Antitrust Enforcement and the Design of Disclosure Rules. An Application to 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 efficiency defense should rest in the insiders (merging firms) whereas the burden of proof for efficiency offense should rest in 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

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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. For correctly deciding, 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 affected by the potentially anticompetitive action. The challenge for Competition Authorities then, is try to elicit from involved parties the relevant information 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 have configured 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 cost 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, 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.

We solve this information revelation problem by using Bayesian subgame

[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.

perfect implementation. In our model, parties can costly manipulate the evidence, creating an intermediate regime between the extreme cases of soft and hard information and CA disposes of limited instruments to elicit the truth: the standard of proof and the decision about the merger (approve or reject). The results obtained allow us to provide robust answer to the following questions: (1) When evidence from third parties is strictly needed, (2) which party has the burden of proof for each of the possible anticompetitive effects of the merger, (3) how to establish the order of disclosing and (4) whether ex-ante communication among parties is desirable.

First, evidence from competitors strongly improves the results only if the ex-ante market power of merging firms exceeds some threshold. Higher ex-ante market shares reduces the range of admissible merger in terms of efficiency gains. This reduction in the range leads to an imperfect two-side screening if the standard of proofs for efficiency defense and offense conflict between them[3]. To better understand this situation, suppose first that CA worries only about insufficient EG. The CA can achieve a perfect screening by setting a high standard of proof to firms and thus overcome the problem of manipulation of evidence (as is done in US jurisdiction). However, if the anticompetitive danger is in both directions (excessive and insufficient EG), forcing firms to prove that efficiency gains are big enough, by applying a very strict standard of proof, may have the adverse effect of attracting mergers that lead to undesirable exit and vice-versa. The exacerbation of the asymmetry of information problem by high level of market shares can explain why antitrust agencies are reluctant to consider evidence in cases of mergers where the level of concentration in the market is large and rather adopt a per se decision. This also explains why merging firms may be reluctant to rely on the efficiency defense principle, if this may generate suspects about the opposite problem: efficiency offense.

The results are ameliorated if CA employs a report from outsiders to check the evidence submitted by insiders. The 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 standard of proof 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 by demanding a high standard of proof for a claim of foreclosure. This rule coupled with sequential disclosure leads that in equilibrium only good mergers are presented. The specialization in the burden of proof result hinges in the coincidence of interest between parties and CA for each of the two potential anticompetitive dangers of the merger. Notice that outsiders do not have incentives to provide evidence about a efficiency defense

[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.

case, since any truthful report they make would lead to a decision that goes against them. Thus, a policy that switch the allocation of the burden of proof would not be optimal since the evidence provided by one agent -the outsiders- would not be informative.

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 to present a credible counter-report acts as a deterrence against excessive manipulation of evidence from insiders. This result has several interesting and not always intuitive implications for the design of the disclosure policy. About the timing of disclosing evidence, is optimal to make insiders report before outsiders do. The general rule is that CA has to avoid to make public what outsiders know and by consequence, the standard of proof applied to 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. Finally, communication among both parties can occur if outsiders are informed and the merger leads to its exit. Although is ex-post efficient to allow that communication, because avoid parties to spend resources in disclosing without modifying the CA decision, ex-ante is inefficient because it eliminates the deterrence effect, which is useful in the state of the world where merger produces exit but outsiders have no counter-evidence.

The situation that we attempt 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 in 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[4]. The Commission considered that this commercial disadvantage would severely put at risk the viability of rivals. Merging parties contested that claim, trying to explain that bundling would not be the preferred strategy of the new firm[5]. In Aerospatiale-Alenia/de Haviland[6] (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

[4] 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.

[5] 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 have generated a big discussion among antitrust scholar 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, expose the risks of abuse and confusion on antitrust if the doctrine is employed.

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

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 ground 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[7]. Insiders made efforts to understate the technical and commercial efficiencies from the merger and paradoxically, some otherwise welcomed 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 in 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[8] (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 significative, 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 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 extensive literature on information disclosure and transmission under asymmetry of information. As in the cheap talk models, like the seminal paper of Crawford and Sobel (1984) and its extensions in the lobbying literature[9], the allocation of the burden of proof is consistent with the convergence of interests between informed parties and the society, although what is distinctive in our setting, and that draws form the underlying oligopoly model, is that potentially informed firms have common and opposite interest between them and with respect to the CA depending on the value of the unknown parameter. The paper is also associated to Milgrom and Roberts (1986), who proposes a "skeptical rule" to extract information from interested parties. They constraint the disclosure strategies of the parties to either tell the truth or omit the evidence, even though a modified rule that includes the

[7] 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.

[8] 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..

