Ex post or ex ante?
On the optimal timing of merger control
Very preliminary version

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Abstract

We develop a theoretical model to compare the current ex post with a possible ex ante merger control. The merger leads to both pro- and anticompetitive effects, and the Competition Authority's information on them is endogenous: it depends on the timing of the merger control as well as on its investment in information acquisition. We show that the better the information the firms have on their merger, the higher the asymmetric information between them and the Competition Authority. As a result, we show that the ex post merger control is socially preferable only if the firms' information on the pro-competitive effects of the merger remains imperfect after the merger.

Keywords: merger control, competition policy, information

JEL classification: L41, K21, D82

1   Introduction

In many cases, competition authorities make decisions based on the firms' actual behavior. For instance, to convict firms for price fixing or abuse of dominant position, competition authorities must provide hard evidence on the illegal conduct. Things are quite different for merger control, since both in the EU and the US mergers are controlled ex ante, i.e. before the completion of the planned merger project. Thus, competition authorities are left to speculate on the expected competitive effect of the merger, and the final decision is based on evidence presented and not on the actual effect of the merger. Nevertheless, in the US, merger control used to take place

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after the completion of the project before the Hard-Scott-Rodino act imposed the compulsory notification of mergers. Such post merger control is likely to reduce decision errors thanks to better information being available ex post, but it may also be costlier to block the merger once completed. The objective of this paper is to assess the social costs and benefits of each type of merger control in order to derive the optimal timing of merger control.

We show that the optimal timing of the merger control depends on the quality of the post-merger evidence on the pro-competitive effects of the merger. Our main result claims that the post-merger control is preferred if the merging firms have only imperfect evidence but not full evidence on the pro-competitive effect of the merger. Instead, if the merging firms have full evidence of pro-competitive effect, the Competition Authority may prefer to control mergers ex ante.

The basic framework we develop to assess the costs and benefits of each type of merger control is the following. Take a simple model where a merger has both pro- and anti-competitive effects, depending on the amount of efficiency gains it generates. Assume that the merging firms have better verifiable information on efficiency gains after the completion of the merger. The Competition Authority (CA hereafter) controls the merger either before (ex ante) or after (ex post) its realization. In both cases the burden of proof lies with the CA, which must demonstrate the anticompetitive effect of the merger. In order for the merger to be cleared unconditionally, the merging firms must in their turn provide verifiable evidence of efficiency gains high enough to offset the anticompetitive effect of the merger. Thus the asymmetric information between the firm and the CA is endogenous, since it depends both on the timing of the merger control and the information acquisition adopted by the CA. Assume also that there exist remedies against the anticompetitive impact of the merger. The remedies are less costly for the firm is they are undertaken before rather than after the merger. Thus we take into account both the cost and benefit of an ex post merger control: it gives rise to a basic trade-off between better evidence on the efficiency gains, allowing a more accurate assessment of the true effect of the merger, and the induced asymmetric information that may lead the CA to clear anticompetitive mergers. In turn, the ex ante lack of evidence on efficiency gains may lead the CA to miscontrol the merger by imposing remedies to efficient projects.

There is a small but growing literature on the optimal timing of the competition policy and the merger control in particular. The earliest papers on this topic (Barros, 2003 and Berges et al., 2008) study the role of the notification for agreement exemptions under Art 101 of the TFUE. One could imagine the same for mergers, i.e. a change from an ex ante compulsory regime to

a voluntary one (as it was also the case for Art 101 agreement exemptions before 2004) - this is precisely the point of Choe and Shekhar, 2009, which examines the impact of compulsory ex ante merger notifications. Our paper departs from these articles in two main aspects. First, we focus on the role of information quality improvement after the merger, while the existing papers ignore this point. Moreover, the information available during merger control is endogenous in our framework. To the best of our knowledge, there is only one paper (Ottavianni and Wickelgren, 2011) that deals with the informational aspect for the timing of merger control. This paper shows that the ex post merger control is preferred to the ex ante merger control as long as the quality of the information available to the CA is low enough to avoid the costly remedies ex post which may dampen the incentives to merge. Our paper takes one step further by studying the role of the endogenous asymmetric information between the firms and the competition authority. Finally the recent literature on endogenous incomplete contracts is also close to our paper. Basically by choosing to control mergers ex post, the contract between the firms and the CA is incomplete as long as the information remains imperfect. Recent papers (Tirole, 2009 or Bolton, 2007) make endogenous the information acquisition by parties. Our paper differs in two main points. First, in our model there is no possibility to agree on a complete contract ex ante because we assume that part of the information remains non verifiable ex ante. Second, ex post, there is information revelation but that information remains private and we introduce ex post information acquissition.

