ANTIDUMPING AND LOBBYING:
A signaling-game approach

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Abstract

This paper analyzes the relationship between domestic firms and an international trade agency which is empowered by the legislative body to administer antidumping laws against possible predatory behavior of foreign firms in domestic markets. In order to focus on the domestic firm-agency interaction, we “control” for the foreign firm’s behavior by assuming that it preys only on relatively low efficiency domestic firms. Accordingly, an informed and benevolent agency provides selective protection through the antidumping procedure to those vulnerable firms only. We build into the model two features that allow us to examine situations that may not correspond to this socially desirable way of implementing the antidumping procedure. First, we introduce asymmetric information on the existence of predatory behavior by assuming that the agency makes its decision on the basis of an output signal by the domestic firm. Second, we introduce lobbying by the domestic firm as a monetary instrument of direct influence of the agency’s decision, taking into account the informational externality it has on the agency’s beliefs. The equilibrium results derived in this paper contribute, from a positive economics standpoint, to the controversial debate on the extent of discretionary power of international trade agencies in the way they administer antidumping laws.

JEL-code: F13, D82, D73
Key words: Antidumping, Lobbying, Asymmetric Information, Signaling.

March 2004
1 Introduction

A paradox that has characterized international trade ever since the General Agreement on Tariffs and Trade (GATT) was created to encourage world trade liberalization, is the widespread use by countries of instruments that turn out to be significant impediments to free trade. Chief among those instruments are the antidumping codes that allow GATT signatories to counter dumping by levying import duties. In fact, work that has examined the functioning of antidumping procedures in various parts of the world (Boltuck and Litan, 1991) as well as efforts to measure the welfare impact of antidumping actions (Gallaway et al., 1999) suggest that antidumping might probably be “...the most costly form of protection” (Blonigen and Prusa, 2001).

In parallel to a large series of papers that have highlighted this protectionist policy aspect of antidumping and assessed its economic consequences, a growing literature has emerged that emphasizes the way antidumping procedures affect the strategic behavior of firms and the agencies that administer these procedures. In its major part, however, this literature has focused on the strategic interaction between the domestic and foreign firms, hence, providing a theory of how firms reach an agreement (often in quantity) before the final decision of the regulatory agency (see, e.g., Prusa, 1992 and Zanardi, 2000).

A strand of this literature has explicitly taken into account the information incompleteness inherent to the antidumping process by introducing the possibility that firms (Kolev and Prusa, 2002) or the agency (Rosendorff,
1996) use an economic-variable signal to influence the outcome of the process which takes the form of a voluntary export restraint (VER) or an antidumping (AD) duty.\(^1\) Another avenue of research, more empirical in nature, has stressed the political economy aspect of antidumping. For example, drawing on the theories of capture and congressional dominance, respectively, Gasmi et al. (1996) and Hansen and Prusa (1996) find that interest groups’ political campaign (PAC) contributions are a significant factor in explaining the decision of the International Trade Commission to protect domestic industries.

The political influence of interest groups has been studied in various contexts. For the purpose of our paper, we need to mention Anderson (1994) and Moore and Suranovic (1992) who provide an analysis of lobbying in antidumping. These two studies, however, are conducted under complete information, an hypothesis that we relax in this paper. Most likely closer to our work in this methodological respect, Ball (1995) assumes that lobbying is a signaling device that interest groups use to influence government policy. By allowing for signaling by the domestic firm in both an economic variable (output) and a political variable (lobbying), our work can be viewed as a contribution to the literature that seeks to investigate the mechanism through which firms attempt to influence the outcome of the antidumping process.\(^2\)

The point of departure of our approach is to assume that the main goal of antidumping laws is to fight social welfare-deteriorating dumping. We go one

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\(^1\) More generally, a series of papers have stressed the role of incomplete information in international trade (see, e.g., Brainard and Martimort, 1997 and Wright, 1998).

\(^2\) Kolev and Prusa (2002) is a representative effort in this literature. We should note, however, that while our work strengthens the signaling dimension of the Kolev and Prusa paper (by introducing sequential signaling in output and lobbying), we do not consider at all VER agreements.
step further and take the view that the purpose of antidumping investigations is to uncover predatory behavior of foreign firms in domestic markets.\(^3\) In addition to the design of the laws themselves, the way they are administered and enforced have become quite controversial. Investigations require a great deal of information and because agencies have considerable discretionary power they are subject to influence from domestic firms. We emphasize these two features of antidumping in a model of the agency-domestic firm relationship in which the firm sequentially uses output and lobbying as signals to influence the agency’s decision.

The paper is organized as follows. The next section presents the basic ingredients of the model we use to describe what we take as the fundamental objective of antidumping laws, namely, to protect domestic firms that are found to be subject to predatory behavior from the part of foreign firms. Such domestic firms are assumed to have some cost “weakness” which makes them vulnerable to predation indeed. As a benchmark, we characterize the decision of the agency based on the firm’s efficiency level which is assumed to be common knowledge. In section 3 we introduce asymmetric information by assuming that the firm’s efficiency parameter is private information and that the agency infers it from output observation. Strategic signaling then takes place and we characterize perfect Bayesian equilibrium outcomes of this firm-agency relationship.

\(^3\)Hence, we go beyond the definition of dumping as international price discrimination. Let us note that our interpretation is reasonably consistent with the “unfair trade” provisions of the GATT. We however are aware of the fact that the issue of the definition of predatory behavior is itself not settled. In this paper, any “aggressive” quantity/price strategy by a foreign firm in a domestic market is regarded as predatory. For a discussion of predatory dumping, see Hartigan (1996).
Section 4 introduce lobbying by the domestic firm as a monetary instrument of direct influence of the agency’s decision, taking into account the informational externality it has on the agency’s beliefs about the firm’s level of efficiency. We characterize equilibrium outcomes of the firm-agency interaction now viewed as a multi-signal game. Section 5 summarizes our results and gives some directions for future research.

2 The basic theoretical setting

This section presents the model used to analyze the antidumping procedure. We consider an international duopoly in which a domestic firm, facing the possibility that a foreign firm enters the domestic market in a predatory fashion, has the ability to seek protection from an international trade agency. Within this basic setting, two types of strategic interaction may be highlighted: that between the firms themselves and that between the firms and the agency. This second type of strategic interaction is the one that draws our attention in this paper. More specifically, we use a simplified model of the decision process of the foreign firm of whether or not to prey on the domestic firm and focus on the latter’s relationship with the agency.\footnote{The simplified model of predation used in this paper might be viewed as a reduced form of a more detailed model that yields predatory behavior when the benefits from so doing are sufficiently large (see, e.g., Gasmi et al., 1997).} Let us be more specific.

We assume that the domestic firm may be of one of two types depending on whether or not it is “vulnerable” to predatory behavior. Let $\theta \in \{\theta, \bar{\theta}\}$,
θ < \bar{\theta}, be a one-dimensional parameter that designates the type of this firm.\(^5\) Within our framework, it is useful to interpret this parameter as the marginal cost of the firm in which case a \(\bar{\theta}\)-type firm is of a relatively low efficiency, and hence is vulnerable to predatory behavior from the part of the foreign firm. In contrast, a \(\bar{\theta}\)-type firm is of a relatively higher efficiency and thus may not be subject to predatory behavior.\(^6\) As will be made more explicit later in the paper, we assume that the foreign firm effectively preys on the domestic firm only if the latter is of a low efficiency, i.e., of type \(\bar{\theta}\).

As mentioned in the introduction, our perception of the antidumping procedure leads us to focus on social welfare-deteriorating cases of dumping that are examined by the agency. We take those as being predatory behavior cases and assume that the main objective of the agency is to counter this behavior by imposing an antidumping (AD) duty. Formally, we let the binary variable \(d \in \{d, \bar{d}\}\) represent the decision of the agency on a given case with \(d = \bar{d}\) if the agency decides to levy an AD duty on the foreign firm’s good and \(d = d\) if the decision is not to levy such a duty. Given the objective of the agency and our assumption about the adoption of predatory behavior by the foreign firm, a socially desirable outcome would be

\[
d = \begin{cases} 
\bar{d} & \text{if } \theta = \bar{\theta} \\
\bar{\theta} & \text{otherwise (1)} 
\end{cases}
\]

We see at least two factors that might prevent this ideal situation (1) from occurring. First, available information on the existence of predatory

\(^5\)This parameter will in due time be private information to the domestic firm.

\(^6\)To be sure, for the domestic firm not to be subject to predatory behavior from the part of the foreign firm it suffices to assume that the efficiency levels of the two firms are close. Hence, \(\bar{\theta}\) might be taken as a level of marginal cost of approximately the same magnitude as that of the foreign firm.
behavior is inherently incomplete and hence the agency might make errors of both “Type” I and II. Second, in the domestic firm-agency relationship, private incentives might not coincide with social incentives leading to outcomes that are distorted away from this ideal outcome. This paper is an attempt to incorporate both of these factors in a model that seeks to predict the (equilibrium) behavior of the domestic firm and the agency.

We study the effects of these two factors in two steps. First, we assume that the agency is benevolent (section 3). Our purpose here is to control for the private versus social incentives effect when introducing incomplete information into the model. Then, we relax this assumption by allowing for some collusion between the domestic firm and the agency to take place (section 4).

3 The domestic firm-agency relationship with a benevolent agency

Let us assume that the interaction between the domestic firm and the agency is described by a game the timing of which is shown in Figure 1 below and discuss the payoff structure of such a game. For a given agency decision-firm type couple \((d; \theta)\), we let \(U(d; \theta)\) designate the ex post utility of the agency which is defined for \((d; \theta) \in \{(d; \bar{\theta}), (\bar{d}; \bar{\theta}), (\bar{d}; \bar{\theta})\}\) by

\[
U(d; \theta) = \begin{cases} 
U & \text{if } (d; \theta) \in \{(d; \bar{\theta}), (\bar{d}; \bar{\theta})\} \\
U' & \text{otherwise}
\end{cases} 
\]  

(2)

where \(U < U'\). This specification of the agency’s utility function is consistent with the preferences of a benevolent agency as reflected in the socially de-
sirable outcome that we described in the previous section. Indeed, it shows that when it makes the “right” decision, namely, when it only protects a vulnerable domestic firm, the agency achieves the higher level of utility.

![Figure 1: Timing of events with a benevolent agency](image_url)

Competition between the two firms takes place in output with the foreign firm moving first. The output level chosen by the domestic firm, $q$, is observed by the agency prior to making its decision $d$. Let $w(q, d; \theta)$ represent the ex post payoff of the domestic firm at the end of the game and assume that this payoff is composed of two per-period payoffs:

$$w(q, d; \theta) = u(q; \theta) + v(d; \theta)$$

(3)

The function $u(q; \theta)$ corresponds to the domestic firm’s first-stage payoff, namely, the profit that it obtains when it sets output in response to the foreign firm’s. The second-stage payoff $v(d; \theta)$ may be viewed as a reduced form of the profit it makes in the period that just follows the agency’s decision. We assume that, following the foreign firm’s move, the domestic firm sets output level $q \in \{q, \overline{q}\}$, with $q < \overline{q}$. We interpret the higher level of output

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7The assumption of the foreign firm moving first reflects the fact that its higher efficiency allows it to enter the domestic market as a leader (see van Damme and Hurkens, 1999 for the relationship between production costs and market leadership).

8For simplicity, we assume away discounting.

9Recall that $\theta$ unambiguously determines the foreign firm’s output level and hence the latter can be dropped from the arguments of the domestic firm’s payoff functions.

10Below, we give an explicite definition of this function $v$. 
as the equilibrium quantity of the domestic firm in a standard Stackelberg game where the foreign firm is the leader. The lower level \( q \) is interpreted as the domestic firm’s best response to an aggressive output strategy by the foreign firm that we refer to as a “predatory strategy.” Accordingly, we can formally define these output levels \( \bar{q} \) and \( q \) respectively by

\[
\bar{q} \equiv \arg\max_{q \in \mathbb{R}_+} \bar{u}(q; \bar{\theta})
\]

and

\[
q \equiv \arg\max_{q \in \mathbb{R}_+} \bar{u}(q; \bar{\theta})
\]

where \( \bar{u} \) has the same form as \( u \) but is defined on \( \mathbb{R}_+ \times \{\theta, \bar{\theta}\} \).

We let the payoff function of the domestic firm after the agency’s decision has been made, \( v(d; \theta) \), take on the values

\[
v(d; \theta) = \begin{cases} 
  u(q; \theta) & \text{if } (d; \theta) \in \{(d; \bar{\theta}), (\bar{d}; \bar{\theta})\} \\
  u(q; \theta) + \omega & \text{if } (d; \theta) = (d; \bar{\theta}) \\
  u(q, \bar{\theta}) & \text{if } (d; \theta) = (\bar{d}; \bar{\theta})
\end{cases}
\]

where \( \omega > 0 \). This component payoff function possesses a few salient properties that are discussed in turn.

First, an efficient firm \( \bar{\theta} \) that receives a (negative) decision \( \bar{d} \) from the agency gets a payoff \( v(d; \theta) \) which is assumed to be the “normal” level that a domestic firm not subject to predatory behavior would achieve as a follower in the quantity game, namely, \( u(q; \theta) \). Second, assuming that the \( AD \) duty just compensates for the adverse effect of predatory behavior, an inefficient firm \( \theta \) that receives a (positive) decision \( \bar{d} \) gets a payoff \( v(d; \theta) \) equal to that

\[11\] Recall that \( u \) is defined on \( \{q, \bar{q}\} \times \{\theta, \bar{\theta}\} \). A necessary and sufficient condition for \( q < \bar{q} \) is that the marginal utility of the firm be strictly decreasing in \( \theta \), i.e., \( \partial^2 \bar{u}/\partial \theta \partial q < 0 \).
of an efficient firm that receives a negative decision, i.e., \( v(d; \theta) \). Third, when the agency makes the wrong decision of imposing a duty in a case involving a \( \theta \)-type firm, this firm enjoys a positive rent \( \omega \) on the top of the normal level \( v(d; \theta) \) it should get. Finally, when the agency makes the wrong decision of not imposing a duty in a case involving a \( \bar{\theta} \)-type firm, the domestic firm obtains the level of payoff \( u(q; \bar{\theta}) \).

Given the component payoff functions \( u \) and \( v \) described above, the aggregate gains that the domestic firm obtains when the game ends can now be derived. It is easy to see that these gains are given by

\[
w(q, d; \theta) = \begin{cases} 
2u(q; \bar{\theta}) + \omega & \text{if } (q, d; \theta) = (q, d; \theta) \\
u(q; \theta) + u(q, \bar{\theta}) + \omega & \text{if } (q, d; \theta) = (q, \bar{d}; \theta) \\
u(q; \bar{\theta}) & \text{if } (q, d; \theta) = (q, d; \bar{\theta}) \\
u(q, \bar{\theta}) + u(q; \bar{\theta}) & \text{if } (q, d; \theta) = (q, \bar{d}; \bar{\theta}) \\
u(q, \bar{\theta}) + u(q, \bar{\theta}) & \text{if } (q, d; \theta) = (q, d; \bar{\theta}) \\
2u(q; \bar{\theta}) & \text{if } (q, d; \theta) = (q, d; \bar{\theta}) 
\end{cases}
\]  

(7)

We now turn to the characterization of equilibrium behavior in this domestic firm-agency relationship.

If the domestic firm’s type is common knowledge to both the firms and the agency, the complete information equilibrium corresponds to the socially desirable outcome in which the agency always makes the right decision and the domestic firm behaves truthfully. More specifically, using (4) and (5), this equilibrium outcome says that if \( \theta = \bar{\theta} \), then \( q = q \) and \( d = \bar{d} \), and if \( \theta = \theta \), then \( q = q \) and \( d = d \).
Suppose now that $\theta$ is common knowledge only to the firms and that the agency holds prior beliefs on it defined by $\Pr(\theta = \underline{\theta}) = p$ and $\Pr(\theta = \bar{\theta}) = 1 - p$. The interaction between the domestic firm and the agency can then be viewed as a two-stage game of incomplete information. Given that the agency observes the firm’s output level prior to making its decision, it can update its beliefs on the basis of this output observation. Clearly then the domestic firm may use its output level as a device to signal its type.

Observe that output signals may be strategically used by the domestic firm. This suggests that the analysis of the firm-agency relationship can be cast within the framework of a signaling game.\textsuperscript{12} Following the standard practice in such contexts (e.g., see Fudenberg and Tirole, 1991), we adopt the concept of perfect Bayesian equilibrium and consider two types of equilibria.\textsuperscript{13} First, equilibrium behavior might prescribe a different level of output for each of the two firm types in which case the equilibrium is qualified as “separating.” Second, a “pooling” equilibrium outcome might occur in which both types choose the same level of output.

Let $\mu(\theta|q)$ represent the posterior belief function. A perfect Bayesian equilibrium for this game is a domestic firm output level-agency decision pair $(q^*(\cdot), d^*(\cdot)) \in \{q, \bar{q}\} \times \{d, \bar{d}\}$, and the associated posterior beliefs $\mu(\cdot|\cdot)$ such that:

$$q^*(\cdot) \in \text{argmax}_q w(q, d^*(\cdot); \theta) \quad \text{for} \quad \theta \in \{\underline{\theta}, \bar{\theta}\}$$

\textsuperscript{12}As is clear from the payoff structure of the game, the output message is costly for the domestic firm. This makes it a credible message and a signal indeed.

\textsuperscript{13}In this paper we only consider equilibria in pure strategies.
\[
\begin{align*}
\mathcal{d}^* (\cdot) \in \arg \max_{d} \sum_{\theta \in \{\bar{\theta}, \theta\}} U(d; \theta) \mu(\theta | q) \\
\forall q, \text{ if } \exists \theta \text{ s.t. } q^*(\theta) = q, \text{ then } \mu(\theta | q) = \frac{Pr(\theta)}{\sum_{\theta' \mid q^*(\theta')} Pr(\theta')}
\end{align*}
\] (9) (10)

The first two conditions merely require sequential rationality from both players and the third one says that, whenever possible, the agency must revise its prior beliefs according to Bayes’ rule.\(^{14}\) Hence, if the set \{\theta' \mid q^*(\theta') = q\} in (10) is empty, Bayes’ rule cannot be used.

The following proposition characterizes the set of equilibria of the game the extensive form of which is exhibited in Figure 2 below.

\[\text{Figure 2: Extensive form of a signaling game with a benevolent agency}\]

\(^{14}\)The caution “whenever possible” means that this condition can only be applied to information sets on the equilibrium path. Note that the only free variables are off equilibrium path beliefs and are completely arbitrary. We will return to this point when we consider the issue of equilibrium refinement.
Proposition 1 For the signaling game that describes the domestic firm-agency relationship with a benevolent agency, perfect Bayesian equilibria in pure strategies are:

- Pooling on $q$ with $d^*(q) = \bar{d}$ if and only if $p \leq 1/2$, $\mu(\bar{q}|\bar{\theta}) > 1/2$, and $\Delta(\bar{\theta}) < \omega$, where $\Delta(\bar{\theta}) \equiv u(\bar{q};\bar{\theta}) - u(q;\bar{\theta})$.

- Pooling on $\bar{q}$ with $d^*(\bar{q}) = \bar{d}$ if and only if $p \leq 1/2$ and $\mu(\bar{q}|q) > 1/2$.

- Separating with $q^*(\theta) = q$, $q^*(\bar{\theta}) = \bar{q}$, $d^*(\bar{q}) = \bar{d}$ and $d^*(q) = d$ if and only if $\Delta(\theta) \geq \omega$.

Proof 1 In this simple signaling game and with the restriction to equilibria in pure strategies, we just have to look at four cases:

- Pooling on $q$: Suppose that $q^*(\bar{\theta}) = q^*(\bar{\theta}) = q$. By Bayes’ rule, we have $\mu(\bar{q}|q) = p$ and $\mu(\bar{q}|\bar{q}) = 1 - p$. The best response of the agency when it observes $\bar{q}$ is to choose $\bar{d}$ if and only if $pU + (1 - p)\bar{U} \geq pU + (1 - p)\bar{U}$, that is, if and only if $p \leq 1/2$. Hence, we have $d^*(q) = \bar{d}$ if $p \leq 1/2$ and $d$ otherwise. Consider now the behavior of the firm and suppose first that $p > 1/2$. Since $d = d$, the $\bar{\theta}$-firm has an incentive to deviate since $q \notin \text{argmax}_q w(q, d; \bar{\theta})$. Thus, equilibrium behavior requires $p \leq 1/2$. The firm of type $\bar{\theta}$ has then no incentive to deviate whereas the $\theta$-type firm will deviate if $2u(\bar{q}, \theta) > u(q;\bar{\theta}) + u(q;\bar{\theta}) + \omega$, but will not if $\Delta(\theta) < \omega$. Finally, if the agency observes $\bar{q}$, it sets $d = \bar{d}$ if and only if $\mu(\theta|\bar{q}) \leq 1/2$. Hence, if $\mu(\theta|\bar{q}) \leq 1/2$, the $\theta$-type firm has an incentive to deviate since by doing so an antidumping duty that would increase
its payoff \( w(q, d; \theta) \) would be levied on its good. Thus, we must have \( \mu(\theta|\bar{q}) > 1/2 \).

- **Pooling on \( \bar{q} \):** Suppose now that \( q^*(\theta) = q^* (\tilde{\theta}) = \bar{q} \). Applying Bayes' rule yields \( \mu(\theta|\bar{q}) = p \) and \( \mu(\tilde{\theta}|\bar{q}) = 1 - p \). When it observes \( q \), the agency sets \( d = \bar{d} \) if and only if \( p \leq 1/2 \). So, \( d^*(q) = \bar{d} \) if \( p \leq 1/2 \) and \( d \) otherwise. Let us examine the behavior of the firm and first assume that \( p > 1/2 \). Since \( d = \bar{d} \), the \( \tilde{\theta} \)-firm has an incentive to deviate since \( \bar{q} \notin \text{argmax} \, w(q, d; \tilde{\theta}) \). Equilibrium behavior thus requires \( p \leq 1/2 \). The \( \theta \)-type has no incentives to deviate and the \( \tilde{\theta} \)-type will find it worthwhile to deviate if an antidumping duty is levied on its good when it chooses \( q \), which is the case if \( \mu(\theta|q) \leq 1/2 \).

- **Separating with \( q^*(\theta) = q \) and \( q^*(\tilde{\theta}) = \bar{q} \):** By Bayes’ rule, we have \( \mu(\theta|q) = 1 \) and \( \mu(\tilde{\theta}|\bar{q}) = 1 \). Hence, \( d^*(q) = d \) and \( d^*(\bar{q}) = \bar{d} \). Clearly, the firm of type \( \theta \) has an incentive to switch from \( q \) to \( \bar{q} \). Hence, the strategies \( q^*(\theta) = q \) and \( q^*(\tilde{\theta}) = \bar{q} \) are not perfect Bayesian equilibrium strategies.

- **Separating with \( q^*(\theta) = \bar{q} \) and \( q^*(\tilde{\theta}) = q \):** Bayes’ rule implies that \( \mu(\theta|\bar{q}) = 1 \) and \( \mu(\tilde{\theta}|q) = 1 \), and hence \( d^*(q) = \bar{d} \) and \( d^*(\bar{q}) = d \). The \( \tilde{\theta} \)-type firm clearly has no incentive to deviate and the same is true for the \( \theta \)-type if and only if \( u(\bar{q}; \tilde{\theta}) - u(q; \theta) \geq \omega \), i.e., \( \Delta(\theta) \geq \omega \).

\( \square \)

This proposition shows how the high-efficiency firm can manipulate information to its advantage. The (perfect Bayesian) equilibrium strategy of the
efficient type results from a comparison of the imitation cost, $\Delta(\theta)$, with the rent from getting a tax, $\omega$. It will hence manipulate information, i.e., send a noisy quantity signal only if the imitation cost is sufficiently low. This rule clearly applies to the case of pooling on $q$ (low imitation cost) and to the case of separating (too high imitation cost).

Another feature of the results is that a systematic protection of the agency is a necessary condition for the existence of pooling equilibria. Indeed, we see that pooling equilibria exist only if $p \equiv \Pr(\theta) \leq \frac{1}{2}$, which means that the agency believes that the domestic firm is more likely to be an inefficient one, and thus always chooses to protect it. The reason lies in the fact that a pooling strategy by definition implies a sub-optimal choice of the signal variable for at least one type. Hence, in our case, if the agency doesn’t grant protection, the imitator firm doesn’t compensate the effect of its choice of a sub-optimal quantity, making its pooling strategy not profit-maximizing.

Since off-equilibrium path beliefs are completely arbitrary in the definition of equilibrium, equilibria might emerge that are counter intuitive as is arguably the case for the equilibrium with pooling on $\theta$. One way to fill this void is to rule out incredible strategies and beliefs as equilibria by requiring consistency of off equilibrium path believes. To ensure such consistency, we rely on the widely used *intuitive criterion* proposed by Cho and Kreps (1987).

The intuitive refinement criterion requires first to introduce the notion of an *equilibrium-dominated* message. Given a perfect Bayesian equilibrium in

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15For a concise presentation of how to use this criterion, see Gibbons (1992).

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In this signaling game, we will say that the message $q$ is equilibrium-dominated for firm of type $\theta$ if $\theta$’s equilibrium payoff, denoted $w^*(\theta)$, is greater than $\theta$’s highest possible payoff from message $q$, i.e., $w^*(\theta) > \max_d w(q, d; \theta)$. The intuitive criterion says then that if the information set following the message $q$ is off the equilibrium path and $q$ is equilibrium-dominated for type $\theta$, then the agency’s belief $\mu(\theta|q)$ must be zero, that is,

$$\mu(\theta|q) = 0 \text{ if } w^*(\theta) > \max_d w(q, d; \theta) \quad (11)$$

whenever the level of production $q$ is not equilibrium-dominated for both types. We now apply the intuitive criterion to refine our set of equilibria.

**Proposition 2** For the signaling game that describes the domestic firm-agency relationship with a benevolent agency, pure strategies perfect Bayesian equilibria that survive the intuitive criterion are:

- **Pooling on $\bar{q}$** with $d^*(\bar{q}) = \bar{d}$ if and only if $p \leq 1/2$, $\mu(\bar{\theta}|\bar{q}) = 1$, and $\Delta(\theta) \equiv u(\bar{q}; \bar{\theta}) - u(q; \theta) < \omega$.

- **Separating** with $q^*(\bar{\theta}) = \bar{q}$, $q^*(\theta) = q$, $d^*(\bar{q}) = \bar{d}$ and $d^*(\bar{q}) = \bar{d}$ if and only if $\Delta(\theta) \geq \omega$.

**Proof 2** The intuitive criterion imposes a restriction only on beliefs that are based on off equilibrium information sets. Hence, our separating equilibrium clearly satisfies the criterion. In the equilibrium with pooling on $q$, $\bar{q}$ is equilibrium-dominated for type $\bar{\theta}$, since this type gets its maximum utility in the equilibrium and that $\bar{q} \notin \arg\max_q w(q, d; \bar{\theta})$. Hence, the intuitive criterion implies that $\mu(\bar{\theta}|\bar{q}) = 0$. Since we must have $\mu(\theta|\bar{q}) > 1/2$ and there is no
equilibrium-dominated strategy for type $\theta$, pooling on $q$ is not eliminated by setting $\mu(\theta|\bar{q}) = 1$. Consider now the equilibrium with pooling on $\bar{q}$. The type $\theta$ gets its maximum utility in this equilibrium. Since $q \not\in \text{argmax}_q w(q, \bar{d}; \theta)$, $q$ is equilibrium-dominated for type $\theta$. Thus, the intuitive criterion requires that $\mu(\theta|q) = 0$ since $q$ is not equilibrium-dominated for type $\bar{\theta}$. But, this is in contradiction with $\mu(\theta|q) > 1/2$, a condition required for equilibrium to exist. Hence, this equilibrium with pooling on $\bar{q}$ is eliminated. \hfill \Box

The perfect Bayesian equilibrium ruled out by the intuitive criterion is the pooling case on $\bar{q}$. The existence condition of this equilibrium relies on an off-equilibrium path posterior belief $\mu(\theta|q)$ larger than one half (see Proposition 1). Thus, in the case where the agency observes $q$, it chooses not to protect the firm which implies that there is no profitable deviation for both types at $\bar{q}$. This situation doesn’t satisfy the intuitive criterion since, for the efficient type, it is a dominated strategy to deviate to $q$ as this firm gets its maximum payoff at $\bar{q}$. Hence, the pooling equilibrium on $\bar{q}$ is a result driven by the constraint-free off-equilibrium path beliefs allowed for in the definition of the perfect Bayesian equilibrium. Clearly, this situation is not relevant from an economic point of view, especially if the quantity $\bar{q}$ is so large that it cannot be sustained by a low-efficiency firm.\footnote{More generally, in asymmetric-information frameworks, imitation typically makes sense only if it goes for the efficient type to the inefficient one.}

Concerning the two remaining types of equilibrium that survive the intuitive criterion, we see that no (pure-strategy) pooling equilibria can exist if the agency has relatively strong beliefs that the firm is efficient. If, in addition, the imitation cost is less than the rent, then an equilibrium in pure
strategies simply fails to exist. This shows the limit of this simple framework as far as the workings of incentives are concerned since the agency might very well accommodate with only the separating equilibrium. One possible direction that might help to mitigate this incentive problem is to enlarge the strategy space of the firm.

In view of the large institutional/empirical and theoretical literature that highlights the role of political influence in international trade policy (see Grossman and Helpman, 2002 and Hansen and Prusa, 1996, among others), it makes sense for us to explore the effect of incorporating lobbying as a strategic tool into our framework. The next section enriches the model by allowing for the possibility that domestic firms exert political influence on antidumping policy.

4 The domestic firm-agency relationship with lobbying

Building on the model presented in the previous section and following the standard literature on lobbying (see, e.g., Grossman and Helpman, 1994), we now write the agency’s ex post payoff as

$$V(l, d; \theta) \equiv U(d; \theta) + \alpha l$$

(12)

where \(l \geq 0\) represents monetary lobbying contributions by the domestic firm, \(\alpha \leq 1\) is the marginal value to the agency of lobbying, and \(U\) is the agency’s utility defined in (2).\(^\text{17}\) The timing of events of this extended game

\(^\text{17}\)Taking \(\alpha \leq 1\) allows for both transferable utility (\(\alpha = 1\)) and transfer losses (\(\alpha < 1\)).
is as shown in Figure 3 and now includes a lobbying episode in which the domestic firm announces a level of monetary lobbying contribution \( l \) for each possible decision of the agency, then the agency makes its antidumping policy decision \( d \), and finally the firm makes the transfers it has announced.\(^{18}\)

<table>
<thead>
<tr>
<th>Nature draws ( \theta )</th>
<th>Firms discover ( \theta )</th>
<th>Behavior of foreign firm learned</th>
<th>Domestic firm sets output</th>
<th>Agency observes domestic firm output</th>
<th>Domestic firm sets lobbying level</th>
<th>Agency makes decision</th>
</tr>
</thead>
</table>

**Figure 3:** Timing of events with lobbying

The domestic firm’s aggregate payoff is expressed as

\[
\pi(q, l, d; \theta) \equiv w(q, d; \theta) - l
\]

(13)

where the function \( w \) is as defined in equation (7) of the previous section.

We first examine the case with complete information (subsection 4.1) and then introduce incomplete information (subsection 4.2).

### 4.1 The complete information benchmark

In this subsection we consider the benchmark case where the agency has complete knowledge of the domestic firm’s type. Under these circumstances, although the domestic firm has two control variables, namely, output and lobbying contributions, because the agency observes \( \theta \), output does not play any strategic role. The level of output \( q^*(\theta) \) is merely determined optimally

\(^{18}\)We assume that the domestic firm can credibly commit to its lobbying announces.
by the domestic firm and hence, by (4) and (5), is equal to $q$ for a $\bar{\theta}$-firm and to $\bar{q}$ for a $\bar{\theta}$-firm.

Given the multi-stage nature of this complete information game, we adopt the concept of subgame perfect equilibrium which in our context corresponds to a firm lobbying contribution-agency decision pair $(l^*(\cdot), d^*(\cdot)) \in \mathbb{R}_+ \times \{d, \bar{d}\}$ such that:\(^{19}\)

\[
l^*(\cdot) \in \arg\max_l \pi(q^*(\cdot), l, d^*(\cdot); \theta) \quad \text{for } \theta \in \{\bar{\theta}, \bar{\theta}\} \tag{14}
\]

\[
d^*(\cdot) \in \arg\max_d V(l, d; \theta) \tag{15}
\]

The next proposition derives the equilibrium of this game of complete information.

**Proposition 3** The equilibrium outcome that corresponds to the complete information game (allowing for lobbying) between the domestic firm and the agency is described as follows:

- If $\theta = \bar{\theta}$, then $(l^*, d^*) = (0, \bar{d})$ and $q^* = \bar{q}$

- If $\theta = \bar{\theta}$, two situations are possible:

  - The lobbying case: If $\omega \geq l^{ci}$ where $l^{ci} \equiv (\bar{U} - \bar{U})/\alpha$, then $(l^*, d^*) = (l^{ci}, \bar{d})$ and $q^* = \bar{q}$.

\(^{19}\)It is important to note that $l^*$ is fundamentally a *menu of contributions*, that is, $l^* \equiv (l^*(d), l^*(\bar{d}))$. However, it is without loss of generality to consider here menus such that $l^*(\bar{d}) \equiv 0$, since this decision corresponds to the worst case for both firms. Hence, with a slight abuse of notation, we denote $l^*(\bar{d})$ by $l^*$. Finally, it is worth noting that since $l^*$ is a contingent contribution, we can have $l^* > 0$ but without any effective contribution. This is the case if the agency chooses $\bar{d}$. 

20
– The no-lobbying case: If $\omega < l^{ci}$, then $(l^*, d^*) = (\bar{l}, \bar{d})$ for $\bar{l} \in [0, \omega]$ and $q^* = \bar{q}$.

**Proof 3** Consider first the case where $\theta = \bar{\theta}$. Facing this high-cost firm, the agency maximizes its payoff by setting $d^*(l, \bar{\theta}) = \bar{d}$ for any $l \geq 0$. Since lobbying is costly, we obviously have $l^* = 0$ in this case. Let us now turn to the case where $\theta = \theta$. The agency then would choose $d = \bar{d}$ if and only if $U_0 + \alpha l \geq \bar{U}$, that is, if and only if $l \geq l^{ci}$, where $l^{ci}$ is as defined in the proposition. The $\bar{\theta}$-firm would want to induce a decision $\bar{d}$ from the agency if and only the benefit from this decision is larger than the cost of inducing it, namely, if and only if $2u(\bar{q}; \theta) + \omega - l^* \geq 2u(\bar{q}; \bar{\theta})$, that is, if and only if $l^* \leq \omega$. Hence, $l^* = \min\{l^{ci}, \omega\}$. When $\omega < l^{ci}$, any $\bar{l} \in [0, \omega]$ is a best response to the agency since $\bar{d}$ is never chosen in equilibrium.

Clearly, under complete information a low-efficiency firm need not make a lobbying transfer in order to receive protection. In contrast, provided that the rent $\omega$ is sufficiently high, the high-efficiency firm would make a contribution since lobbying is a *sine qua non* condition for it to obtain protection. This lobbying contribution just compensates the cost of implementing an unjustified protection, i.e., makes the participation constraint of the agency binding. Finally, note that the condition for lobbying to take place, $\omega > l^{ci}$, will be more difficult to fulfill the higher the lobbying transaction costs (low $\alpha$).
4.2 The incomplete information case

With lobbying introduced into the model, we now return to the case where the agency has incomplete information and holds prior beliefs on the firm’s type defined by $p$, the probability that the domestic firm is cost efficient, i.e., of type $\theta$. Observe that although lobbying can convey information on the domestic firm’s type, because contributions are made after the output decision and its observation by the agency (see Figure 3), this game is a multi-signal game rather than a multidimensional signaling game. Thus, we assume that the agency updates its beliefs twice and in a sequential manner, namely, once after the output decision by the firm and once after the lobbying decision.\(^{20}\) The key consequence of this assumption is that the quantity choice creates an information externality on the agency’s beliefs by possibly affecting them prior to the lobbying move. This suggests that there exists a strategic link between the output and lobbying choices. Let us give a formal representation of this link.

Let $\mu(\theta|q)$ represent the first posterior beliefs of the agency, i.e., the beliefs updated on the basis of the firm’s output choice $q$, and $\zeta(\theta|\mu(\cdot),l)$ refer to the second posterior beliefs, i.e., the beliefs updated on the basis of the firm’s lobbying choice $l$ and given the first posterior beliefs hold by the agency. An important feature of this structure of beliefs is that while first posterior beliefs are updated versions of prior beliefs, second posterior beliefs are updated versions of first posterior beliefs. Consequently, Bayesian consistency

\(^{20}\)It seems then natural to assume that the agency uses the output information at the time it receives the lobbying offer from the firm.
consists in the two following requirements:

\[ \forall q, \text{ if } \exists \theta \text{ s.t. } q^{**}(\theta) = q, \text{ then } \mu(\theta|q) = \frac{\Pr(\theta)}{\sum_{\{\theta': q^{**}(\theta') = q\}} \Pr(\theta')} \quad (16) \]

and

\[ \forall l, \text{ if } \exists \theta \text{ s.t. } l^{**}(\theta, q) = l, \text{ then } \zeta(\theta|\mu(\cdot), l) = \frac{\mu(\theta|q)}{\sum_{\{\theta': l^{**}(\theta', q) = l\}} \mu(\theta'|q)} \quad (17) \]

Such a consistency thus says that the agency is able to perfectly update its beliefs if at least one of the choices (output or lobbying) made by the two types of firms are different. In contrary, if both choices are similar for the two types, nothing can be inferred by the agency.

Let us now turn to the resolution of this signaling game with double updating. We define a perfect Bayesian equilibrium as an output-lobbying contributions-agency decision triple \((q^{**}(\cdot), l^{**}(\cdot), d^{**}(\cdot))\) defined by

\[ q^{**}(\cdot) \in \arg\max_q \pi(q, l^{**}(\cdot), d^{**}(\cdot); \theta) \text{ for } \theta \in \{\bar{\theta}, \theta\} \quad (18) \]

\[ l^{**}(\cdot) \in \arg\max_l \pi(q, l, d^{**}(\cdot); \theta) \text{ for } \theta \in \{\bar{\theta}, \theta\} \quad (19) \]

\[ d^{**}(\cdot) \in \arg\max_d \sum_{\theta \in \{\bar{\theta}, \theta\}} V(d, l; \theta)\zeta(\theta|\mu(\cdot|q), l) \quad (20) \]

and associated with corresponding first and second posterior beliefs \(\mu(\cdot|q)\) and \(\zeta(\cdot|\mu, l)\) verifying (16) and (17) respectively.

Given that off-equilibrium path beliefs involve arbitrary revisions for first and second posterior beliefs, there clearly is room for multiple equilibria. We therefore restrict our analysis of equilibrium to two focal output strategies,
namely, pooling on $q$ and separating with $q(\bar{\theta}) = \bar{q}$. Besides the fact that these output strategies are interesting per se, recall that they were part of the equilibrium outcomes that characterized the game without lobbying (see Propositions 1 and 2). The analysis will then allow us to examine how the introduction of lobbying affects output strategies in equilibrium. The next proposition considers the case of separation in output strategies.

**Proposition 4** When $q^{**}(\theta) = \bar{q}$ and $q^{**}(\bar{\theta}) = q$, there are two cases according to whether or not lobbying occurs.

- **The case with lobbying:**

  If $l^{ci} \leq \min\{\Delta(\theta), \omega\}$, then $q^{**}(\theta) = \bar{q}$, $q^{**}(\bar{\theta}) = q$, $l^{**}(\theta) = l^{ci}$, $l^{**}(\bar{\theta}) = 0$, $d^{**(q,0)} = \bar{d}$, $d^{**(\bar{q},l^{ci})} = \bar{d}$, associated with beliefs $\mu(\theta | q) = 1$, $\mu(\bar{\theta} | q) = 1$, $\zeta(\theta | \mu(\theta | q), l^{ci}) = 1$ and $\zeta(\bar{\theta} | \mu(\bar{\theta} | q), 0) = 1$, are perfect Bayesian equilibrium strategies.

- **The case without lobbying:**

  If $l^{ci} > \omega$ and $\omega \leq \Delta(\theta)$, then there is no lobbying and the strategies $q^{**}(\theta) = \bar{q}$, $q^{**}(\bar{\theta}) = q$, $d^{**(q,0)} = \bar{d}$, $d^{**(\bar{q},0)} = d$, associated with beliefs $\mu(\theta | \bar{q}) = 1$, $\mu(\bar{\theta} | q) = 1$, $\zeta(\theta | \mu(\theta | q), 0) = 1$ and $\zeta(\bar{\theta} | \mu(\bar{\theta} | q), 0) = 1$ are perfect Bayesian equilibrium strategies.

**Proof 4** Suppose that $q^{**}(\theta) = \bar{q}$, $q^{**}(\bar{\theta}) = q$ and that $l^{**}(\theta) \neq l^{**}(\bar{\theta})$. Bayesian consistency requires that first posterior beliefs must be such that $\mu(\theta | q) = 1$ and $\mu(\bar{\theta} | q) = 1$. Then, second posterior beliefs are given by $\zeta(\theta | \mu(\theta | q), l^{**}(\theta)) = 1$ and $\zeta(\bar{\theta} | \mu(\bar{\theta} | q), l^{**}(\bar{\theta})) = 1$. The agency maximizes its
payoff by setting $d^{**}(q, l) = \bar{d}$ for all $l \geq 0$, and $d^{**}(\bar{q}, l) = \bar{d}$ for all $l \geq l^{ci}$ and $d$ otherwise. The firm of type $\theta$ obtains its maximum payoff by setting $l^{**}(\theta) = 0$ and thus has no incentive to deviate. For the $\bar{\theta}$-type firm, it is profitable to mimic the other type if and only if $2u(\bar{q}; \theta) + \omega - l^{ci} \geq u(q; \theta) + u(\bar{q}; \theta) + \omega$ whenever $\omega \geq l^{ci}$, and if and only if $2u(\bar{q}; \theta) \geq u(q; \theta) + u(\bar{q}; \theta) + \omega$ whenever $\omega \leq l^{ci}$. Hence, when $\omega \geq l^{ci}$, there is no profitable deviation if $l^{ci} \leq \Delta(\theta)$. When $\omega < l^{ci}$, there is no lobbying and the situation can be analyzed as a case without lobbying since second posterior beliefs are “perfect” even if there is pooling on $l$.

By allowing for the possibility of lobbying, we see that optimal quantities can be chosen both in the case where the agency protects the two types of firms and in the case where only the inefficient firm receives a protection. We know from Proposition 1 that when lobbying is not a choice variable for the domestic firm, only the second possibility can be an equilibrium. Now that lobbying is allowed, the domestic firm can use two tools to maximize its profit. Since these two instruments are substitutes for obtaining protection, provided that the rent is sufficiently high, it is the comparison between the imitation cost $\Delta(\theta)$ and the lobbying contribution cost $l^{ci}$ that matters for the efficient firm.

Hence, we obtain two possible situations. First, when the rent is low, the lobbying activity is not profitable and we are back to the separating case without protection for the efficient firm studied in Proposition 1. Second, when the rent is high, lobbying becomes profitable and, most importantly, alleviates the incentive constraint on the quantity choice. In Proposition 1,
we saw that the condition for the existence of a separating equilibrium is that the rent $\omega$ be lower than the imitation cost $\Delta(\theta)$. With lobbying, we see that even if the rent is high, a separating equilibrium can exist since we only need to have $l^{ci} \leq \Delta(\theta)$, i.e., the presence of lobbying takes out the rent from the incentive constraint.

These two effects of lobbying, namely, buying protection and relaxing the incentive constraint, taken together allow a separating equilibrium with protection for both types of firms to emerge. A consequence of the introduction of lobbying is then to relax the constraint on the existence of a separating equilibrium, making information revelation more likely. This result is consistent with the findings of the literature on monetary lobbying under incomplete information. For example, Ball (1995) shows that lobbying can be (social) welfare-enhancing when it is used as a signaling device to the extent that it conveys information that allow government to improve their policies. In our framework, this positive effect corresponds to the increase in the inefficient firm welfare due to the fact that it gets protection at no cost whenever there is information revelation.

We just saw that the additional instrument (lobbying) allows the efficient firm to obtain protection while producing the optimal level of output. We note that the lobbying contribution that yields protection in the separating equilibrium is equal to the contribution of the efficient firm under complete information (see Proposition 3). In the next proposition, we show that the efficient firm can reduce its lobbying contribution by distorting output.

**Proposition 5** When $q^{**}(\theta) = q^{**}(\bar{\theta}) = q$, there are two cases according to
the value of the agency’s prior belief parameter $p$.

- **Case with $p \geq \frac{1}{2}$**

  If $l^{ii} \leq u(\bar{q}; \bar{\theta}) - u(q; \bar{\theta})$ where $l^{ii} \equiv (\bar{U} - U)(1 - 2p)/\alpha$ and $\Delta(\theta) \leq l^{ci} - l^{ii}$, then $q^{**}(\bar{\theta}) = q^{**}(\bar{\theta}) = q$, $l^{**}(\theta) = l^{**}(\theta) = l^{ii}$, $d^{**}(q, l^{ii}) = \bar{d}$, associated with beliefs

$$\mu(\theta | q) = \begin{cases} p & \text{if } q = q \\ 1 & \text{if } q = \bar{q} \end{cases} \quad (21)$$

and

$$\zeta(\theta | \mu(\cdot), l^{ii}) = \begin{cases} p & \text{if } l = l^{ii} \\ 1 & \text{if } l \neq l^{ii} \end{cases} \quad (22)$$

are perfect Bayesian equilibrium strategies.

- **Case with $p < \frac{1}{2}$**

  If $\Delta(\theta) \leq l^{ci}$, the same strategies as in the case with $p \geq \frac{1}{2}$ (see above) but with $l^{**}(\theta) = l^{**}(\bar{\theta}) = 0$, associated with the same beliefs as above but with $l^{ii} = 0$ in (22), constitute perfect Bayesian equilibrium strategies.

**Proof 5** Suppose that $q^{**}(\theta) = q^{**}(\bar{\theta}) = q$ and that $l^{**}(\theta) = l^{**}(\bar{\theta}) = \bar{l}$. Bayesian consistency requires that first posterior beliefs be such that $\mu(\theta | q) = p$ and $\mu(\bar{\theta} | \bar{q}) = 1 - p$. Further, suppose that second posterior beliefs are such that

$$\zeta(\theta | \mu(q), \bar{l}) = \begin{cases} p & \text{if } l = \bar{l} \\ 1 & \text{if } l \neq \bar{l} \end{cases} \quad (23)$$
so that they satisfy Bayes’ rule. The best response function of the agency is then

\[
d^{**}(q, l) = \begin{cases} 
\bar{d} & \text{if } p < 1/2 \text{ and } l = \bar{l} \geq 0 \\
\bar{d}_{ii} & \text{if } p \geq 1/2 \text{ and } l = \bar{l} \text{ and } l = \bar{l} \\
\bar{d} & \text{if } l \neq \bar{l} \text{ and } l = \bar{l} \\
d & \text{otherwise}
\end{cases}
\]  

(24)

where \(l^{ii} = (\bar{U} - U)(1 - 2p)/\alpha\), since, when beliefs are given by \(\Pr(\theta) = p\), the agency is willing to choose \(\bar{d}\) if and only if \(p\bar{U} + (1-p)\bar{U} + \alpha \geq p\bar{U} + (1-p)\bar{U}\).