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

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 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 form the combined effects of the incentives to disclose the information when is convenient to do it with the impossibility of having two-sides screening when the evidence can be concealed[10].

We proceed as follows: First, we set the oligopoly model and explicit the information transmission technology. Secondly, we derive the optimal disclosure policy for different levels of reliability of the outsiders and finally we consider two extensions: one where we endogenize the sequence 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 ex-ante and ex-post the merger, firms face a market downward slope demand, offer an homogenous product and compete using quantities as strategic variables[11]. The cost function of the firms, before merging, is given by $C_i = F + c_i q_i$, 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 c_i and q_i are the marginal cost and quantity supplied per each firm. For simplicity it is assumed that F is similar to all firms and is independent of the market share. Insiders are symmetric, having both an ex-ante marginal cost equal to c_1. If the merger takes place, the new firm will have a variable cost equal to $c_1 - \theta$. The cost structure of the outsider remains unaltered after the merger. The efficiency parameter θ belongs to the interval $\left[0, \bar{\theta}\right] \equiv \Theta$, 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- is denoted as $\Pi_I(\theta)$, $\Pi_0(\theta)$ and $S(\theta)$ respectively and they represent the change in the surplus, measured in monetary units, of each party if the merger is approved. Payoffs satisfy the following properties: $\Pi_I'() \geq 0$, $\Pi_0'() \leq 0$ and $S'() \geq 0$, as long as no exit occurs after the merger. These

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

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

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. It is further assumed that only profitable mergers are proposed, i.e. $\Pi_I() \geq 0$ for all θ, and when the merger does not bring any efficiency gains, the suppressed rivalry in the market makes competitors better off and consumers worst off, i.e. $\Pi_0(0) \geq 0$ and $S(0) \leq 0$.

We define the threshold θ_1 such that: $S(\theta_1) = 0$ and it is assumed that $\Pi_0(\theta_1) = 0$, which implies that $S() \leq 0$ and $\Pi_0() \geq 0$ for $\theta \leq \theta_1$ and also $S() \geq 0$ and $\Pi_0() \geq 0$ for $\theta \leq \theta_1$ The cut-off value θ_1 corresponds to the '**efficiency defense**' threshold and is interpreted as the minimum level of efficiency gains that leaves consumers at least as good as in the scenario without merger. 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 and price competition with imperfect substitutes. More explanation about this property is provided by Farrell and Shapiro (1990) and Duso, Neven and Roller (2003)[12]

There is a possibility of exit when the 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 ex-ante cannot break even, its best strategy is to leave the market without incurring in the fixed cost[13] F. We define θ_2 as the **efficiency offense** threshold such that: $\Pi_O^D(\theta_2) - F = 0$, where $\Pi_0^D(\theta_2)$ is the post-merger duopoly profits of the outsiders. Since $\Pi_0^D(\theta_2)$ is decreasing, the competitor leaves the market for any $\theta \geq \theta_2$. To configure a situation of non-desirable exit we look for cases where $S() \leq 0$ for all $\theta \geq \theta_2$. This case is possible to occur if the magnitude of the fixed and avoidable cost is over some minimum value[14] $F_{\min}$. From the definition of the efficiency offense threshold, we know that θ_2 is decreasing in F, thus, 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 effects of suppressing a competitor dominates over 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 can not be positive if the merger leads to a monopoly. Figure 1 shows the payoffs of the parties involved in function of the parameter θ, we can observe that the exit of the outsider produces a discontinuity in the payoffs of insiders and consume

[12] 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.

[13] 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 $q_i(\theta)$.

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

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 will determine 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 the sufficient statistics to predict the future equilibrium of the market[15]. Summarizing, CA accepts a reduction the number of competitors as long as there is enough cost savings that are passed to consumers (**Efficiency Defense** argument), and at the same time, the cost saving are not be big enough to induce the exit of the remaining competitor (**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 coherent 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 yield to a convex 'lying' cost function that is symmetric respect to the real 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 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 shown evidence is hard information[16]. 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 sup-

[15] 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.

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

port 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.

The specification of lying cost is similar to the one employed by Maggi and Rodriguez-Clare (1995). In their model the optimal policy applied by the regulator induces to the informed party to lie. Similar result, although in a different setting is found in Sanchirico (2001)[17]. This property is found in models of partial verifiability,as demonstrated by Laffont and Green (1986), when the space of feasible messages is restricted, it is not always possible to implement a mechanism or decision rule truthfully.

We assume that informed parties are not forced to provide information if they do not wish. They can either send a document providing not useful information or refuse to submit any message at all. Any of these non-collaborative actions that we name as "uninformative message " are equally informative and have zero cost for the party. On the other hand, not informed parties are not able to produce evidence to be accepted by CA and therefore they just send the uninformative message if they are called for.