2 The model

We consider a merger control framework with a merging firm and a competition authority. The merger has anticompetitive effects of magnitude x^A and pro-competitive effects of magnitude x^P. The profit earned depends on both effects and is denoted by $\pi(x^A + x^P) = \pi.(x^A + x^P)$ with π a positive parameter. The net impact of the merger on the consumer surplus depends also on both variables: $W(x^P, x^A)$ where the function W denotes the consumer surplus variation due to the merger. The firm could be of six types types depending on the level of pro-competitive effects and anticompetitive effects: x^P is either high $(2x)$ with probability p_H, low (x) with probability p_L or very low (0). The variable x^A can take two levels: x with probability a and $2x$. The merger is welfare increasing only if $x^P \geq x^A$. Moreover the expected social welfare is negative:

$$a \left[p_H W(2x, x) + p_L W(x, x) + (1 - p_H - p_H) W(0, x) \right]$$

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$+(1-a)\left[p_{H}W(2x,2x)+p_{L}W(x,2x)+(1-p_{H}-p_{H})W(0,2x)\right]<0.$

There exist remedies denoted by R that reduce the anticompetitive impact x^{A} by $2x$ and thus make the merger consumer surplus increasing. Nevertheless, remedies also reduce efficiency gains by x. Remedies required after the merger have an additional cost for firms equal to $k>0$.

Information available

Ex ante that is before the completion of the merger, the CA has hard evidence on the lower possible level of x^{A} that is $x^{A}=x$, and at a cost c has hard evidence on the whole variable x^{A}. The cost is distributed on the interval $[\underline{c},\overline{c}]$ according to a cdf $F(c)$. The firm observes her type but has no hard information on x^{P}. We introduce uncertainty on the true type in an extended version of the model.

Ex post, after the completion of the merger, the firm has imperfect hard evidence on the variable x^{P}. A merger has hard information on the whole variable x^{P} with probability q and on $x^{P}-x$ with probability $1-q$. The CA does not observe x^{P} and its information on x^{A} is unchanged.

The merger control

We consider two possible timings for the merger control exerted by the CA: before the completion of the merger (ex ante) and after the merger (ex post). In both cases the CA has the burden of proof and must provide hard evidence on the anticompetitive impact of the merger to block it. For the merger to be cleared, the firm must provide enough hard information on efficiency gains to make-up for the anticompetitive impact provided by the CA. Otherwise, the CA impose remedies to ensure a procompetitive mergers. Ex ante and ex post control differ only in the hard evidence on efficiency gains available as well in the cost of remedies incurred by the firms.

The merger control game

Stage 1: The CA decides or not to control the merger ex ante

Stage 2: In case of ex ante merger control, the firm notifies the merger project with the provision of hard information on x^{P}. Then, the CA invests in information acquisition and firms undertake the required remedies for the merger to be cleared.

Stage 3: If no merger control takes place ex ante, the firms decide to undertake (or not) remedies before the merger.

Stage 4: The CA invests in information acquisition ex post if no merger control was done before. The firm provides the information available on efficiency gains and undertake the required remedies for the merger clearing.

We determine the Perfect Bayesian Equilibrium of that game.

3   The optimal timing of merger control

Let us consider first the case of the ex ante merger control. The following lemma gives the CA decision.

Lemma 1 *In case of ex ante merger control, the CA does not invest in information acquisition and the firms undertake remedies.*

Proof. The CA can require remedies only with hard evidence of $x^A = x$ since the firms have no hard evidence on x^P. Because the expected social welfare is negative, it is not in the interest of the CA to clear the merger without remedies. As a result for the merger to ble cleared, the firms undertake remedies and the resulting expected welfare is equal to

$a\left[p_H W(x, -x) + p_L W(0, -x) + (1 - p_H - p_L)W(0, -x)\right]$

$+(1 - a)\left[p_H W(x, 0)) + p_L W(0, 0) + (1 - p_H - p_H)W(0, 0)\right]$ ∎

Ex ante the firms have no verifiable information on efficiency gains. Thus basic information on the anticompetitive effects of the merger is sufficient to impose remedies in order to clear the merger and avoid anticompetitive mergers. The social cost of the merger control is to impose remedies to pro-competitive mergers. That cost increases with the negative social effect of remedies on efficiency gains.

We now consider the ex post merger control. The following proposition gives both the CA and the firms strategies at the equilibrium.

Proposition 1 *In case of ex post merger control, there exists a threshold on the information quality on efficiency gains such that:*

if $q < \widehat{q}$, then the CA does not invest in information acquisition and only the merging firms with low and no efficiency gains undertake remedies ex ante.

