Eliciting Information from Interested Parties in Merger Control

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Abstract

This article investigates how antitrust agencies should structure the disclosing of information about efficiency gains from interested parties (merging firms, and competitors) in merger control. We analyze the particular case of a horizontal merger with danger of foreclosure, where welfare can decrease either due to insufficient efficiency gains (efficiency defense) or due to excessive efficiency gains if the competitor exits (efficiency offense). The first result is that evidence from competitors is not required unless the ex-ante market shares of the merging firms exceed a threshold. Second, we support the role of advocacy of the parties. The burden of proof for the efficiency defense should rest on the insiders (merging firms) whereas the burden of proof for the efficiency offense should rest on outsiders (competitors). Finally, it is optimal to make insiders report first and outsiders second and any communication among parties has to be prohibited.

Keywords: Competition Policy, Merger Control, Efficiency Gains, Asymmetry of Information.

1   Introduction

Information plays a crucial role in the implementation of antitrust policy. The qualification of an action as anticompetitive usually depends on information that is known by a firm or a group of them, but it is not available to the Competition Authority (CA). The reduction in price of the incumbent in response to entry can be the natural accommodation to a new more competitive scenario but also can correspond to an outright predatory strategy. A merger can be motivated by the synergies of combining assets of two firms or it may correspond to an attempt to reduce the intensity of competition in the industry. In the first example, the price is predatory if it is below some measure of the incumbent supplying cost[1]. In the second example, the merger is anticompetitive if the synergies are not enough to offset the increase in market power. To decide correctly, the CA needs to extract the critical information primarily from firms that have some interest in influencing the verdict of the antitrust agency. This includes not only the firms undertaking the action but also third parties like competitors, entrants, suppliers or customers that are affected by the potentially anticompetitive action. The challenge for Competition Authorities then, is to elicit from involved parties the relevant information that they have. However the incentives to provide evidence and the congruence between the interests of affected parties and society has to be carefully analyzed at the moment of implementing a decision rule based in the evidence disclosed by the firms with some stake in the case[2].

In order to analyze the above described problem we considered a case of horizontal merger with danger of foreclosure, where the asymmetry of information parameter is the level of efficiency gains (EG) that is attained by the merger. In our scenario, the market is very concentrated (only three firms) and the technology of supply requires high fixed costs to stay active in the market. The competitive concern is twofold. First if there is not enough EG, the ex-post price will increase due to the reduction in the number of participants and second if EG are very big, it will cause the exit of the remaining competitor, leading also to higher prices ex-post (we select the parameters in order to reproduce a welfare decreasing exit). This scenario gives way to multiple mimicking behavior -in terms of information disclosure- from both the merging firms and competitors. When EG are low, firms will pretend that they are higher,

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[1] In the U.S. jurisdiction, for instance, courts have relied mostly in the *Areeda-Turner* rule to decide about predation cases. Under that standard, a price is considered as predatory if it is below the average variable cost of producing the good.

[2] See Rey (2000) for an extension of this argument.

when EG induce exit, merging firms will try to convince the regulator that they are lower. Competitors, whenever EG are high, will push for blocking the merger even if they do not exit, and they will strategically keep silent when the problem is about insufficient EG because they free ride in the merger of the two other firms.

In our model, parties can manipulate the evidence at cost, creating an intermediate regime between the extreme cases of soft and hard information. The CA has limited instruments to elicit the truth: the admissible evidence and the decision about the merger (approve or reject). The results obtained allow us to provide robust answers to the following questions: (1) Which party has the burden of proof for each of the two possible anticompetitive effects of the merger, (2) What is the optimal order of disclosure between parties (3) Whether ex-ante communication among parties is desirable.

If CA had perfect information, it would only approve mergers whose level of EG are between two thresholds: the efficiency defense and the efficiency offense [3]. Under asymmetry of information, the CA has to apply a stricter standard of proof on EG in order to overcome the manipulation problem. Thus, if CA counts only on insiders as a source of information, it has to move inwards the both above defined thresholds, and the perfect screening would be achieved. However, if the range of admissible evidence, in terms of EG is too narrow, the "asymmetric information thresholds" may conflict between them. To better understand this situation, suppose that a merger can be cleared if cost savings are at least of 5 %, but given the possibility of manipulation, the CA asks for a 7 %. At the same time if EG are over 9 %, the remaining competitor is not able to survive in the market. If merging firms show evidence on EG above 7%, although the efficiency defense test will be satisfied, the merger will raise concern about the opposite problem: the efficiency offense. This conflict between screening each anticompetitive effect, is what we name the "double trap" of efficiency gains. Firms approving one test, are real candidates to fail the other test.

In this situation, we show that the best policy is to reduce the range of admissible evidence to the minimum. However, the CA cannot achieve the perfect two-sided screening and some undesirable mergers will be approved. In our model, having an imperfect screening depends on the

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[3]The "Efficiency Defense" principle is known as the positive consideration by antitrust authorities of synergies and cost savings of a merger that attenuate the otherwise negative effect of increased concentration in the market. By the contrary, the "Efficiency Offense" principle is the negative consideration of efficiency gains when they lead to the exit of the competitor and this exit reduces welfare.

ex-ante market shares of the merging firms. When these market shares are higher, the admissible range of EG where the merger should be approved is narrower, relationship that is satisfied by most of the oligopoly models where market shares depend on marginal cost. Thus, a high concentration in the market exacerbates the problem of asymmetry of information between CA and firms, which can explain why antitrust agencies are reluctant to consider evidence in cases of mergers on markets already highly concentrated and rather adopt a per se decision.

The results are ameliorated if CA employs a report from outsiders to check the evidence submitted by insiders. Perfect screening is achieved if the burden of proof is allocated in a way where insiders have only to satisfy the efficiency defense threshold and outsiders have to prove that the merger leads to its exit. With two informed agents, CA can move upwards the admissible threshold of evidence for efficiency defense without risking to attract very efficient types, since those will be blocked by an outsiders counter-report. The risk that outsiders overstate the EG can be controlled, as in the case of insiders, by demanding a high standard of proof for a claim of foreclosure. Notice that if we switch the burden of proof between informed parties, we do not obtain the same result. Although insiders collaborate whenever they have the evidence, the same does not apply to outsiders. If the latter has evidence that is useful to clarify the efficiency defense case, they will not submit it. Any truthful report from outsiders would lead to a decision that goes against them. If EG are below the minimum level, the merger should be rejected, which is not in the interest of outsiders. On the contrary, if EG are above that threshold, the merger should be approved, but that would hurt outsiders because the price would go down. An omission from outsiders has no informative power for the CA and contrary to the case of insiders, the agency has no way to induce outsiders to show the evidence[4].

This specialization result is the main contribution of the article and it provides a solid rationale for allocating the burden of proof of anticompetitive actions among interested parties. Although the merging firm may become dominant, we prefer it to prove that EG are above the efficiency defense threshold. Instead, it is better to employ outsiders to prove that the merger would lead to a monopoly. Using only insiders to reject both anticompetitive dangers, provides inferior results because perfect screening is not feasible when the evidence is subject to manip-

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[4]The Competition Authority can credibly induce insiders to show the evidence by rejecting the merger if there is no collaboration. The same rule cannot be applied for outsiders, because CA does not know what is the worst scenario or punishment to apply to outsiders in case of no submission of evidence.

ulation. The specialization in the burden of proof hinges in the coincidence of interest between parties and CA for each of the two potential anticompetitive dangers of the merger. When the merger satisfies the efficiency defense threshold, both consumers and insiders are better off with the merger. If the merger is above the efficiency offense threshold, consumers and outsiders are better off if the merger is blocked.

We further allow for different degree of reliability of outsiders by assuming that there is a strictly positive probability that they are not informed. We find that the uncertainty about whether outsiders are capable of presenting a credible counter-report acts as a deterrence against excessive manipulation of evidence from insiders. This result has some interesting and not always intuitive implications for the design of the disclosure policy. About the timing of the disclosure of evidence, it is optimal to make insiders report before outsiders do. If outsiders move first, and they do not have the evidence, insiders know that they will not face a counter-report and they will be more willing to conceal the evidence if EG is above the efficiency offense threshold. On the contrary, if insiders go first, they take into account the risk of having counter-evidence. which induce them to behave more conservative in under-playing the EG. In this disclosure game, there is a second move advantage for the insiders that does not plays in favour of the CA. This deterrence effect of the uncertainty explains also why is not desirable to allow communication among parties. Although it is ex-post efficient, because it avoids parties spending resources in disclosing without modifying the CA decision, ex-ante it is inefficient because makes insiders informed about what outsiders can present. The general rule is that CA has to avoid making public what outsiders know and by consequence, the admissible evidence required from insiders has to be independent of that contingency. This result makes a case against transparency, an attribute usually deemed as desirable in antitrust disclosure proceedings.

