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# Optimal Pre-Merger Notification Mechanisms

## Incentives and Efficiency of Mandatory and Voluntary Schemes

*Aldo González*

*Daniel Benítez*

The World Bank  
Sustainable Development Network  
Finance Economics & Urban Department  
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## Abstract

The authors compare the two merger control systems currently employed worldwide: a mandatory system based on merger size threshold and a voluntary system with ex-post monitoring and fines. The voluntary system possesses two informational advantages: (i) the enforcement agency employs more information—verifiable and non verifiable parameters—to decide the set of mergers to investigate, and (ii) the first move of merging firms reveals useful information to the agency

about the competitive risk of a merger. If fines for undue omission to notify are upward limited, then a mixed mechanism is optimal, where small transactions are under a voluntary regime while the big mergers are obliged to report. Remedies for fixing anticompetitive mergers act as an instrument that induces firms to notify the operation, improving further the advantage of the voluntary mechanism.

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# **Optimal Pre-Merger Notification Mechanisms. Incentives and Efficiency of Mandatory and Voluntary Schemes\***

**Aldo González<sup>1</sup>**  
**Daniel Benítez<sup>2</sup>**

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<sup>1</sup> Department of Economics, University of Chile, [agonzalez@econ.uchile.cl](mailto:agonzalez@econ.uchile.cl)

<sup>2</sup> World Bank, [dbenitez@worldbank.org](mailto:dbenitez@worldbank.org)

## 1. Introduction

Although there is agreement worldwide about the economic goals pursued by merger enforcement, some differences remain at the implementation level, in particular in the type of mechanism employed to control mergers. Most developed economies like Europe, the United States, Canada and Japan have an obligatory system where all mergers whose magnitude is above a predefined threshold must be notified to the antitrust agency before consummation. On the contrary, Australia and New Zealand have a voluntary mechanism where firms must decide whether to report the merger on the basis of a set of criteria defined by law. Nowadays, many developing countries are starting to implement their merger control mechanisms and the choice which system to adopt is a relevant policy issue for them.

The purpose of this paper is to compare these two merger control mechanisms – compulsory and voluntary. We set up a model where the competitive effect of a merger is private information of merging firms. This effect can be discovered through costly monitoring by the antitrust agency. The population of mergers is characterized by two ex-ante observable parameters: the size of the transaction and the probability that the merger is anticompetitive. The compulsory mechanism is based on the first parameter, due to the property of verifiability of the size of the acquired (or acquiring) firm. In order to obtain the optimal size threshold above which mergers are inspected before consummation, the lawmaker takes in account the average competitive risk of the whole population of mergers. On the contrary, the voluntary mechanism with ex post monitoring provides the agency with the flexibility to employ all the information –verifiable or not- to decide which non self-notified merger to inspect. This discretionary advantage of the voluntary scheme seems relevant since competition agencies in the US and Europe spend important resources in reviewing mergers that although being above the notification threshold posses no competitive risk.<sup>3</sup>

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<sup>3</sup> According to the statistics, more than 95% of the notified mergers in Europe and the US are approved in the first phase.

The second advantage of the voluntary system –already mentioned by Choe and Shekhar (2005) -relies on the fact that the Competition Agency (CA) acts after the firms have made a decision about notifying the authorities, which provides some information to the agency about the competitive risk of the merger. Since the CA moves in a second stage, the agency does not have to inspect all merger cases. The credible threat of an ex –post review, and the risk of being fined, discourages anti competitive mergers to take place without notification. The lower effective enforcement cost of the voluntary system implies that more anticompetitive mergers are inspected and blocked compared with the compulsory system.

If maximum fines for unlawful omission to notify are not large enough to induce self notification, the superiority of the voluntary system disappears and the optimal solution is a mechanism that is contingent on the size of the transaction. Notification should be voluntary below a size threshold and compulsory above that level. Finally, the possibility to eliminate the anticompetitive effect of some mergers through remedies is an additional instrument that eases notification in a voluntary system. Remedies act as a carrot that relaxes the incentive compatibility condition that induces anticompetitive operations to be self-notified. Thus, remedies reduce the enforcement cost of the voluntary mechanism since lower monitoring intensity is required to satisfy the self-notification constraint. This benefit arising from the remedies agreed between the CA and the firms is not present in the mandatory system.

This paper is structured as follow: In the next section we set up the basic model and the enforcement mechanisms we want to compare. In section three we obtain the optimal mechanism under constrained maximum fines. In the fourth section we introduce the possibility of negotiating remedies between firms and the agency and in section five we conclude.

## 2. The Model

Consider a population of mergers that are characterized by two parameters: the magnitude of the transaction, denoted by  $S$ , and the anticompetitive risk of a merger represented by the parameter  $\rho$ . We assume that both,  $S$  and  $\rho$ , are independent variables distributed in the interval  $[0, S_{max}]$  with density  $f(s)$  and  $[0, 1]$  with density  $g(\rho)$  respectively.

The magnitude  $S$  represents the monetary value of the transaction, i.e. the price paid by the acquiring firm to the owners of the acquired company. It may also represent the asset value of the newly created firm in case of integration of two companies. The parameter  $\rho$  is defined as the probability that the merger decreases welfare. It contains all the relevant information about the risk that a transaction becomes anticompetitive. For instance, variables such as market concentration, change in concentration, entry barriers, likelihood of collusion, efficiencies as well as industry specific characteristics are included in the probability  $\rho$ .