*if $q > \widehat{q}$, then the CA invests in information acquisition if its cost is lower than $\widehat{c}(q)$. The merging firms without efficiency gains undertake remedies, inefficient mergers with low efficiency gains undertake remedies with probability $\alpha(q)$, efficient mergers with either high or low efficiency gains never undertake remedies. The probability $\alpha(q)$ increases with q but its limit may be lower than 1. The cost threshold $\widehat{c}(q)$ *** with q.*

Proof. Let us consider the different types of mergers:

Merger without efficiency gains. That merger always undertake remedies since the evidence on efficiency gains is always lower than the information the CA has on x^A.

The merger $x^A = 2x$ and $x^P = x$ never faces the risk to be imposed remedies by the CA since at worst the firm has evidence x on efficiency gains. Thus that type of merger never undertakes remedies.

Merger $x^P = x^A = x$. That type undertakes remedies iff we have $(1-q)\left[\pi(-x) - \pi(2x)\right] < k$.

Merger $x^P = x^A = 2x$. That type undertakes remedies iff $\left[F(c)(1-q)(\pi(x) - \pi(4x)\right] < k$.

Merger $x^P = x$ and $x^A = 2x$. That type undertakes remedies iff $\left[(F(c) + (1 - F(c))(1 - q))(\pi(0) - \pi(2x)\right] < k$. The firm is indifferent between undertaking remedies and not undertaking remedies iff $c = c(q)$ with $c(q)$ such that the profit difference is equal to k. The type $c(q)$ increases with q. Moreover for $q < \widehat{q}$, the firms always undertake remedies so $c(q)$ does not exist.

As a result we deduce that for $c > 0$, if the types $x^P = x^A = 2x$ and $x^P = x^A = x$ do not undertake remedies, then the type $x^P = x$ and $x^A = 2x$ undertakes remedies with probability $0 \leq \alpha(q) \leq 1$.

If $c = 0$, then types $x^P = x, x^A = 2x$ and $x^P = x^A = x$ undertake remedies iff q is such that $(1 - q)\left[\pi(-x) - \pi(2x)\right] < k$ and do not otherwise. Let us denote by $\widehat{q}$ this threshold on q.

Consider first the case where $q < \widehat{q}$. Then if the CA does not invest in information, following the previous discussion, inefficient mergers undertake remedies and efficient mergers do not except type $x^P = x^A = x$. Thus the CA has no incentives to deviate by investing in information.

Second, if $q > \widehat{q}$,

If the CA invests in information with c such that $\alpha = 1$, then, the inefficient merger undertakes remedies. This induces the CA to deviate by not investing in information.

The CA of type c is indifferent between investing and not investing iff:

$(1 - a)p_L q(1 - \alpha)\left[W(0, 0) - W(x, 2x)\right]$

$+ap_H(1 - q)\left[W(x, 0) - W(2x, 2x)\right] = c.$

This expression decreases with α and increases with q.

We deduce the existence of $\widehat{c}(q)$ and $\widehat{\alpha}(q)$ such that the CA of type $\widehat{c}(q)$ is indifferent between investing and not investing and the merger of type is indifferent between undertaking remedies and not undertaking remedies. ∎

We show that firms information quality on efficiency gains plays a key role on the CA decision as well as on the firms choice to undertake remedies before the merger. Let us explain these two different cases.

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First, for low quality of information the inefficient merging firms always undertake remedies and thus the CA is not induced to invest in information acquisition to block these mergers. Let us explain that equilibrium. The inefficient mergers undertake remedies. Indeed, because of the low information quality, with a high probability, the firms have no verifiable information on efficiency gains. This would constrain the firm to undertake costly remedies even if the CA has information on low anticompetitive effects only. Here it is the expected cost of ex post remedies that force the inefficient firms to undertake them before the merger. As a result the CA has no incentives to acquire information on the full anticompetitive effects. Despite low information quality, the efficient mergers with high efficiency gains face no risk to undertake remedies ex post because the CA does invest in information acquisition. In the end, there is no anticompetitive mergers at the equilibrium and the CA does not invest in information more ex post than ex ante. In other terms, the poor quality of evidence on efficiency gains reduces the magnitude of ex post asymmetric information between the firm and the CA. This reduced asymmetric information prevents information investment from the CA and thus induces the efficient merger not to undertake remedies. The additional cost of ex post remedies is sufficient to give incentives to the inefficient mergers to undertake them. There is one source of inefficiency yet in the decision process if information quality is low: the efficient merger with low efficiency gains undertake remedies because the low information quality on efficiency gains makes the risk to undertake remedies ex post high.