The situation that we want to represent is well illustrated by two cases of mergers presented before the European Commission. In General Electric (GE) - Honeywell, a merger of complementary goods, the Commission blocked the deal based on the fact that competitors (supplying only single components) would not be able to properly match a bundle of engines and avionics offered by the new firm[5]. The Commission considered that this commercial disadvantage would put the viability of rivals severely at risk. Merging parties contested that claim, trying to explain

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[5]General Electric/Honeywell, Case COMP/M.2220 (2001). Although this merger has no relevant horizontal overlaps and is rather a merger of complementary goods, the discussion about whether EG should play in favour or against the case is representative of the situation we wish to characterize.

that bundling would not be the preferred strategy of the new firm[6]. In Aerospatiale-Alenia/de Haviland[7] (a merger between manufacturers of small and medium size aircraft) the synergies arising from combining the production of aircraft of different sizes plus the advantages of standardization and commercialization vis a vis competitors by offering the full range of products to airlines also raised fears in the Commission about the exit of the two other competitors. These two examples belong to industries that, given their technological nature have strong economies of scale, sunk costs are relevant and entry is not commonly observed. Consequently, the concentration in these markets is high, which gives grounds to the concern of antitrust authorities for the prospect of exit of one of the participants. From the point of view of the evidence disclosure strategy of involved parties, rivals played an active role in trying to prove that the merger would lead to a scenario of a dominant firm with negative consequences for themselves and consumers in the long run[8]. Insiders made efforts to understate the technical and commercial efficiencies from the merger and paradoxically, some otherwise welcome effects from the deal such as buyers discounts, cost savings in maintenance and standardization were turned against the insiders' cause.

Relationship with the Literature. The horizontal foreclosure effect that stems from the merger for high values of EG builds on similar foundations of many well known contributions in the literature of Industrial Organization such as the entry preemption model by Dixit (1980), tying by Whinston[9] (1990) and bundling by Nalebuff (1999). All these models have in common that one firm ex-ante takes a strategic action in order to compete more aggressively ex-post. If the rival stays in the market the result is welcomed since price will diminish, but if fixed cost are significant, the strategy may induce the exit of the competitor and the outcome may be negative in terms of higher prices. In general, the above models are a representation of the 'top dog' strategy described by

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[6]This argument is extended in Patterson and Shapiro (2001). Interestingly, they mention the fact that the main buyers of aircraft components -Airbus and Boeing- did not oppose the merger. The decision of the European Commission on the GE-Honeywell merger has generated a big discussion among antitrust scholars and practitioners about the desirability of applying the Efficiency Offense doctrine. Padilla (2002) proposes a set of conditions to be satisfied in order to apply the doctrine. Evans and Salinger (2002), using a decision theoretical approach, set out the risk of abuse and confusion on antitrust if the doctrine is employed.

[7]Aerospatiale/Alenia/De Haviland. Case No IV/M.53 (1991)

[8]This active role was played by British Aerospace and Fokker in the Aerospatiale-Alenia merger and by Rolls Royce and United Technologies in the GE-honeywell case.

[9]Whinston (1990) has been the most influential paper of the post-chicago era to theoretically support the per se illegality of tying in the U.S..

Fudenberg and Tirole (1984) where firms over-invest in cost reduction in order to credibly drive out competitors from the market, and that strategy applies whether firms compete with prices or quantities. Here, since the EG are exogenous and merging is always profitable, foreclosure is not the primary purpose of insiders, although it increases the benefits from merging whenever it happens.

The article is also related to the literature on disclosure and information transmission when parties are asymmetrically informed. In the cheap talk models, like the seminal paper of Crawford and Sobel (1984) and its extensions in the lobbying literature[10], the allocation of the burden of proof is consistent with the convergence of interests between informed parties and the society. What is distinctive in our setting, and that draws form the underlying oligopoly model, is that potentially informed firms have common and opposite interests between them and with respect to the CA depending on the value of the unknown parameter: The efficiency gains. The paper is also related to the skeptical rule proposed by Milgrom and Roberts (1986), that is useful to extract information from interested parties. They constrain the disclosure strategies of the parties to either tell the truth or omit the evidence, even though a modified rule that includes the concealing effect could be applied to a merger without foreclosure problems, the possibility of manipulation hurts when the screening is two-sided as in our model.

We share the advocacy result of Dewatripont and Tirole (1999) although for different reasons. In their model, agents are rewarded by finding hard evidence that allows the principal to move from the status-quo. Therefore a system of specialization of agents (advocates) in each side, produces more information (or induces more effort) than a having a single non-partisan agent searching for evidence that supports conflicting causes. In our model, information is exogenously given to the parties and the effort is rather allocated to the manipulation task. Our advocacy result stems from the combined effects of the incentives to disclose the information when is desirable to do it with the impossibility of having two-sides screening when the evidence can be concealed[11].

We proceed as follows: First, we set the oligopoly model and explain the information transmission technology. Secondly, we derive the optimal disclosure policy for different levels of reliability of the outsiders. Then we consider two extensions: one where we endogenize the sequence

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[10]Grossman and Helpman (2001) present a comprehensive review of how lobbyists can credibly transmit information to the authority about the effect of policies that affect them.

[11]For instance, if manipulation were not possible, then it would be sufficient to count only with the insiders to obtain the perfect screening.

of disclosure and the other when we allow for interim communication among parties. In the last section we conclude.

2 The Model

We have a highly concentrated market formed by three firms, where two of them, that we label "the insiders", want to merge. Without loss of generality, we assume that before and after the merger, firms face a market downward-slopping demand, offer an homogenous product and compete using quantities as strategic variables[12]. The cost function of the firms, before merging, is given by $C_i = F + \gamma_i q_i$, where F is a fixed and avoidable cost, that has to be incurred in all the periods and before the firm decides how much to produce. The parameters γ_i and q_i are the marginal cost and quantity supplied by each firm. For simplicity it is assumed that F is the same for all firms and is independent of the market share. Insiders are symmetric, both having ex-ante a marginal cost equal to γ, whereas the marginal cost of the outsider is equal to γ_0. If the merger takes place, the new firm will have a variable cost equal to $\gamma - \theta$. Synergies only affect marginal cost, so after merging the fixed cost of the insiders is equal to $2F$[13] The cost structure of the outsider remains unaltered after the merger. The efficiency parameter θ belongs to the interval $\left[\underline{\theta}, \bar{\theta}\right] \equiv \Theta$, is specific to the merger and is known by the insiders but also can be learned by the outsiders.

The payoffs of the parties affected by the deal - insiders, outsiders and consumers- are denoted by $\Pi_I(\theta)$, $\Pi_0(\theta)$ and $S(\theta)$ respectively. They represent the change in profits and surplus, measured in monetary units, of each party if the merger is approved. Depending on the level of EG, payoffs are defined as:

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\begin{array}{llll}
\Pi_I(\theta) & = \Pi_I^D(\theta) & if & \theta \leq \theta_2 \\
& = \Pi_I^M(\theta) & if & \theta \geq \theta_2. \\
S(\theta) & = S^D(\theta) & if & \theta \leq \theta_2 \\
& = S^M(\theta) & if & \theta \geq \theta_2. \\
\Pi_0(\theta) & = \Pi_0^D(\theta) & if & \theta \leq \theta_2 \\
& -(F - \pi^T) & if & \theta > \theta_2.
\end{array}
$$

The parameter θ_2 is the **"efficiency offense"** threshold, value above which the merger induces the exit of the competitor. Thus, if $\theta \leq \theta_2$, the market evolves to a duopoly structure. such that the duopoly payoffs satisfy the following properties:

(A1) $\frac{\partial \Pi_I^D()}{\partial \theta} \geq 0, \frac{\partial \Pi_0^D()}{\partial \theta} \leq 0, \frac{\partial S^D()}{\partial \theta} \geq 0$

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[12]Results are robust to other models of competition.

[13]Since we are interested in efficiency gains that affect consumer surplus, i.e. prices, this assumption is not crucial.

These properties are common to the standard models of imperfect competition where lower marginal cost makes a firm more profitable, harms rival profits and pushes down the equilibrium prices. We define θ_1 as the "**efficiency defense**" threshold, which is interpreted as the minimum level of efficiency gains that leaves consumers at least as well off as in the scenario without merger. Therefore, we have that: $S^D(\theta_1) = 0$ and it is assumed that:

(A2) $\qquad \Pi_0^D(\theta_1) = 0$

Properties (A1) and (A2) imply that $S^D() \leq 0$ and $\Pi_0^D() \geq 0$ for $\theta \leq \theta_1$ and also $S^D() \geq 0$ and $\Pi_0^D() \leq 0$ for $\theta \geq \theta_1$. The fact that any merger with θ in the neighborhood of θ_1 that favors consumers hurts competitors and vice versa is satisfied by most of the models of oligopoly competition such as classic Cournot with homogeneous product and price competition with imperfect substitutes. More explanation of this property is provided by Farrell and Shapiro (1990) and Duso, Neven and Roller (2003).[14] It is further assumed that only profitable mergers are proposed, i.e. $\Pi_I^D() \geq 0$ for all $\theta \in \Theta$, and when the merger brings the minimum level of efficiency gains, the suppressed rivalry in the market makes competitors better off and consumers worse off, i.e. $\Pi_0^D(\underline{\theta}) \geq 0$ and $S^D(\underline{\theta}) \leq 0$.

When EG are above the efficiency offense threshold -case of $\theta > \theta_2$- the market becomes a monopoly. Merging firms become very efficient and the post-merger profits of the outsider are not enough to cover the fixed cost of being in the market. If the outsider cannot break even, its best strategy is to leave the market without incurring in the fixed cost[15] F. The **efficiency offense** threshold is defined such that: $\pi_0^D(\theta_2) - F = 0$, where $\pi_0^D(\theta_2)$ is the post-merger duopoly profits of the outsiders. Since $\Pi_0^D(\theta)$ is decreasing in θ, the competitor leaves the market for any $\theta \geq \theta_2$. Above θ_2, the loss of the outsider is constant and equal to $\pi^T - F$, its before merger net profit. To model a situation of non-desirable exit we look for cases where $S^M() \leq 0$ for all $\theta \geq \theta_2$. This case can occur if the magnitude of the fixed and avoidable cost is above

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[14]Based in this property, Duso et al (2003) use the reaction of the stock value of competitors to asses whether a merger is anti or pro-competitive. They provide a proof why the property is held when the competition is waged through prices. This results hinges in the fact that prices are strategic complements, so whenever the post-merger scenario pushes up insider prices, outsiders will react by also increasing prices making the former better off and consumers worst off. The opposite result holds when insiders reduce price after the merger. This clear causality is lost when the competition is through quantities.

