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Political Contributions for Trade Policy and National Public Finance

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Abstract: This study explores the relation between economic openness and government spending through a political contribution approach. This conclusion is that there exists a positive correlation between the degree of trade liberalization in organized industries and the government size, whereas a negative correlation in unorganized industries. In addition, we show that it is more difficult for the countries where a large part of industries are organized to carry out trade liberalization, as the share of national income accruing to the organized sectors decreases.

Key words: Lobbying, tariff setting, government spending, income taxation

INTRODUCTION

This study aims to analyze the role of the lobbying activity of industries in the determination of economic policies. The international trade theory has generally claimed that free trade is the best international trade policy for small open economies, but has, in fact, rarely practiced it in most countries. A considerable amount of researches about the political economics of trade policy have been developed in the last two decades in order to explain the causes of the difference between practice and theory. As a result, numerous approaches have been derived from such researches. Literature reviews on these approaches can be found in detailed surveys conducted by Rodrik (1995) and so on. One of these mainstream theories is the political contribution approach suggested by Grossman and Helpman (1994) as an adoption of the common agency model of Bernheim and Whinston (1986). They analyzed the relation between lobbying activities and actual trade policy decisions and succeeded in explaining why industries, by offering political contributions, can make incumbent officeholders practice the trade policy of protection that benefits these industries⁰.

It is very difficult, however, to practice protectionism because of the dominant stream toward bilateralism such as free or preferential trade agreements and multilateralism such as trade liberalization within the GATT/WTO framework. The incumbent will compensate special interest groups for their loss of free trade in order to secure their political contributions. Thus, it can be stated that government spending will increase as trade liberalization proceeds in a country that has enough special interest groups. A number of empirical studies have been conducted on the level of an economy's exposure to international trade and the government size and it was firstly shown in Cameron (1978) that there exists a positive correlation between the two. Rodrik (1998) studied the relation between these two elements in more than 100 countries and demonstrated the existence of a positive correlation between the openness of an economy and government spending. He emphasized that the reason for such correlation is that societies seem to demand an expanded government role as the provider of social insurance against external shocks caused due to trade liberalization. Alesina and Wacziarg (1998) emphasized that a larger number of public goods are supplied in countries in which the government or market size are smaller. Adsera and Boix (2002) explored the combinations of trade policy, fiscal strategy and political regimes through both theoretical and empirical methods.

The aim of this study is to clarify theoretically the effect of the lobbying activity of special interest groups on the government size in the trend of trade liberalization through the political

contribution approach suggested by Grossman and Helpman (1994)⁽ⁱⁱ⁾. Persson and Tabellini (1994) showed that political centralization creates opportunities for rent seeking, so the government size becomes large through special interest groups' lobbying activities. Mazza and Winden (2002) extended their model to the case where budgeting process is divided into the decision of the budget size and the allocation of it and argue that separating political powers in the budgeting process reduces the incentives to lobbying activities. Persson (1998) dealt with the special interest groups' lobbying activities for providing public goods that are financed by an economy-wide pool of tax revenue. Brou and Ruta (2006) analyzed economic influence by special interest groups under political integration and separation and show that political integration benefits the countries where more groups are organized into lobby and affects the formation of interest groups. In our model, it is assumed that special interest groups offer policymakers their contribution schedules for import tariffs and income taxation in order to make politicians protect their interests.

We derive the following results from our theoretical analysis. First, there exists a positive correlation between the degree of trade liberalization in organized industries and the government size, whereas a negative correlation in unorganized industries. Second, as the share of national income accruing to the lobby members decreases, politicians tends to protect producers rather than consumers in organized industries and consumers rather than producers in unorganized industries.

THE MODEL

Present basic model is mainly based on Grossman and Helpman (1994). This study considers a small open economy in which the size of the population is normalized to unity. Individuals' preferences are identical and represented by the following quasi-linear utility function:

$$u = x_0 + \sum_{i=1}^n u_i(x_i) + H(g) \quad (1)$$

where, x_0 is the consumption of good 0, x_i is the consumption of good i ($i = 1, 2, \dots, n$), g is the volume of public goods supplied by the government, $u_i(\cdot)$ is the subutility gained by good i and $H(\cdot)$ is the subutility gained by public goods⁽ⁱⁱⁱ⁾. We assume that both $u_i(\cdot)$ and $H(\cdot)$ are differentiable, increasing and strictly concave functions. Good 0 is considered as the numeraire goods and its world and domestic prices are equal to 1. The domestic price of non-numeraire good i is denoted by p_i and p_i^* is its world price, which is exogenously given. Since each individual's utility function is quasi-linear, the demand function of good i is can be derived as a function of its domestic price $d_i(p_i)$, where $d_i' < 0$. Each individual's expenditure E is incurred on the consumption of numeraire and non-numeraire goods; therefore, we obtain the following equation:

$$x_0 = E - \sum_i p_i \cdot d_i(p_i)$$

By substituting this equation into (1), the indirect utility function takes the following form:

$$V(\mathbf{p}, E, g) = E + s(\mathbf{p}) + H(g) \quad (2)$$

where, $\mathbf{p} = (p_1, p_2, \dots, p_n)$ is the price vector of non-numeraire goods and $s(\mathbf{p}) \equiv \sum_i u_i[d_i(p_i)] - \sum_i p_i \cdot d_i(p_i)$ is the consumer surplus derived from these goods.