Second, if the information quality is higher and if the CA does not invest in information acquisition, the inefficient merger with low efficiency gains is induced not to undertake remedies. Then, if the information cost is low enough it is optimal for the CA to have better information on the anticompetitive effect to block such a type of merger. Indeed, whenever the inefficient merger has information of efficiency gains, information on low anticompetitive effects is not sufficient to require remedies. Concerning the efficient mergers, the higher information quality on efficiency gains does not induce them to undertake remedies even those with low efficiency gains. Nevertheless, with a positive probability the firms have no evidence on the true level of efficiency gains. That could force the efficient mergers with high efficiency gains and high anticompetitive effects or low efficiency gains and low anticompetitive effects to undertake remedies ex post. Here the higher information quality of firms is a source of higher asymmetric information between the firms and the CA. This asymmetric information constrains the CA to invest in information. In brief, firms' better information combined with the cost of information acquisition on anticompetitive effects magnifies the asymmetric information between the firms and the CA. This is a

source of inefficiencies: the CA may clear anticompetitive mergers and may impose remedies to efficient mergers.

We next determine the optimal merger control decision.

Proposition 2 *The ex post merger control is optimal whenever information quality is low. For high information quality, the ex ante merger control may be optimal.*

Proof. The expected welfare depends on the timing adopted for the merger control.

Ex ante:$a\left[p_H W(x,-x) + p_L W(0,-x) + (1 - p_H - p_L)W(0,-x)\right]$

$+(1-a)\left[p_H W(x,0)) + p_L W(0,0) + (1 - p_H - p_H)W(0,0)\right]$

Ex post:

For $q < \widehat{q}$:

$a\left[p_H W(2x,x) + p_L W(x-R,-x) + (1 - p_L - p_H)W(0,-x)\right]$

$+(1-a)\left[p_H W(2x,2x) + p_L W(x-R,0) + (1 - p_L - p_H)W(0,0)\right]$

For $q > \widehat{q}$

$F(\widehat{c})(a\left[p_H W(2x,x) + p_L W(x,x) + (1 - p_L - p_H)W(0,-x)\right]$

$+(1-a)\left[p_H W(2x,2x) + p_L W(x-R,0) + (1 - p_L - p_H)W(0,0)\right]) - E(c/c < \widehat{c})$

$+(1 - F(\widehat{c}))(a\left[p_H W(2x,x) + p_L W(x,x) + (1 - p_L - p_H)W(0,-x)\right]$

$+(1-a)\left[p_H W(2x,2x) + p_L\left(\alpha W(x-R,0)\right) + (1-\alpha)W(x,2x)\right) + (1 - p_L - p_H)W(0,0)\right])$. ∎

We derive in that proposition the optimal choice of the CA. That choice depends on the quality of information on efficiency gains. If that quality is low, the ex post merger control is more efficient than the ex ante merger control. Indeed, following proposition 1 in that case the merging firms take much better decision regarding remedies than they do under ex ante control and then the CA does not over-invest in information acquisition. Instead, a higher quality of information constrains the CA to increase its investment in information to block anticompetitive inefficient mergers that have high quality information on low efficiency gains. In proposition 1 we stressed that this investment depends on the cost of information. As a result anticompetitive mergers could be cleared even if no remedies are undertaken and if the investment is not high enough. In addition because the CA has information on the anticompetitive impact of the merger and because the information on efficiency gains is not perfect, the CA may also wrongly impose remedies to an efficient merger. In brief, high quality information leads to both types of errors in the final decision. The cost and benefit of each merger control is then clear. Ex ante the CA informational advantage leads to the prohibition of all the mergers anticompetitive by always requiring remedies. The social cost is due to efficient mergers that are constrained

to undertake remedies. Ex post, asymmetric information between CA and the firms is likely to induce errors in the CA decision. Nevertheless, information on efficiency gains is also likely to avoid remedies for efficient mergers. The most efficient merger control mergers is the result of a trade-off between the cost of imposing remedies to efficient mergers and the cost of clearing anticompetitive mergers as well as the cost of information acquisition. If the cost of information is high and if the social cost of anticompetitive mergers is high, then ex ante merger control is preferred.

The optimal timing of merger control depends on the post-merger information quality on efficiency gains. If we consider that the quality increases with the time lag between the merger and the control, proposition 2 gives insight on the optimal merger control timing. In that case, the optimal merger control should take place after the merger for an intermediate level of information quality. In that way, the CA induces the firms to undertake ex ante the optimal decision in terms of remedies. We claim that the CA does not control mergers when firms have full evidence on efficiency gains.