[15]More technically, when $\theta \geq \theta_2$, competitor' exit is the subgame perfect equilibrium of the two stage game where in the first stage firms wanting to be in the market have to pay F and in the second stage, the participating firms compete offering quantities $q_i(\theta)$.

some minimum value[16] $F_{\min}$. From the definition of the efficiency offense threshold, we know that θ_2 is decreasing in F. Thus, a larger F makes that exit happens at lower values of θ, which involves higher prices and lower values of consumer surplus in the post merger scenario. In other words, when $F \geq F_{\min}$ the negative effect of suppressing a competitor dominates the positive effect of cost reduction. Finally it is assumed that $S\left(\bar{\theta}\right) \leq 0$, which implies that the change in consumer surplus cannot be positive if the merger leads to a monopoly. Figure 1 shows the payoffs of the parties involved as a function of the parameter θ.

Regarding the efficiency defense and offense thresholds, the following properties are satisfied:

(A3) $\theta_1'(\gamma) \leq 0$

(A4) $\theta_2'(\gamma) \geq 0$

Both thresholds depend on γ, the marginal cost of the merging firms. The first property says that when marginal cost is lower, merging firms need to comply with a more demanding efficiency defense test. If CA wants to keep prices at least at the same level as before the merger, the cost reduction has to be big enough in order to offset the negative effect of reducing competition in the market, and this negative effect becomes more significant the smaller γ is, because the merger is suppressing a more efficient independent competitor. The second property says that a lower γ implies that the outsider is less competitive vis a vis the insiders and by consequence it has lower ex-ante profits. Since $\Pi_0'\left(\theta\right) \leq 0$, a low value of γ renders the outsider more vulnerable to exit because it induces him to quit the market for smaller values of θ. These two properties, that are common to oligopoly models[17], We denote the length of the efficiency gains range where mergers increase consumer surplus by $\Delta\theta(\gamma) = \theta_2\left(\gamma\right) - \theta_1\left(\gamma\right)$ and we establish the following lemma.

Lemma 1 *The efficiency gains interval where mergers are favorable for consumers is increasing in γ, the marginal cost of merging firms*

Proof. From the definition of $\Delta\theta(\gamma)$ we have that $\Delta\theta'(\gamma) = \theta_2'\left(\gamma\right) - \theta_1'\left(\gamma\right)$, and using properties A3 and A4 we obtain $\Delta\theta'(\gamma) \geq 0$. ∎

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[16] For lower values of F any prospect of exit would be a good indicator of low future prices in the market.

[17] In the appendix A1 we provide the expressions for the thresholds θ_1 and θ_2 as a function of γ for the case of Cournot competition with homogeneous goods. Under price competition between imperfect substitutes both properties also apply. After the merger, the new firm will price less aggressively because it internalizes the loss in profit in the other brand. This external effect is more prominent when γ is lower because the mark-up is bigger and by consequence the profit lost is more significant. Thus, a higher value of θ will be required in order to compensate the bigger loss on competition due to a low value of γ.

The Competition Authority decides about the merger using consumer surplus as standard. With the notation already introduced, the merger is allowed whenever $S(\theta) \geq 0$ or equivalently if $\theta \in [\theta_1, \theta_2]$, otherwise the merger is blocked. Generally speaking, the CA is concerned about how competition will work in the after-merger scenario. In our setting, there are two unknown factors that drive the new market equilibrium: The level of efficiency gains θ, and the existence of a remaining competitor. Since the occurrence of exit depends on θ, we have that the level of efficiency gains jointly with the other known parameters of the demand and cost function are sufficient statistics to predict the future equilibrium of the market[18]. Summarizing, CA accepts the increase in concentration -from triopoly to duopoly- as long as cost savings are big enough to be passed through consumers (**Efficiency Defense** argument). However, at the same time, the cost saving cannot be so big as to induce the exit of the remaining competitor and thus create a monopoly (**Efficiency Offense** argument).

Merger Enforcement and Information disclosure. The parameters of the demand and cost function of firms are public information, there is only asymmetric information respect to θ. The CA can ask the insiders and outsiders to provide evidence about the magnitude of efficiency gains. Informed parties can produce a piece of information that is accepted as evidence by the CA. This evidence can be concealed at some cost, which is proportional to the level of manipulation. As we know, firms spend resources in convincing the authorities at the merger revision stages, they hire specialized teams of lawyers and economists to present the case in a convincing way to the antitrust agency. We set up an evidence production cost function whose nature is consistent with the fact that when firms have a more difficult case to defend, they have to spend more resources to produce a convincing piece of information. Hence, we have that $C = C(\tilde{\theta} - \theta)$ where $\tilde{\theta}$ is the pretended level of EG and θ is the true value. We assume that C is a continuous and differentiable function such that $C''() \geq 0, C(0) = C'(0) = 0$ and $C(\tilde{\theta} - \theta) = C(\theta - \tilde{\theta})$. These assumptions lead to a convex 'lying' cost function that is symmetric with respect to the true type. Notice that this model of manipulable creation of evidence, is a generalization of the extreme cases of hard and soft information. We can re-write the manipulation cost function as $C = C(\alpha, e)$ where $e = \theta - \tilde{\theta}$ is the lying effort term and α is a parameter related with the curvature of the function such that $C_\alpha \geq 0$ and $C_{\alpha e} \geq 0$, where the subscripts stand for partial

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[18]We focus here only in problems derived from single dominance or lessen of competition. We do not consider 'joint dominance' issues like increased danger of collusion that may arise from the merger.
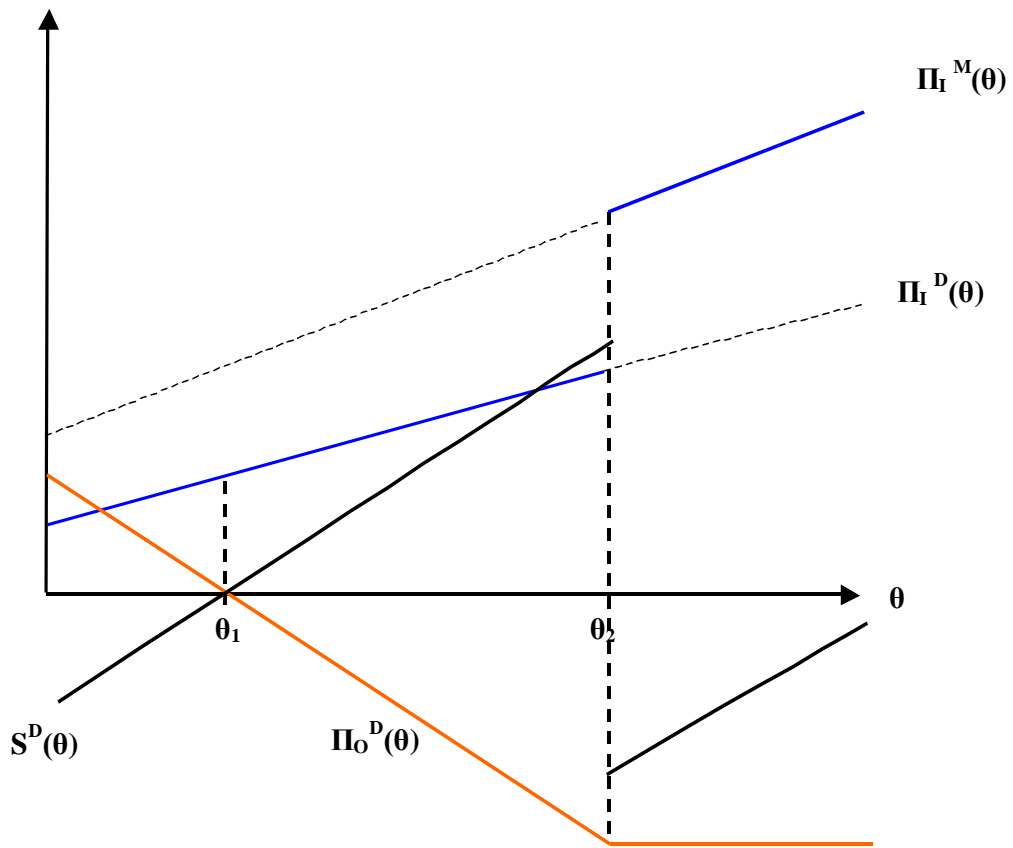
Figure 1: Figure 1. Payoffs of interested parties in function of efficiency gains θ.

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derivatives. When $\alpha = 0$ we are in the case of pure soft information and any message sent to CA has to be considered as cheap talk communication. Conversely, when α tends to infinity, the evidence exhibited is hard information[19]. The intermediate regime of concealing evidence, we think is more representative of what is observed in antitrust proceeding where different parties use to present acceptable evidence that support conflicting views. We only impose the constraint that $\alpha \in (\alpha_0, +\infty)$, thus, lying is costly enough to make feasible some upward and downward screening for most of the types θ. A feasible screening means that for high levels of manipulation, the costs incurred by parties are of comparable magnitude with the benefits of merging. This assumption is plausible since the CA can extend the period of revision of the merger until it gets convinced about the submitted evidence of EG. Another possible interpretation is that CA count on a specialized unit that asses the validity of EG claims, and the probability of accepting the evidence is inversely related to the level manipulation. In both cases, merging firms that have a more difficult case will be reluctant to spend resources in convincing the authorities if they know that the likelihood of being successful is low, although the potential gains of the merger -if approved- are high. Our specification of the lying cost function is similar to the one employed by Maggi and Rodriguez-Clare (1995). In their model the optimal policy applied by the regulator induces the informed party to lie[20]. This property of untruthful revelation is common in models of partial verifiability, where the space of feasible messages sent by parties is restricted. As demonstrated by Green and Laffont (1986), under partial verifiability it is not always optimal for the principal to implement a direct mechanism that induces truthtelling[21].

We assume that informed parties are not forced to provide information if they do not wish. They can either send a document providing no useful information or refuse to submit any message at all. Any of these non-collaborative actions that we call as "uninformative message " are equally informative and have zero cost for the party. On the other hand,

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[19]This is the case ilustrated in Milgrom and Roberts (1986) where the informed agent have the possibility either to tell the truth or not to disclose information at all.

[20]Maggi and Rodriguez-Clare (1995) show that, in a standard procurement contract with asymmetry of information, it is optimal to induce falsification of cost reports. The falsification acts as a countervailing incentives device that makes more costly for the efficient type to mimic the less efficient agents and therefore reduces the rents to be transfered to the former.

[21]Green and Laffont (1986) use a setting where parties can costlessly manipulate the evidence within a subset of messages that depends on the real type of the EG and lying costs are infinite outside that subset. If we employ that setting instead of the continuous lying function, screening is still possible, although there is no waste of resources in lying.

uninformed parties are not able to produce evidence to be accepted by CA and therefore they just send the uninformative message if they are called on to do so.

The literature recognizes that the principal (CA in this case) can obtain information from the fact that agents decide to omit the presentation of evidence that it is very likely they have. In our model, since insiders are perfectly informed, any refusal to provide information will naturally play against them. In this case, we can apply the sophisticated skepticism approach of Milgrom and Roberts (1986), and penalize them - with no merger - if they do not present evidence. However, the no-cooperation strategy from outsiders has no unique interpretation and moreover the skeptical rule has no trivial application because we do not know a priori what is the worst scenario for outsiders.

Optimal decision policy with only insiders. This policy consists in a decision rule about the merger that is based on whether the evidence about EG submitted by the merging firms satisfies or not the standard or requirement defined by the CA. Formally, there is a disclosure game where the insiders present a message or evidence $\mu_I(\theta) : \Theta \longrightarrow \hat{\Theta}$ to CA. The set of feasible messages is the same as the set of types plus the omission action i.e; $\hat{\Theta} \equiv \Theta \cup \{0\}$, where $\{0\}$ is the uninformative message. The agency establishes a standard of proof or admissible interval $R_I \subset \hat{\Theta}$ and a decision variable $X(\mu_I) : \hat{\Theta} \rightarrow \hat{X} \equiv \{0,1\}$. We restrict ourselves to consider only deterministic decisions; either accept or reject the merger[22].

The timing of the disclosure game is the following:

T=1   Insiders learn θ and announce to CA the merger proposal (we assume this announcement is costless).

T=2   CA defines the admissible interval R_I , the decision policy $X(\mu_I)$ and asks insiders to provide evidence μ_I.

T=3   Insiders decide whether or not to create a report μ_I, knowing their type θ, the standard of proof required R_I and the decision rule $X(\mu_I)$ of the CA.

T=4   The merger is approved if and only if insiders present a message in accordance with the above defined rule, otherwise the merger is rejected.

If we are in the hard information regime ($\alpha \rightarrow \infty$), the admissible interval is: $R_I \equiv [\theta_1, \theta_2]$ and the optimal rule is : $X() = 1$ if $\mu_I \in R_I$ and $X() = 0$ otherwise. However, in the general case, when lying is feasible, applying the above policy would lead to the approval of undesirable

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[22]Random policies are ruled out due to problems of commitment from the part of CA. The agency may be tempted change the policy after observing the evidence submitted by the parties.

mergers. Some firms with insufficient EG will pretend to be θ_1 and others with excessive θ will find feasible to mimic the θ_2.

Intuitively, the solution to this problem is to reduce the interval R_I by moving inwards the limits of it, in a way that only the good types submit admissible evidence. Defining the net utility of insiders after the merger as $U(\theta)$, we have:

$$U(\theta) = X(\mu_I)\Pi_I(\theta) - C(\mu_I - \theta) \tag{1}$$

The optimal policy is such that $X() = 1$ if and only if $\mu_I \in R_I \equiv \left[\hat{\theta}_1, \hat{\theta}_2\right]$, otherwise $X() = 0$. The limits of R_I: $\hat{\theta}_1$ and $\hat{\theta}_2$ are derived from the two incentive compatible (IC) constraints represented by equations 2. The first constraint is for the efficiency defense case, thus, we set $\hat{\theta}_1$ in a way that makes $U(\theta_1) = 0$. Since $U'(\theta) \geq 0$, any θ type below θ_1 will be discouraged from mimicking the more efficient types. The second equation of 2 is the efficiency offense constraint that applies for the types in the neighborhood of θ_2, we set $\hat{\theta}_2$ such that $U(\theta_2) = 0$, thus any $\theta \geq \theta_2$ gets negative utility if he presents admissible evidence [23]

$$U(\theta) = \Pi_I(\theta) - C\left(\hat{\theta}_1 - \theta\right) \leq 0 \qquad \forall \theta \leq \theta_1 \tag{2}$$

$$U(\theta) = \Pi_I(\theta) - C\left(\theta - \hat{\theta}_2\right) \leq 0 \qquad \forall \theta \geq \theta_2$$

It is clear that the implementation of the optimal policy is not truthful, since by definition: $\hat{\theta}_1 \geq \theta_1$ and $\theta_2 \geq \hat{\theta}_2$, all types with $\theta \in \left[\theta_1, \hat{\theta}_1\right] \cup \left[\hat{\theta}_2, \theta_2\right]$ will present a message $\mu_I(\theta) \neq \theta$. It is precisely by inducing them to lie that we prevent the bad types from mimicking the good types. This policy achieves the first best or symmetric information solution as long as $\hat{\theta}_2 \geq \hat{\theta}_1$. If this condition is violated, the CA cannot have perfect screening.

Proposition 2 *There exists a $\gamma = \gamma^*$ such that $\Delta\hat{\theta}(\gamma^*) = 0$. If $\gamma \geq \gamma^*$, the first best is achieved and CA employs the interval $R_I \equiv \left[\hat{\theta}_1, \hat{\theta}_2\right]$ with $\hat{\theta}_2 \geq \hat{\theta}_1$, as the required standard of proof to separate the types. If $\gamma \leq \gamma^*$ the standard of proof is a singleton: $R_I \equiv \{\theta_I\}$, CA cannot fully screen out the non-desired types and some level of error is present.*

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[23] In this case is not trivial that $U'() \leq 0$. However, the condition that the technology of evidence production is reliable enough (α sufficiently big) to guarantee the existence of a message $\hat{\theta}_2 \in \Theta$ is the sufficient condition for having: $C'() \geq \Pi_I'()$ and by consequence: $U'() \leq 0$ for all $\theta \geq \hat{\theta}_2$.

Proof. See the appendix ∎

Proposition 1 says that the possibility of perfect screening depends ultimately on γ, the ex-ante marginal cost of the merging firms. To properly understand this phenomenon we have to explore what the choice of the threshold standards $\hat{\theta}_1$ and $\hat{\theta}_2$ depends on. From lemma 1 we know that the perfect information admissible range of EG: $\Delta\theta$ is increasing on γ. Defining as $\Delta\hat{\theta}(\gamma) = \hat{\theta}_2(\gamma) - \hat{\theta}_1(\gamma)$ the length of the imperfect information admissible interval R_I, we also have that $\Delta\hat{\theta}'(\gamma) \geq 0$. As γ decreases, the range of feasible merger is reduced and the range of admissible evidence is reduced as well. Since $\Delta\theta(\gamma) \geq \Delta\hat{\theta}(\gamma)$, for very high values of γ it is possible to have a case where $\Delta\theta(\gamma) > 0$ and $\Delta\hat{\theta}(\gamma) \leq 0$. In the anomalous situation of having $\hat{\theta}_1 \geq \hat{\theta}_2$ the thresholds conflict with each other. Such negative range of admissible messages has the following interpretation: if CA worries about the efficiency defense problem, it will move $\hat{\theta}_1$ upwards in order to overcome the manipulation problem. The optimal location of $\hat{\theta}_1$ conflicts with the optimal location of $\hat{\theta}_2$ and will end up attracting the offensive types ($\theta \geq \theta_2$) rendering useless $\hat{\theta}_2$ for that purpose. For the very same reason, the fear of the efficiency offense problem, will induce CA to move downwards the threshold $\hat{\theta}_2$ and $\hat{\theta}_1$ becomes useless for leaving out the low θ types. Obviously this reversion of roles of the thresholds is not efficient in terms of optimal screening, and in this particular case of low γ mergers, the policy defined by the equations 2 has to be modified. Whenever full separation is not feasible ($\Delta\hat{\theta}(\gamma) \leq 0$), the admissible standard of proof reduces to the minimum and any merger has to satisfy the unique standard θ_I in order to be accepted[24]

When $\gamma \leq \gamma^*$ the unique admissible evidence θ_I is obtained by:

$$Max : \int_{\theta_1^*}^{\theta_2^*} S(\theta) f(\theta) d\theta$$

s.t. the incentive compatible constraints:
$$U(\theta) \geq 0 \qquad \forall\theta \in [\theta_1^*, \theta_2^*]$$
$$U(\theta) \leq 0 \qquad \forall\theta \notin [\theta_1^*, \theta_2^*]$$
which can be expressed as:

$$U(\theta_1^*) = \Pi_I(\theta_1^*) - C(\theta_I - \theta_1^*) = 0 \qquad (3)$$
$$U(\theta_2^*) = \Pi_I(\theta_2^*) - C(\theta_2^* - \theta_I) = 0$$

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[24] When full separation is feasible, each IC constraint is 'specialized' in overcoming one problem, either efficiency defense (equation 2) or efficiency offense (equation 3). In the case of low γ, both constraints have to face both problems which is equivalent to having only one constraint with one admissible evidence.