Form the literature we know that the principal (CA in this case) can obtain information from the fact that agents decide to omit the presentation of evidence that 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 since in general we do not know a priori what is the worst scenario for outsiders.

Optimal disclosure policy only with insiders. The disclosure game consists in a evidence about efficiency gains $\mu_I(\theta) : \Theta \longrightarrow \hat{\Theta}$, submitted by the merging firms to the CA, a standard of proof or admissible interval $R_I \subset \hat{\Theta}$ and a decision variable: $X(\mu_I, R_I) : \hat{\Theta} x \hat{\Theta} \rightarrow \hat{X} \equiv [0,1]$,that corresponds to the probability of accepting the merger given the evidence and the standard of proof. 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 timing of the disclosure game is the following:

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

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

[17] 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 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 transfer to the former. Sanchirico (2001) with a more general specification of evidence cost function shows that is not optimal to induce minimal cost evidence production, this in our model is translated to not-truthtelling implementation.

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 $X(\mu_I, R_I)$ of the CA.

T=4 The merger is approved if and only if insiders present a message accordingly with the above defined rule, otherwise the merger is not accepted.

It is clear that if we are in the hard information regime ($\alpha \to \infty$), 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 undesirables mergers. Some firms with insufficient E.G. will pretend to be $\theta_1$and others with excessive θ will find feasible to mimic the θ_2. (see figure 2). Intuitively, the solution for this problem is to reduce the interval R_I by moving inwards the limits of it, in a way that only the goods types present admissible evidence. More formally, defining the net utility of insiders 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 and 3. 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 low θ type will be discourage of mimicking the more efficient types. The equation 3 is the efficiency offense constraint that applies for the types in the neighborhood of θ_2, as above, we set $\hat{\theta}_2$ such that $U(\theta_2) = 0$[18].

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

$$U(\theta) = \Pi_I(\theta) - C\left(\theta - \hat{\theta}_2\right) \leq 0 \qquad \forall\theta \geq \theta_2 \tag{3}$$

It is clear that the implementation of the optimal policy is not truthfull 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 to lie that we prevent that the bad types mimic the good types. The policy achieves the first best as long as $\hat{\theta}_2 \geq \hat{\theta}_1$, if this condition is violated, the CA cannot have the perfect screening. To understand better this phenomenon we have to explore on what depends the choice of the threshold standards $\hat{\theta}_1$,and $\hat{\theta}_2$. We denote $\Delta\theta(\lambda) = \theta_2(\lambda) - \theta_1(\lambda)$ as the length of the perfect information admissible range, where λ is a parameter that is negatively related with c_1 (the ex-ante

[18] 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 $\theta \geq \hat{\theta}_2$.

marginal cost of the firms to merge) and represents the added market share of the insiders before merging. The way λ affects $\Delta\theta(\lambda)$ is twofold. First, for high values of λ, merging firms must pass a more demanding efficiency defense test because the merger is suppressing a bigger and more efficient competitor. If we want to keep prices at least at the same level as before the merger, the cost reduction has to be larger in order to offset the negative effect of reducing competition in the market, and this negative effect becomes more significative the bigger λ is[19]. Secondly, higher λ means lower market share and lower ex-ante profits of the competitor. In consequence, since $\Pi_0'(\theta) \leq 0$,high values of λ make the outsider more vulnerable to exit because it induces to quit the market with lower values of θ. These two effects imply that $\Delta\theta(\lambda)$ unambiguously decreases with λ because $\theta_1'(\lambda) \geq 0$ and $\theta_2'(\lambda) \leq 0$. From equations 2 and 3 we obtain that the asymmetric information thresholds $\hat{\theta}_i$ are increasing in θ_i, thus, defining as $\Delta\hat{\theta}(\lambda) = \hat{\theta}_2(\lambda) - \hat{\theta}_1(\lambda)$ the length of the interval R_I, we also have that $\Delta\hat{\theta}'(\lambda) \leq 0$.