Good 0 is produced from only labor with constant returns to scale. Given that its input-output coefficient is equal to 1 and that there is a sufficiently large aggregate supply of labor, the wage rate is equal to 1 in a competitive equilibrium. On the other hand, the production of non-numeraire goods

requires both labor and a sector-specific input factor; further, the production technology used for such goods exhibits constant returns to scale. Since the wage rate is equal to 1, the reward for the specific factor used for producing good i depends only on its domestic price. Therefore, we can denote this reward by $\pi_i(p_i)$.

Each individual's income before taxes consists of wages and the reward earned from the ownership of some sector-specific input. We assume that the specific inputs are indivisible and nontradable and that each individual can own at most one type of factor. Then, the taxable income of the members of sector i can be represented as follows:

$$M_i(p_i) = l_i + \pi_i(p_i) \quad (3)$$

where, l_i is the total labor supply of the owners of the specific factor used in industry i , which is equivalent to their total labor income because the wage rate is equal to 1. Likewise, the social aggregate income before taxes can be derived as the following equation:

$$M(p) = 1 + \sum_{i=1}^n \pi_i(p_i) \quad (4)$$

where l is the social aggregate labor supply.

In this study, we restrict the economic policy instruments available to politicians: trade policy and income tax policy. It is postulated that the domestic price of every non-numeraire good is larger than its world price; therefore, the difference between the domestic and the world prices can be interpreted as a unit tariff rate⁽⁶⁾. When we denote the domestic products of good i by $y_i(p_i)$, $y_i(p_i) = \pi_i'(p_i)$ can be led by Hotelling's lemma, where $y_i' > 0$. Since the total population is normalized to 1, the import demand function is $m_i(p_i) = d_i(p_i) - y_i(p_i)$. Here, it can confirm that $m_i' < 0$, because $d_i' < 0$ and $y_i' > 0$. The government imposes a proportional income tax on individuals' incomes; its tax rate is τ , with $0 \leq \tau \leq 1$. The government revenue comprises both tariff and income-tax revenue and the government supplies public goods that are financed by this revenue; therefore, it is represented as follows:

$$g(p, \tau) = \tau M(p) + \sum_{i=1}^n (p_i - p_i^*) m_i(p_i) \quad (5)$$

Denoting the gross-of-contributions disposal welfare of the members of sector i by W_i , we have

$$W_i(p, \tau) = (1 - \tau) M_i(p_i) + \alpha_i [H(g(p, \tau)) + s(p)] \quad (6)$$

where, α_i is a fraction of the total population that owns some of this factor. The aggregate gross-of-contributions disposal welfare is equal to the social aggregate income plus the tariff and income tax revenue, that is:

$$W_i(p, \tau) = (1 - \tau) M(p) + H(g(p, \tau)) + s(p) \quad (7)$$

In this study, it focus on the lobbying activity carried out by groups in which the owners of the same specific factor are organized. They have common interests in the policies for their sector; therefore, they are willing to join forces for the political activity. It is assumed that the set of these organized sectors, denoted by L , is exogenously given and they can offer their campaign contributions

to politicians contingent on the economic policies that they choose. Whereas, the members of unorganized sectors are unable to pressure the government. We denote the contribution schedule of lobby i by $C_i(\mathbf{p}, \tau)$, which can be customized to maximize this sector's gross-of-contributions disposal welfare by diminishing contributions.

The incumbent government has the following two concerns: (1) social welfare and (2) gathering support for the purpose of holding their office. Therefore, the government's objective function can be represented as follows⁽⁶⁾:

$$G(\mathbf{p}, \tau) = \sum_{i \in L} C_i(\mathbf{p}, \tau) + a \cdot W(\mathbf{p}, \tau) \quad a \geq 0 \quad (8)$$

We focus on the following two-stage noncooperative political game. The timing of this game is as follows: In the first stage, each lobby simultaneously chooses his contribution schedule. In the second stage, the government determines its economic policies. Since, our aim is to solve the political equilibrium of this game, we suppose that the government always fulfills its promises; otherwise, it is unable for the incumbent to gain the support of lobbyists.

EQUILIBRIUM POLICIES

Here, we focus on the political equilibrium policies derived from the model mentioned above, which has the same structure as the menu-auction problem suggested by Bernheim and Whinston (1986). This problem was applied to a international trade model by Grossman and Helpman (1994). Dixit *et al.* (1997) widely expanded this problem into general economic policy-decision models with general preferences of individuals. To solve the equilibrium in these models, truthful Nash equilibria are used as a central concept. In our political-contribution game, even we follow this equilibrium concept.