Clearly there isn’t any profitable deviation in lobbying for the firm since \(\bar{l} < l^{ci}\). Let us see if there is any in output. We first examine the case where \(p < 1/2\), which implies that \(d = \bar{d}\). An optimal lobbying decision is then to set \(\bar{l} = 0\). Furthermore, the \(\bar{\theta}\)-firm has no incentive to deviate since it gets its maximum payoff. As to the \(\theta\)-firm, it prefers \(q\) over \(\bar{q}\) if and only if

\[
2u(q; \theta) + \omega - l(q) \leq u(q; \theta) + u(\bar{q}; \theta) + \omega
\]  

(25)

where \(l(q)\) is the amount of lobbying necessary to induce decision \(\bar{d}\) from the agency when the output choice of \(\theta\) is \(q\). If we assume that

\[
\mu(\theta|q) = \begin{cases} 
p & \text{if } q = \bar{q} \\
1 & \text{if } q = q
\end{cases}
\]  

(26)

then, we must have \(l(q) = l^{ci}\). Hence, there is no profitable deviation if and only if \(\Delta(\theta) \leq l^{ci}\). Consider now the case where \(p \geq 1/2\), which implies that \(d = d\) if there is no lobbying by both types. Given the second posterior belief, \(l = \bar{l} = l^{ii}\) is optimal, provided that lobbying is itself optimal. For the \(\bar{\theta}\)-type, \(l^{ii} \leq \omega\) is the only condition required. For the other type, the following constraint must hold:

\[
u(q; \theta) + u(\bar{q}; \theta) - l^{ii} \geq 2u(q; \theta)
\]  

(27)
Hence, lobbying is optimal provided that \( l^{ii} \leq \min\{u(q; \theta) - u(q; \bar{\theta}); \omega\} \). Concerning the choice of \( q \), we have to insure that firm \( \theta \)'s incentive constraint is satisfied. Hence, the following condition must hold:

\[
2u(q; \bar{\theta}) + \omega - l(q) \leq u(q; \theta) + u(q; \bar{\theta}) + \omega - l^{ii}
\]  

(28)

Given the first and second posterior beliefs, \( l(q) = l^{ci} \), and this condition reduces to \( \Delta(\theta) \leq l^{ci} - l^{ii} \).

This proposition reveals an interesting effect. The existence of the pooling equilibrium (on \( q \)) is not anymore constrained by the value of the prior on \( \theta \) while in Proposition 1 this prior had to be low. The possibility that the agency believes that an efficient firm is more likely doesn’t preclude pooling strategies since both types of firms can now use lobbying to obtain protection (see the case with \( p \geq \frac{1}{2} \) in Proposition 5). An important feature of this equilibrium is the strategic link between output and lobbying strategies. Pooling on \( q \) is possible only if it is accompanied by pooling strategies on lobbying contributions. This is so because with two possible channels of influence, keeping the agency uninformed might indeed be a good “strategy.”

The critical player here is the efficient firm. The reason why it can be interested in a pooling strategy is that, in this case, the uninformed agency cannot eliminate the possibility that the firm is an inefficient one. The main consequence of a pooling output strategy is then to alleviate the participation constraint of the agency in the lobbying game, i.e., to reduce the amount of lobbying necessary to induce a favorable decision. Hence, the trade-off for the high-efficiency firm is between the cost of pooling \( \Delta(\theta) \), i.e., the cost
of imitating the inefficient type, and the cost of deviating to a separating strategy, i.e., a lobbying contribution that is more costly, \( l^{ii} \) instead of \( l^{ii} \).\(^{21}\)

As noted above, this trade-off makes sense only if the inefficient firm is willing to engage in lobbying, i.e., only if \( l^{ii} \leq u(q; \theta) - u(q; \bar{\theta}) \). Indeed, if there is separation on lobbying, the agency can infer which firm it faces and hence change its participation condition in the lobbying game. A low output would then no longer be optimal for the high-efficiency firm since the cost of this output distortion would not be compensated by a lower lobbying contribution. The interdependence between the two instruments (output and lobbying) makes the effect of lobbying more complex and an important consequence of this interdependence is that it can imply a bias towards pooling strategy. Hence, the inefficient firm might be penalized since it gets a protection only if it lobbies as much as the efficient firm.

5 Conclusion

In a model of the domestic firm-agency interaction in antidumping, we have analyzed some implications on equilibrium behavior of the existence of an asymmetric information on the firm’s efficiency, i.e., on whether or not the firm is vulnerable to dumping. When output is used by the firm to signal information to the agency, an incentive issue arises: separating strategies

\(^{21}\)This effect of the informational externality between the two instruments (output and lobbying) is in the spirit of a result obtained by Bennedsen and Feldmann (2003). They propose a model where an interest group can search verifiable information and make lobbying contribution to induce a favorable decision by the politician. When the information search of the group (but not its result) is observable by the politician, they show that the interest group might prefer not to search any information because it might induce an informational externality that increases the level of the lobbying contribution.
correspond to optimal quantity choices but induce that the efficient firm doesn’t receive a protection. Hence, the domestic firm may face contradictory forces because the rent generated by protection gives it an incentive to adopt pooling strategies while the lack of information for the agency implies that protection is granted only if it believes a priori that the firm is likely to be inefficient. Hence, for the case where both the rent from protection as well as the prior on the efficient firm are relatively high, this mono-signal model leads to an impasse.

To circumvent this difficulty, we have introduced lobbying as an additional instrument that the firm can use to influence the antidumping outcome. The efficient firm can now choose an optimal quantity and still get a protection by simply making a lobbying contribution. The incentive constraint is now alleviated since the high-efficiency firm does not face the trade-off between a rent from protection and an optimal quantity choice. Moreover, by inducing information revelation, separating strategies lead to a protection at no cost for the inefficient firm.

The introduction of a second tool to influence the agency’s decision highlights another effect which is due to the existence of asymmetric information. In our model, signaling in quantity and in lobbying occur sequentially so that the output chosen by the firm can possibly modify the agency’s beliefs before lobbying takes place. A consequence of this structure of information transmission is that separating strategies on output make the agency completely informed. In order to reduce the lobbying contribution that induces protection, the efficient firm might then prefer to pool on the output choice. Thus,
introducing lobbying as a signaling device in addition to output yields, “all things equal,” pooling as an equilibrium behavior.\textsuperscript{22}

Further research is needed. Our model doesn’t make the distinction between a direct lobbying assimilated to a collusion between the domestic firm and the agency and an indirect lobbying through the political institutions that oversee the agency. Furthermore, we do not distinguish between lobbying to implement existing laws favorably and lobbying to change the laws in a favorable manner. Disentangling these various aspects of lobbying would probably enhance our understanding of the complex antidumping process. Finally, while this paper has considered the impact of lobbying on the decision of the agency on a given case, it would also be instructive to investigate how it affects the other important outcome of the antidumping process, namely, the withdrawal of a case because a VER agreement has been reached.

\textsuperscript{22}This shows the importance of accounting for both economic and political factors when analyzing the determinants of government policies, an objective that takes a large place in the research agenda of modern political economy.
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