As λ increases, the range of feasible merger reduces and the standard of proof range reduces as well. Since $\Delta\theta(\lambda) \geq \Delta\hat{\theta}(\lambda)$, for very high values of λ it is possible to have a case where $\Delta\theta(\lambda) > 0$ and $\Delta\hat{\theta}(\lambda) \leq 0$. In the anomalous situation of having $\hat{\theta}_1 \geq \hat{\theta}_2$ both thresholds conflict between each other. In order to solve the efficiency offense problem, CA moves $\hat{\theta}_1$ upwards, but if its optimal location is above to $\hat{\theta}_2$, the former thresholds will attract the high θ types, rendering innocuous $\hat{\theta}_2$ for the purpose of screening out the offensive types. For the very same reason, we have that $\hat{\theta}_2$ now will attract 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 high λ mergers, the policy defined by the equations 2 and 3 has to be modified. Whenever full separation is not feasible ($\Delta\hat{\theta}(\lambda) \leq 0$), 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[20].

a 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. When $\Delta\theta(\lambda)$ is small, the optimal location of $\hat{\theta}_1$ may conflict with the optimal location of $\hat{\theta}_2$, and may end up attracting the efficiency offensive types if $\hat{\theta}_1 \geq \hat{\theta}_2$, rendering useless $\hat{\theta}_2$ for the purpose of screening out the offensive types and by the same token, $\hat{\theta}_1$becomes useless for leaving out the low θ types. Obviously this reversion of

[19] In the case of cournot competition with homogeneous goods, merging implies supressing one firm, hence, the loss for consumer is larger when c_1 is smaller (or λ bigger). Under price competition between imperefect substitutes, the merged firm prices less agressively because it internalizes the loss in profit in the other brand. This external effect is more prominent when c_1 is lower because the mark-up is bigger and by consequence the profit lost is more significant.

[20] 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 high λ,both constraints have to face both problems which is equivalent to have only one constraint with one standard.

roles of the thresholds is not efficient in terms of optimal screening, and in this particular case of high λ mergers the policy defined by the equations 2 and 3 has to be modified[21]. Whenever, full separation is not feasible ($\Delta\hat{\theta}(\lambda) \leq 0$), 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.

Proposition 1 *There exists a $\lambda = \lambda^c$ such that $\Delta\hat{\theta}(\lambda^c) = 0$. If $\lambda \leq \lambda^c$, the first best is achieved and CA employs the interval $R_I \equiv [\hat{\theta}_1, \hat{\theta}_2]$ with $\hat{\theta}_2 \geq \hat{\theta}_1$, as the required standard of proof to separate the types. If $\lambda \geq \lambda^c$ 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.*

When $\lambda \geq \lambda^c$ the unique standard of proof θ_I is obtained by:

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

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:

$$\begin{aligned} U(\theta_1^*) &= \Pi_I(\theta_1^*) - C(\theta_I - \theta_1^*) = 0 \\ U(\theta_2^*) &= \Pi_I(\theta_2^*) - C(\theta_2^* - \theta_I) = 0 \end{aligned} \tag{4}$$

FOC gives us:

$$\frac{dE[S]}{d\theta_I} = S(\theta_2^*) f(\theta_2^*) \frac{\partial \theta_2^*}{\partial \theta_I} - S(\theta_1^*) f(\theta_1^*) \frac{\partial \theta_1^*}{\partial \theta_I} \leq 0 \tag{5}$$

The values θ_1^* and θ_2^* are the limits of the range where the merger is going to be admissible. By the definition of λ^c 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 5 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 λ is slightly over $\lambda^c$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

[21] When full separation is feasible, each IC constraint is 'specialized' in getting rid of one problem, either efficiency defense (equation 2) or efficiency offense (equation 3). In the presence of the

new optimal policy increases the expected consumer surplus, i.e. $E[S^*()] \geq 0$. This is equivalent to say that is less costly to take the type I and III error than taking type II error or having the risk of rejecting good mergers.

We have shown that when merging firms enjoy a substantial market power, they have to satisfy a stricter standard of proof for efficiency defense and also for efficiency offense. When there exist the possibility of concealing evidence in both directions, satisfying a very strict standard 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 argument and a merger that initially was challenged in basis of low E.G. can be blocked by the danger of high E.G. and vice versa. To face this dilemma, if CA still wants to apply some screening to capture some good mergers, it has to reduce the standard of proof to an unique value[22]. Notice that CA cannot distinguish if the firms that satisfy the unique standard θ_I are overplaying or underplaying the magnitude of cost savings.

Introducing Outsiders Competitors are an important source of information. As mentioned by Scheffman (2002), their contribution is useful to understand many 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. What remains no so clear is how to provide incentives to competitors to disclose the information they have.

We assume, that with a probability $\rho \leq 1$ they learn 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

[22] As we mentioned above, this is valid under the condition that type II error is larger than type I plus type III error. If manipulation is not very costly, that condition is reversed and CA must reject any merger no matter the evidence disclosed by the insiders. Lagerlof and Heidhues (2002) found also that under some circunstances is better not to accept an efficiency defense argument. This is desirable when the influence cost of producing evidence offset the benefit of having better information. That policy requires the commitment ex-post of not accepting any defense. In our model there is no problem of commitment, because the evidence to be presented may induce to costly error.

