Lobbying for Antidumping

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Abstract: We analyze the interaction between a domestic firm and an international trade agency in charge of administering an antidumping procedure. We introduce asymmetric information about the domestic firm’s efficiency, and let the agency’s decision to grant protection be influenced by the firm’s choices of output and lobbying contributions. We characterize equilibria the properties of which shed some light on the way political and economical factors interplay in antidumping, and perform a comparative statics analysis that highlights some of the benefits of reforming antidumping laws.

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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 (AD) codes that allowed GATT signatories to counter dumping by levying import duties.\(^1\) 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).

The use of antidumping has grown at an impressive rate throughout the world. For instance, over the last two decades, it has more than doubled both in the United States and the European Union. Meanwhile, many countries including South-Africa, Brazil, Mexico, and India have emerged as new intensive users of AD next to more traditional users such as Australia, Canada, the EU, New-Zealand, and the US. One reading of these trends suggests that AD has come to supersede more traditional trade barriers that countries use to protect their national economies, and hence, according to this view, antidumping is nothing other than “protectionism in disguise.”

An alternative view has emphasized the notion of “antidumping privatization” reflecting the fact that private firms may use the AD procedure for their own interest (Hindley and Messerlin, 1996). A growing literature has indeed analyzed the way antidumping procedures affect the strategic behavior of firms and the agencies that administer these procedures. In its major

\(^1\)Under the World Trade Organization, all members have the right to impose AD duties and may report such actions to the organization.
part however, this literature has focused on the strategic interaction between the domestic and foreign firms, hence, among other things, providing a theory of how firms reach an agreement before the final decision of the regulatory agency (see, e.g., Prusa, 1992 and Zanardi, 2004). One 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 an AD duty or an agreed-upon price.\(^2\)

On a more empirical front, a strand of this “strategic” AD literature has stressed the political economy aspect of antidumping. Following the work of Finger et al. (1982) and drawing on the theories of capture and congressional dominance, 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 main message that comes out of this empirical literature is that both economic and political factors are needed to explain AD outcomes. The analysis conducted in this paper sheds some light on the way these factors interact.

The role of interest groups in the shaping of public policy has attracted the interest of economists and political scientists for so long. For our purpose, we need to mention Anderson (1994) and Moore and Suranovic (1992) who examine lobbying in antidumping under a framework that abstracts from information problems. Accounting for information incompleteness, Rosendorff (1996) introduces the role of domestic politics in the choice of antidumping versus VER policies, but the influence of firms is not endogenized. Closer to

\(^2\)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).
our approach, although not concerned with antidumping, Ball (1995) analyzes monetary lobbying under asymmetric information. Along these lines, Bennedsen and Feldman (2003) introduce information search as an additional instrument of political influence. In this paper, we assume that the domestic firm uses lobbying as a monetary instrument of direct influence of the AD decision in addition to using an economic signal for obtaining a favorable decision. Our modeling framework therefore allows us to uncover some important aspects of the interaction between economic and political factors in antidumping.

We develop a model of the relationship between a (domestic) firm and a government agency in which the firm seeks protection from the agency. The agency is willing to grant protection if the firm is inefficient.\(^3\) This approach is motivated by the fact that, in antidumping, there are known economic-based prerequisites for obtaining protection.\(^4\) Because domestic firms can strategically fulfill these conditions for being protected, it is likely that the set of economic conditions that are necessary to obtain protection is not sufficient. Rather, the agency in charge of administering the protection system can more fundamentally try to discriminate between efficient and inefficient domestic firms.\(^5\)

The firm’s efficiency type is unobservable to the agency but the firm’s

\(^3\)We use the term “efficient firm” with some caution. In antidumping, it is the domestic firms that initiate procedures. Hence, if the firm is very efficient, the strategy of getting protection may not be optimal for the firms, either because it wants to maintain its reputation or because it is too costly to mimic an inefficient firm. Thus, when we use the term “efficient firm,” we mean that the firm is efficient among those that find it optimal to initiate a procedure.

\(^4\)In antidumping, it is necessary to have been “materially injured” by foreign firms, that is, it is expected to observe a significant decrease in sales or in employment, or possibly the shut down of plants. Protection is conditional on observing some “bad” economic signals.

\(^5\)The idea is simply that bad economic conditions should be a result of foreign competition, not of a deliberate (strategic) choice.
output is and hence can be used as a signal. We then extend this standard signaling game by allowing the firm to influence the agency by offering contingent contributions that compensate the agency from granting protection when it believes the firm efficient.\(^6\)

Our main result states that an efficient firm may pool on the economic variable even when the agency’s prior belief does not justify protection, as both types of firms will induce protection via contributions. By pooling and keeping the agency uninformed of its type, the efficient firm reduces the amount of compensation necessary to induce protection as the agency places positive probability on the firm being inefficient. Lobbying may facilitate pooling and thus reduces the information level of the agency, a conclusion in contrast with the view that lobbying contributions can act as a signaling device (Ball, 1995).

There also exists a case in which the firm divulges more information with lobbying than without, thus confirming the “classic result.” The type of equilibria that prevails mainly depends on the cost for the efficient firm to imitate the inefficient firm. Since this cost is related to how stringent the legislation on antidumping is, we get the conclusion that the more stringent the legislation, the less likely pooling takes place in equilibrium, which has positive welfare effects.

The paper is organized as follows. The next section presents the basic theoretical ingredients that we put together to model the domestic firm-agency relationship. In section 3, we characterize equilibrium outcomes of the game without lobbying. In section 4, we extend the model by introducing lobbying. In section 5, we discuss some possible extensions and perform some compara-

\(^6\)To model monetary lobbying, we use the standard model of contingent contributions (Grossman & Helpman, 2001). The interpretation is either a direct collusion with the agency or an indirect lobbying through politicians assuming that they can in turn influence the agency.
tive statics analysis that turns out to be informative for the role of legislative reforms in antidumping. We conclude the paper by summarizing our results and giving some directions for future research.

2 The basic theoretical setting

2.1 Preliminaries

We consider a domestic firm that faces a potentially damaging foreign competition but may seek protection from an international trade agency. We examine the process of protection granting by the agency and analyze some of the strategies through which the domestic firm can influence this process. In order to focus on the domestic firm-agency relationship, we leave aside strategic considerations by foreign firms (cf. Introduction).

The domestic firm is of one of two types. Let \( \theta \in \{ \underline{\theta}, \bar{\theta} \} \subset \mathbb{R}_+ \), \( \underline{\theta} < \overline{\theta} \), be a parameter that designates the type of this firm. Within our framework, it is useful to think of this parameter as representing the domestic firm’s marginal cost. A \( \bar{\theta} \)-type firm is of a relatively low efficiency (high marginal cost) and is thus vulnerable to foreign competition. In contrast, a \( \underline{\theta} \)-type firm is of a relatively higher efficiency (lower marginal cost) and is thus less likely to be vulnerable to competition. Hereafter, when discussing market interactions, we will suppose that foreign competition is just a function of the cost parameter.