There is empirical evidence that supports the relationship between the above indicated factors and the evaluation of anticompetitive risk by the enforcement agencies. In the U.S., Coate, Higgins y Mc Chesney (1990) show that the importance of four competitive variables is positively correlated with the possibility that the Federal Trade Commission (FTC) either blocks the merger or asks for remedies.<sup>4</sup> Similar results are found by Coate and Ulrick (2006) for a set of second request cases analyzed by the FTC between 1996 and 2003. In New Zealand, Strong, Bollard y Pickford (2000) found that the firm joint market share of the merging firms and the height of entry barriers had a positive effect in the probability that dominance were found and the merger were rejected.

In this model,  $S$  and  $\rho$  are observed at no cost by the CA but  $\rho$  is not verifiable by a third party like a court of justice. The different nature of these two parameters is relevant at the moment of designing and comparing different notification mechanisms. As discussed below, notification rules need to be based on verifiable parameters.

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<sup>4</sup> The variables included in the regression are level of HHI, change in HHI, entry barriers and likelihood of collusion.

About the competitiveness of a proposed merger, we assume two states of nature: The operation is either competitive or anticompetitive. In the first case, the merger adds a social value normalized to 1. On the contrary, when it is anti-competitive, it generates a social cost equals to -1. Formally, we represent the competitive effect by a parameter  $\theta$  such that  $\theta$  belongs to the set  $\{-1,1\}$ .

The competitiveness  $\theta$  is private information of the merging firms and unknown by the competition agency. The agency only perceives the risk behind this transaction as is captured by  $\rho$ . Formally, the parameter  $\rho$  is defined as the probability of  $\theta = -1$ , conditional on the set of characteristics  $X_i$  of a merger such as the magnitude of entry barriers, the concentration in the market, the change in concentration, etc. Thus:  
$$\rho = \text{Pr ob}[\theta = -1/X_1, X_2, X_3 \dots]$$

We assume that the size of the transaction amplifies the welfare effect of the merger. Thus, the change in welfare induced by a merger of size  $S$  would be equal to  $\theta S$ . It means that an anticompetitive merger reduces welfare in  $S$ , whereas a competitive one increases it in  $S$ . A merger that is likely to increase prices by 3%, for instance, is going to be more harmful in absolute terms when it affects a market of bigger size.<sup>5</sup>

The competition agency (CA) can spend resources in discovering whether a merger will increase or decrease welfare. The CA at cost  $C$  can learn whether the transaction is competitive or not with total certainty. For simplicity, we assume that the cost  $C$  of investigating the effect of a merger is independent both on the transaction size  $S$  and the ex ante risk  $\rho$ . It is also assumed that by reviewing the merger, the agency is able to generate hard information that can be presented before a court to support a case either for blocking or accepting the operation. It is not possible to prevent a merger only based on the a priori beliefs represented by  $\rho$ .

The function of the CA is to allow that competitive mergers take place while preventing the anticompetitive ones being materialized. Naturally, the cost of reviewing mergers restricts the actions that the CA can undertake. Thus, the CA maximizes an objective function that contains two components. One is achievement of the CA main goal which is

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<sup>5</sup> If the market demand is linear, the welfare loss associated the higher ex-post price is proportional to the size of the market

deciding without error, and the second is the cost of the investigation process. We define three different merger control mechanisms:

- (i) Mandatory Discretionary Mechanism
- (ii) Mandatory Mechanism based on Transaction Size Threshold
- (iii) Voluntary Mechanism

This division is a useful device to compare mechanisms (ii) and (iii) which is the main objective of the paper.

## 2.1 Mandatory Discretionary Mechanism

Under this mechanism all mergers must be announced to the CA no matter the transaction size or competitive risk. This merging announcement imposes no cost to the involved firms and the merger cannot be materialized until the CA explicitly approves it.

Once the merger is submitted, the agency observes the parameters  $S$  and  $\rho$  and then decides whether to review the merger or not according to the CA's objective function. If the CA resolves not to open an investigation, the merger can be materialized. Otherwise, the CA proceeds as mentioned above, studying the effect of the merger. If the investigation detects that the merger does not damage competition, the CA will approve it. On the contrary, if the outcome of the revision<sup>6</sup> is that the merger is anticompetitive, the CA will block the operation. The hard evidence generated by the investigation is enough to satisfy the standard of proof required by a court of justice for blocking a merger and consequently the court will reject with probability one an appeal from the affected firms.

The CA decides about opening an investigation in base to the expected value of both alternatives. If the merger is approved without reviewing, it produces an expected change in social welfare equals to  $W_0$ :

$$W_0 = -S(1 - \rho) + S\rho = S(1 - 2\rho)$$

When the merger goes through the revision process, the CA incurs in a cost  $C$  and the merger is approved if it is competitive, otherwise it is rejected. The expected social benefit of reviewing a merger net of costs is equal to:

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<sup>6</sup> The meaning of revision in this article is equivalent to an investigation.



$$W_r = -C + S(1 - \rho)$$

Thus, the revision shall take place if and only if

$$W_r > W_0 \quad \text{or if} \quad \rho S > C. \quad (1)$$

*Lemma 1: Under a discretionary mandatory mechanism, a merger is reviewed if and only if the expected competitive damage is bigger than the cost of the revision.*

Lemma 1 says that is convenient to review a merger when the risk of passing an anticompetitive merger, times the transaction size, is larger than the cost of studying the operation. This result supports the fact that competition agencies tend to review larger transactions that justify the cost of getting crucial information. Small transactions or those that are perceived as riskless should not be reviewed.