Following from proposition 1, we analyze the case of $\lambda \geq \lambda^C$, where counting only with insiders report is not enough to get the first best. We add now 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: $X(\mu_I, \mu_0, R_I, R_0) : \hat{\Theta}^4 \rightarrow \hat{X} \equiv [0,1]$. The disclosure process is set in a sequential way by introducing an outsiders report that follows the report of the insiders. Later, 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=5 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=6 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=7 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_0 to the CA.

T=8 CA blocks the merger if and only if the report presented by outsiders accomplish the rule: $\mu_0 \in R_O$. 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.

Type III error. Proceeding in the same way as we did for defining the insiders' standard, 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:

$U(\theta) = X(\mu_O)\Pi_I(\theta) - C(\mu_O - \theta)$

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 $\mu_O \geq \theta_0$. The threshold θ_0 is defined by

$$U(\theta_2) = \Pi_O(\theta_2) = -C(\theta_0 - \theta_2) \tag{6}$$

Equation 6 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 block the merger or to 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, in the other side, for types lower than θ_2, is better to face a

tougher competitor than creating an admissible evidence that would induce the rejection of the merger. The main message is that CA can delegate to 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[23]. This result is based in the fact that when $\theta \geq \theta_2$ and exit may occurs, both consumer surplus and outsiders payoff are 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 is why a cheap talk communication is not useful in this case).

Type I error In the case that θ lays around θ_1, outsiders are not going to disclose the evidence they have because it goes against its interest. To see this, suppose first that manipulation is extremely costly, so firms cannot lie about the magnitude of EG. When $\theta \leq \theta_1$ we have that $\Pi_O() \geq 0$ and $S() \leq 0$ in case the merger is approved. Whenever outsiders present evidence, the merger is blocked and outsiders are worst-off than any scenario that considers the approval of the merger with some positive probability. Hence, outsiders have no incentives 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 $\Pi_O() \leq 0$ 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, non presenting evidence is the dominant pure strategy for outsiders[24]. When the uncertainty is about whether θ lays above or below θ_1, there is no transmission of information at all from the fact that outsiders do not show evidence and 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 in 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 of not showing evidence that goes against them. The asymmetry of information respect to what outsiders know, leads CA to choose an unique insiders' standard

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

[24] 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, outsiders prefer to mimick 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" in Crawford and Sobel (1982).

θ_I. We will address in the extensions the possibility of making θ_I contingent on whether the learning have 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:

$$E[S] = \rho S_L(\theta_I) + (1-\rho)\, S_N(\theta_I) \tag{7}$$

Subject to the Incentive Compatibility conditions (IC):

$$\begin{aligned} U(\theta) &= \Pi_I(\theta) - C(\theta_I - \theta) \leq 0 \qquad \forall \theta \leq \theta_1^* \\ U(\theta) &= (1-\rho)\Pi_I(\theta) - C(\theta - \theta_I) \leq 0 \qquad \forall \theta \geq \theta_2^* \end{aligned} \tag{8}$$

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 scenario, 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:

$$\Pi_I(\theta_1^*) - C(\theta_I - \theta_1^*) = 0 \tag{9}$$

$$(1-\rho)\Pi_I(\theta_2^*) - C(\theta_2^* - \theta_I) = 0 \tag{10}$$

First Order Conditions give us:

$$\frac{dE[S]}{d\theta_I} = -\rho S(\theta_1^*) f(\theta_1^*) \frac{d\theta_1^*}{\theta_I} + (1-\rho) \cdot S(\theta_2^*) f(\theta_2^*) \frac{d\theta_2^*}{\partial \theta_I} - S(\theta_1^*) f(\theta_1^*) \frac{\partial \theta_1^*}{\partial \theta_I} \text{,} \tag{11}$$

To understand better the meaning of this new result, let suppose first that there is the same knowledge about θ among insiders and outsiders, i.e. $\rho = 1$. In this case, the second term of the right hand side disappears and remains only the first one. Since $S(\theta_1^*) \leq 0$, 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 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: provided that

we know by sure that outsiders will block any exit-inducing merger and won't block anyone with $\theta \leq \theta_1$, we 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 form outsiders. The optimal decision policy of the CA is equivalent to a complete specialization in the burden of proof between parties. The allocation of the burden is done in a way that aligns the incentives of each party to submit evidence with the interest of CA of having that evidence.