To ensure the existence of an equilibrium, we must restrict the policy instruments available to politicians, namely, the import tariff levels and the income tax rate. We allow the government's trade policy (namely, the domestic price vector \mathbf{p}) to be continuous and in the range of $\underline{p}_i \leq p_i \leq \bar{p}_i$ for all $i = 1, \dots, n$. Similarly, we limit the income tax rate τ to be continuous and $0 \leq \tau \leq 1$. Let denote the truthful Nash equilibrium of this game. Then, the following are the characteristics of this equilibrium:

- Each lobby customizes its own equilibrium contribution schedule so as to maximize the net welfare of its own sector for given the government's optimal policy vector. Here, it is postulated that $\{C_i^o(\mathbf{p}, \tau)\}$ is nonnegative, differentiable and not greater than the aggregate income available to the lobby members.
- The government sets the equilibrium domestic price vector \mathbf{p}^o and the equilibrium income tax rate τ^o so as to maximize its own objective function and the net welfare of each lobby for given contribution schedules of the lobbies.

The second condition helps us to obtain first-order conditions of the government's optimization problem. Initially, the equilibrium combination of policies (\mathbf{p}^o, τ^o) maximizes the government's objective function $G(\mathbf{p}, \tau) = \sum_{i \in L} C_i(\mathbf{p}, \tau) + a \cdot W(\mathbf{p}, \tau)$; therefore, the first-order conditions imply,

$$\sum_{i \in L} \frac{\partial C_i}{\partial p_j} + a \cdot \frac{\partial W}{\partial p_j} = 0 \quad \text{for all } j = 1, \dots, n, \quad (9)$$

$$\sum_{i \in L} \frac{\partial C_i}{\partial \tau} + a \cdot \frac{\partial W}{\partial \tau} = 0 \quad (10)$$

Moreover, the equilibrium combination of policies $(\mathbf{p}^\circ, \tau^\circ)$ maximizes the total welfare of all lobbies $\sum_{i \in L} [W_i(\mathbf{p}, \tau) - C_i(\mathbf{p}, \tau)]$; thus, the first order conditions imply,

$$\sum_{i \in L} \frac{\partial W_i}{\partial p_j} = \sum_{i \in L} \frac{\partial C_i}{\partial p_j} \quad \text{for all } j = 1, \dots, n, \quad (11)$$

$$\sum_{i \in L} \frac{\partial W_i}{\partial \tau} = \sum_{i \in L} \frac{\partial C_i}{\partial \tau} \quad (12)$$

Substituting Eq. 11 and 12 into Eq. 9 and 10, respectively, it can obtain the following conditions:

$$\sum_{i \in L} \frac{\partial W_i}{\partial p_j} + a \cdot \frac{\partial W}{\partial p_j} = 0 \quad \text{for all } j = 1, \dots, n, \quad (13)$$

$$\sum_{i \in L} \frac{\partial W_i}{\partial \tau} + a \cdot \frac{\partial W}{\partial \tau} = 0 \quad (14)$$

Equation 13 implies the condition the equilibrium domestic price of good j should satisfy for given domestic prices of the other non-numeraire goods and an income tax rate. Likewise, Eq. 14 implies the condition the equilibrium income tax rate should satisfy for given domestic prices of the non-numeraire goods. From Eq. 13 and 14, it can obtain the equilibrium trade and fiscal policies under my political-economic model. To solve the pair of equilibrium economic policies, Appendix A investigates the effects of a marginal change in the domestic price of a certain non-numeraire good and in the income tax rate. Main purpose of this study is to analyze the characteristics of optimal trade and fiscal policies and to reveal the interaction between them^(vi).

Trade Liberalization and Public Finance

In this model, politicians possess two policy instruments: trade and fiscal policies. For the time being, we confine its policy instrument only to a fiscal policy. That is, the government cannot determine import tariff rates for itself. The reason why we do not allow the government to set tariff rates independently is that, as the trend toward free trade proceeds, it turns to be more difficult that the government intends to protect certain industries by imposing import tariffs. Solving Eq. 14, it can analyze the effect of trade liberalization in this case. Initially, the following lemma can be derived from this condition.

Lemma 1: As the share of national income accruing to the organized sector decreases, the optimal government size becomes bigger.

Proof: Substituting Eq. 23 and 24 into Eq. 14, the optimal amount of government spending for given optimal domestic prices can be derived as follows^(vii):

$$H(g^\circ) = \frac{\beta(\mathbf{p}) + a}{\alpha_L + a} \Leftrightarrow g^\circ = G\left(\frac{\beta(\mathbf{p}) + a}{\alpha_L + a}\right) \quad (15)$$

where, g° is the optimal government size $\beta(\mathbf{p}) \equiv \frac{\sum_{i \in L} M_i(p_i)}{M(\mathbf{p})}$, represents the share of national income accruing to the organized sectors and $\alpha_L = \sum_{i \in L} \alpha_i$ is the share of members who belongs to some

organized lobbies. Here, $G(\cdot)$ is the inverse function of $H'(\cdot)$, which is decreasing; therefore, $G(\cdot)$ is also decreasing. Consequently, it can confirm that there exists a negative correlation between the share of national income accruing to the organized sectors $\beta(\mathbf{p})$ and the optimal government size g° .