## **2.2 Mandatory Mechanism Based on Transaction Size Threshold**

In this mechanism, the competition agency reviews all mergers whose transaction size is above a pre-established threshold  $S^*$ . As mentioned, it is not optimal to submit all mergers to a review since some of them are likely to be competitive or have a null impact on welfare. Unfortunately, a formal rule cannot be based in the result of equation (1) as the parameter  $\rho$  is not verifiable. However, it is feasible and partially optimal to define the threshold in function of  $S$ . In practice, most of the known mandatory mechanisms like those of U.S, Europe, Canada and Japan for instance are based on variables related to  $S$  and not with  $\rho$  in order to avoid ambiguities when interpreting the law. We also name this mandatory mechanism as “traditional” since is the one applied in most of the developed countries.

The optimality of  $S^*$  can be directly obtained from the CA’s objective function. In order to avoid corner solutions, we assume that  $C \leq S_{max}$ , otherwise no merger will be subject to review by the CA. The value of  $S^*$  can be deduced from the following maximization problem:

$$\text{Max}_{S^*} \int_0^1 \left[ \int_0^{S^*} W_0(s, \rho) f(s) ds + \int_{S^*}^{S_{\max}} W_r(s, \rho, C) f(s) ds \right] g(\rho) d\rho$$

The first order conditions yields to:

$$\int_0^1 [(s^* (1 - 2\rho) - (-C + s^* (1 - \rho))) f(s^*)] g(\rho) d\rho = 0$$

$$s^* \int_0^1 \rho g(\rho) d\rho - C = 0$$

From this last equation we can deduce that mergers should be reviewed if:

$$E[\rho] S^* \geq C \quad (2)$$

or

$$S^* = \frac{C}{E[\rho]}$$

*Lemma 2: On a mandatory mechanism based on transaction size threshold, a merger must be notified if and only if the size of the merger times the expected competitive risk of the population of mergers is greater than the cost of reviewing an operation.*

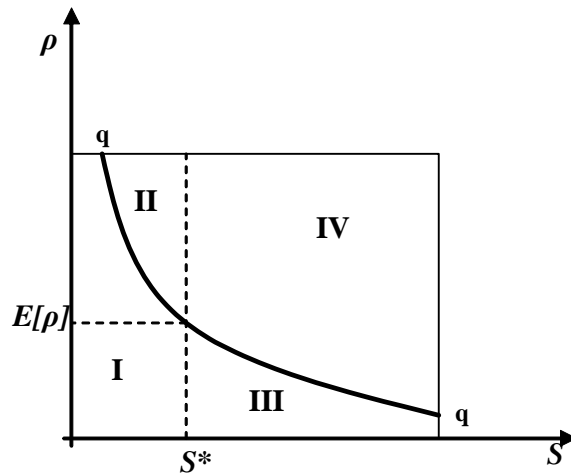
The solution expressed by (2) differs from the result obtained in equation (1) since the traditional mandatory scheme fixes the notification threshold based only in the transaction size. When choosing the optimal threshold  $S^*$ , the lawmaker takes in account the average competitive risk of the population of mergers which is represented by  $E[\rho]$ . On the contrary, under the discretionary mechanism, the CA decides the action to undertake using the information provided by two parameters:  $S$  and  $\rho$ .

Clearly, two types of errors are incurred when using a traditional mandatory mechanism with respect to the discretionary scheme defined in (1). First, some mergers that do not possess a large competitive risk are reviewed despite their magnitude, that is when  $\rho < E[\rho]$ . Second, some other mergers that should be reviewed are not when  $\rho > E[\rho]$ .

In figure 1 we graph both mechanisms: the discretionary and the traditional one. The curve  $qq$  represents equation (1) and divides in two the space  $(\rho, S)$ . At the left hand side of the

qq frontier we have the set of merger that it is not efficient to review, whereas at the right hand side are the mergers that must be investigated. The traditional mandatory mechanism is illustrated by the vertical dotted line that starts at  $S^*$ . Then, only the mergers above  $S^*$  go to revision regardless its competitive risk  $\rho$ .

Figure 1



The two types of relative errors of the traditional mechanism are observed on Figure 1. Region II contains the mergers that are free from notification since their transaction size is below the threshold but are risky in their respective market. On the contrary, region III include those mergers with low competitive risk but that would be reviewed anyway since their size is above the threshold  $S^*$ .

*Lemma 3: A discretionary mandatory mechanism is superior to one based only in the size of the merger. Under the latter some harmless merger are controlled (Region III) while others with a high risk of being anticompetitive are free from revision (Region II).*

The superiority of the discretionary mechanism hinges on the fact that employs more information than the traditional system, which is based only on one parameter: the size of the merger.

The performance of the traditional mandatory system could be improved, for instance, if the CA applies a short inspection to the mergers falling in region III, without allocating the same resources as the case when the competitive risk is higher.<sup>7</sup> Undoubtedly, this action would be time and resource saving. Also, it helps to define the optimal threshold  $S^*$  (by moving it to the left) in a way that some mergers located in region II will go to revision. However, the cost of analyzing mergers in region III will not be totally eliminated. First, the CA has the mandate to review them and some resources will be spent at least to explain why there is not need of further examination, and second, because the firms have the obligation to notify the merger and wait for the pronouncement of the CA before finalizing the operation. Notice that there is no equivalent action that allows us to reduce the error of region II, since mergers lying in region II are excluded by law from antitrust control.