The above result is summarized in the proposition 2:

Proposition 2 *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 merger are presented and the first best is achieved.*

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 to stop the merger. Given that, CA must still count on insiders' report to screen those mergers in the eventuality that outsiders do not learn θ. It is clear that CA puts more trust on outsiders the bigger is ρ, making the chosen standard θ_I monothonically 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 11, we obtain:

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

Comparing it with the F.O.C. of equation 5 (when we have no outsider), we can see that the difference is the term $(1-\rho)$ that multiplies the first term of R.H.S. We have now 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, implying that the optimal standard θ_I moves 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[25].

Deterrence Effect.

This is an effect that work through the IC constraint of the high θ types. Comparing these constraints in the cases when we count and we do not count with an outsider (equations 5 and 8), for the same θ_I, the value of θ_2^* is larger when we do not count with an outsiders. Without an informed outsider, an

[25] In the extreme case of $\rho = 1$,we are back to proposition 1, where θ_1 takes the maimum value and is only used to get rid of type I error.

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 a 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 say that the marginal cost of lying upwards is augmented by $\frac{1}{1-\rho}$, hence we have that the value of $\frac{\partial \theta_2^*}{\partial \theta_I}$is always smaller when the outsider is present[26]. 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, respect to the case of no outsiders. 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[27].

In the case of having a corner solution when we count only with 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 by the same reasons already presented, increasing the value of the derivative $\frac{dE[S]}{d\theta_I}$ and eventually making it equal to zero, which would yield to an interior solution. By inspecting equation 11, it is clear that it is more likely that CA abandon the corner solution when ρ is larger.

Proposition 3 *When outsiders may learn the parameter θ with some positive probability ρ, the insider's optimal standard $\theta_I(\rho)$ 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 can be considered as a generalization of proposition 2, for the case when 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 its exit and as long as they are informed they will eliminate any possibility of approving exit-inducing mergers The standard of proof required for them (θ_0) is independent of ρ and perfectly screen 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 in the insiders, and this burden is going to be less stringent -higher standard θ_I- the more reliable are the outsiders respect to provide relevant evidence.[28] Remember that the existence of type III error is what restrain CA for pushing upwards θ_I up to the maximum value (θ_I for $\rho = 1$). Because in the margin both type of errors should impose the same cost, accepting type III

[26] More technically: $\frac{\partial^2 \theta_2^*}{\partial \theta_1 \partial \rho} \leq 0$

[27] 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.

[28] Some types of insiders benefit from having outsiders as a counter-part because thay are not longer forced to downplay their level of EG.

error implies that we accept some type I as well. Finally, in equilibrium only merging firms with $\theta \in [\theta_1^*, \theta_2^*]$ are going to present evidence at T= 5. 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 gets first information from merging firms and then, based in what it receives ask evidence form 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 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 looking at the details of the proposal, establishes the approval policy. This policy consists on a decision rule based on whether the evidence $\{\mu_I, \mu_O\}$ presented by each parties lies inside of its corresponding admissible intervals $\{R_I, R_O\}$.

T=4 CA asks first for a evidence μ_O from outsiders.

T=5 Outsiders, based on what they have learned on θ, in the standard R_O 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 $\mu_O \in R_O$ 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 to 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 it but they do not want to disclose it. In this second case, CA ask evidence form insiders and defines a standard of proof θ_I that takes in 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:

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

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

Comparing this program with the one of 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 reporting evidence against an exit-inducing merger and is always a weakly dominant strategy not presenting evidence when the merger cannot be blocked. In consequence, in both cases, θ_I is chosen in a way that trade-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 constraint in equation 8 ,there is no here the term $(1-\rho)$ multiplying 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 of information. Having outsiders first, plays in favor of insiders because it completely eliminates the uncertainty about having counter-evidence[29]. Using the above defined terminology, the deterrence effect vanishes when we switch the order of reporting and ask to outsiders reporting first.

From the point of view of CA altering the timing is not beneficial due to the disappearance of the deterrence effect. Some 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[30].

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 4 *An optimal policy that ask a report first form insiders and second from outsiders is superior to a policy that ask first form outsiders and then from insiders.*

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

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

3.2 Interim Communication Among Parties

Now, we allow for the possibility that involved parties can exchanges messages before the official reporting process takes place. The interim communication is about disclosing the other 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 It is in the interest of the CA that interim communication takes place? We analyze the two 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 costless 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[31]. 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[32]. Since both interested parties are better-off with this communication and the outcome does not change for CA (always merger is 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[33] the absence of truthful message form outsiders is interpreted by insiders as ignorance of the outsiders. This imply that the uncertainty about whether they will be blocked by an counter-report disappear and merging firms will be more willing to present favorable evidence for not desirable mergers.

In other words, the deterrence effect is out and we are in the same scenario as when outsiders report first and insiders second. As we now, 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 is not always in the interest of

[31] 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.

[32] 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.