This lemma means that, as the share of national income accruing to the lobbies decreases, they intend to pay more contributions in order to make politicians provide more public goods. Then, lowering the domestic price of lobby's products (that is, the proceeding of market opening in this sector) decreases the income of this sector; thus, the share of national income accruing to the organized sectors also decreases. Consequently, from this lemma, it follows that the optimal government size becomes larger. Alternatively, the proceeding of market opening in non-lobby's industry brings a decrease in the income of this sector; therefore, the share of national income accruing to the lobbies increases. As a result, from this lemma, it follows that the optimal government size becomes smaller. These results can be summarized as the following proposition.

Proposition 1: As trade liberalization proceeds in an organized (unorganized) industry, the optimal amount of government spending becomes larger (smaller).

The Interaction Between Trade and Fiscal Policies

From here, again, we allow the government to make both trade and fiscal policies on its own and examine the interaction between the equilibrium domestic prices and income tax rate. It has already shown the first order conditions that the equilibrium combination of policies $(\mathbf{p}^\circ, \tau^\circ)$ should satisfy. The equilibrium domestic price of good j should satisfy Eq. 13 for given domestic prices of the other non-numeraire goods and an income tax rate and the equilibrium income tax rate should satisfy Eq. 14 for given domestic prices of the non-numeraire goods. Analyzing these conditions separately, it can definitely declare how economic factors affect the equilibrium trade and fiscal policy.

Initially, we consider the determination of the equilibrium income tax rate for given domestic prices of the non-numeraire goods. The optimal government revenue (namely, the supply of public goods) is $g^\circ = \tau^\circ \cdot M(\mathbf{p}) + \sum_{i=1}^n (p_i - p_i^*) \cdot m_i(p_i)$; therefore, it can solve the equilibrium income tax rate for given domestic prices of the non-numeraire goods by Eq. 15, which is derived from Eq. 14,

$$\tau^\circ = \frac{T(\mathbf{p})}{M(\mathbf{p})} \quad \text{subtract to} \quad T(\mathbf{p}) = G\left(\frac{\beta(\mathbf{p}) + a}{\alpha_t + a}\right) - \sum_{i=1}^n (p_i - p_i^*) \cdot m_i(p_i) \quad (16)$$

where, $T(\mathbf{p})$ represents the government's income tax revenue. Here, $G\left(\frac{\beta(\mathbf{p}) + a}{\alpha_t + a}\right)$ is not smaller than the government's tariff revenue and not larger than the sum of the social aggregate income and the tariff revenue $M(\mathbf{p}) + \sum_{i=1}^n (p_i - p_i^*) \cdot m_i(p_i)$. Hence, $0 \leq \tau^\circ \leq 1$. Using Eq. 16, it can establish the following lemma.

Lemma 2: Suppose that the domestic prices of all products are exogenously given. When, the price of a certain product is sufficiently high, the price reduction of this product decreases the equilibrium income tax rate. On the contrary, when the price of it is sufficiently low, this price reduction increases the equilibrium income tax rate.

This lemma can be intuitively explained about a lobby's product in Fig. 1 and a non-lobby's product in Fig. 2. When, the domestic price of a certain non-numeraire good drops in the case where its price is sufficiently high, the increase in the tariff revenue caused by the increase in the imports of this good is more than the decrease in the tariff revenue caused by the reduction in its domestic price. Therefore, lowering the domestic price increases the tariff revenue earned by the government. On the other hand, lowering the domestic price, which reduces to low enough, decreases the tariff revenue earned by the government. This is because the increase in the tariff revenue caused by the increase in

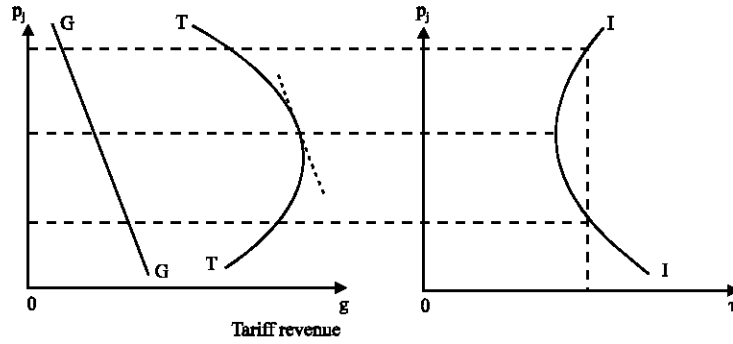


Fig. 1: The relation between the domestic price of a lobby's product and the tariff revenue

