the government is allowed to prescribe both policies, the welfare is higher under sequential than under simultaneous policy implementation.

Keywords: Export Subsidy, Technology Subsidy, Taxation Distortion, Strategic Trade Policies

I.Introduction

Ever since 1980's, there have been serious challenges on traditional Heckscher-Ohlin trade theory which is based on the assumption of perfect competition. Recognizing that international competition among firms in many industries is imperfectly competitive, the study of trade theory and policy under imperfect competition becomes a new subject. Among other things, Brander (1981) claimed firstly that when international markets are characterized by oligopolistic competition, the pattern of trade is indeed intra-industry trade rather than inter-industry trade. Later on, trade theorists began to focus on the profit-shifting motive for trade policy under oligopoly, notably including Brander and Spencer (1984, 1985), Spencer and Brander (1983), Venables (1985), Harris (1985), Eaton and Grossman (1986), Hwang and Mai (1991), Mai and Hwang (1987) and others. In particular, Brander and Spencer (1985) argued that if the domestic government can credibly pre-commit itself to pursue a particular trade policy before firms make output decisions, then an export subsidy in a

Cournot-Nash equilibrium is optimal and such an export subsidy can actually move the domestic firm to what would be, in the absence of a subsidy, the Stackelberg leader position. However, this result can also be achieved by other means. For example, Spencer and Brander (1983) showed that a government can credibly commit itself to R&D subsidies before the R&D decisions are made by private firms.

In fact, the type of optimal strategic export policy is sensitive to many industry-specific factors such as the cost structures (or technologies) of producers. It then becomes clear that if policy makers do not have relevant information about the firm's technology costs, the government could very likely adopt the wrong type of policy.

Rather than taking the technology as given, we endogenize the cost level by assuming that it is a result of costly investment, like R&D, by forward-looking and optimizing agents. More specifically, the present paper intends to explore the long-run consequences of active trade policies, namely how the pursuit of profit-shifting technology and/or export policies can affect the long-run choice of technology by producers.¹ To this end, we wish to pursue the following issues:

(i) We will examine the effects of technology and export subsidies on the technology choice and compare the superiority of both policies.

(ii) If both policies can be adopted and implemented simultaneously or sequentially, what is the welfare effect of simultaneous policy implementation on the technology choice compared with that of sequential policy implementation?

(iii) Which policy implementation requires a higher government subsidy expenditure?

The last question is highly related to the literature on distortionary taxation. Once an export/ technology subsidy policy is adopted, the domestic government's revenue to pay the export subsidy will typically be raised by some form of distortionary taxation. The opportunity cost of the subsidy is not the money value of the subsidy. In stead, it should be measured by the marginal welfare cost (MWC) occasioned by the increase in distortionary taxation. Many empirical studies have shown that MWC is higher than one. For example, Snow and Warren (1996) estimated MWC and found that the social cost of an extra dollar in subsidy payments lies between 1.195 and 1.236. Moreover, based on the assumption that subsidies are financed by taxes on labor earnings, calculations by Browning (1987) for the U.S. economy imply that the social cost of subsidy is between 1.10 and 4.03, with his preferred estimates lying between 1.32 and 1.47. If we accept the finding that MWC of the subsidy/ technology

payment is higher than 1, a higher payment, other things being equal, leads to a lower welfare ranking.

The structure of the report is as follows. Section II points out technology distortion under free-trade equilibrium. Section III considers optimal technology subsidy only. In Section IV, optimal export subsidy is examined. Section V assumes that the domestic government can adopt technology and export subsidies simultaneously and then investigate their welfare implications. Section VI considers instead that technology and export subsidies are implemented sequentially. In Section VII, the ranking of the two policy combination is made. Concluding remarks are provided in the final section.