Finally the information quality is also linked to the standard of proof required. Parameter q could be also interpreted as the standard of proof required. According to our result, the ex post merger control is optimal if it is associated to a high standard of proof.

Until now we have assumed that the merging firms were perfectly informed of their type. We now consider that the firms do not know ex ante the level of efficiency gains. More specifically the firms observe the anticompetitive effect (the variable x^A) and know if there are no efficiency gains ($x^P = 0$). Yet, they do not observe the true level of $x^P > 0$. The firms receive an informative signal on x^P. If the signal takes the value 1, then the true level of x^P is $2x$ with probability $\sigma > \frac{1}{2}$ and if the signal received is 0, then the true level of x^P is x.

We determine first the equilibrium of the game and in particular the incenvives of the firms to undertake remedies.

Lemma 2 *For a signal 0: firms undertake remedies if the cost of remedies is high enough.*

For a signal 1: firms do not undertake remedies with probability $1 - \beta(q, \sigma)$. Function $\beta(q, \sigma)$ increases with uncertainty (lower σ) and decreases with q. For σ high enough (low uncertainty) we have $\beta(q, \delta) = 0$.

Proof. Suppose that firms with signal 0 undertake remedies and do not undertake remedies otherwise. Then, the CA does not invest iff $\frac{1}{2}(1 - \sigma)(1 - q)(W(x, 2x) - W(0, 0)) > \underline{c}$. The firms with signal 1 have no incentives to invest in remedies iff $(1 - \sigma)(1 - q)(-k) + \sigma(\pi(4x) - \pi(x)) > 0$

and firms with signal 0 have incentives to invest in remedies iff $q(\pi(3x) - \pi(x)) - (1 - q)k < 0$. This is true as long as the the cost of remedies is high. If the CA invests in information, the firms with signal 0 have less incentives not to invest in remedies and the firms with signal 1 do not invest in remedies iff $((1 - \sigma)(1 - q) + qF(c))(-k) + \sigma(\pi(4x) - \pi(x)) > 0$. This is true as long as q is high enough or as long as σ is low enough. Other wise there is an equilibrium where the firms with a signal 1 undertake remedies with a positive probability β. ∎

We show in that lemma that the level of uncertainty is likely to induce firms that receive a positive signal to undertake remedies if the ex post cost of these remedies is high. Clearly, if uncertainty is high, even if the signal is positive the risk for the firms to have low efficiency gains and then to pay the cost of remedies is high. In that case, to induce firms not to undertake remedies, the information quality must be higher. Then, the informational advantage allows inefficient firms not to pay the cost of remedies ex post. In the same way, if the cost of remedies is low, a high level of uncertainty leads firms that receive a bad signal not to undertake remedies. Indeed, the benefit to undertake remedies with a bad signal is being reduces by the level of uncertainty.

It follows that a high level of uncertainty is likely to reduce the efficiency of the ex post merger control. We ddeduce in the following proposition the optimal merger control depending on the level of uncertainty as well as on the infortmation qualityu of firms after the merger.

Proposition 3 *For a low level of uncertainty, the ex post merger control is better than the ex ante merger control. The level of firms information quality that ensures the optimality of the ex ante merger control increases with the level of uncertainty.*

For a high level of uncertainty, the ex ante merger control is optimal.

Proof. (sketch)Start from no uncertainty. We apply proposition 1 according to which the inefficient firms undertake remedies if q is low and efficient firms do not.

For low level of uncertainty, the firms that receive a signal 0 undertake remedies and the firms that receive a signal 1 do not undertake remedies. Then the ex post merger control with the lowest q is more efficient than the ex ante merger control.

For higher level of uncertainty, firms with a signal 1 still do not undertake remedies only if q is higher. The ex post merger control remains optimal as long as the cost of errors due to a higher q is lower than the benefit. This is true for σ low enough. ∎

For a low level of uncertainty the ex post control is preferred. Indeed, in that case if the information quality is low, the CA clears ex post procompetitive mergers and requires remedies

from anticompetitive mergers. In addition, the low level of uncertainty combined with the ex post low level of information quality constrains the firms to undertake remedies in case of low signal. In that way most of the time the CA avoids both inefficient mergers and efficient mergers with remedies. In the presence of higher uncertainty, in order to give incentives to the firms not to undertake remedies in case of positive signal, the level of information quality must be higher. That higher information quality leaves a rent to the firms and makes the ex post merger control less efficient since the CA is then constrained to clear anticompetitive mergers. As a result, for high uncertainty the CA should optimally adopt an ex ante merger control.

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