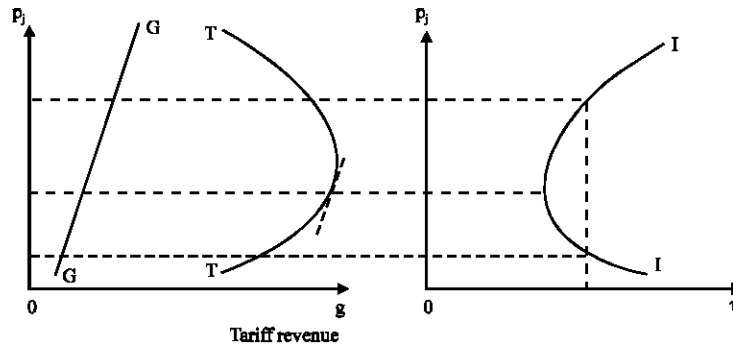


Fig. 2: The relation between the domestic price of a non-lobby's product and the tariff revenue

the imports of this good is less than the decrease in the tariff revenue caused by the reduction in its domestic price. The curve labeled TT in the graphs on the left side of Fig. 1 and 2 shows the relation between the domestic price of good j and the tariff revenue. Further, the curve labeled GG in the graphs on the left side of Fig. 1 plots the relation between the domestic price of a lobby's product and optimal government spending, while the curve labeled GG in the graphs on the left side of Fig. 2 plots the relation between the domestic price of a non-lobby's product and optimal government spending. The difference between them reflects the level of an equilibrium income tax rate, which is represented as the curve labeled II in the graphs on the right side of Fig. 1 and 2.

Next, we consider the equilibrium domestic price vector of non-numeraire goods for a given income tax rate. Substituting Eq. 20 and 21 into Eq. 13, it can derive the following equilibrium domestic price of good $j^{(ni)}$:

$$p_j^\circ - p_j^* = \frac{(1-\tau)(I_j + a)y_j(p_j^\circ) + (\alpha_L + a)[H'(g)[\tau \cdot y_j(p_j^\circ) + m_j(p_j^\circ)] - d_j(p_j^\circ)}{-(\alpha_L + a)H'(g) \cdot m_j'(p_j^\circ)} \quad (17)$$

where, I_j is an indicator variable that equals 1 if $j \in L$ and 0 otherwise. Substituting Eq. 17 into Eq. 15 and applying the implicit function theorem, we can obtain the following lemma.

Lemma 3: Raising the income tax rate causes a rise in the equilibrium domestic prices of lobbies' products and a fall in those of non-lobbies' products.

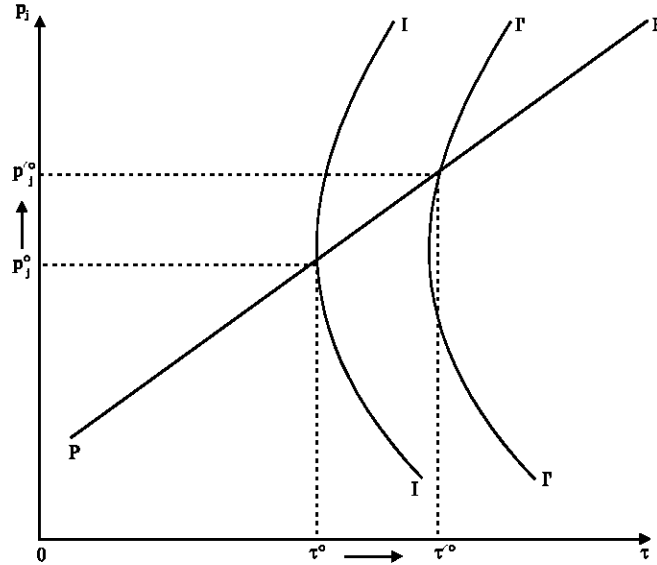


Fig. 3: The decrease in the share of national income accruing to the organized sectors and the economic policies (The case in a lobby’s product)

Why does the government set high domestic prices for lobbies’ products and low domestic prices for non-lobbies’ products based on an increase in the income tax rate? The raise in the income tax rate considerably affects lobby members, because the burden of paying the income tax is greater than the gains from consuming more public goods for them. Hence, the government needs to offer more protection to producers in organized sectors and consumers in unorganized sectors in order to compensate for losses incurred due to raising the income tax rate. The curve labeled PP in Fig. 3 (for a lobby’s product) and 4 (for a non-lobby’s product) represents the loci of the equilibrium domestic price for a given income tax rate.

The curve labeled II in Fig. 3 and 4 shows the loci of the equilibrium income tax rate for a given equilibrium domestic price of non-numeraire good j. The pair of equilibrium trade and fiscal policies is represented as an intersection of curves II and PP in these figures. From Eq. 15, it can easily show that decreasing the share of national income accruing to the organized sectors raises the equilibrium income tax rate τ^o for given domestic prices of all products. Therefore, curve II moves right, as the share of national income accruing to the organized sectors decreases. In such a case, the equilibrium domestic prices of a lobbies’ products are raised and those of non-lobbies’ products are lowered. The following proposition is led by summarizing the above discussion.