We assume that the main objective of the agency is to counter the economic effect of foreign competition if the domestic firm is considered as being vulnerable.\(^7\) More formally, let the binary variable \( d \in \{ \underline{d}, \bar{d} \} \) represent the decision of the agency on a given case, with \( d = \bar{d} \) if the agency decides to levy

\(^7\)Alternatively, one can also say that foreign firms behave more aggressively when they face high-cost domestic firms.
a tax on the foreign firms good and \( d = d \) otherwise. We fix the task of the agency of being to achieve

\[
d = \begin{cases} 
    d & \text{if } \theta = \bar{\theta} \\
    \bar{d} & \text{if } \theta = \bar{\theta} 
\end{cases}
\]  

We see at least two factors that might prevent this ideal situation from occurring. First, available information on the domestic firm’s cost is inherently incomplete and hence the agency might make both Type I and Type II errors. 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. We incorporate both of these factors into the basic model and analyze the (equilibrium) behavior of the domestic firm and the agency. To fully understand the effect of lobbying, we consider asymmetric information first under the assumption that the agency’s decision cannot be influenced through monetary transfers.

### 2.2 The domestic firm-agency relationship without lobbying

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 by

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

where \(\underline{U} < \bar{U}\). This specification of the agency’s utility function is consistent with the idea that the goal of the agency is to protect the firm if and only if it is vulnerable to foreign competition.

In order to achieve its task, the agency would like to screen demands of protection directly with respect to the cost of the domestic firm, \(\theta\). However,
the agency has not access to this information. It only knows that $\theta$ belongs to the set $\{\bar{\theta}, \underline{\theta}\}$ and that, a priori, $\Pr(\theta = \bar{\theta}) = p$. To fill its informational gap, the agency uses variables that controls the domestic firm to infer its level of cost. We suppose that the agency only uses a single economic variable that hereafter is taken to be output.\(^8\) The output level chosen by the domestic firm, $q$, is observed by the agency prior to making its decision $d$. Figure 1 summarizes the timing of this game.

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. More specifically, ignoring discounting, this aggregate payoff is

$$w(q, d; \theta) = u(q; \theta) + v(d; \theta) \quad (3)$$

The domestic firm’s first-stage payoff $u(q; \theta)$ may correspond to the profit it makes in the output game against foreign competition.\(^9\) 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 the domestic firm chooses output $q \in \{q, \overline{q}\}$, with $q < \overline{q}$, and that the low (high) output maximizes the low- (high-) efficiency firm’s

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\(^8\)One can also thinks, more generally, as any economic variable that the domestic firm controls and that enters in the agency criteria when it evaluates the right for the firm to be protected. For instance, this variable could represent labor which may be more appropriate in the case of Europe.

\(^9\)Recall that we consider the foreign firms behavior as a function of the cost parameter.
first-period payoff:

\[ u(q; \theta) > u(q'; \theta) \quad (4) \]

\[ u(q'; \theta) > u(q; \theta) \quad (5) \]

The domestic firm’s second-stage payoff function is assumed to take on the following values:

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

(6)

where \( \omega > 0 \). Let us say a few words on this component payoff function’s defining properties.

First, an efficient firm \( \theta \) that receives a (negative) decision \( d \) from the agency gets a payoff \( v(d; \theta) \) which is assumed to be the “normal” level that a domestic firm would achieve in the quantity game, namely, \( u(q; \theta) \). Second, assuming that the agency’s tax is designed to just compensate the vulnerability state of the domestic firm, an inefficient domestic firm \( \theta \) that receives a (positive) decision \( d \) gets a payoff \( v(d; \theta) \) equal to that 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 an efficient firm \( \theta \), this firm enjoys a rent \( \omega \) on the top of the normal level \( v(d; \theta) \) it should get. Finally, when the agency doesn’t protect an inefficient firm \( \theta \), this firm obtains the level of payoff \( u(q; \theta) \).

Let’s now analyze the game. Given that the agency observes the firm’s output level prior to making its decision, it can infer the firm’s type from this...
observation. Clearly then, the domestic firm may use output as a (strategic) signal of its type. Hence, the analysis of the firm-agency relationship as modeled so far can be cast within a framework of a signaling game. Figure 2 exhibits the extensive form of this game.\footnote{As is clear from the payoff structure of this game, the output message is costly for the domestic firm and hence is a credible message, and a signal indeed.}

Following standard practices (see, e.g., Fudenberg and Tirole, 1991), we adopt the concept of perfect Bayesian equilibrium (PBE). PBE in pure strategies for this game consist of a pair of firm output and agency decision functions $q^*(\cdot)$ and $d^*(\cdot)$ defined, respectively, from $\{q, \bar{q}\}$ to $\{q, \bar{q}\}$ and from $\{q, \bar{q}\}$ to $\{d, \bar{d}\}$, associated with a posterior probability measure $\mu(\theta|q)$.

Equilibrium conditions first require sequential rationality of both the firm and the agency and, second, the agency’s posterior beliefs must conform with Bayes’ rule whenever possible. Since off-equilibrium path beliefs are unrestricted, equilibria might emerge that are not consistent on a economic point of view. We use the intuitive criterion (Cho and Kreps, 1987) to avoid this problem. The following proposition characterizes the set of intuitive PBE in...
Proposition 1: Intuitive PBE (in pure strategies) are as follows:

- **Separating**: \( q^*(\theta) = q, \ d^*(q) = \overline{d} \), with beliefs \( \mu(\theta|q) = \mu(\theta|\overline{q}) = 1, \) if and only if \( \Delta(\theta) \geq \omega \), where \( \Delta(\theta) \equiv u(q;\theta) - u(q;\overline{\theta}) \).

- **Pooling**: \( q^*(\theta) = q^*(\overline{\theta}) = q, \ d^*(q) = \overline{d} \), with beliefs \( \mu(\theta|q) = p \) and \( \mu(\theta|\overline{q}) = 1, \) if and only if \( \Delta(\theta) < \omega \) and \( p \leq 1/2 \).

Proposition 1 shows how a high-efficiency domestic firm can manipulate information to its advantage. Examine the behavior of such a firm across the two equilibria. This firm weighs the cost of (output-) imitating the less efficient firm \( \Delta(\theta) \) against the rent from getting protection \( \omega \). In the separating equilibrium, the imitation cost is high relative to the rent and the firm decides to behave truthfully. In the pooling equilibrium, the imitation cost is relatively low and the firm chooses to misrepresent its type by sending a noisy output signal \( q \).

However, since granting protection to an efficient firm is costly for the agency, the imitation cost is only part of the story. In fact, pooling “blurs the picture” for the agency and forces it to rely on a priori information to make its decision. In this case, since the agency believes that the domestic firm is likely to be of a low-efficiency type \( p \equiv \Pr(\theta) \leq 1/2 \), it decides to protect it.