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

competitors to transmit to 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 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 save also a report to outsiders[34]. The way CA signals to insiders that 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 ant report. If we assume that CA can fine afterwards a lying firm for claiming that they have some evidence without support, we rule out this mimicking behavior of the ignorant outsider[35].

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 implying that $\theta \geq \theta_2$ or he does not receive any message at all, which may imply that outsiders know something but $\theta \leq \theta_2$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 and in the second scenario the standard is obtained by Bayesian updating. 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 section is that allowing outsiders to communicate to other parties what they know is socially detrimental because it destroy the deterrence effect of insiders ignorance about what opposition they will face.

We summarize the results in proposition 5

Proposition 5 *Any interim communication between outsiders and the rest of the parties -insiders and CA-respect to what the first ones know, even if ex-post efficient is not desirable form the ex-ante point of view since it completely eliminate the deterrence effect.*

[34] 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.

[35] 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 many interesting 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 affected in markets that are highly concentrated, where exit is a concern and entry is not likely to timely take place. The conflict of objectives of 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 concentrate only in 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 specialization in the burden of proof result hinges in 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 proof that a merger fails the efficiency defense test, that is not feasible to apply due to the evident divergence of interests between outsiders and CA. However, the fact that we can count on them for 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 counting with 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 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) 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 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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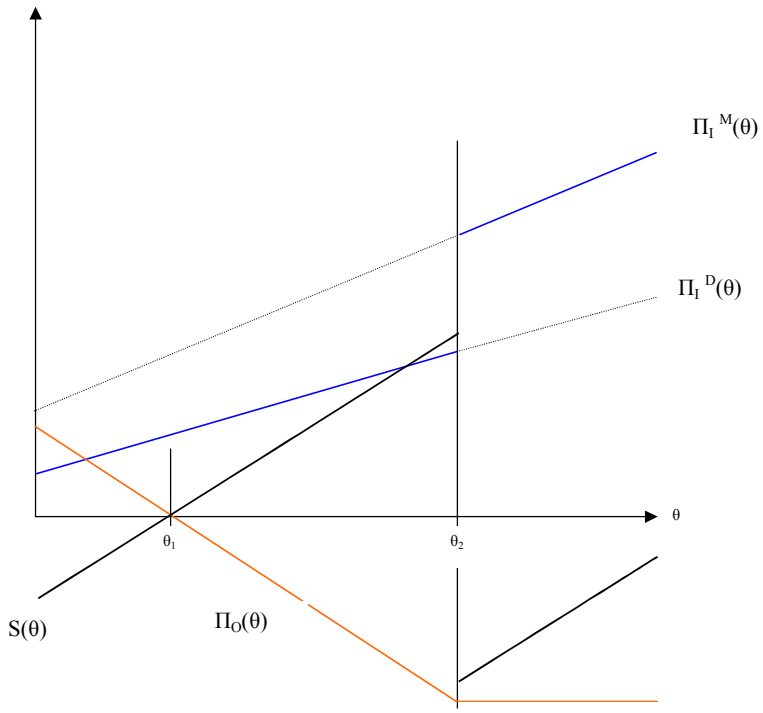

Figure 1:

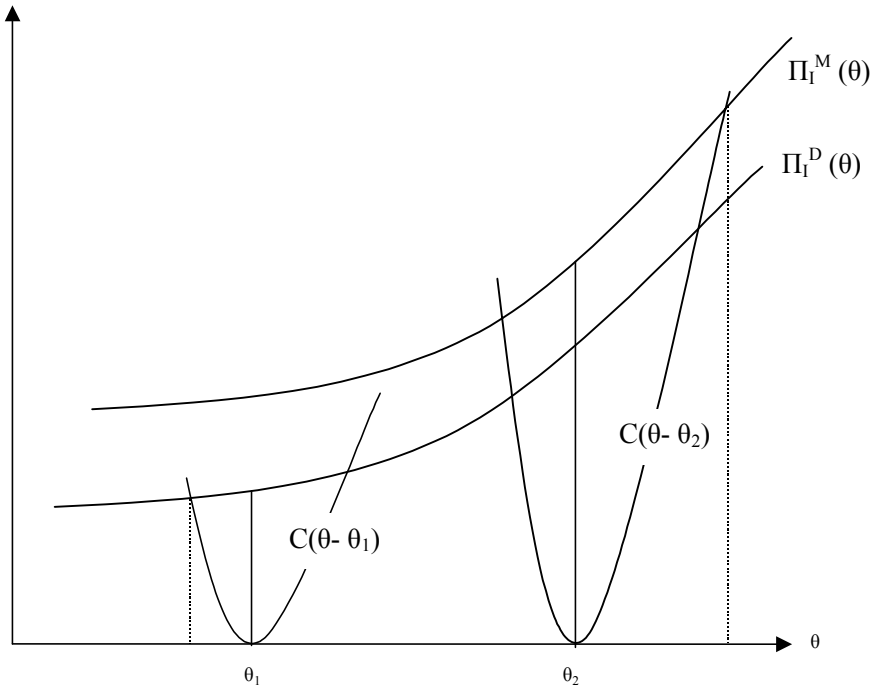
$\Pi_I^M(\theta)$
$\Pi_I^D(\theta)$
$C(\theta - \theta_2)$
$C(\theta - \theta_1)$
θ
θ_1
θ_2