Proposition 2: Decreasing the share of national income accruing to the organized sectors raises the equilibrium domestic prices of lobbies’ products and reduces those of a non-lobbies’ product.

The Equilibrium Trade Policies

Which industries does the government aim to protect through the trade policy? Substituting Eq. 17 into Eq. 15 and 16, it can solve the equilibrium domestic price of non-numeraire good j can be derived as follows:

$$P_j^o - P_j^* = - \frac{[M(\mathbf{p}^o) - T(\mathbf{p}^o)][I_j - \beta(\mathbf{p}^o)]y_j(p_j^o) - [\alpha_L - \beta(\mathbf{p}^o)]M(\mathbf{p}^o) \cdot d_j(p_j^o)}{[\beta(\mathbf{p}^o) + a]M(\mathbf{p}^o) \cdot m_j'(p_j^o)} \quad (18)$$

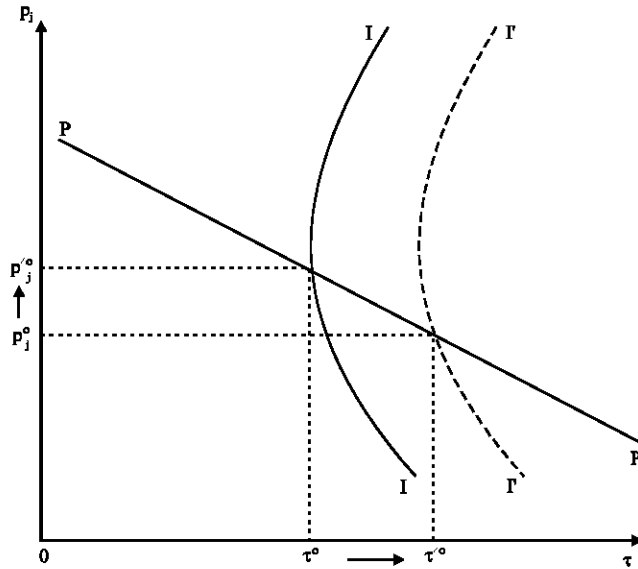


Fig. 4: The decrease in the share of national income accruing to the organized sectors and the economic policies (The case in a non-lobby's product)

Similar to the statement made by Grossman and Helpman (1994), this equation states that a modified Ramsey rule can be applied to our model. All else equal, industries that have high import demand or export supply elasticities have smaller ad valorem deviations from free trade. In addition, Grossman and Helpman (1994) verify that the organized interest groups collectively manage to raise the domestic prices of goods that they produce and to lower the price of goods that they only consume in order to derive their own interests. From Eq. 18, it can also verify that the domestic price of products in a organized industry is set higher than in an unorganized industry^(ix).

In addition, we consider the situation where all industries are organized into lobbies.

Corollary 1: In the situation where all industries are organized into lobbies, the government practices free trade in all industries and both the equilibrium income tax rate and the government size are equal to the level which is accomplished with no lobbying activities.

This corollary can be easily confirmed by substituting Eq. 15 and 18 into $\beta(\mathbf{p}) = \alpha_L = I_j = 1$. In this situation, lobbying industries compete to pay contributions each other in order to their own interests; therefore, such competition results in free trade (that is, $\mathbf{p}^o, \mathbf{p}^*$). Then, the amount of government spending is $H'(g^o) = 1$: that is equal to the level practiced in the case where there are no organized industries.

CONCLUDING REMARKS

In this study, we studied the effects of carrying out lobbying activities on trade and fiscal policies and the relation between trade liberalization and government spending. Cameron (1978) and Rodrik (1998) indicated via empirical research the existence of a positive correlation between an economy's exposure to the international market and the government size. In contrast, present discussion, which is based on the political contribution approach developed by Grossman and Helpman (1994), focuses on the influence of lobbying practiced by industries on policymaking in order to gain protection. In present research, it is verified that there exists a positive correlation between the openness in the

markets of organized industries and the government size. However, it points out a negative correlation in unorganized industries because lobbying industries intend to drive politicians to compensate for losses due to free trade through government spending. Hence, it is very difficult to accomplish both the opening of an economy and reduction in government spending in the country where organized lobbies possess great power to influence incumbent officeholders.

In addition, it could also indicate that as the share of national income accruing to the organized sectors decreases, the equilibrium domestic prices of lobbies' products are raised and those of non-lobbies' products are reduced. This statement is supported by an empirical study conducted by Ray (1981) in the US, which pointed out that the government tended to practice protectionist policies in industries where its market size was small enough or labor's average wage was sufficiently low. In other words, the wider the difference in the available income between organized and unorganized sectors, the more difficult it is for the country in which a large part of the industries are organized to exercise trade liberalization with other countries. Alesina and Wacziarg (1998) showed that the smaller countries have a larger share of public consumption in the GDP and are also more open to trade. Present result suggests that the expansion of the income difference may cause difficulties in trade liberalization; such a trend is already observed in only a part of the developed countries such as the US, Britain and Japan, as well as in developing countries.