While Proposition 1 offers some useful equilibrium existence results, its implications show some of the limits of this simple model. In particular, we see that no pure-strategy pooling equilibrium exists if the agency has relatively strong prior beliefs that the firm is efficient \( p > 1/2 \). If, in addition, the efficient firm’s imitation cost is less than the rent \( \Delta(\theta) < \omega \), then an

\[\text{12}\text{The proof is in the appendix.}\]

\[\text{13}\text{In fact, it can be argued that it should generally be the case that } p > 1/2.\]
equilibrium in pure strategies simply fails to exist. One way to circumvent this problem is to enlarge the strategy space of the firm.\textsuperscript{14}

In view of the large institutional/empirical and theoretical literature on political influence in international trade policy (see, e.g., Grossman and Helpman, 1994 and Hansen and Prusa, 1996), it makes sense for us to explore the effect of incorporating lobbying as an additional firm’s strategic tool into our framework. Extending our basic model in this direction allows us to explore the relationship between economic and political factors in administered protection.

3 The Case with Lobbying

Building on the model presented in the previous section, we now introduce lobbying and write the agency’s payoff as

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

where \( l \geq 0 \) represents a monetary lobbying contribution by the domestic firm, \( \alpha \leq 1 \) is the agency’s marginal value of lobbying, and \( U \) is the agency’s utility defined in (2).\textsuperscript{15} The domestic firm’s payoff is given by

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

where the function \( w \) is as defined in (3).

The domestic firm now simultaneously chooses a level of output \( q \) and a menu of lobbying contributions before the agency takes its decision. A menu

\textsuperscript{14}Beyond the fact that, as mentioned, we restrain our investigation of equilibrium to pure-strategy equilibria, our approach can also be justified on the ground of our objective to explore the political economy of administered protection.

\textsuperscript{15}Taking \( \alpha \leq 1 \) allows for both transferable utility (\( \alpha = 1 \)) and transfer losses (\( \alpha < 1 \)). This specification follows the standard literature on lobbying (see, e.g., Grossman and Helpman, 2002).
of contributions is a contribution promise conditional on each decision the agency can take.\textsuperscript{16} Hence, it is a take-it-or-leave-it proposal \((l(d, \theta), l(d, \theta))\), where \(l(d, \theta) \in \mathbb{R}_+\) is the amount of lobbying the domestic firm of type \(\theta\) will give to the agency if it chooses the decision \(d\). We denote by \(\mathcal{C}(\theta)\) the lobbying proposal (contract) of the type \(\theta\).

It is easy to see that for all possible equilibria, \(\mathcal{C}(\theta)\) is such that \(l(\theta, d) = 0\) for all \(\theta \in \{\underline{\theta}, \bar{\theta}\}\). Therefore, with an abuse of notation, we will specify a contract \(\mathcal{C}(\theta)\) only by \(\mathcal{C}(\theta) = (l(d, \theta))\).

### 3.1 Lobbying as a signaling device

With the possibility of lobbying, the domestic firm is no more constrained by the choice between protection and output distortion (Proposition 1). Indeed, lobbying can now buy protection. Suppose that this is the strategy followed. Then, as a result, the efficient firm chooses to not to distort its output and propose to the agency a sufficient level of contribution to induce protection. In turn, this implies that the inefficient firm can separate from the efficient firm by choosing a low level of output.

Choosing not to distort its output amounts for the efficient firm to reveal its type to the agency. Let’s denote by \(l^{ci}\) the minimal level of lobbying the firm has to give in order to compensate the agency from granting protection when it believes (with probability 1) the firm efficient. Clearly, such a minimal level of successful lobbying under complete information, \(l^{ci}\), is such that \(V(l^{ci}, d; \theta) - V(0, d; \theta) = 0\), where \(V\) is as defined in (7). This gives us

\[
l^{ci} = \frac{1}{\alpha}(\bar{U} - \underline{U}) \tag{9}\]

If this contribution of lobbying \(l^{ci}\) remains lower than the cost of imitating the inefficient firm in output, the efficient firm doesn’t have any incentives to

\textsuperscript{16}We make the standard assumption that the firm is able to commit to its announcement.
deviate. As a result, the agency is completely informed by either the choice of output or the level of lobbying contribution.

Our previous conclusion is true only if protection for the efficient firm is sufficiently interesting. The cost of getting it, \( l^{ci} \), should thus be compared with the rent from protection, \( \omega \). When the rent from protection is low, the lobbying activity is not profitable and we are back to the separating case without protection encountered in Proposition 1. The next proposition states the conditions under which a separating equilibrium exists.

**Proposition 2:** A separating equilibrium with \( q(\theta) = \overline{q} \) and \( q(\overline{\theta}) = \underline{q} \) exists if \( l^{ci} \leq \min\{\omega, \Delta(\theta)\} \) or if \( \omega < \min\{l^{ci}, \Delta(\theta)\} \). In the former, the \( \theta \)-type proposes a lobbying contribution \( l^{ci} \) so that both types receive protection. In the latter, there is no lobbying and protection is granted only to the inefficient type.

**Proof.** Since strategies are separating, the agency is under complete information. Thus, it is willing to offer a protection to the efficient type iff \( l(d, \theta) \geq l^{ci} \). The efficient type will lobby iff \( \omega \geq l^{ci} \). Furthermore, it doesn’t want to mimic the inefficient type iff doing so is more costly, that is, iff \( l^{ci} \leq \Delta(\theta) \). Finally, it is clear that there is no incentives to deviate for the inefficient type. Gathering the conditions leads to a separating equilibrium with lobbying iff \( l^{ci} \leq \min\{\omega, \Delta(\theta)\} \). When \( l^{ci} > \omega \), the efficient type doesn’t want to lobby the agency. Then, \( q(\theta) = \overline{q} \) and \( q(\overline{\theta}) = \underline{q} \) can be an equilibrium with no lobbying if and only if the efficient type doesn’t want to pool on the output level, that is, iff \( \omega < \Delta(\theta) \). This gives an equilibrium without lobbying iff \( \omega < \min\{l^{ci}, \Delta(\theta)\} \). \( \square \)

We see that, provided that the rent from protection is sufficiently high, it is the comparison between the output imitation cost, \( \Delta(\theta) \), and the lobbying contribution cost, \( l^{ci} \), that matters for the more efficient firm. When the rent
is high, lobbying becomes attractive and most importantly it 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 may exist since what needs only to be checked is that $l^{ci} \leq \Delta(\theta)$. Hence, in addition to allowing the firm to “buy” protection, the presence of lobbying takes out the rent from the incentive constraint on output choice, and hence relaxes it.

These two effects of lobbying taken together allow a separating equilibrium with protection of both types of firms to emerge. An important consequence of the introduction of lobbying is then to lessen the constraints needed for 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 is reflected in the increase of the less efficient firm’s welfare due to the fact that this firm gets protected with no lobbying cost whenever there is information revelation.

3.2 Lobbying and the informational trade-off

We just saw that the additional instrument (lobbying) allows the more efficient firm to obtain protection without the need to distort output. We however observe that the lobbying contribution that yields protection in the separating equilibrium is equal to the contribution that this firm would make under complete information. This result raises some doubts on the likelihood of this equilibrium. It is quite reasonable to think that the agency (politicians) is
reluctant to grant protection if it really knows that the firm doesn’t deserve it. However, one can easily imagine that lobbying is able to alleviate some doubts about the relevance of a protection granting. Signaling its type simply might be too costly in terms of lobbying.