II. The Model and the Results

We use the simplest possible structure capable of bringing out the main points. There are two competing firms : one domestic firm and one foreign firm. We assume that both firms produce only for a third market and there is no consumption in the producing countries. Assume further that the foreign firm is well-established and its technology level is predetermined at $\bar{c}^*$. The free-trade equilibrium is characterized by two stages. In the first stage, the domestic firm chooses its best technology level by selecting a level of marginal cost c at the fixed cost F . In general, levels of technology may be characterized as "backward" (a high marginal cost and a low fixed cost technology) and "advanced" (a low marginal cost and a high fixed cost technology). In the second stage, the domestic firm competes with the foreign firm in a third country output market in the second stage. Within this framework, we obtain a sub-game perfect equilibrium as our solution. Under this setting, the profit functions of the two firms are specified as follow:

$$\pi(q, q^*) = R(q, q^*) - cq - F(c) \quad (1)$$

$$\pi^*(q, q^*) = R^*(q, q^*) - c^*q^* - F^*(c^*) \quad (2)$$

where R is total revenue; q is the output of the domestic firm; c is its marginal cost which is assumed to be constant in the second stage; F is (i.e., capital cost) fixed cost ; and variables with asterisks denote that they are associated with the foreign firm. Note that there is a trade-off between the marginal cost and the fixed cost. We assume that $F(c)$ is twice continuously differentiable with $F'(c) < 0$ and $F''(c) > 0$. That is, a lower marginal cost is achieved at the expense of a higher fixed cost. In fact, we can think of F as an irreversible investment in cost-reducing R&D.

We solve for the equilibrium in the standard backward fashion. In stage two,

each firm maximizes its profit with respect to its own output. Based on the aforementioned model, we can derive the following lemma and propositions.

Proposition 1. *The optimal technology policy is laissez-faire. The technology subsidy can not remove or reduce the technology distortion.*

Proposition 2. *The domestic country has a unilateral incentive to offer an export subsidy to the domestic firm. However, the optimal export subsidy aggravates the technology distortion. Moreover, it does not move the domestic firm to the Stackelberg leader position in the output space.*

Proposition 3. *The welfare under optimal technology subsidy is the same as the welfare at zero export subsidy. But, the welfare under optimal export subsidy is necessarily higher than the one under technology subsidy.*

Proposition 4. *If both the technology and the export subsidies are adopted simultaneously, the domestic country can reach its first-best: cost minimization in its technology choice and the Stackelberg leader position in the export market.*

Proposition 5. *In the 4-stage game, the optimal technology subsidy can remove the entire technology distortion, leading the domestic firm to choose the cost-minimizing technology. On the other hand, the export subsidy can move the domestic firm to the Stackelberg leader position. The first-best solution is ensured.*

Lemma 1. *Other things being equal, the policy that requires more government subsidy is worse than that requires less.*

Proposition 6. *The tax revenue achieving the first-best solution is higher under the sequential than the simultaneous policy implementation. Hence, the welfare of the former is higher than the latter.*

III. Concluding Remarks

National governments especially in developing countries play a key role in certain international industries, particularly those high technology and high investment industries. By endogenizing the firm's technology choice, this paper has developed a strategic approach to examine the economic effects of technology subsidy and/or export subsidy on the technology and output decisions. The main findings of this paper are briefly summarized as follows:

- (1) If the domestic government can prescribe only one policy to improve its competitiveness in the international market, then export subsidy is superior to technology subsidy.
- (2) No matter both technology and export subsidies are implemented simultaneously or

sequentially, both policies can lead to the first-best solution: cost minimization in the technology choice and Stackelberg leader position in the export market.

- (3) To reach the cost-minimizing technology level, the tax revenue required, and therefore the welfare, is higher under sequential than simultaneous policy implementation.

Our analysis generates at least one important policy implications. We have shown that with export subsidies available, countries would not choose to subsidize technology. Nevertheless, because GATT codes effectively restrict direct export subsidies, we may view the setting in which only technology subsidies are available as the most relevant case.

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