FOC gives us:

$$\frac{dE[S]}{d\theta_I} = S(\theta_2^*) f\left(\theta_2^*\right) \frac{\partial \theta_2^*}{\partial \theta_I} - S(\theta_1^*) f\left(\theta_1^*\right) \frac{\partial \theta_1^*}{\partial \theta_I} \leq 0 \qquad (4)$$

The values θ_1^* and θ_2^* are the real limits of the range where the merger is going to be admissible. By the definition of γ^* we know that $\theta_1^* \leq \theta_1$ and $\theta_2^* \geq \theta_2$, which reflects that the optimal policy includes some level error because some undesirables mergers will be accepted. We denote error as type I if there is insufficient cost saving or $\theta \in [\theta_1^*, \theta_1]$ and type III if the merger leads to exit or $\theta \in [\theta_2, \theta_2^*]$. In the case of an interior solution, the value of the derivative in equation 1.4 is equal to zero and the optimal standard θ_I is set in a way that makes in the margin both types of error equal. A corner solution is possible to exist when γ is slightly over γ^* and, given the discontinuity in the $S()$ function for $\theta = \theta_2$, the CA prefers to take only type I error avoiding the bigger loss derived form type III error. In this case θ_I is fixed at the minimum level, which is equal to the threshold $\hat{\theta}_2$ of the previous policy. Finally, it is assumed that the new optimal policy increases the expected consumer surplus, i.e. $E\left[S^*()\right] \geq 0$. This is equivalent to say that is less costly to take the type I and III error than taking type II error which is the risk of rejecting good mergers[25].

We have shown that when merging firms are efficient enough ex-ante, they have to satisfy a stricter test for efficiency defense and also for efficiency offense. When it is possible to conceal evidence in both directions, satisfying a very severe level of proof for efficiency defense will naturally raise suspicion about the opposite problem: efficiency offense. This danger of back-firing in the disclosing strategy is what we call the "double trap" of the efficiency gains. Hence, a merger that initially was challenged in basis of low EG can be blocked by the danger of high EG and vice versa. To solve this dilemma, if the CA still wants to apply screening in order to capture some good mergers, it has to reduce the range of admissible evidence to an unique value. Notice that CA cannot tell whether the firms that satisfy the unique standard θ_I are overplaying or underplaying the magnitude of cost savings.

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[25] If manipulation is not very costly or merging firms are too efficent (very low value of γ), the error of aproving bad mergers may be bigger than the error of rejecting the good ones. In this case, $E\left[S^*()\right] \leq 0$ and CA must reject any merger no matter the evidence disclosed by the insiders. Lagerlof and Heidhues (2002) found that under some circunstances it is better not to accept an efficiency defense on merger revision. This is desirable when the cost of producing evidence offsets the benefit of having better information. This policy requires the ex-post commitment of the CA of not accepting any proof about efficiencies. In our model there is no such a problem of commitment, because the evidence to be presented may induce to costly error.

Notice that lower marginal cost implies higher market shares and consequently higher market power. Hence, our result gives support to the fact that market shares are a relevant variable at the moment of deciding about a merger. In particular, we predict that the problem of eliciting information from firms in a merger is exacerbated when markets are more concentrated.

Introducing Outsiders   Competitors are an important source of information. Scheffman (2002) mentions that their contribution is useful to understand important aspects of how competition works in the market e.g. what are the pricing strategies or what is the level of substitution among different suppliers. By their knowledge of the industry, they are also able to asses the magnitude of cost advantages that a merger can achieve in terms of economies of scale, enhancing services to costumers and better bargaining power vis a vis suppliers. However, it is not so clear how to provide incentives for competitors to disclose the information they presumably have.

We assume that with probability $\rho \leq 1$ the outsider learns the value of θ. The parameter ρ is exogenous and known by the CA and insiders as well. Only outsiders know if they have finally learned θ. CA and insiders know that with some probability they may learn about the efficiency gains carried by the merger, but both do not know exactly if competitors finally knew the truth. As explained above, if nature determines that outsiders do not learn the parameter θ, they cannot report any acceptable evidence if they are asked to do it. However, if outsiders learn θ, they can either present a report $\mu_0(\theta)$ based on what they have learned or they can pretend not to know θ and just provide an uninformative message. As we will see later this second source of asymmetry of information -whether outsiders are informed- that gives way to a strategic report decision from the outsiders, plays a relevant role in the design of the optimal disclosure policy.

Following from proposition 1, we analyze the case of $\gamma \leq \gamma^*$, where using only with the insiders' report is not enough to get the first best. We now add to the disclosure game defined above, an outsiders message: $\mu_0(\theta) : \Theta \longrightarrow \hat{\Theta}$ and an admissible interval for outsiders evidence: $R_0 \subset \hat{\Theta}$. The instrument of decision about the merger becomes: $X(\mu_I, \mu_0) : \hat{\Theta}^2 \to X \in \{0, 1\}$. The disclosure process is set in a sequential way by introducing an outsiders' report that follows the report of the insiders. Later on, we look at the effects of switching the order of disclosure between parties.

T=1   Insiders announce to CA they want to merge (this announcement is costless).

T=2   With probability ρ, outsiders learn the value of θ.

T=3   CA defines the admissible standards of proof R_I and R_0 , the decision policy $X\,()$ and asks first insiders to provide evidence μ_I.

T=4   Insiders decide whether or not to present a report μ_I about efficiency gains, knowing their type θ, the standards of proof required $\{R_I, R_0\}$ and the decision rule of the CA.

T=5   If the message presented by insiders is such that $\mu_I \in R_I$, CA asks then for a message μ_0 from outsiders. Otherwise the merger is rejected.

T=6   Outsiders, based on what they have learned about θ, the standard R_0 and the decision rule decide whether or not to present a report μ_0 to the CA.

T=7   CA blocks the merger if and only if the report presented by outsiders meets the rule: $\mu_0 \in R_0$. Otherwise, the merger is accepted.

In the timing just presented we have already included some features of the decision policy for reasons that will become clear below.

We proceed by backward induction, solving for the optimal R_0, first in the scenario where outsiders have learned θ and insiders at T=4 have satisfied the standard required, i.e. $\mu_I \in R_I$. In what follows we analyze how CA can employ outsiders in order to get rid of the remaining type I and type III errors.

Lemma 3 *CA can extract information from outsiders that is useful to eliminate type III error.*

Proceeding in the same way as we did for defining the insiders' admissible evidence, CA selects a standard of proof θ_0 in order to have efficient separation of types above and below θ_2.

Outsiders select a evidence or message μ_0 that maximizes:

$U(\theta) = X(\mu_0) \Pi_0(\theta) - C(\mu_0 - \theta)$

Since we want to avoid the exit of the competitor, the optimal rule is given by :$X\,() = 1$ if $\mu_O \leq \theta_0$ and $X\,() = 0$ if $\mu_0 \geq \theta_0$. The threshold θ_0 is defined by:

$$U(\theta_2) = \Pi_0(\theta_2) = -C(\theta_0 - \theta_2) \tag{5}$$

Equation 5 says that the threshold θ_0 is selected in such way that the θ_2 type is indifferent between presenting a report that leads to the merger being blocked or not opposing the merger and leaving the market afterwards. Since the utility of outsiders is decreasing in θ we have that all types that are bigger than θ_2 will present evidence. On the other hand for types lower than θ_2, it is better to face a tougher competitor than create an admissible evidence that would induce the rejection of the merger. The main message of lemma 2 is that CA can delegate to

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outsiders the task of detecting efficiency 'offensive' mergers and whenever θ is greater than θ_2 the outsider will have incentive to present the evidence[26]. This result is based in the fact that when $\theta \geq \theta_2$ and exit may occur, both consumer surplus and outsiders' payoff is negative and there is full coincidence of interest between both parties. However, provided that any type in the neighborhood of θ_2 will have an incentive to claim that the merger leads to exit, the CA has to select the standard of evidence θ_0 big enough in order to discourage the mimicking of the types $\theta \leq \theta_2$ and in this way avoiding to block a merger that is good for consumers. This lying possibility explains why a cheap talk communication is not useful in this case.