Figure 2:

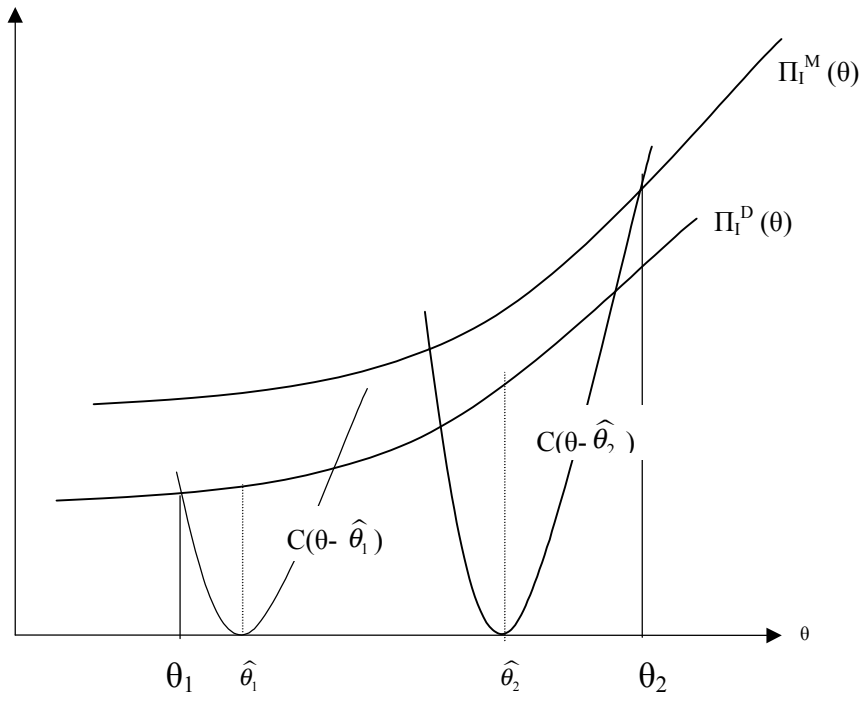
$\Pi_I^M(\theta)$
$\Pi_I^D(\theta)$
$C(\theta - \hat{\theta}_2)$
$C(\theta - \hat{\theta}_1)$
θ
θ_1
$\hat{\theta}_1$
$\hat{\theta}_2$
θ_2

Figure 3:

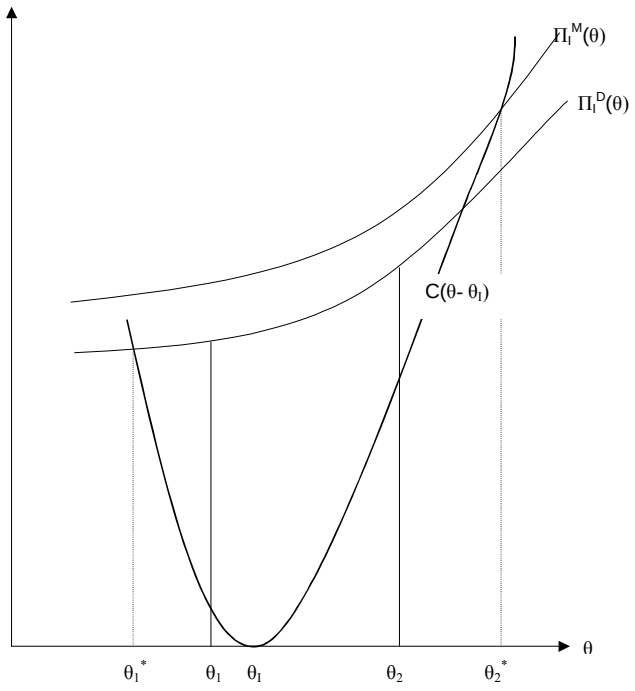
$\Pi_I^M(\theta)$
$\Pi_I^D(\theta)$
$C(\theta - \theta_I)$
θ
θ_I^*
θ_1
θ_I
θ_2
θ_2^*

Figure 4: