The Peril of Implementing Export Subsidies in the Presence of Special Interests

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Preliminary Draft

21 February 2003

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1 Introduction

Free trade is one of the profession's most cherished beliefs. In most situations of perfect competition, the optimal policy for governments is free trade. However, in situations of imperfect competition, the optimal policy for governments may be an export subsidy. Such strategic trade policies are not without their problems. Eaton and Grossman (1986) shows that the nature of the policy is quite sensitive to the assumption regarding how firms compete. If firms compete in quantities, then the optimal policy is generally a subsidy. However, if firms compete in prices, then the optimal policy is generally a tax. In this manner, the knowledge required for a government implementing strategic trade policy is formidable.

Even if governments know how firms compete in an industry in which strategic trade policy is being considered, there is a strong political economy argument against the implementation of such a policy. Grossman criticizes strategic trade policy saying:

> Experience has shown that the trade policy apparatus is susceptible to the political pressures of special interest groups, and that the outcomes often fail to take adequate account of the interests of consumers... The risk that any scheme of targeted export promotion would fall prey to much the same sort of special interest pressures is cause for grave concern. If an apparatus for discretionary industrial policy of this type were to be erected, each and every export sector would have ample incentive to argue the (alleged) merits of its own case for subsidization. And even if the policy analyst could somehow solve the difficult technical problems of identifying industries worthy of promotion, there could be little guarantee that these would be the ones to emerge from a politically influenced process of selection.

To our knowledge, this political economy critique of sophisticated export subsidization has not been formally modeled. In doing so, we rely heavily on a political economy model developed in Coate and Morris (1995) which analyzes transfers from politicians to special interest groups.

This paper is organized as follows. Section 2 outlines the model. Section 3 shows that, in equilibrium, politicians use export subsidies as a means of inefficiently transferring income to a special interest at the expense of domestic citizens. In section 4, we discuss some points of interest that arise from the model. Section 5 concludes.

2 The Model

We construct a two-country model in which two firms, one domestic and one foreign, are Cournot competitors and only operate in an external third market. There are two periods. In the first period, the domestic government led by an incumbent politician must decide whether or not to subsidize the domestic firm. Subsidizing the domestic firm may or may not be of benefit to domestic citizens, but its always of some benefit to a special interest group. In addition, the incumbent must also decide whether or not to give a direct transfer to the firm in order to cover its fixed costs. At the end of the first period, an election is held between the incumbent and a randomly chosen challenger. The domestic citizens alone possess the power to vote and determine the outcome of the election. In the second period, the winner of the election decides whether or not to implement a second direct transfer to the special interest.

2.1 Domestic Citizens and the Special Interest

Suppose there are two countries, one domestic and one foreign, each with a corresponding firm. The two firms are Cournot competitors and only operate in a third market that is external to the two countries. The domestic firm may or may not receive a non-negative subsidy and/or direct transfer from the domestic government. The foreign firm receives no such subsidy or transfer. The domestic firm and foreign firm profit functions are respectively,

$$\pi(q, q^*, s) = p(Q)q - cq + sq - f + T \qquad \text{and} \tag{1}$$

$$\pi^*(q, q^*, s) = p(Q)q^* - c^*q^* - f^* \ , \tag{2}$$

where all starred terms denote foreign firm variables, q is the firm's quantity produced, Q is the sum of domestic and foreign production, $p(Q)$ is the inverse demand function, c is the firm's marginal cost, f is the firm's fixed costs, s is the subsidy, and T is the direct transfer.

Domestic citizens own a share $\alpha \in (0, 1)$ of the domestic firm and are therefore

entitled to an α-share of the domestic firm's profits. The remaining $(1-\alpha)$-share of the domestic firm's profits go to the special interest. The cost of any subsidy or direct transfer is borne fully by domestic citizens. Hence, the per period utility of domestic citizens and the per period utility of the special interest are respectively,

$$u_c = \alpha\pi - sq - T \qquad \text{and} \tag{3}$$

$$u_{si} = (1-\alpha)\pi \ . \tag{4}$$

At the end of the first period, the domestic citizens make their only decision in the game: whether or not to reelect the incumbent politician who leads domestic government. The special interest has no decisions to make.

2.2 Government Policies and Policy Uncertainty

In each period the politician in office must decide whether or not to implement the direct transfer to the firm. A direct transfer clearly benefits the special interest at the expense of domestic citizens. To see this notice that domestic citizens only receive an α share of a direct transfer through the domestic firm's profit, but pay the full cost of such a transfer. The special interest, however, receives a $(1-\alpha)$ share of the direct transfer through the domestic firm's profit, but pays nothing.

In addition to her transfer decision(s), in the first period the incumbent politician must also decide whether or not to subsidize the firm. Subsidizing the firm is always beneficial to the special interest. To see this, differentiate equation (4) with respect to s. Then using properties of the Cournot equilibrium obtain:

$$\frac{du_{si}}{ds} = (1-\alpha)\Big[p'q\frac{dq^*}{ds} + q\Big] \ . \tag{5}$$

Notice that $p' < 0$ and $dq^*/ds < 0$. Hence, this expression is unambiguously positive and establishes our first proposition.

Proposition 1 *Subsidizing the firm is always beneficial to the special interest.*

Unlike the special interest, domestic citizens may or may not benefit from subsidizing the firm—this depends on α and inverse demand function $p(Q)$. To see this, differentiate equation (3) with respect to s. Then using properties of the Cournot equilibrium evaluate this expression at $s = 0$ to obtain:

$$\left.\frac{du_c}{ds}\right|_{s=0} = \alpha\Big[p'q\frac{dq^*}{ds}\Big] + (\alpha - 1)q \ . \tag{6}$$

The first term is positive, while the second term is negative. Therefore, the sign of the optimal subsidy from the domestic citizens' point of view is ambiguous. This leads to our second proposition.

Proposition 2 *Fix α. Then there exist two inverse demand functions $\underline{p}$ and $\overline{p}$ such that the optimal subsidy from the domestic citizens' point of view is $s = 0$ under $\underline{p}$ and $s > 0$ under $\overline{p}$.*

Proof. See the Appendix.

As Proposition 2 states, the preference of domestic citizens regarding a subsidy will depend on the inverse demand function. In our model, the inverse demand function is stochastic and governed by a compound lottery.

In the first stage of the compound lottery, there are two interim states of the world, one in which the expected benefit to the domestics citizens from the subsidy is positive and one in which it is negative. The former interim state occurs with probability ω^H and the latter interim state occurs with probability $(1 - \omega^H)$. When the expected benefit is positive, domestic citizens clearly prefer implementation of the subsidy. When the expected benefit is negative, domestic citizens clearly prefer no subsidy.

In each of the interim states, there is a lottery over two inverse demand functions $\overline{p}(Q)$ and $\underline{p}(Q)$. In the interim state with positive expected benefit, $p(Q) = \overline{p}(Q)$ with probability ϕ^s and $p(Q) = \underline{p}(Q)$ with probability $(1 - \phi^s)$. In the interim state with negative expected benefit, $p(Q) = \overline{p}(Q)$ with probability ϕ^{ns} and $p(Q) = \underline{p}(Q)$

with probability $(1-\phi^{ns})$. Notice that $\phi^s > \phi^{ns}$. For reasons we discuss below, we must restrict these probabilities so that $\phi^s, \phi^{ns} \in (0,1)$.

The incumbent and the special interest are the only ones to observe the interim state of the world. That is, the incumbent and the special interest alone know if $\phi = \phi^s$ or if $\phi = \phi^{ns}$. Domestic citizens do not observe the interim state of the world and therefore do not know if implementation of the subsidy yields them positive expected benefit. All they know are the probabilities of the two interim states of the world, ω^H and $(1-\omega^H)$.

Although domestic citizens observe the incumbent's subsidy decision and the domestic firm's profits, together these form an imperfect signal of ϕ and their expected benefit from the subsidy. This is due to the stochastic nature of the inverse demand function. As mentioned above, $\phi^s, \phi^{ns} > 0$ so that both $\overline{p}(Q)$ and $\underline{p}(Q)$ are possible in each interim state of the world. Therefore, when domestic citizens observe ex-post $p(Q) = \overline{p}(Q)$ so that a subsidy is in their ex-post benefit, they cannot determine whether the subsidy was in their expected benefit. The same is true when domestic citizens observe ex-post $p(Q) = \underline{p}(Q)$ so that a subsidy is not in their ex-post benefit. In this manner, domestic citizens face what Coate and Morris (1995) refers to as "policy uncertainty."

2.3 Politicians and Politician Uncertainty

Politicians can be one of two possible types: *good* or *bad*. A good politician who holds office cares only about the welfare of domestic citizens and hence her per period utility is $u_g = u_c$. A bad politician who holds office cares only about the welfare of the special interest and hence her per period utility is $u_b = u_{si}$. Politicians receive zero utility when they are out of office regardless of their type. In addition, politicians discount future payoffs using discount factor δ.

Domestic citizens face what Coate and Morris (1995) calls "politician uncertainty." That is, they do not observe politicians' types. Instead they have an initial belief regarding a politician's type—in the literature this is called a politician's ini-

tial reputation. Specifically, domestic citizens believe the incumbent is good with probability $\theta_I \in (0,1)$. Similarly, they believe the challenger is good with probability $\theta_C \in (0,1)$. The incumbent knows her initial reputation. After the incumbent makes her first period subsidy and transfer decisions, a challenger is chosen, i.e., θ_C is drawn from some smooth and increasing cumulative distribution function $\lambda(\theta)$ with $\lambda(0) = 0$.

2.4 The Game

This model describes a two-period game between the incumbent, the challenger, and the domestic citizens. At the beginning of the first period, nature chooses the incumbent's type $t \in \{good, bad\}$ and the probability $\phi \in \{\phi^s, \phi^{ns}\}$ that the inverse demand function is equal to $\overline{p}(Q)$. The incumbent observes both of nature's choices. Domestic citizens have belief θ_I that the incumbent is good and only know that $\phi = \phi^s$ with probability ω^H. After nature has moved, the incumbent must decide whether or not subsidize the domestic firm and whether or not to implement the direct transfer. Domestic citizens observe the incumbent's decisions and then nature chooses the inverse demand function. In keeping with Coate and Morris (1995), we refer to $(s, T, p(Q))$ as the incumbent's first-period record where $s \in \{0, \overline{s}\}$ is the incumbent's subsidy decision, $T \in \{0, f\}$ is the incumbent's direct transfer decision, and π is the profit generated by the domestic firm.

At the end of the first period, nature randomly chooses the challenger and an election is held. As mentioned above, the challenger has an initial reputation θ_C which is drawn from the cumulative distribution function $\lambda(\theta)$. The domestic citizens base their voting decision on the incumbent's first period record and the challenger's initial reputation. In the second period, the elected politician simply decides whether or not to implement a second direct transfer and the game ends.

In this model, a PBNE consists of: (1) the domestic citizens' beliefs, (2) a strategy for the domestic citizens, (3) a strategy for the incumbent, and (4) a strategy for the challenger, which satisfy the following properties. First, the domestic citizens'

beliefs must be consistent with the incumbent's strategy—they must be formed using Bayes Rule where possible. Second, the domestic citizens' strategy must be optimal given their beliefs and the strategies of the incumbent and the challenger. Third, the incumbent's strategy must be optimal given the beliefs and strategy of the domestic citizens and the strategy of the challenger. Fourth, the challenger's strategy must be optimal.

The domestic citizens' beliefs specify the probabilities regarding the realizations of ϕ and the incumbent's type t. The belief as to the realization of ϕ is based solely on the ω^H. The belief as to the realization of the incumbent's type is based on the incumbent's initial reputation and her first-period record.

A strategy for the domestic citizen specifies the probability with which to vote for the incumbent. This probability depends on the incumbent's initial reputation and her first-period record.

A strategy for the incumbent is a rule that specifies an action or actions to be taken in the first period and action to be taken in the second period if reelected. In the first period, the strategy specifies whether or not to subsidize the domestic firm and whether or not to implement a direct transfer given the incumbent's type and the realization of ϕ. In the second period, the strategy only specifies whether or not to implement a direct transfer given the incumbent's type.

A strategy for the challenger is a rule that specifies, if elected, whether or not to implement a direct transfer given the challenger's type.

3 Subsidies As Transfers to the Special Interest

We use backward induction to find the PBNE of this game. We then analyze the incumbent's equilibrium behavior and show that there exist equilibria in which the bad incumbent will hide as the good incumbent and use subsidies to benefit the special interest.

3.1 Politicians' Second-Period Behavior

Regardless of whether the incumbent or the challenger is elected, the action taken by the politician in office during the second period depends only her type. If she is good, then she will make no direct transfers to the special interest, i.e., $T = 0$. If she is bad, then she will make a direct transfer to the special interest, i.e., $T = f$.

3.2 Domestic Citizens' Behavior

By backward induction, domestic citizens' know that they will be better off in the second period if they elect a good politician than if they elect a bad politician. Therefore, they elect the politician they believe is more likely to be good. Given an incumbent's first-period record $(s, T, p(Q))$, the domestic citizens estimate that the probability that the incumbent is good, $\beta(s, T, p(Q))$. As mentioned above, they are also aware of the challenger's initial reputation θ_C. Hence, the domestic citizens will reelect the incumbent if and only if $\beta(s, T, p(Q)) > \theta_C$. The probability that the incumbent is reelect is given by $\lambda(\beta(a, T, p(Q))$ because the challenger's initial reputation is randomly drawn from cumulative distribution function $\lambda(\theta)$.

3.3 The Incumbent's First-Period Behavior and the Beliefs of Domestic Citizens

Consider the incumbent's expected payoff when the probability that $p(Q) = \overline{p}(Q)$ is ϕ. If she is good, then her expected payoff as a function of her first period subsidy and transfer decisions is

$$\begin{aligned} U_g(s, T, \phi) = \phi[u_g(s, T, \overline{p}(Q)) + \delta\lambda(\beta(s, T, \overline{p}(Q)))u_g(s, 0, \overline{p}(Q))] \\ +(1-\phi)[u_g(s, T, \underline{p}(Q)) + \delta\lambda(\beta(s, T, \underline{p}(Q)))u_g(s, 0, \underline{p}(Q))]\,. \end{aligned} \tag{7}$$

If she is bad, then her expected payoff as a function of her first period subsidy and direct transfer decision is

$$U_b(s,T,\phi) = \phi[u_b(s,T,\overline{p}(Q)) + \delta\lambda(\beta(s,T,\overline{p}(Q)))u_b(s,f,\overline{p}(Q))] \\ +(1-\phi)[u_b(s,T,\underline{p}(Q)) + \delta\lambda(\beta(s,T,\underline{p}(Q)))u_b(s,f,\underline{p}(Q))]\,. \tag{8}$$

Clearly, the optimal strategy for the incumbent will depend on the beliefs of the domestic citizens. In a PBNE, for any first-period record that occurs along the equilibrium path, these beliefs must be formed from the incumbent's strategy using Bayes's rule. However, for first-period records which do not occur along the equilibrium path, these beliefs are not restricted. This gives rise to multiple equilibria, many of which consist of unusual behavior on the part of the incumbent such as the good incumbent's implementing the first-period direct transfer. In order to concentrate on the appropriate equilibria, we assume that first-period records with a greater direct transfer cannot result in a greater belief that the incumbent is good. This is known as the monotonic beliefs property and formally states that for any pair of first-period records $(s,T,p(Q))$ and $(s,T',p(Q))$ such that $T' > T$, then $\beta(s,T',p(Q)) < \beta(s,T,p(Q))$.

In any equilibrium satisfying the monotonic beliefs property, the incumbent's first-period strategy will be the pair (s,T). The good incumbent will never implement a direct transfer in the first period because doing so will lower her first period utility and lower the probability that she is reelected. Therefore, the good incumbent may choose between two possible first-period strategies: (1) $(0,0)$ do not implement the first-period direct transfer and do not subsidize the domestic firm, or (2) $(s,0)$ do not implement the first-period direct transfer and subsidize the domestic firm. It then follows that if the domestic citizens' observe direct transfers in the first period, they will believe that the incumbent is bad with probability one and vote her out of office. If the bad incumbent decides to implement the first-period direct transfer, then she also subsidize the domestic firm in a manner that will maximize her first-period utility. Therefore, the bad incumbent may choose between three first-period strategies: (1) $(0,0)$ do not implement the first-period direct transfer and do not subsidize the

domestic firm, (2) $(s,0)$ do not implement the direct transfer and subsidize the domestic firm at the same level as the good incumbent, or (3) $(\hat{s},T)$ implement the direct transfer and subsidize the domestic firm beyond the level of the good incumbent.

Let $\sigma_s^g(\phi)$ and $\sigma_{ns}^g(\phi)$ be, respectively, the probability that the good incumbent chooses $(s,0)$ and $(0,0)$ when the probability the inverse demand function is $\overline{p}(Q)$ is ϕ. Similarly, let $\sigma_s^b(\phi)$ and $\sigma_{ns}^b(\phi)$ be, respectively, the probability that the bad incumbent chooses $(s,0)$ and $(0,0)$ when the probability that the inverse demand function is $\overline{p}(Q)$ is ϕ. In addition, let $\sigma_T^b(\phi)$ be the probability that the bad incumbent chooses $(\hat{s},T)$ when the probability that the inverse demand function is $\overline{p}(Q)$ is ϕ.

Given the above strategies for the incumbent, we obtain the following equilibrium-path beliefs of the domestic citizens using Bayes's rule.

$$\beta(s,0,\overline{p}(Q)) = \frac{\theta_I[\omega^H\phi^s\sigma_s^g(\phi^s) + (1-\omega^H)\phi^{ns}\sigma_s^g(\phi^{ns})]}{\theta_I[\omega^H\phi^s\sigma_s^g(\phi^s) + (1-\omega^H)\phi^{ns}\sigma_s^g(\phi^{ns})] + (1-\theta_I)(\omega^H\phi^s\sigma_s^b(\phi^s) + (1-\omega^H)\phi^{ns}\sigma_s^b(\phi^{ns})]}$$

$$\beta(s,0,\underline{p}(Q)) = \frac{\theta_I[\omega^H(1-\phi^s)\sigma_s^g(\phi^s) + (1-\omega^H)(1-\phi^{ns})\sigma_s^g(\phi^{ns})]}{\theta_I[\omega^H(1-\phi^s)\sigma_s^g(\phi^s) + (1-\omega^H)(1-\phi^{ns})\sigma_s^g(\phi^{ns})] + (1-\theta_I)(\omega^H(1-\phi^s)\sigma_s^b(\phi^s) + (1-\omega$$

$$\beta(0,0,\overline{p}(Q)) = \frac{\theta_I[\omega^H\phi^s\sigma_{ns}^g(\phi^s) + (1-\omega^H)\phi^{ns}\sigma_{ns}^g(\phi^{ns})]}{\theta_I[\omega^H\phi^s\sigma_{ns}^g(\phi^s) + (1-\omega^H)\phi^{ns}\sigma_{ns}^g(\phi^{ns})] + (1-\theta_I)(\omega^H\phi^s\sigma_{ns}^b(\phi^s) + (1-\omega^H)\phi^{ns}\sigma_{ns}^b(\phi^{ns})]}$$

$$\beta(0,0,\underline{p}(Q)) = \frac{\theta_I[\omega^H(1-\phi^s)\sigma_{ns}^g(\phi^s) + (1-\omega^H)(1-\phi^{ns})\sigma_{ns}^g(\phi^{ns})]}{\theta_I[\omega^H(1-\phi^s)\sigma_{ns}^g(\phi^s) + (1-\omega^H)(1-\phi^{ns})\sigma_{ns}^g(\phi^{ns})] + (1-\theta_I)(\omega^H(1-\phi^s)\sigma_{ns}^b(\phi^s) + (1-$$

$$\beta(s,T,\overline{p}(Q)) = \beta(s,T,\underline{p}(Q)) = 0$$

Solving for the incumbent's optimal strategy requires...