### **2.3 Voluntary mechanism**

We follow a set up similar to the one employed by Choe and Shekhar (2006). Under that scheme, merging firms make the first move by deciding whether to report or not the merger to the antitrust agency. After that decision, the CA must resolve the course of action to undertake about the merger. The sequences of actions of the voluntary mechanism are the following:

- T=1 The lawmaker sets the rules about merger notification, defining which merger should be notified to the CA. In our model, firms are not obliged to notify when their merger is competitive, i.e. when  $\theta=1$ .
- T=2 Firms learn  $\theta$  and decide whether to inform the action to the CA. If they decide to notify, they have to wait until the CA pronounces a positive decision about the merger. If firms do not notify the operation to the agency, the merger continues knowing that the CA can react adversely.

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<sup>7</sup> The compulsory mechanisms of the U.S. and Europe have a preliminary review or first phase stage where the CA applies a first screening to the submitted mergers.

T=3 The CA, by observing  $S$  and  $\rho$ , decides to open a case according to the action followed by the firms. If the firms notify, the CA reviews the case under the same procedure described for the mandatory schemes. On the contrary, if the firms opt for not reporting the merger, the CA decides whether to open an investigation or not. Note that when firms do not submit the case for approval, they continue with the merger.

T=4 In case that the CA opens an investigation without notification and it discovers that the merger is welfare decreasing, the CA is entitled to contest the merger and fine the firms with  $F > 0$ . On the other hand, if the investigation concludes that the action is pro competitive the CA closes the case. It is assumed that the merger is irreversible and thus it cannot be reversed once implemented, independently of the outcome resulted from the investigation.<sup>8</sup>

The objective behind this mechanism is to provide incentives for self-selection in such a way that those mergers without competitive concerns should not be reported. On the other hand, mergers which are likely to be anticompetitive should opt for notification. Thus, the challenge is to give the interested parties strong incentives for notification when it is necessary. Naturally, when a merger is anti competitive, firms need to obtain a higher benefit reporting the action than not reporting it.

The change in the private benefit of merging parties with respect to the status quo is captured by a function  $U(S, \theta)$ . It is assumed that  $U(\cdot) \geq 0$ , where  $U(\cdot)$  is increasing in the transaction size and decreasing with respect to the second argument. That is, mergers are more profitable when the transaction size is higher and when they are less competitive.<sup>9</sup>

The antitrust system -competition law and institutions- has two instruments to induce firms to notify when is due. The first is the probability to investigate given the fact that firms did not report the activity and the second, is the possibility to fine the firms if the merger investigation shows an adverse result. We denote the probability of investigating a merger by  $X$ , which is a discretionary decision of the CA. The fine is fixed exogenously

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<sup>8</sup> The irreversibility of the process is a convenience assumption that simplifies the problem. We later release this assumption.

<sup>9</sup> For instance, mergers that rise prices, create entry barriers or make more feasible collusion, are likely to be more privately profitable but less socially desirable.

either by a law that specifies the magnitude of fines for this type of behavior or by an independent third party like a court of justice.

The incentive compatible condition that induces firms to report an anticompetitive merger is obtained by the following equations:

$$\begin{aligned} U_m &= (1 - X)U(S, \theta_{-1}) + X(U(S, \theta_{-1}) - F) \\ U_n &= 0 \end{aligned}$$

Where  $U_m$  denotes the utility when firms merge without notification and  $U_n$  the utility if they notify. Thus, notification and wait dominates merge and fine if and only if  $U_n > U_m$ , which implies:

$$X(S) \geq \frac{U(S, \theta_{-1})}{F} \equiv X^*(S) \quad (3)$$

This inequality deserves some comments. First, as the probability is bounded in the interval  $[0, 1]$ , the change in the utility when firms merge without notification cannot be higher than the perceived cost in case they are punished. If fines are capped, some mergers will not be notified since they still get a positive benefit even if they are fined afterwards. Second, since the utility is increasing in the transaction size, the probability of investigating a merger also must be increasing in  $S$ .

The Bayesian Nash equilibrium of this sequential game of voluntary notification and ex – post inspection is characterized as follows:

- The CA sets a monitoring policy such that for a not notified merger of size  $S$ , it opens an investigation with a probability slightly above the minimum value  $X^*(S)$ , which induces all the anticompetitive mergers to be reported.
- If the merger is anticompetitive, the operation it is notified to the CA and consequently reviewed by the agency at cost  $C$ .
- If the merger is competitive the firms do not notify the operation. The CA consequently reviews the case according to the probability  $X^*(S)$ .

Notice that although in equilibrium only the competitive mergers are not notified, the CA must commit to apply its monitoring policy defined by  $X(s)$ . Otherwise, the mechanism

unravels and the anticompetitive mergers will take advantage of the lack of monitoring of the CA, and will not notify their operations. Also, it is worth to mention that the plain act of notification does not relieve the CA from performing the revision of the merger in order to reject it. Even if the CA knows with total certainty that a notified merger is anticompetitive, the agency must generate the information for supporting the blocking of the operation before a court of justice.<sup>10</sup>

Like in the discretionary mandatory system, it is not optimal to apply the reviewing policy defined in (3) to the full set of transactions. For each merger, characterized by the observable parameters  $(S, \rho)$ , the CA compares the benefits of not reviewing and let the firms merge versus applying the monitoring policy. Within the timing of the voluntary mechanism, the decision whether to apply or not the monitoring policy is done in  $T = 3$ . Notice that the decision to apply the monitoring policy is not the same as the decision to monitor a merger. In the latter a merger can be investigated with probability  $X(s)$ , while in the former the merger is totally left out of revision.

If the CA decides not to investigate at all, both types of mergers will take place, the competitive and the anticompetitive ones. The value of the no review option in terms of social welfare is equal to:

$$W_0 = S(1 - 2\rho)$$

The social value of the optimal monitoring policy as a function of  $\rho$  and  $S$  is:

$$W_m = -\rho C + (1 - \rho)[S - X^*(S)C]$$

With probability  $\rho$  the merger is anticompetitive and by the incentive compatibility condition it is notified and reviewed at cost  $C$  and then rejected by the agency. On the other hand, with probability  $(1 - \rho)$  the merger is competitive and it is not reported by firms. Then, the CA investigates the case with probability  $X^*(s)$  as defined by equation 3.

Therefore, it would be optimal to apply the monitoring policy if and only if  $W_m \geq W_0$ , or if:

$$\rho S \geq C[(1 - \rho)X^*(S) + \rho] \quad (4)$$

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<sup>10</sup> Otherwise the firms may appeal to a court of justice that the merger is refused without any justification. Courts of Justice are not Bayesian, therefore they cannot resolve based on the updating of information due to the screening property of the merger control mechanism. They decide on the base of the hard information generated by the examination process.

The result provided by equation (4) can be compared with the similar condition obtained in (1). In the latter, the policy is deterministic in the sense that all mergers that satisfy this condition will be reviewed with total certainty, while in the former the candidates for revision will be investigated with some probability between zero and one. The difference between condition (1) and (4) is that in the right hand side of the latter equation, the cost of reviewing a merger is multiplied by a coefficient that is lower than one.<sup>11</sup> Thus, the voluntary mechanism reduces the expected cost of enforcement because it is not socially optimal to review all non reported mergers as the incentive compatible condition (3) shows.

We can graph the optimal monitoring policy in the  $(\rho, S)$  space. The frontier  $pp$  in figure 2 corresponds to the equation (4) in state of equality. All mergers at the down left hand side of the frontier are not notified neither investigated. The mergers lying at the up right side of the frontier are notified and controlled if they are anticompetitive, whereas the competitive transactions are not notified and the CA investigates them with probability  $X^*(S)$ . In technical terms we have a pooling equilibrium for low values of  $\rho$  and  $S$  where the CA is not interested in controlling mergers. Conversely, for high values of  $\rho$  and  $S$  there is separation of types where the notification of anticompetitive mergers is induced by the monitoring policy  $X^*(S)$ .

A first comparison on the effective cost of controlling mergers between the discretionary mandatory and voluntary mechanism can be stated.

*Lemma 4: For a given set of mergers belonging to the space  $(\rho, S)$ , the cost of enforcement is lower under a voluntary mechanism than a discretionary mandatory scheme. A similar level of effectiveness in terms of error is achieved by both mechanisms, but the voluntary mechanism does it with a lower cost.*

This is the result obtained by Choe and Shekhar (2006). Given that the voluntary mechanism creates a sort of self-selection of firms, it induces the same number of cases than in the mandatory scheme being submitted but at a lower effective cost. In terms of objectives pursued by the competition law, the performance of both schemes – the

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<sup>11</sup> The coefficient that multiplies  $C$  in the right hand side of equation 4 corresponds to a weighted average between the probability of monitoring  $X^*(s)$  and 1.

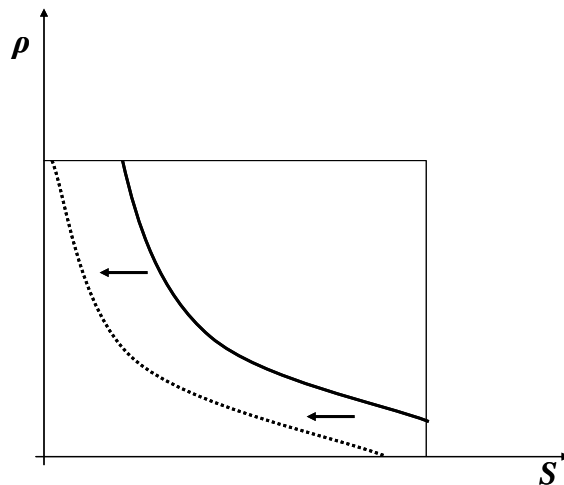


identification error – would be equal, that is, both mechanisms avoid that the same number of anti competitive mergers to take place, but the implementation cost is lower under a voluntary mechanism.

Since the inspection cost is reduced in real terms using a voluntary mechanism, it is optimal to investigate more mergers, improving further the effectiveness of this mechanism with respect to the mandatory one. This effect is represented in Figure 2 where the frontier pp of the voluntary mechanism corresponds to an inward shift of the inspection frontier qq. One important implication of this result is that under a voluntary mechanism, more anticompetitive mergers are blocked compared to a mandatory mechanism. Such increment in the set of merger to be potentially reviewed is optimal since the benefit from marginally inspecting more mergers outweighs the cost generated by it. Although in aggregate terms the mandatory mechanism performs more revisions, the voluntary system allocates better the resources in the more dangerous cases, which reinforce the deterrence effect of the latter system.

*Corollary 1: The lower enforcement cost of the voluntary system, allows blocking more anticompetitive mergers than the mandatory discretionary system.*

**Figure 2**



The advantage of a voluntary system relies on the fact that the CA acts after the firms have taken a decision about notifying, which provides some information to the CA about the competitive risk of the merger. Since the CA moves in a second place, the agency does not have to perform controls in the hundred percent of cases that are needed. The

credible threat of an ex –post review, and the risk of being fined, discourages anti competitive mergers to take place without notification. On the other hand, competitive mergers are not reported despite that eventually –ex post– they are investigated. Although in equilibrium only competitive mergers are not notified, the CA cannot evade the monitoring. Otherwise the anticompetitive cases will not be reported as well, leading to a clear suboptimal policy. It is crucial the commitment of the CA to the optimally defined monitoring policy.

Given the advantages of the voluntary mechanism with respect to the discretionary mandatory one, as shown in lemma 3, and the advantages of the latter respect to the traditional mandatory mechanism, by transitivity we conclude that the voluntary scheme is a superior solution than the mandatory system based on transaction size threshold.

*Proposition 1: A voluntary merger notification mechanism is superior to a traditional mechanism where notification is compulsory over a size threshold. This superiority is due to two effects: (i) The discretionality effect and (ii) The screening effect.*

These two effects follow from lemma 3 and 4 respectively. The voluntary scheme gives discretionally to the CA about the set of mergers to be investigated. The CA performs revisions following a case-by-case approach after observing two parameters  $S$  and  $\rho$  and does not follow a pre-established ex-ante rule based only in the transaction size  $S$ . Besides, the voluntary scheme does not require inspecting all the universe of potential anti competitive mergers. It induces the firms to self-select themselves and to opt for notifying the operation when it is socially desirable to do so.

### **3. Constrained Fines**

If fines for unlawful no notification are exogenously capped, some of the mergers will not be reported even if firms are punished for that omission. This undesired behavior will occur for the mergers that entail a larger transaction size, which in turn are the ones to create the largest social cost in case of being anticompetitive.

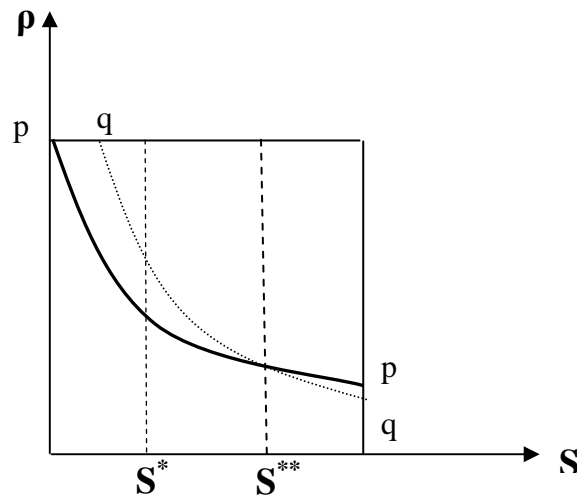
To illustrate this phenomenon, we define as  $S^{**}$  the merger size such that  $U(S^{**}, \theta_{-1}) = F_m$ , where  $F_m$  is the maximum penalty. Then, for all mergers such that  $S > S^{**}$  the transaction will not be notified despite that the merger is anticompetitive and the firms will be fined

for that omission. Those firms will prefer to consummate the merger, even knowing that with probability one the CA will investigate the operation and will punish them for not notification.

In this case of limited fines, the advantage of a voluntary mechanism disappears since it is not possible to block large anticompetitive mergers. In this scenario, the comparison of mechanisms –voluntary versus mandatory- renders an ambiguous result that will depend on the level of maximum fines and the probability of having large mergers among the population ( $S > S^{**}$ ).

A superior solution consists in a mixed mechanism where notification is voluntary for mergers with  $S \leq S^{**}$  and compulsory for the set of mergers where  $S > S^{**}$ . In figure 3 we represent this optimal mechanism, subject to the constraint on the maximum fine. At the size  $S^{**}$  the discretionary obligatory mechanism becomes equivalent to the voluntary system, because by definition, a merger of size  $S^{**}$  is monitored with probability equal to one. Hence, equations (3) and (4) that represent the optimal policies on both mechanism are equivalent at  $S = S^{**}$  since  $X^*(S^{**}) = 1$ . Graphically  $S^{**}$  is the value at which frontier pp intersects qq.

Figure 3



*Proposition 2: If maximum fines are not large enough to induce the whole population of mergers to pre- notify, the optimal policy is the following:*

(i) If  $S^* < S^{**}$ , all mergers above  $S^{**}$  must pre-notify the operation no matter if they are pro or anti-competitive. For mergers below  $S^{**}$  the monitoring policy of the voluntary system applies.

(ii) If  $S^* > S^{**}$  the optimal policy is to make mandatory the notification for  $S > S^*$  and voluntary for  $S < S^*$ .

If we are in case (i), for values of  $S > S^{**}$  the obligation to notify dominates voluntary notification since in the latter, no merger will be notified and by consequence the error associated to the materialization of anticompetitive mergers will be maximum. In contrast, under forced notification, that error is zero. However, there are some competitive mergers that the CA is obliged to inform despite their low competitive risk (those located below frontier  $qq$  and to the left of  $S^{**}$ ). This error of over-notification is lower than the error of no-notification of the voluntary system as long as  $S^* < S^{**}$ . Recall that  $S^*$  is defined as the merger size threshold that minimize the aggregate error of the mandatory notification system. At the size  $S^*$ , in the margin both errors are equal, therefore for values of  $S$  greater than  $S^*$ , the error no notification must be larger than the error of over notification.

In case (ii) -when  $S^* > S^{**}$  - it is not optimal to make mandatory the notification above  $S^{**}$  because the error of over notification is greater than the error of omission. Thus, the threshold for compulsory notification is set at  $S^*$ . As in the mandatory mechanism, mergers with  $S > S^*$  are obliged to notify and by consequence anticompetitive mergers in that range are prevented. If  $S^{**} < S < S^*$ , no merger is notified which means that all operations are materialized without revision. Only if  $S < S^{**}$  we have separation of types and the voluntary mechanism induces the proper separations of types. In the limit case of zero fine, the voluntary system converge to a traditional mandatory system, where all mergers above  $S^*$  must compulsorily notify.

*Corollary 2: A traditional mandatory notification system based on transaction threshold is a particular case of an optimal voluntary system with no fines for unlawful omission to notify.*

#### 4. Remedies

In merger control, the decision of the CA is not always constrained to a binary policy of either approving or rejecting the concentration. In most of the complex cases, mergers are allowed subject to conditions that are called remedies.

These remedies render acceptable mergers that are anticompetitive if permitted in its original proposal, but at the same time reduce the private benefit that firms obtain from the operation. For the sake of simplicity we assume that all anticompetitive mergers can be modified in a way that they become competitively harmless through remedies. We define  $Z$  as a variable that represents the intensity of the remedy or the level of intervention applied to the merger, such that  $Z$  belongs to the interval  $[0,1]$ . If  $Z = 0$ , the merger is accepted in its original proposal while  $Z = 1$  represents the most satisfactory remedy for the CA but leaves no private benefit to the merging firms (see figure 4).

With the possibility of remedies the private benefit of the merger as a function of  $Z$  becomes:

$$U(S,Z) = (1-Z)U(S)$$

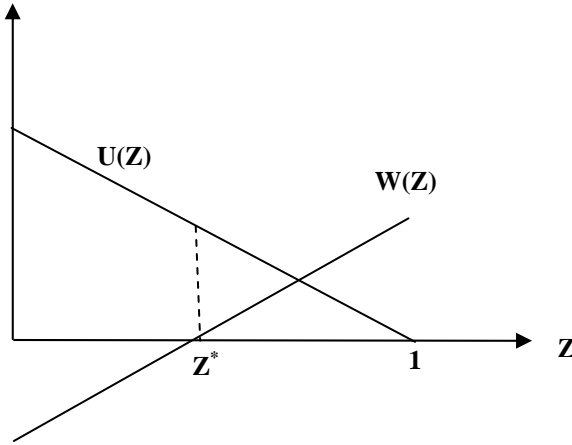
The change in welfare function becomes

$$W(S,Z) = \frac{S}{Z^*} (Z - Z^*),$$

The parameter  $Z^*$  is the minimum level of remedy that avoids an anticompetitive merger. We further assume that  $Z^* > 0.5$ , which implies that a merger fixed through remedies cannot renders a higher welfare than an originally competitive merger, for any size  $S$  of the operation.

The way the performance of both types of mechanisms –mandatory and voluntary- are affected by the introduction of remedies is analyzed under two scenarios: (i) Full Commitment and (ii) Activism.

Figure 4



**(i) Full Commitment**

Under full commitment, the CA does not go beyond what is necessary to accept the merger. It means that the level of remedy chosen is  $Z = Z^*$  which by definition makes  $W(S,Z) = 0$ . Under the voluntary mechanism, the incentive compatibility condition that induces anticompetitive mergers to notify becomes:

$$(1-Z^*)U(s) \geq X(U(s) - F) + (1-X)U(s)$$

Which yields to:

$$X_d(s) \geq \frac{Z^*U(s)}{F} \equiv X_d^*(s) \quad (5)$$

Compared with the condition of equation (3), the remedy  $Z^*$  reduces the minimum intensity of monitoring to induce notification. For given values of  $F$  and  $S$  and  $\alpha$  we have that  $X^*(S) \geq X_d^*(S)$ . Since firms have now a strictly positive benefit for notifying, they are now more willing to report the operation with respect to the situation where the notification led to rejection. The lower the level of intervention (lower  $Z^*$ ) needed to fix the competitive problems of the merger, the higher the incentives of the firms to notify the merger and the lower is the monitoring required to induce the report to CA. In this sense, the remedies that both parties may accord act as a “carrot” to the firms whereas the fine plays the role of a “stick”. As we see in equation 5, both instruments are useful to induce notification when is needed.

The implementation of remedies at level  $Z^*$  does not affect the objective function of the CA respect to the case of no remedies at all. In both cases the change in welfare is equal to zero, either the merger is totally rejected or it is accepted under intervention  $Z^*$ . Hence, the expected value of monitoring policy in terms of  $S$  and  $\rho$  becomes:

$$W_m = S(1 - \rho)[S - X_d^*(S)C] - \rho C$$

Therefore, with remedies, the condition for being optimal to review a merger is:

$$\rho S \geq C[\rho + (1 - \rho)X_d^*(S)] \quad (6)$$

Making the comparison with equation 4, the term in the right hand side of equation 6 is reduced due to the decrease in the minimum probability of monitoring from  $X^*(S)$  to  $X_d^*(S)$ . This lower “effective” cost of monitoring will induce the CA to open more cases to revision, shifting inwards the frontier pp of Figure 2.

The effectiveness of both compulsory mechanisms is not affected by the existence of remedies of magnitude  $Z^*$ . As we explained, the value of the objective function of the CA remains unmodified either the merger is rejected or allowed with the minimum intervention.

*Proposition 3: If mergers that are originally anticompetitive can be modified through minimum intervention remedies  $Z^*$ , the voluntary mechanism performs even better than the mandatory mechanisms. This additional advantage is explained by the higher incentives firms have to self notify when mergers can be amended instead of rejected, which in turn reduces the minimum monitoring effort to induce notification.*

### **(i) Activism**

We say that the CA follows an activist policy if it tries to extract the maximum surplus from the merging firms. This policy makes sense because it increases the value of the objective function defined for the agency.

Under the discretionary mandatory mechanism the value of controlling a merger in function of the intensity  $Z$  of the remedy is now:

$$Wr(Z) = -C + (1 - \rho)S + \rho S \left( \frac{Z}{Z^*} - 1 \right)$$

The value of not controlling is always  $W_0 = S(1-2\rho)$ . Thus, the condition that makes profitable for the agency to review the transaction becomes:

$$\rho S \geq C \frac{Z^*}{Z} \quad (7)$$

Compared with equation 2, which represents the case of no remedies, the effective cost is reduced by a coefficient that is decreasing in the level of intervention  $Z$ . As we observe, in the case of full commitment, where  $Z = Z^*$ , there is no extra benefit for controlling mergers respect to the no remedies situation. Since the benefit of controlling a merger is increasing with  $Z$ , it is expected that the agency be more willing to inspect a merger when it can extract a higher benefit form it in terms of welfare.

In the traditional mandatory mechanism, the optimal threshold  $S^*$  in function of the intensity of the remedy  $Z$  is obtained through the following maximization program:

$$Max_{S^*} \int_0^1 \left[ \int_0^{S^*} S(1 - 2\rho) f(s) ds + \int_{S^*}^{S^{\max}} \left[ S(1 - \rho) + \rho S \left( \frac{Z}{Z^*} - 1 \right) - C \right] f(s) ds \right] g(\rho) d\rho$$

Yielding to the following solution:

$$S^* = \frac{C}{E[\rho]} \frac{Z^*}{Z} \quad (8)$$

The threshold  $S^*$  is lower with respect to the no remedy scenario for  $Z \geq Z^*$  and decreasing in  $Z$ . Like in the discretionary mechanism, a higher level of intervention  $Z$  gives more incentives to the CA to inspect mergers, reducing further the minimum size that makes convenient to control a merger.

*Lemma 5: An activist policy that imposes remedies such that  $Z \geq Z^*$  induces the CA to control more mergers because it increases the value the agency obtains from reviewing*



*the transactions. If there is no extra cost for the agency to implement the remedies, the optimum in the mandatory mechanisms is to apply the maximum level of remedies  $Z = 1$ .*

In the voluntary mechanism, both, the value of controlling a merger and the incentive compatibility condition are affected by applying a remedy larger than  $Z^*$ . The minimum probability of monitoring  $X$  in function of  $Z$ , that induces self-notification, is obtained from:

$$(1-Z)U(s) \geq X(U(s) - F) + (1-X)U(s)$$

This yields to:

$$X_d(s) \geq \frac{ZU(s)}{F} \equiv X_d^*(s)$$

As we observe, a higher intensity of remedy increases the minimum probability of monitoring. Since the prize for self-notification is decreasing in  $Z$ , the CA has to increase the probability of controlling in order to offset the first effect.

The condition for applying the optimal monitoring policy instead of leaving the firms to merge is:

$$\rho[-C + S(\frac{Z}{Z^*} - 1)] + (1 - \rho)(S - X_d^*C) \geq S(1 - 2\rho)$$

That is equivalent to the following equation:

$$\rho S \geq C \frac{Z^*}{Z} [\rho + (1 - \rho)X_d^*] \quad (9)$$

If the CA applies stronger remedies to a merger, it extracts a higher social welfare from the operation, but at the same time it demands more monitoring in order to induce self-notification. The first effect, that is positive, is reflected in the denominator that accompanies the cost  $C$  at the right hand side of equation 9. The second effect works through the monitoring probability  $X_d^*$ , term that is increasing in  $Z$ .

In terms of comparison between both mechanisms we can state the following lemma:

*Lemma 6: For any value of intensity of remedies  $Z$ , such that  $Z > Z^*$ , the voluntary mechanism dominates any mandatory mechanism.*

Like in the comparison between both mechanisms without remedies, the CA can avoid the same set of anticompetitive mergers to be consummated but a lower enforcement cost using the voluntary system.

## **5. Conclusions**

Our paper shows the benefits of the voluntary merger notification mechanism compared with the currently employed mandatory system, where the operation must be notified if they are above a size threshold. Besides the second move monitoring advantage of the voluntary mechanism, there is a benefit arising from the flexibility that the competition agency has in the choice of mergers to control. Instead of following an ex-ante rule based uniquely on merger size, the agency may employ more information –like anticompetitive risk- at the moment of deciding to investigate or not an operation.

The superiority of the voluntary mechanism strongly relies on the ability of the antitrust system to promptly respond to anticompetitive mergers that omit notification. If the instruments, like fines, are not enough to induce notification, then the advantages of the voluntary regime disappears and some large anticompetitive mergers will be consummated. Under this scenario, the best solution is to apply a mixed mechanism where notification is compulsory above a certain threshold, and voluntary below that.

Finally, the possibility that the competition agency and the firms may agree on remedies to fix anticompetitive mergers acts as an additional instrument to induce firms to notify their operation. The effect of the remedies is a reduction in the implementation cost of the voluntary mechanism, improving further its advantage with respect to a mandatory system.

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