The reason why the efficient firm may be interested in a pooling strategy is that, in this case, the uninformed agency cannot rule out the possibility that the firm is of the less efficient type. 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 an agency’s decision that is favorable to the more efficient firm.\footnote{This information cross-effect between the output and lobbying instruments is in the spirit of an effect discussed by Bennedsen and Feldmann (2003). They propose a model where interest groups influence political actors’ decisions through the provision of verifiable information and lobbying contributions. They show that a lobby might find it worthwhile to abandon information provision because this might induce an information externality that leads to an increase of the lobbying cost.}

Let’s denote by $l^{ii}$ the cost of lobbying when the agency has to rely on its a priori belief to take its decision (which is the case if both firms pool on output and lobbying). Then the agency is willing to protect the firm if and only if the contribution is larger than or equal to\footnote{Note that, when $p < 1/2$, the agency is willing to grant protection without lobbying, i.e., with $l(\cdot, \tilde{d}) = 0.$}

$$ l^{ii} = \max \left\{ 0, \frac{1}{\alpha}(2p - 1)(U - \bar{U}) \right\} $$

Hence, the relevant comparison for the efficient firm is that of the cost of pooling on output and lobbying, $\Delta(\vec{y}) + l^{ii}$, with the cost of deviating to a separating strategy that saves $\Delta(\vec{y})$ but brings with it a lobbying cost $l^{ci}$.

Note also that this comparison makes sense only if the less efficient firm is willing to engage in lobbying which, as can easily be checked, is true if

\[
\begin{align*}
\Delta(\bar{y}) + l^{ii} &\geq 0 \\
\Rightarrow \Delta(\bar{y}) &\geq \max \left\{ 0, (2p - 1)\bar{U} \right\}
\end{align*}
\]
Indeed, if there is lobbying separation, the agency becomes completely informed and this changes its participation constraint in the lobbying game. A low output would then no longer be optimal for the more efficient firm since the cost of this output distortion would not be compensated by a lower lobbying contribution.

**Proposition 3:** There exists a pooling equilibrium in which both types of firm chooses output \( q \) and lobbying \( l^{ii} \) if \( l^{ii} \leq \min\{u(\overline{\theta}|-\overline{q}, \theta) - u(\overline{\theta}|\overline{q}), \omega\} \) and \( \Delta(\overline{\theta}) + l^{ii} \leq \min\{l^{ci}, \omega\} \).

*Proof.* First, the inefficient firm should be willing to lobby the agency, which is the case iff \( l^{ii} \leq u(\overline{\theta}|-\overline{q}, \theta) - u(\overline{\theta}|\overline{q}) \). Second, the same has to be true concerning the efficient type, leading to the condition \( l^{ii} + \Delta(\overline{\theta}) \leq \omega \). Consider now the incentive’s constraints. For the efficient type, it could deviate to the output's level \( \overline{q} \). But then, assuming that \( \mu(\overline{\theta}|\overline{q}, \cdot) = 1 \), the lobbying contribution conditional on \( \overline{d} \) has to be larger than or equal to \( l^{ci} \). This amounts to say that we must have \( l^{ii} + \Delta(\overline{\theta}) \leq l^{ci} \). The inefficient firm has no incentives to change its output’s level when \( \mu(\overline{\theta}|\overline{q}, \cdot) = 1 \). Finally, let’s consider a deviation in the lobbying choice. It can be profitable if \( l(\cdot, \overline{d}) < l^{ii} \). But, in this case, both types of firms want to announce this lobbying contribution so that, by construction of \( l^{ii} \), we have \( l(\cdot, \overline{d}) \geq l^{ii} \), a contradiction.

This proposition reveals an interesting effect. The possibility that the agency believes that a given firm is most likely to be of the more efficient type doesn’t preclude pooling strategies since both types of firms can lobby to obtain protection. But, there is a strong link between output and lobbying decisions. Pooling on the lower output level \( \overline{q} \) is possible only if it is accompanied by pooling strategies on lobbying contributions. This is so because with two channels of influence, keeping the agency uninformed might indeed be beneficial for the efficient firm.
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 strategies. At this point, it might be interesting to interpret $q$ as any economic signal that enters in the agency considerations for granting protection. What the last proposition suggests is then that domestic firms will use economic instruments to create doubts about their relative efficiency. This strategy allows in turn to decrease the cost of lobbying. Like this, some plants closing or some cuts in the level of employment can be interpreted as being part of a global strategy to receive protection. Their role is to “blur the picture” while lobbying finishes to turn down the authority’s remaining doubts about the relevance of granting protection.

4 Discussion and Extensions

4.1 The effect of lobbying

We saw in the last section that the introduction of lobbying can either have a signaling effect or, on the contrary, implies less information revelation. One important point is that each case cannot happen simultaneously. Rather, the three equilibria we have underlined are mutually exclusive. Under a reasonable restriction of the equilibrium analysis, it even makes sense to talk about the effect of lobbying.

Providing that lobbying is beneficial (lobbying occurs), the only two possible pure strategy equilibria that are reasonable from an economic point of view (such that the inefficient type doesn’t choose the high level of output) cannot

19Recall that a separating equilibrium with and without lobbying can exist as well as a pooling equilibrium with lobbying.
coexist. More precisely, there is no value of the imitation cost $\Delta(\theta) \in \mathbb{R}_+$ such that both a separating equilibrium with $q(\theta) = \overline{q}$ and $q(\theta) = q$ and a pooling on $q$ exist. Indeed, the last two propositions state that the separating equilibrium (with lobbying) exists if $\Delta(\theta) \geq l^i$ and the pooling equilibrium exists if $\Delta(\theta) + l^{ii} \leq l^i$, that is, if $\Delta(\theta) \leq 2(1 - p)l^i$. It now remains to see what happens when $\Delta(\theta) \in (l^i - l^{ii}, l^i)$. For this purpose, we need to introduce the possibility of mixed strategies.

Proposition 4: Assume that $\omega \geq l^i$ and $u(q; \theta) - u(q; \overline{\theta}) \geq l^m$, where

$$l^m := \max \left\{ 0, \frac{p\beta - (1 - p)}{p\beta + 1 - p} l^i \right\}$$

Then, there exists an equilibrium in which the efficient type plays the strategy $(q, l^m)$ with probability $\beta$ and $(\overline{q}, l^i)$ with probability $(1 - \beta)$, and the inefficient type plays the strategy $(q, l^m)$ with probability $1$, where

$$\beta = \begin{cases} 
0 & \text{if } \Delta(\theta) > l^i \\
\in [0, 1] & \text{if } \Delta(\theta) = l^i \text{ and } p \leq 1/2 \\
\in [0, (1 - p)/p] & \text{if } \Delta(\theta) = l^i \text{ and } p > 1/2 \\
\min \left\{ 1, \frac{1-p}{p} \left( 2 \frac{l^i}{\Delta(\theta)} - 1 \right) \right\} & \text{otherwise} 
\end{cases}$$

Furthermore, if $l^i < \Delta(\theta)$, where $\Delta(\theta) := u(q, \theta) - u(q, \overline{\theta})$, this equilibrium is unique.

Proof. See the appendix. \(\square\)

This proposition gives us a complete picture of what happens at the equilibrium. First, provided that $\Delta(\theta) > l^i$, we get the pure separating equilibrium (the case with $\beta = 0$). Second, it is easily seen from the expression of $\beta$ that the pure pooling equilibrium (the case with $\beta = 1$) occurs either when $p \leq 1/2$ or when $\Delta(\theta) < l^i - l^{ii}$ (these two conditions are not mutually exclusive). In this case, note that $l^m = l^{ii}$ as it should be. Finally, when $l^i - l^{ii} < \Delta(\theta) < l^i$
and $p > 1/2$, we have a strict mixed equilibrium (thus with $0 < \beta < 1$) with lobbying $0 < l^m < l^c$.

The best way to see what happens is through a graphical analysis. Recall first that the pooling level of lobbying, $l^{ii}$, is given by $\max\{0, (2p - 1)l^c\}$, and is thus a function of $p$. Define then the function $\varphi : [0, 1] \to \mathbb{R}_+$ by $\varphi(p) := l^c - l^{ii}(p)$, i.e., $\varphi(p)$ is the value of $\Delta(\theta) \in \mathbb{R}_+$ that satisfies $\Delta(\theta) + l^{ii}(p) = l^c$.

Fix now a given value of $p$, say $\tilde{p}$. By definition we have $\varphi(\tilde{p}) + l^{ii}(\tilde{p}) = l^c$. Thus, for all value of $\Delta(\theta)$ such that $\Delta(\theta) \in [0, \varphi(\tilde{p})]$, the inequality $\Delta(\theta) + l^{ii}(\tilde{p}) \leq l^c$ holds, i.e., for this prior we have a pooling equilibrium. When $\Delta(\theta) > l^c$, we get the separating equilibrium and, when $\Delta(\theta) \in (\varphi(\tilde{p}), l^c)$, it is the mixed equilibrium that prevails (see Figure 3).

Hence, for a given pair $(\Delta(\theta), \tilde{p}) \in \mathbb{R}_+ \times [0, 1]$, it is possible to associate a unique type of equilibria. The main element that comes out from this exercise is that pooling occurring with a strictly positive probability prevails for a large set of parameters values. Thus, we are inclined to conclude that introducing lobbying is likely to imply a bias towards pooling strategies. Because of the “rent seeking” nature of lobbying and the social cost of output distortion, the bias towards pooling strategies may be welfare deteriorating. We now connect this result to the role of the antidumping legislation.
4.2 Lobbying and the antidumping legislation

In a general model, we would like to have an endogenous antidumping legislation. Without trying to do that — this is is beyond the scope of this paper — one can still exploit the idea that the legislation, for being consistent, cannot imply all the possible values for our parameters. In particular, we think it makes sense to assume that there is a positive correlation between the imitation cost and the agency’s prior. Let’s be more specific.

Suppose that the (administered) trade legislation can be characterized by a one-dimensional parameter $\Psi \in \mathcal{I}_\Psi = [\underline{\Psi}, \overline{\Psi}]$, $\Psi < \overline{\Psi}$, that represents its more or less stringent nature. Assume further that a legislation of type $\Psi'$ is strictly more stringent than one of type $\Psi''$ if and only if $\Psi' > \Psi''$. This parameter $\Psi$ may imply for example the level of marginal cost above which a firm is a priori considered by the agency to be of a less efficient type and hence potentially entitled to receive protection. Hence, the closer $\Psi$ is from its lower bound $\underline{\Psi}$, the more light-handed the intervention of the agency.

If this cutoff value of the marginal cost is a increasing function of $\Psi$, clearly a higher level of $\Psi$ makes it, all things equal, harder for a firm to credibly pretend that it needs protection from the agency. Accordingly, it makes sense to assume that the more stringent the trade legislation, the higher the imitation cost, or more formally that $\Delta(\theta)$ is increasing in $\Psi$.

Under this same interpretation of $\Psi$ and assuming that the agency “estimates” its prior $p$ from frequency data on a fixed-size sample of representative firms, one can further assume that, all things equal, the more stringent the legislation, the higher the probability that a given firm is a priori taken to be of the higher efficiency type $\theta$ by the agency.

The most important implication of this little model of the antidumping legislation is that it shrinks the values that we must consider in the parameters
space. Given our assumptions, most notably that both the imitation cost and the prior are increasing in $\Psi$, the relevant area in the parameter space may look like something like an ellipse (see figure 4). The ellipse form comes from the fact that we allow that an increase in $\Psi$ (strictly) increases only one parameter. The most interesting conclusion concerns the effect of reforming the antidumping legislation.

Let us denote the pooling equilibrium with lobbying $P_l$, the mixed equilibrium with lobbying, $M_l$, the separating equilibrium with lobbying, $S_l$, and the separating equilibrium without lobbying, $S_{nl}$. In this the set of possible equilibria, $\mathcal{E}(\Psi) \equiv \{P_l(\Psi), M_l(\Psi), S_l(\Psi), S_{nl}(\Psi)\}$, let $A_{\Psi} \in \mathcal{E}(\Psi)$, $\Psi \in \mathcal{I}_\Psi$, designate the actual equilibrium under the legislation $\Psi$. Figure 5 describes the mapping $\Psi \rightarrow A_{\Psi}$ that results from Propositions 1 and 4; it is supposed that $l^{ci} < \omega$, thus $\{\Psi : A_{\Psi} = S_{nl}\} = \emptyset$.

Assume that the feasible equilibrium types are ordered according to the level of “social welfare” achieved as $S_{nl} \succeq_W S_l \succeq_W M_l \succeq_W P_l$, where for any two equilibria $E_1$ and $E_2$, $E_1 \succeq_W E_2$ means that a move from $E_2$ to $E_1$ weakly increases social welfare.\(^{20}\) Given these social preferences over the set

\(^{20}\)The underlying reason for this ordering lies in the “rent seeking” nature of lobbying under an equilibrium outcome of a $S_l$ or a $P_l$ type and the social cost that output distortion
of feasible equilibrium outcomes, the next proposition basically says that a reform towards a harsher trade legislation is socially desirable:

**Proposition 5:** Assume that the imitation cost $\Delta(\theta)$ is increasing in $\Psi$ as well as in the agency’s prior $p$. Then, for any two administered trade legislation types $\Psi_1, \Psi_2 \in \mathcal{I}_\Psi$ such that $\Psi_1 < \Psi_2$, we have $A_{\Psi_2} \succeq_W A_{\Psi_1}$.

*Proof.* The proposition directly follows from propositions 1 and 4, and the assumptions we made about the effect of increasing $\Psi$. \hfill $\square$

Reforming antidumping laws so as to make them more severe has a double negative effect on the likely occurrence of the pooling equilibrium with lobbying. In fact, since both $\Delta(\theta)$ (as assumed) and $l^i$ are increasing in $\Psi$ ($l^i$ is increasing in $p$), such a reform would increase the likelihood of the conditions characterizing the pooling equilibrium with lobbying being violated. A more stringent procedure (a higher $\Psi$) increases the cost of the more efficient firm imitating the less efficient firm in output, and hence should make the former reluctant to implement output pooling. This is a direct effect of the reform via the firm’s choice of output. There also exists an indirect effect of the reform imposes under an equilibrium of type $P_l$. 