A theoretical analysis of lobbying activities and economic policies has been discussed above extensively, but further consideration is required for greater empirical evidence. Therefore, this matter is left open to be dealt with in the future.

APPENDIX A

In this appendix, it consider the effects of fiscal and trade policies on the social welfare and the welfare of each sector.

How much does a marginally change in the trade policy affect the social welfare and the welfare of each sector? First, a marginal change in the trade policy yields the following effect on the welfare of each sector:

$$\frac{\partial W_i}{\partial p_j} = (1 - \tau)\delta_{ij} \cdot y_j(p_j) + \alpha_i [H'(g)[\tau \cdot y_j(p_j) + (p_j - p_j^*)m_j'(p_j) + m_j(p_j)] - d_j(p_j)] \quad (19)$$

where, δ_{ij} is an indicator variable that equals 1 if $i = j$ and 0 otherwise. Second, a marginal change in the trade policy causes the following effect on the welfare of all lobbies:

$$\sum_{i \in L} \frac{\partial W_i}{\partial p_j} = (1 - \tau)I_j \cdot y_j(p_j) + \alpha_L [H'(g)[\tau \cdot y_j(p_j) + (p_j - p_j^*)m_j'(p_j) + m_j(p_j)] - d_j(p_j)] \quad (20)$$

where, $I_j \equiv \sum_{i \in L} \delta_{ij}$ is an indicator variable that equals 1 if $j \in L$ and 0 otherwise. Third, a marginal change in the trade policy results in the following effect on the social welfare:

$$\frac{\partial W}{\partial p_j} = (1 - \tau)y_j(p_j) + H'(g)[\tau \cdot y_j(p_j) + (p_j - p_j^*)m_j'(p_j) + m_j(p_j)] - d_j(p_j) \quad (21)$$

We are also interested in investigating the manner in which a marginal change in the income tax rate affects the social welfare and the welfare of each sector. To begin with, a marginal change in the income tax rate has the following effect on the welfare of each sector:

$$\frac{\partial W_i}{\partial \tau} = \alpha_i \cdot H'(g) \cdot M(\mathbf{p}) - M_i(p_i) \quad (22)$$

Next, a marginal change in the income tax rate has the following effect on the welfare of all lobbies:

$$\sum_{i \in L} \frac{\partial W_i}{\partial \tau} = \alpha_L \cdot H'(g) \cdot M(\mathbf{p}) - \sum_{i \in L} M_i(p_i) \quad (23)$$

Finally, a marginal change in the income tax rate causes the following effect on the social welfare:

$$\frac{\partial W_s}{\partial \tau} = [H'(g) - 1]M(\mathbf{p}) \quad (24)$$

APPENDIX B

In this appendix, we give the proofs of main propositions and lemmas.

Proof of Lemma 1

Proof: Differentiating $G(\cdot)$ with respect to p_j by Eq. 15, it can derive the following equation:

$$\frac{\partial g^\circ}{\partial p_j} = \frac{G'(\cdot)}{\alpha_L + a} \cdot \frac{\partial \beta}{\partial p_j} \quad (25)$$

where, $\frac{\partial \beta}{\partial p_j} = \frac{[1_j \cdot M(\mathbf{p}) - \sum_{i \in L} M_i(p_i)]y_j(p_j)}{(M(\mathbf{p}))^2}$. Because of the concavity of $G(\cdot)$, we can obtain the following results:

If $j \in L$, then
$$\frac{\partial g^\circ}{\partial p_j} = \frac{G'(\cdot)}{\alpha_L + a} \left[\frac{[M(\mathbf{p}) - \sum_{i \in L} M_i(p_i)]y_j(p_j)}{(M(\mathbf{p}))^2} \right] < 0 \quad (26)$$

If $j \notin L$, then
$$\frac{\partial g^\circ}{\partial p_j} = -\frac{G'(\cdot)}{\alpha_L + a} \cdot \frac{\sum_{i \in L} M_i(p_i) \cdot y_j(p_j)}{(M(\mathbf{p}))^2} > 0 \quad (27)$$

These inequalities indicate the content of lemma 1.

Proof of Lemma 2

Proof: By differentiating Eq. 16 with regard to the domestic price of good j , the next equation is derived:

$$\frac{\partial \tau^\circ}{\partial p_j} = \frac{\left[\frac{G'(\cdot)}{\alpha_L + a} \cdot \frac{\partial \beta}{\partial p_j} - (p_j - p_j^*)m_j'(p_j) - m_j(p_j) \right] M(\mathbf{p}) - T(\mathbf{p}) \cdot y_j(p_j)}{(M(\mathbf{p}))^2} \quad (28)$$

If the numerator of the fraction on the right side of Eq. 28 is positive (negative), the value of this equation will also be positive (negative), because $(M(\mathbf{p}))^2 > 0$. Focusing on $m_j'(\cdot) < 0$, it can confirm that

$$\text{If } p_j - p_j^* \geq \frac{\left[\frac{G'(\cdot)}{\alpha_L + a} \cdot \frac{\partial \beta}{\partial p_j} - m_j(p_j) \right] M(\mathbf{p}) - T(\mathbf{p}) \cdot y_j(p_j)}{m_j'(p_j) \cdot M(\mathbf{p})}, \text{ then } \frac{\partial \tau^\circ}{\partial p_j} \geq 0 \quad (29)$$

$$\text{If } p_j - p_j^* < \frac{\left[\frac{G'(\cdot)}{\alpha_L + a} \cdot \frac{\partial \beta}{\partial p_j} - m_j(p_j) \right] M(\mathbf{p}) - T(\mathbf{p}) \cdot y_j(p_j)}{m_j'(p_j) \cdot M(\mathbf{p})}, \text{ then } \frac{\partial \tau^\circ}{\partial p_j} < 0 \quad (30)$$

Summarizing the implication of the above conditions 29 and 30, it can derive lemma 2.

Proof of Lemma 3

Proof: Letting $p_j^\circ = f(\tau)$ be the function that is led by Eq. 17, it can represent of the transforming Eq. 17 as follows:

$$F(\tau, f(\tau)) = 0 \quad (31)$$

Differentiating Eq. 31 with respect to τ implies that

$$\frac{\partial F(\tau, p_j^\circ)}{\partial \tau} + \frac{\partial F(\tau, p_j^\circ)}{\partial p_j^\circ} \cdot f'(\tau) = 0 \quad (32)$$

Paying attention to satisfy the equation $f'(\tau) = \frac{\partial p_j^\circ}{\partial \tau}$, it can lead

$$\frac{\partial p_j^\circ}{\partial \tau} = \frac{\frac{\partial F(\tau, p_j^\circ)}{\partial \tau}}{\frac{\partial F(\tau, p_j^\circ)}{\partial p_j^\circ}} \quad (33)$$

Here, it can confirm that $\frac{\partial F(\tau, p_j^\circ)}{\partial \tau} > 0$. Hence, the next condition is satisfied,

$$\frac{\partial p_j^\circ}{\partial \tau} \geq 0 \Leftrightarrow \frac{\partial F(\tau, p_j^\circ)}{\partial p_j^\circ} \geq 0 \Leftrightarrow H'(g) \leq \frac{I_j + a}{\alpha_L + 1} \quad (34)$$

$$\frac{\partial p_j^\circ}{\partial \tau} < 0 \Leftrightarrow \frac{\partial F(\tau, p_j^\circ)}{\partial p_j^\circ} < 0 \Leftrightarrow H'(g) < \frac{I_j + a}{\alpha_L + 1} \quad (35)$$

By using Eq. 15, since $0 \leq \beta(p) \leq 1$, it is shown that:

If $j \in L$, then $\frac{\partial p_j^\circ}{\partial \tau} \geq 0$ (36)

If $j \notin L$, then $\frac{\partial p_j^\circ}{\partial \tau} < 0$ (37)

These inequalities indicate the content of lemma 3.

NOTES

⁹The political contribution approach is applied to the structure of taxation by Dixit (1996) and to the connection between tariffs and minimum wages by Rama and Tabellini (1998). Dixit *et al.* (1997) expanded this approach into the application to general economic policies.

¹⁰The formal model about special interest groups' lobbying activities for government spending was provided by Persson and Tabellini (2000).

^(iv)This type of individuals' preferences is referred to Persson and Tabellini (2000), Chapter 3. They assume that each individual has the quasi-linear preferences over private consumption and publicly provided goods.

^(v)If $p_i < p_i^*$, then the domestic government imposes taxes on the exports of sector i . We eliminate this case from my analysis.

^(vi)such a form of objective function is called the modified form of political support function. Here, α means the weight attaches to the aggregate welfare compared to campaign contributions. Hillman (1982) and Grossman and Helpman (1994).

^(vii)This study does not include the detailed discussion on the shape of the optimal contribution schedules. At the equilibrium trade and fiscal policies, each lobby should pay its surplus from these equilibrium policies to the government as its campaign contributions. Here, this surplus can be calculated by subtracting its reservation payoffs from its payoffs gained from these equilibrium policies. For this point, Bernheim and Whinston (1986), Grossman and Helpman (1994) and Dixit *et al.* (1997).

^(viii)About the derivation of Eq. 23 and 24, (Appendix A).

^(ix)About the derivation of Eq. 20 and 21, (Appendix A).

^(x)However, in our model where the government provides public goods to all industries, there exist some possibilities that certain sectors with no organized representation are protected by import tariffs, and it may impose export taxes on products in other sectors that are represented by lobbies have.

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