Lemma 4 *CA cannot extract any information from outsiders that leads to eliminate type I error.*

In the case that θ is close to θ_1, outsiders do not disclose the evidence they have because it goes against their interest. To see this, suppose first that manipulation is extremely costly, so outsiders cannot lie about the magnitude of EG. When $\theta \leq \theta_1$ we have that $\Pi_0() \geq 0$ and $S() \leq 0$ in case the merger is approved. Whenever outsiders present evidence, the merger is blocked and outsiders are worse-off than any scenario that considers the approval of the merger with some positive probability. Hence, outsiders have no incentive to present a report and they will pretend that they do not know the truth. When $\theta \geq \theta_1$ we have an analogous result, since $\Pi_0() \leq 0$ and $S() \geq 0$, whenever outsiders present a report, CA will approve the deal, decision that will hurt the competitors. For any decision rule that the CA can implement, not presenting evidence is the dominant pure strategy for outsiders[27]. Note that in this case, the CA cannot force outsiders to submit information through the use of the skeptical rule of Milgrom and Robert, because the CA does not know θ and in consequence does not know what is worst for outsiders: the approval or the rejection of the merger. Thus, when the uncertainty is about whether θ lies above or below θ_1, there is no transmission of information at all from the fact that outsiders do not show evidence and

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[26]We can also say that whenever $\theta \geq \theta_2$, informed outsiders do not have incentives to pretend that they have not learned θ

[27]This result also holds when concealing evidence is feasible. Any policy seeking to extract useful information from outsiders and that includes some manipulation is going to be dominated by a truthtelling policy, case in which we know, the outsider prefers to mimic the types of firms that did not learn θ. In the extreme situation of pure chaep talk communication $(\alpha = 0)$, any message sent by outsiders will have the same value for CA as not having a message, this is the case labeled as "Babbling Equilibrium" by Crawford and Sobel (1982).

CA gets no update of beliefs about the distribution of θ from that omission. Contrary to the case of type III error, in this situation, CA cannot delegate to outsiders the task of detecting mergers with insufficient efficiency gains. The total divergence of interest between the CA and the competitors makes impossible any revelation of information.

Going back to T=3, if outsiders did not learn θ, they do not present any evidence to CA. Still in the case that insiders report satisfactorily at T=5, the no submission of evidence from outsiders at T=7 can be interpreted either as a truthful message that they do not have the information or as a strategic decision to not show evidence that goes against them. The asymmetry of information with respect to what outsiders know, leads CA to choose a unique insiders' standard θ_I. We will address in the extensions the possibility of making θ_I contingent on whether the learning has occurred.

The optimal standard of proof for insiders, like in the case when we do not count on outsiders, balances the cost of type I and type III error, but now takes in account the additional fact that outsiders may learn the type and they will disclose only type III error. Type I error will always remain uncovered.

Employing simple Bayesian updating, CA maximizes:

$$E[S] = \quad \rho S_L(\theta_I) + (1 - \rho) \, S_N(\theta_I) \tag{6}$$

Subject to the Incentive Compatibility conditions (IC):

$$U(\theta) = \Pi_I(\theta) - C(\theta_I - \theta) \leq 0 \qquad \forall \theta \leq \theta_1^* \tag{7}$$
$$U(\theta) = (1 - \rho)\Pi_I(\theta) - C(\theta - \theta_I) \leq 0 \qquad \forall \theta \geq \theta_2^*$$

S_L is the expected change in consumer surplus when outsiders have learned θ and S_N is the value of the same expression but when outsiders do not learn anything. The objective function now is a weighted average of both scenarios, when we have outsider learning and when we do not.

$$S_L = \int_{\theta_1^*}^{\theta_2} S(\theta) f(\theta) d\theta \qquad and \qquad S_N = \int_{\theta_1^*}^{\theta_2^*} S(\theta) f(\theta) d\theta$$

The difference between S_L and S_N is that when there is learning from outsiders we do not have type III error. That is reflected in the upper limit of the integral for both terms.

The (IC) constraints become:

$$\Pi_I(\theta_1^*) - C(\theta_I - \theta_1^*) = 0 \tag{8}$$
$$(1 - \rho)\Pi_I(\theta_2^*) - C(\theta_2^* - \theta_I) = 0$$

First Order Conditions give us:

$$\frac{dE[S]}{d\theta_I} = -\rho S\left(\theta_1^*\right) f\left(\theta_1^*\right) \frac{\partial \theta_1^*}{\partial \theta_I} + (1-\rho)\left[S\left(\theta_2^*\right) f\left(\theta_2^*\right) \frac{\partial \theta_2^*}{\partial \theta_I} - S(\theta_1^*) f\left(\theta_1^*\right) \frac{\partial \theta_1^*}{\partial \theta_I}\right]$$

(9)

Proposition 5 *When both parties -insiders and outsiders- know θ and that is known by the Competition Authority, the optimal policy is a specialization in the burden of proof. Insiders have to show that the merger has enough efficiency gains (efficiency defense) and outsiders have to show that the merger can lead to their exit (efficiency offense). In equilibrium, only consumer surplus' increasing mergers are presented and the first best is achieved.*

Proof. See the appendix ∎

If outsiders are perfectly informed about θ, then $\rho = 1$. In this case, the second term of the right hand side of equation 9 disappears and only the first one remains. Since $S\left(\theta_1^*\right) \leq 0$, the value of the derivative is always positive and the optimal standard corresponds to the maximum value of θ_I, given the constraints, which means that the standard θ_I is set in a way that completely eliminates type I error i.e. $\theta_1^* = \theta_1$. The intuition for that result is very simple. From lemma 2 and 3 we know for sure that outsiders will block any exit-inducing merger and won't block anyone with $\theta \leq \theta_1$. Therefore CA can push forward as much as possible the insiders standard θ_I in order to screen out the low θ types without worrying about attracting the high θ types because those ones will be blocked by a counter report from outsiders. This optimal decision policy of the CA entails a complete specialization of the burden of proof between informed parties. Each interested party has to proof only one of the anticompetitive dangers of the merger; the insiders that the merger has enough efficiency gains (efficiency defense) while the outsiders that the merger leads to its exit of the market (efficiency offense). The allocation of the burden is done in a way that aligns the incentives of each party to submit evidence with the use that CA will give to that evidence.

Proposition 6 *When outsiders may learn the parameter θ with some positive probability ρ, the insider's optimal standard $\theta_I\left(\rho\right)$ is weakly increasing in ρ. The optimal policy contains in general both type I and type III errors, which are both decreasing in ρ..*

This proposition is a generalization of proposition 2 for the case when it is uncertain that outsiders are informed. For any value of ρ, outsiders

are called in only if they can show evidence that the merger produces their exit and as long as they are informed they will eliminate any possibility of approving exit-inducing mergers. The standard of evidence required for them (θ_0) is independent of ρ and perfectly screens out the types with $\theta \geq \theta_2$. Nevertheless, the type III error emerges now as uncertainty about whether outsiders have obtained the information. The burden of proof for the efficiency defense still rests uniquely with the insiders, and this burden is less stringent -higher value of θ_I is required− the more reliable are the outsiders respect to providing relevant evidence.[28] Thus, for values of ρ strictly lower than 1, CA cannot completely delegate the task of stopping 'offensive mergers' to outsiders, because the latter may not be able to obtain the information needed for making a credible report aimed at stopping the merger. Given that, CA must still count on the insiders' report to screen those mergers in the eventuality that outsiders do not learn θ. It is clear that CA places more trust on outsiders the bigger is ρ, making the chosen standard θ_I monotonically increasing in ρ. This result, although intuitive, is due to two separate effects that work in the same direction: the *Direct effect* and the *Deterrence effect.*

Direct effect

Focusing first in the case of interior solution and rearranging equation 9 we obtain:

$$\frac{dE[S]}{d\theta_I} = S\left(\theta_2^*\right)\left(1 - \rho\right) f\left(\theta_2^*\right) \frac{\partial \theta_2^*}{\partial \theta_I} - S(\theta_1^*) f\left(\theta_1^*\right) \frac{\partial \theta_1^*}{\partial \theta_I} = 0 \qquad (10)$$

Comparing it with the F.O.C. of equation 4 (when we have no outsider), there is a difference in the term $(1 - \rho)$ that multiplies the first term of the middle of equation 10. This means that the marginal cost of type III error is diminished by $(1 - \rho)$. Since optimality imposes that both errors in the margin must be equal, the type I error has to be diminished as well, which implies that the optimal standard θ_I has to move upwards. Notice that the higher the ρ, the less likely or less relevant type III error becomes, the more we can diminish type I error and the more θ_I can move upwards[29].

Deterrence Effect.

This is an effect that works through the IC constraint of the high θ types. Comparing these constraints in the cases when we use and

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[28]Some types of insiders benefit from having outsiders as a counter-party because they are no longer forced to downplay their level of EG.

[29]In the extreme case of $\rho = 1$,we are back to proposition 2, where θ_I takes the maximum value and is only used to get rid of type I error.

we do not use an outsider (equations 5 and 7), for the same θ_I, the value of θ_2^* is larger when we do not count with outsiders. Without an informed outsider, an insider with $\theta_2 \leq \theta \leq \theta_2^*$ does not risk anything by preparing a costly defense that he is not over θ_2^* since there is no possibility of facing counter-evidence. However, when there is a positive probability of having an informed outsider, not all the insiders' types will spend resources in a report that can be blocked afterwards by the other party. This is equivalent to saying that the marginal cost of lying upwards is augmented by $\dfrac{1}{1-\rho}$. Hence, the value of $\dfrac{\partial \theta_2^*}{\partial \theta_I}$ is always smaller when the outsider is present[30]. This transformation in the lying cost function allows CA to move even forward the standard θ_I without risking too much of attracting high θ types, with respect to the case of no outsiders. It is easy to see that this effect also makes type III error less important and again, gives room to decrease type I error by displacing the θ_I upwards[31].