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**Figure 5:** An unique type of equilibria is associated to a given policy.
via its positive impact on the agency’s prior $p$ that renders protection for the firm more costly in terms of lobbying when there is some pooling in output.\footnote{Following an increase in $\Psi$, a given firm is more likely to be considered of the more efficient type, and so it is as if the agency revised its prior belief $p$ upward. Because pooling in output is not informative for the agency, the latter has an incentive to trade protection for a larger amount of lobbying money. Note that this effect on lobbying can be substantial as can be checked from the sensitivity to the prior $p$ of the ratio of the lobbying under asymmetric information to that under complete information, $l^{ii}/l^{ci} (= 2p - 1)$.}

This proposition shows the benefits of an active reform that tightens the antidumping legislation. More precisely, it says that such a reform can never lead to a move from a separating equilibrium to a pooling equilibrium. Moreover, for a reform that erects sufficiently high barriers to firms’ output misrepresentation, through a higher marginal cost threshold, say, a move from the pooling equilibrium to the separating equilibrium leading to welfare enhancement is possible. Provided that the trade legislation is sufficiently stringent, the argument can even be further stretched. Indeed, any policy that pushes up the level of lobbying under complete information, $l^{ci}$, i.e., that renders the fulfilling of the agency’s participation constraint more difficult, should be seen as highly beneficial since it gives the separating equilibrium without lobbying at all the highest likelihood of occurrence.\footnote{A policy that decreases the agency’s marginal value of lobbying, $\alpha$, would certainly achieve such a result.}

4.3 Robustness of the results

One potential limit concerning the results we’ve obtained is their robustness with respect to the set of output choice, in particular, the result we underlined that adding the possibility of lobbying can induce a situation of pooling on output. One could argue that this result follows from the fact the inefficient firm cannot choose a sufficiently low level of output in order to separate from
the efficient firm, especially because doing so would be less costly for this type.

To capture the argument developed above, suppose first that \( q \in \{ \underline{q}, \bar{q}, \underline{\bar{q}} \} \), where \( \underline{q} < q < \bar{q} \). Second, assume that \( q \) is still the best choice for the inefficient firm, i.e., \( q = \arg\max u(q; \theta) \), but that the choice of \( q \) always allows the inefficient firm to separate from the efficient one.\(^{23}\) Denote now by \( \Delta(\theta) \) the cost for the inefficient firm to produce \( q \) instead of \( \underline{q} \).

Suppose now that it is optimal for the efficient firm to choose \( q \) with a positive probability \( \beta \in (0,1] \). For the inefficient type, the basic choice is between the allocation \((q, l^m)\) and the allocation \((\underline{q}, 0)\). In both cases, the inefficient will receive protection but in the latter this protection costs \( \Delta(\theta) \) while in the former it costs \( l^m \). We then see that all our previous results remain valid provided that

\[
l^m \leq \Delta(\theta) \quad (12)
\]

when \( \Delta(\theta) \leq l^{ci} \), i.e., the inefficient firm must prefer the allocation \((q, l^m)\) to \((\underline{q}, 0)\) whenever the high type wants to choose \((q, l^m)\) with a positive probability \( \beta \). Note that a sufficient condition for expression (12) to hold is \( l^{ii} \leq \Delta(\theta) \) since \( \max_\beta l^m = l^{ii} \).

Let’s now analyze the constraint \( l^{ii} \leq \Delta(\theta) \). Since \( l^{ii} \) is an increasing function of \( p \), it is basically a condition on the prior: we must have \( p \leq \bar{p} \), where \( l^{ii}(\bar{p}) := \Delta(\theta) \). The condition \( p \leq \bar{p} \) is really intuitive: if the agency considers, a priori, that the likelihood to face an inefficient firm is not too low, then it is willing to accept protection in exchange of a low lobbying contribution.

Two cases must thus be considered: the case with a low prior and the case with a high one. If the prior \( \bar{p} \) is not too high, then it must be the case that \( l^m < \Delta(\theta) \) since \( l^{ii}(\bar{p}) < \Delta(\theta) \). Thus nothing changes and our results continue

\(^{23}\)Assume, for instance, that it is always too costly for the efficient firm to produce \( \underline{q} \).
to hold. When, on the contrary, the prior is high, for instance it is such that $l^{ii} > \Delta(\theta)$, a pure pooling equilibrium is no more possible. However, it this doesn’t imply the separating equilibrium. Instead, a semi-pooling equilibrium (on $q$) is likely to hold. here is why.

When the prior is relatively high, the imitation cost for the efficient firm is also relatively high. That is, we are in the case where the trade legislation is relatively tough (cf. Figure 4). Hence, assuming a high prior also means that $\Delta(\theta) \in (l^{ci} - l^{ii}, l^{ci})$. But, under these conditions, the efficient firm prefers to chooses $q$ only with a probability less than one. This makes the lobbying contribution now associated to $q$, i.e. $l^m$, strictly less than $l^{ii}$. What we want to underline here is that $l^m$ is decreased by the behavior of the efficient firm when the prior could have make it high. Thus, while we get $l^{ii} > \Delta(\theta)$ when the prior is high, having $l^m > \Delta(\theta)$ is really less likely because of the efficient firm behavior. This make us conclude that our results are relatively robust to a larger economic signal space.

5 Conclusion

In a model of the domestic firm-agency interaction in bureaucratic trade policies, we have analyzed some implications of asymmetric information about the firm’s efficiency on equilibrium behavior. When output only is used by the firm to signal its type to the agency, an incentive issue arises: separating strategies correspond to optimal quantity choices but induce that the firm of the more efficient type doesn’t receive 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 agency’s lack of information implies that it grants protection to the firm only if it believes a priori that the firm is likely to be of the less efficient type. Hence, for the case where both the
rent from protection and the prior on the efficient type are sufficiently high, this basic 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 agency’s decision. The more efficient firm can now afford not to distort output and still get a protection by making a lobbying contribution. This firm’s incentive constraint is alleviated since it does not face the tradeoff between rent from protection and cost of output distortion. Moreover, by inducing information revelation, separating strategies lead to protection at no lobbying cost for the less efficient 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, separating strategies on output make the agency completely informed. In order to reduce the lobbying contribution that induces protection, the more efficient firm may then prefer to pool on the output choice. Thus, introducing lobbying as an instrument of influence in addition to output tends to favor, *all things equal*, pooling as an equilibrium behavior, provided that the more efficient firm does not incur too high a cost when it goes on to imitate the less efficient firm in output.

The emergence of this pooling equilibrium outcome fundamentally rests on two assumptions. First, the imitation cost has to be relatively low. Second, the agency’s prior, i.e., its belief that a given firm is not in need of protection, although allowed to be greater than one-half, has to be sufficiently remote from one.\footnote{Indeed, a too high prior would lead to a level of lobbying cost under incomplete information close to that under complete information.} In our framework, these characteristics taken together correspond to a loose antidumping legislation.

Unfortunately, many scholars of antidumping have underlined how antidumping legislations generally lack of precision. The mere notion of material
injury, the decisive criterion in many antidumping cases, is relatively fuzzy in the American as well as in the European legislation. This is particularly problematic if we understand this absence of precise criteria as implying a relatively low imitation cost. A reform that strengthens the necessary conditions for the implementation of an antidumping might thus increase social welfare.

Further research is warranted. First, 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. Second, there clearly is a need to introduce within the framework of our model a distinction between lobbying to implement existing laws favorably and lobbying to change the laws in a favorable manner. Disentangling these various aspects of lobbying would certainly enhance our understanding. Last but not least, given the growth of antidumping cases and the availability of data on those cases, empirically testing some of the important implications of the analysis in this paper seems particularly promising.
Appendix

Proposition 1 (Proof). We start by characterizing the best response of the agency when the posterior beliefs are given.25

Claim 1: Given an output choice \( q \) by the domestic firm, \( d^*(q) = \overline{d} \) if \( \mu(\theta|q) \geq 1/2 \) and \( d^*(q) = \underline{d} \) if \( \mu(\theta|q) < 1/2 \).

Proof. The result comes from the fact that the agency maximizes its payoff by choosing \( \underline{d} \) if and only if \( \mu(\theta|q) \underline{U} + [1 - \mu(\theta|q)] \overline{U} \geq \mu(\theta|q) \overline{U} + [1 - \mu(\theta|q)] \underline{U} \), that is, if and only if \( \mu(\theta|q) \leq 1/2 \), i.e., \( \mu(\theta|q) \geq 1/2 \). \( \square \)

We now examine the four possible pure-strategy equilibrium candidates.

Claim 2: The separating case with \( q^*(\theta) = q \) and \( q^*(\overline{\theta}) = \overline{q} \), \( d^*(q) = \overline{d} \) and \( d^*(\overline{q}) = \underline{d} \), with beliefs \( \mu(\theta|\overline{q}) = 1 \) and \( \mu(\overline{\theta}|q) = 1 \), constitutes a PBE if and only if \( \Delta(\theta) \geq \omega \).

Proof. Bayes’ rule implies that \( \mu(\theta|\overline{q}) = 1 \) and \( \mu(\overline{\theta}|q) = 1 \) and the agency chooses \( d^*(q) = \overline{d} \) and \( d^*(\overline{q}) = \underline{d} \) by Claim 1. The \( \overline{\theta} \)-type firm clearly has no incentive to deviate and the same is true for the \( \theta \)-type if and only if \( u(\overline{q}, \theta) - u(q, \theta) \geq \omega \), i.e., \( \Delta(\theta) \geq \omega \). \( \square \)

Claim 3: The separating case with \( q^*(\theta) = \overline{q} \) and \( q^*(\overline{\theta}) = q \) is not a PBE.

Proof. Bayes’ rule implies that \( \mu(\theta|q) = 1 \) and \( \mu(\overline{\theta}|\overline{q}) = 1 \). Hence, \( d^*(q) = \underline{d} \) and \( d^*(\overline{q}) = \overline{d} \) by Claim 1. Then, clearly, the firm of type \( \theta \) has an incentive to switch from \( q \) to \( \overline{q} \). \( \square \)

Claim 4: The pooling case with \( q^*(\theta) = q^*(\overline{\theta}) = q \), and \( d^*(q) = \overline{d} \), with beliefs \( \mu(\theta|q) = p \), constitutes a PBE if and only if \( p \leq 1/2 \), \( \omega < \Delta(\theta) \), and \( \mu(\theta|\overline{q}) > 1/2 \).

\( ^{25} \)We assume that the agency protects the firm when it is indifferent between protection and no protection.
Proof. Bayes’ rule implies that \( \mu(\theta|q) = p \). By Claim 1, the best response of the agency is \( \overline{d} \) if and only if \( p \leq 1/2 \) and \( d \) otherwise. Now, consider the behavior of the firm and suppose first that \( p > 1/2 \). Then, since \( d^*(q) = d \), the \( \theta \)-firm should deviate as \( 2u(q; \overline{\theta}) > u(q; \theta) + u(q; \theta) \) (see (5)). Thus, we require \( p \leq 1/2 \). If the off-equilibrium beliefs are such that \( \mu(\theta|q) \leq 1/2 \), then \( d^*(q) = \overline{d} \) (by Claim 1) and this firm won’t have an incentive to deviate iff \( u(q; \theta) + u(q; \theta) + \omega > 2u(q; \theta) + \omega \), a contradiction to (5). Now, assume then \( \mu(\theta|q) > 1/2 \). By Claim 1, \( d^*(q) = d \), and the \( \theta \)-firm won’t deviate iff \( u(q; \theta) + u(q; \theta) + \omega > 2u(q; \theta) \), i.e., \( \Delta(\theta) < \omega \). Finally, concerning the \( \overline{\theta} \)-firm, when \( p \leq 1/2 \), \( d^*(q) = \overline{d} \) (by Claim 1) and (4) imply that a deviation from \( q \) to \( \overline{q} \) is detrimental. \( \square \)

Claim 5: The pooling case with \( q^*(\theta) = q^*(\overline{\theta}) = q \), and \( d^*(q) = \overline{d} \), with beliefs \( \mu(\theta|q) = p \), constitutes a PBE if and only if \( p \leq 1/2 \), \( 2u(q; \overline{\theta}) < u(q; \theta) + u(q; \theta) \), and \( \mu(\theta|q) < 1/2 \).

Proof. Bayes’ rule yields \( \mu(\theta|q) = p \). The agency then sets \( d^*(q) = \overline{d} \) if and only if \( p \leq 1/2 \) and \( d^*(q) = d \) otherwise. Assume first that \( p > 1/2 \). Since \( d^*(q) = d \), the \( \overline{\theta} \)-firm clearly has an incentive to deviate since \( u(q; \theta) + u(q; \theta) < 2u(q; \theta) \) (see (4)). Equilibrium behavior thus requires \( p \leq 1/2 \) which we assume. If \( \mu(\theta|q) \geq 1/2 \), then \( d^*(q) = \overline{d} \) by Claim 1, and this firm won’t have an incentive to deviate iff \( u(q; \theta) + u(q; \theta) > u(q; \theta) + u(q; \theta) \), a contradiction to (4). Hence, assume that \( \mu(\theta|q) < 1/2 \), in which case, by Claim 1, \( d^*(q) = d \). Then the \( \overline{\theta} \)-firm won’t deviate iff \( 2u(q; \overline{\theta}) < u(q; \theta) + u(q; \theta) \). As to the \( \theta \)-firm, when \( p \leq 1/2 \), \( d^*(q) = \overline{d} \) (by Claim 1) and (5) imply that a deviation from \( q \) to \( \overline{q} \) is not beneficial. \( \square \)

Claim 6: Among the three PBE, only the following two satisfy the Intuitive Criterion:

- The separating case with \( q^*(\theta) = q \) and \( q^*(\overline{\theta}) = \overline{q} \), \( d^*(\theta) = \overline{d} \) and \( d^*(\overline{\theta}) = \overline{d} \).
\( d \), with beliefs \( \mu(\theta|\overline{q}) = 1 \) and \( \mu(\overline{\theta}|q) = 1 \), constitutes an Intuitive PBE if and only if \( \Delta(\theta) \geq \omega \).