In the case of having a corner solution when we only use insiders ($\rho = 0$), the same effects are at work and the same result holds when we introduce outsiders. The risk of type III is diminished for the same reasons already presented, increasing the value of the derivative $\dfrac{dE[S]}{d\theta_I}$ and eventually making it equal to zero, which would yield an interior solution. By inspecting equation 10, it is clear that when ρ is larger, it is more likely that CA abandons the corner solution because the type III error becomes less relevant.

Finally, in equilibrium only merging firms with $\theta \in [\theta_1^*, \theta_2^*]$ present evidence at T= 4. Those with $\theta \leq \theta_2$ will be unopposed by outsiders and thus will be approved and those with $\theta \in [\theta_2, \theta_2^*]$ will take the bet of presenting a case and will be opposed only if competitors learned θ.

3 Extensions

3.1 Altering the Timing of Disclosure

We have structured the disclosure game taking as given that CA first gets information from merging firms and then, based in what it receives asks for evidence from outsiders. It may be reasonable to think that is better first to dissipate the uncertainty about what outsiders can tell and then call insiders, applying to them a standard of proof contingent

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[30]More technically: $\dfrac{\partial^2 \theta_2^*}{\partial \theta_I \partial \rho} \leq 0$

[31]Notice that this deterrence effect does not apply for type I error since outsiders never are going to disclose that $\theta \leq \theta_1$. Thus, the lying cost function becomes asymmetric, being more costly to lie upwards than downwards.

on what outsiders have presented.

An alternative disclosure timing that switches the order of evidence showing is the following:

T=1   Insiders announce to CA they want to merge (this announcement is costless)

T=2   With probability ρ, outsiders learn the value of θ.

T=3   CA establishes the approval policy. This policy consists on a decision rule based on whether the evidence $\{\mu_I, \mu_0\}$ presented by each parties lies inside of its corresponding admissible intervals: R_I, R_0.

T=4   CA first asks for evidence μ_0 from outsiders.

T=5   Outsiders, based on what they have learned on θ, in the standard R_0 and in the decision rule decide whether or not to present a report μ_O to the CA.

T=6   If outsiders present a report such that $\mu_0 \in R_0$ the merger is blocked, otherwise CA asks a report form insiders.

T=7   Insiders decide whether or not to present a report μ_I about efficiency gains, knowing their type θ, the standard of proof required R_I and the decision rule of the CA.

T=8   CA accepts the merger if the message presented by insiders is such that $\mu_I \in R_I$, Otherwise the merger is rejected.

It is clear that the standard of proof θ_0 asked of outsiders is the same as before, where CA eliminates mergers with $\theta \geq \theta_2$. In the end of the stage 5, we may have two possible responses from outsiders: Either they present evidence consistent with the standard of proof or they do not present any evidence at all. The first case happens when they learn the type and $\theta \geq \theta_2$. The no response case may have two interpretations: Outsiders did not learn θ or they did but they do not want to disclose it. In this second case, CA asks for evidence from insiders and defines a standard of proof θ_I that takes into account the strategic disclosure behavior form the outsiders. Again, using Bayesian updating, CA chooses θ_I by maximizing:

$$E[S] = \rho S_L(\theta_I) + (1 - \rho) S_N(\theta_I)$$

subject to the IC constraints:

$$U(\theta_1^*) = \Pi_I(\theta_1^*) - C(\theta_I - \theta_1^*) = 0$$

$$U(\theta_2^*) = \Pi_I(\theta_2^*) - C(\theta_2^* - \theta_I) = 0$$

Comparing this program with the one with the basic timing, we see that the objective function is the same in both cases. The disclosure strategy of the outsiders is the same, whether they have to report in the

first or second place. It is always their dominant strategy to report evidence against an exit-inducing merger and is always a weakly dominant strategy not to present evidence when the merger cannot be blocked. In consequence, in both cases, θ_I is chosen in a way that trades-off the two types of errors. We have that the direct *effect*, described above and represented by ρ in the objective function, is present exactly in the same way for both modalities of the game.

However, there is a difference in the IC constraint for the types over θ_2. Compared with the constraints in equations 1.7, here the term $(1 - \rho)$ does not multiply the insiders´ payoff. When $\theta_2 \leq \theta \leq \theta_2^*$, by making a report, insiders do not risk being opposed by outsiders because there is no further requirement for information. Having outsiders first plays in favor of insiders because it completely eliminates the uncertainty about having counter-evidence.[32] Using the above defined terminology, the deterrence effect vanishes when we switch the order of reporting and ask the outsiders to report first.

From the point of view of CA altering the timing is not beneficial due to the disappearance of the deterrence effect. Non-desired merger will be presented more often, increasing type III error and CA will react by moving downwards the standard θ_I and increasing type I error[33].

By comparing the maximization program (including the IC constraints) of both games we can observe that for any θ_I the type I error is the same in both cases but the type III error is greater when outsiders report first because θ_2^* is larger. Therefore for any value of ρ, the total error is larger when CA asks first outsiders and then insiders. This result is summarized in the following proposition:

Proposition 7 *An optimal policy that asks for a report first from insiders and second from outsiders is superior to a policy that asks first from outsiders and then from insiders.*

3.2   Interim Communication Among Parties

Now we allow for the possibility that involved parties can exchanges message before the official disclosure process takes place. The interim communication is about disclosing the second private information variable: whether or not outsiders learned the value of θ.

The questions we want to address are two: Do outsiders have incentives to communicate what they know? and; Is it in the interest of the CA that interim communication takes place? We analyze the two

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[32]This is equivalent to say that the asymmetry of information between insiders and outsiders about whether outsiders know θ has been eliminated.

[33]The insiders have a second move advantage that is not in the benefit of the CA.

possible cases: outsiders with insiders and outsiders with CA, using the optimal game where insiders report first and then outsiders.

Outsiders and insiders. Suppose that after T=2, outsiders have the possibility to tell insiders if they have learned the truth about θ. The communication technology is just a message from outsiders to insiders saying that they know the truth and the value of the parameter. This mean that outsiders, if they wish, can transmit costlessly and truthfully their knowledge about θ to insiders.

In the case that outsiders know the information, it is clear that only when $\theta_2 \geq \theta \geq \theta_2^*$ they are strictly better off by telling insiders what they know[34]. By revealing that, outsiders induce insiders to not present evidence because the latter will not have to spend resources in preparing a report that and the end is going to be opposed by the competitors. For this very same reason, outsiders also save resources by not preparing an opposition[35]. Since both interested parties are better-off with this communication and the outcome does not change for CA (the merger is always blocked) we have that allowing communication between firms is a Pareto improvement whenever $\theta_2 \geq \theta \geq \theta_2^*$.

The problem exists when θ lies in the same interval as before but outsiders do not know the information. Because the ignorant outsider cannot mimic the informed one,[36] the absence of a truthful message from outsiders is interpreted by insiders as ignorance of the outsiders. This implies that the uncertainty about whether they will be blocked by an counter-report disappears and merging firms will be more willing to present favorable evidence for undesirable mergers.

In other words, the deterrence effect goes away and we are in the same scenario as when outsiders report first and insiders second. As we know, this structure of the game is not optimal from the point of view of the CA and consequently, allowing communication among parties is ex-ante inefficient.

Outsiders and CA We know that if outsiders are as well informed as insiders, CA can obtain the first best. However it is not always in the interest of competitors to tell the CA that they are informed. First we have to clarify how outsiders would transmit that information to CA. We assume that there is a simple cheap talk communication among

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[34]For the other values of θ, insiders are not going to change the reporting strategy of insiders and thus they are indifferent between reporting and not doing it. We assume that in the case of indifference, outsiders do not send messages at all.

[35]Remember that the optimal policy, in equilibrium have both parties presenting opposite reports when outsider learn θ and $\theta_2 \geq \theta \geq \theta_2^*$. In this case the outcome is a rejection of the merger.

[36]The probability of guessing θ for the outsiders is zero.

them, where the competitors just send a message saying: we know the truth or we do not know it. When outsiders learn θ, they only want to communicate it only to CA if $\theta \geq \theta_2$ for the same reasons exposed above: insiders learning that outsiders are informed are not going to present a defense for their case and this saves also a report for outsiders[37]. The way CA signals to insiders that it is informed about outsiders knowledge is through the choice of the standard of proof θ_I, that in this case of an informed outsider, will be the maximum value: $\theta_I (\rho = 1)$.

When outsiders do not learn θ, they cannot pretend to know it because they are not able to produce any report. If we assume that CA can fine afterwards a lying firm for claiming that they have some evidence without support, we can rule out this mimicking behavior of the ignorant outsider[38].

Given that outsiders do not lie about whether they know something, then CA has two scenarios: Either it receives a message from outsiders saying that they know the truth, which implies that $\theta \geq \theta_2$ or it does not receive any message at all, which implies that outsiders know something and $\theta \leq \theta_2$ or they did not learn the type. In the first scenario, the best policy is to set $\theta_I = \theta_I (\rho = 1)$, inducing insiders to not present a report. In the second scenario, the standard is obtained by Bayesian updating. It is clear that this structure is the same as the game where outsiders report first and insiders second. Again, the deterrence effects completely vanishes because insiders learn what outsiders know through the standard of proof they face. Asking outsiders whether they have some information is totally equivalent to asking them at the same time to reveal what they know. This equivalence rests in the fact that outsiders only have incentives to reveal the information when $\theta \geq \theta_2$. The main message of this sub-section is that allowing outsiders to communicate to other parties what they know is socially detrimental because it destroys the deterrence effect on insiders ignorance about what opposition they will face.