- The pooling case with \( q^*(\theta) = q^*(\overline{\theta}) = \overline{q} \), and \( d^*(q) = \overline{d} \), with beliefs \( \mu(\theta|q) = p \), constitutes an Intuitive PBE if and only if \( p \leq 1/2 \), \( \omega < \Delta(\theta) \), and \( \mu(\theta|\overline{q}) = 1 \).

**Proof.** 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 \( q \), \( \overline{q} \) is equilibrium-dominated for the type \( \overline{\theta} \) firm, since its equilibrium utility \( w^*(\theta) \equiv w(q, d; \overline{\theta}) > \max_d w(\overline{q}, d, \overline{\theta}) \). Hence, the intuitive criterion implies that \( \mu(\overline{\theta}|\overline{q}) = 0 \). Since we must have \( \mu(\overline{\theta}|\overline{q}) > 1/2 \) and there is no equilibrium-dominated strategy for type \( \overline{\theta} \), pooling on \( \overline{q} \) is not eliminated by setting \( \mu(\overline{\theta}|\overline{q}) = 1 \). Consider now the equilibrium with pooling on \( \overline{q} \). In this equilibrium, \( q \) is equilibrium-dominated for the type \( \theta \) firm, since this firm’s equilibrium utility \( w^*(\theta) \equiv w(\overline{q}, d, \theta) > \max_d w(q, d, \theta) \). Thus, the intuitive criterion requires that \( \mu(\theta|q) = 0 \) since \( q \) is not equilibrium-dominated for type \( \theta \). But, this is in contradiction with \( \mu(\theta|q) > 1/2 \), a condition required for equilibrium to exist. Hence, the intuitive criterion rules out this equilibrium with pooling on \( \overline{q} \).

**Proposition 4 (Proof).** Given the domestic firm strategy, the agency revises its beliefs such that \( \mu(\theta|\overline{q}, \mathcal{C}(\overline{\theta})) = 1 \) for all \( \mathcal{C}(\overline{\theta}) \), and

\[
\mu(\theta|q, \mathcal{C}(\theta)) = \frac{p^\beta}{p^\beta + 1 - p}, \quad \text{if } \mathcal{C}(\theta) = \mathcal{C}(\overline{\theta})
\]

If the agency observes \((\overline{q}, l^{ci})\), it prefers to choose \( \overline{d} \) by construction of \( l^{ci} \) (since \( \mu(\overline{\theta}|\overline{q}, \mathcal{C}(\overline{\theta})) = 1 \)). Suppose now that the agency observes \((q, l^m)\). The agency
prefers $\overline{d}$ even without lobbying each time it considers that the probability it faces a type $\overline{\theta}$ is greater than the probability it faces a type $\overline{\theta}$. This gives $\overline{d}$ whenever $\beta p \leq 1 - p$, and this is true for all $l^m \in \mathbb{R}_+$. Thus, $l^m = 0$ if $\beta \leq (1 - p)/p$. Suppose now that $\beta \geq (1 - p)/p$. The agency is willing to choose $\overline{d}$ if

$$\alpha l(\overline{d}, \cdot) \geq [\mu(\theta|q, l(\overline{d}, \cdot)) - \mu(\overline{\theta}|q, l(\overline{d}, \cdot))] (U - \overline{U})$$

which gives

$$l \geq l^m := \frac{1}{\alpha} \frac{p\beta + p - 1}{p\beta + 1 - p} (U - \overline{U}) = \frac{p\beta - (1 - p)}{p\beta + 1 - p} l^{ci}$$

Hence, if the agency observes $(q, l^m)$, it chooses $\overline{d}$ providing that

$$l^m := \max \left\{ 0, \frac{p\beta - (1 - p)}{p\beta + 1 - p} l^{ci} \right\}$$

Let's then consider the domestic firm of type $\theta$. Its payoff when it chooses $(\overline{q}, l^{ci})$ is given by $2u(q; \overline{\theta}) + \omega - l^{ci}$. When it chooses $(q, l^m)$, its payoff is $u(q; \overline{\theta}) + u(\overline{q}; \overline{\theta}) + \omega - \max\{0, l^m\}$. This means that the cost of obtaining a protection is given by $l^{ci}$ in the first case and by $\Delta(\theta) + \max\{0, l^m\}$ in the second case. It is then clear that $\beta = 0$ whenever $l^{ci} < \Delta(\theta)$ (type $\overline{\theta}$ cannot be indifferent between the two pure strategies since $l^m \geq 0$). Suppose then that $\Delta(\overline{\theta}) = l^{ci}$. Type $\theta$ is indifferent only if $l^m = 0$, and this is the case when $\beta \leq (1 - p)/p$. Note then that this expression is always true whenever $p \leq 1/2$. Hence, we have $\beta \in [0, 1]$ if $\Delta(\overline{\theta}) = l^{ci}$ and $p \leq 1/2$. When $p > 1/2$, we have $(1 - p)/p < 1$ and thus we must have $\beta \in [0, (1 - p)/p]$ for the type $\overline{\theta}$ to be indifferent, i.e., to have $l^m = 0$. Suppose now that $\Delta(\overline{\theta}) < l^{ci}$. Then, the indifference condition $\Delta(\theta) + \max\{0, l^m\} = l^{ci}$ imposes that $l^m > 0$, and thus, using the expression of $l^m$, we can rewrite the indifference condition as

$$\Delta(\overline{\theta}) = \frac{2(1 - p)}{p\beta + 1 - p} l^{ci}$$
Solving for \( \beta \) yields
\[
\beta = \frac{1 - p}{p} \left( 2 \frac{l^{ci}}{\Delta(\theta)} - 1 \right)
\]
Since we are assuming that \( \Delta(\theta) < l^{ci} \), and we remarked that \( (1 - p)/p > 1 \) when \( p < 1/2 \), \( \beta \) is well-defined only if we impose
\[
\beta = \min \left\{ 1, \frac{1 - p}{p} \left( 2 \frac{l^{ci}}{\Delta(\theta)} - 1 \right) \right\}
\]
It remains to consider a possible deviation in lobbying when \( \beta = 1 \). It is profitable if we have \( l(\cdot, \theta) < l^{\text{ii}} \). But, in this case, both types of firms want to offer this contribution so that \( l(\cdot, \theta) \) must be larger or equal to \( l^{\text{ii}} \) (by construction of \( l^{\text{ii}} \)), a contradiction. Let’s finally prove the uniqueness’ result. It comes from the construction of the equilibrium if we are able to eliminate the possibility that the inefficient firm chooses \( q \). By deviating to \( q \), a protection costs at least \( \Delta(\theta) \). By choosing \( q \), a protection costs at most \( l^{ci} \). Thus, the assumption \( l^{ci} < \Delta(\theta) \) is sufficient to deter the possibility that the inefficient firm chooses the level of output \( q \). \( \square \)
References


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