We summarize the results of this extension in proposition 5

Proposition 8 *Any interim communication between outsiders and the rest of the parties -insiders and CA-with respect to what the first ones know, even if ex-post efficient, is not desirable from the ex-ante point of view since it completely eliminates the deterrence effect.*

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[37]Notice that when $\theta_1^* \leq \theta \leq \theta_1$ outsiders do not want to disclose they are informed because that will completely eliminate the possibility that a merger that favour them be accepted. For the remaining interval, outsiders are indiferent.

[38]Notice that lying about knowing something is not the same as lying about what firms know. The first one is verifiable because an ignorant firm cannot produce any evidence. The second one is subject to manipulation.

4 Conclusion

This paper provides a number of insights that are useful for an optimal implementation of antitrust policy when asymmetry of information plays a relevant role as is the case of efficiency gains in merger control. As we have demonstrated, the feasibility of screening pro-competitive mergers is severely limited in markets that are highly concentrated, where exit is a concern and entry is not likely to take place in any reasonable time horizon. The conflict of objectives in simultaneously detecting two types of anti-competitive mergers has real basis as has been reported with two important cases presented before the European Commission. Instead of applying an outright prohibition of those mergers or concentrating only on the efficiency defense problem, CA can still have two-side screening by making intelligent use of informed parties, even if they can manipulate -upwards or downwards- the evidence. The result of specialization in the burden of proof hinges on the incentives that each party has to disclose information in any of the two possible anticompetitive contingencies. Even if it would be less costly for outsiders to prove that a merger fails the efficiency defense test, that is not feasible due to the evident divergence of interests between outsiders and CA. However, the fact that we can count on them to detecting offensive mergers, allows CA to reduce the type I error by applying a more demanding standard of proof for efficiency defense to insiders. The possibility of using an informed competitor decreases both types of errors and makes more credible the claims of efficiency gains of merging firms.

The second important result, which is unexpected, is that transparency, in the sense of making each party know what evidence the other party has, is not desirable. Even though it is ex-post a Pareto improvement to make public that outsiders have evidence against a exit inducing merger, this is not efficient ex-ante since makes insiders perfectly aware of the opposition they will face, giving them incentives to overstate their claim and by consequence, increasing the scope for manipulation and error. The implications of this last finding are multiple: (1) It is better to make insiders disclose first and outsiders second (2) CA has to apply a standard of proof applied to insiders that is independent of the information outsiders have and (3) CA has to prohibit any communication among parties about what they know. Notice that using consumer surplus as standard is beneficial because it does not create a commitment problem to CA about allowing communication in the state of world where EG are very high and outsiders are informed.

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5 Appendix

Appendix A1

Consider a model of Cournot competition with homogeneous product. The demand function is linear of the type: $Q = A - P$, where Q is the total quantity supplied and P, the market price. Before the merger, there are 3 firms, the two insiders, each one having a marginal cost equal to γ and the outsider with a marginal cost of γ_0. Under triopoly, competition yields the following results. The profit of each insider is equal to: $\pi_I^T = \frac{1}{16}(A - 2\gamma + \gamma_0)^2$ and the profit of the outsider is equal to $\pi_0^T = \frac{1}{16}(A - 3\gamma_0 + 2\gamma)^2$. The equilibrium price is equal to $P_1 = \frac{1}{4}(A + 2\gamma + \gamma_0)$

After the merger there are two firms, the merging firms or insiders and the outsiders. The former has a marginal cost of $\gamma - \theta$, whereas the marginal cost of the outsider remains as γ_0. Profits are, for the insiders: $\pi_I^D = \frac{1}{9}(A - 2\gamma + 2\theta + \gamma_0)^2$ and for the outsider: $\pi_0^D = \frac{1}{9}(A - 2\gamma_0 + \gamma - \theta)^2$. Accordingly, the payoff of the merger is equal to: $\Pi_I = \pi_I^D(\theta) - 2\pi_I^T$ for the insider and $\Pi_0 = \pi_0^D(\theta) - \pi_0^T$ for the outsider. Market price is equal to: $P_2^D = \frac{1}{3}(A + \gamma - \theta + \gamma_0)$

The efficiency defense threshold θ_1 is obtained from the condition that merger does not increase prices:

$\frac{1}{4}(A + 2\gamma + \gamma_0) = \frac{1}{3}(A + \gamma - \theta_1 + \gamma_0) \Rightarrow \theta_1 = \frac{1}{4}(A - 2\gamma + \gamma_0)$

The efficiency offense threshold θ_2 is derived from the condition that the outsider leaves the market after the merger.

$\pi_0^D(\theta) - F \leq 0 \; \forall \theta \geq \theta_2 \Rightarrow \frac{1}{9}(A + \gamma - \theta_2 - 2\gamma_0)^2 = F \Rightarrow \theta_2 = A + \gamma - 2\gamma_0 - 3\sqrt{F}$.

It is easy to see that θ_1 is decreasing in γ and θ_2 increasing in γ. The length of the interval where the merger is admissible is equal to: $\Delta\theta = \theta_2 - \theta_1 = \frac{1}{4}(3A + 6\gamma - 9\gamma_0 - 12\sqrt{F})$. Therefore the more efficient are the insiders (a lower γ) before merging, the shorter is the interval of efficiency gains where the merger is accepted. The ex-ante the joint market share of the insiders is given by: $S_I = \frac{2q_I}{Q} = \frac{2A - 4\gamma + 2\gamma_0}{3A - 2\gamma - \gamma_0}$. Taking the derivative of S_I with respect to γ, we obtain: $\frac{dS_I}{d\gamma} = \frac{-4Q + 2q_I}{Q^2}$, which is negative since $Q \geq q_I$.

In order to guarantee the existence of the situation we want to describe, the parameters have to satisfy the following conditions:

(1) Whenever exit occurs, prices are higher after the merger.

(2) If exit happens, efficiency gains cannot be too big to make prices lower than before the merger

(3) Before the merger, firms are able to break even.

Conditions (1) and (2): If exit occurs after the merger, the monopoly price will be equal to: $P_2^M = \frac{1}{2}(A + \gamma - \theta)$. We need that $\forall \theta \in \left[\theta_2, \bar{\theta}\right]$:

$P_2^M(\theta) \geq P_1 \iff A + 2\gamma + 5\gamma_0 \leq 6\sqrt{F}$ and $\bar{\theta} = \frac{1}{2}(A - \gamma_0)$.

Condition (3): $Min\{\Pi_I^T, \Pi_0^T\} \geq F \iff A - 2\gamma + \gamma_0 \geq 4\sqrt{F}$ and $A - 3\gamma_0 + 2\gamma \geq 4\sqrt{F}$. These conditions coupled with condition (1) lead to the following conditions: (i) $A + 2\gamma - 19\gamma_0 \geq 0$ if $\gamma \leq \gamma_0$ and $A - 10\gamma - 7\gamma_0 \geq 0$ if $\gamma \geq \gamma_0$. Thus, for given values of γ and γ_0, we can make A as big as possible in order to satisfy the constraints

Proof of proposition 1: Form equations 2, we have that :
Efficiency defense screening: $\mu \geq \hat{\theta}_1 \iff \theta \geq \theta_1$
Efficiency offense screening: $\mu \leq \hat{\theta}_2 \iff \theta \leq \theta_2$
If $\gamma \geq \gamma^* \Rightarrow \hat{\theta}_2 \geq \hat{\theta}_1$ and there exists a set of messages or evidences μ, such that $\mu \in \left[\hat{\theta}_1, \hat{\theta}_2\right]$ that satisfies both screening constraints.

If $\gamma \leq \gamma^* \Rightarrow \hat{\theta}_1 \geq \hat{\theta}_2$ and there exist no a message μ that satisfy both constraints. For any $\mu \geq \hat{\theta}_1 \Rightarrow \mu \geq \hat{\theta}_2$, and for any $\mu \leq \hat{\theta}_2 \Rightarrow \mu \leq \hat{\theta}_1$.

It is clear that if γ is slightly below γ^*, rejecting any merger has an infinitesimal benefit -avoiding marginal types I and III error- that is dominated by the first order loss of rejecting good mergers -type II error. The best policy, in this situation implies an abandonment of having a perfect two-sided screening and the optimal solution is given by the F.O.C. represented by equation 4.

Proof of proposition 2:

The case of totally informed outsiders corresponds to the case of $\rho = 1$. Then $\dfrac{dE[S]}{d\theta_I} = -S(\theta_1^*) f(\theta_1^*) \dfrac{\partial \theta_1^*}{\partial \theta_I}$. Since $\theta_1^* \leq \theta_1$, then $S(\theta_1^*) \leq 0$, and totally differentiating the first constraint of equation 8, we obtain that $\dfrac{\partial \theta_1^*}{\partial \theta_I} = \dfrac{C'()}{C'() + \frac{\partial \Pi_I}{\partial \theta}}$, term that is positive from the property of strong convexity of the lying cost function. Therefore $\dfrac{dE[S]}{d\theta_I} \geq 0$. If the derivative is always positive, the optimum corresponds to the highest possible value of θ_I that satisfy the constraints of the maximization program. Then θ_I is such that $\Pi_I(\theta_1) = C(\theta_I - \theta_1)$, which implies that $\theta_1^* = \theta_1$.