Settlement in Merger Cases: Remedies and Litigation

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Abstract

This paper performs a pre-trial settlement analysis for the negotiation of asset divestitures in merger control cases. Taking into account the asymmetric information between the competition agency and the merging firms concerning the true competition impact of the merger, we examine the impact on the likelihood of settlement divestiture and the divestiture amount in equilibrium of various factors, such as the transfer rate of the merger's cost savings, the severity of the appeal court, as well as the bargaining power of the merging partners in the sale of the divested assets.

Keywords: out-of-court settlement, merger control, divestitures, imperfect information

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1. Introduction

Two firms, competing with each other in at least one line of business, must submit their horizontal merger plan to the approval of the Competition Authority or Agency (CA) in charge of merger control. On the one hand, mergers may improve welfare (total and even consumers') through their future efficiency gains materializing into post-merger cost savings. But on the other, horizontal market concentration is likely to lead to price increases and lower consumer welfare (Williamson (1968)).

More often than not, this trade-off facing the CA is solved not through downright prohibitions, but by conditional approval. In other words, the majority of competitive concerns identified during the review process are settled out by the application of merger fixes or remedies, either structural, under the form of asset divestitures, or behavioral, such as mandatory licenses for instance. The primary purpose of such merger fixes or remedies is to prevent and alleviate the competition concern raised by the merger by reducing post-merger market concentration.

Most of the required merger remedies are not the result of court litigation but are instead amiably agreed upon by the parties, i.e. the CA and the merging firms. In the US, where court hearings are mandatory for a merger prohibition to be obtained or even a remedy injunction to be issued, most merger cases and divestiture injunctions never get in front of a state, let alone a federal court. Instead, as Baer and Redcay (2001) observe, "in recent years, merger enforcement has largely been accomplished by negotiation rather than litigation, [...] and over two-thirds of Federal Trade Commission and Department of Justice merger challenges in fiscal years 1998 and 1999 were resolved by negotiated restructuring." To put it short, out-of-court settlement rather than litigation is the general rule for determining merger remedies. A similar conclusion can safely be drawn for the European Union merger control, where over the last 18 years 84 out of 177 phase II merger investigations (as of February 29, 2008) ended in conditional approval, for only 20 prohibitions. Actually, only a handful of cases ended in litigation in front of the Court of First Instance, although they were front page cases such as Sony/BMG or Airtours/First Choice, because the European Commission's initial decisions were overturned.

The point is that while there is a lot of economics literature on the effects of mergers, there is not so much on merger fixes and divestitures, and virtually no economic analysis for the public authority as antitrust negotiator and litigator. In this paper, we model the out-of-court interactions between the CA and the merging firms in order to examine

their outcome in terms of settlement over a certain divestiture package. We focus on the settlement negotiation as an alternative for litigation, so as to study the amount and likelihood of settlement and sign the impact of various factors on them.

The framework we consider in this paper is very simple. Two firms competing on the same market and planning to merge submit their merger for approval to the public agency. The latter is in charge of merger control, and as such it needs to make sure that competition and consumers are not harmed by the horizontal merger. In order to prevent such competition damages, the agency is entitled to grant a conditional approval and thus require a structural remedy, i.e. an asset divestiture from the merging firms in order to allow them to merge. The CA will engage in out-of-court settlement negotiation with the parties over the amount of divested assets. Explicitly, the agency makes a settlement offer under the form of a divestiture request, which the merging firms accept or reject. Hence the merger is either cleared conditionally on this negotiated divestiture, or blocked.

The point about settlement negotiation is that the CA lacks full information on the merger's likely competition effect (Yao and Dahdouh (1993), Rey (2000)). Merging partners are privately informed on the amount of cost savings generated through merger, which eventually defines the competitive status of their association in terms of resulting consumers' surplus. Practitioners acknowledge this information asymmetry between merging firms and competition authorities. For instance, although the US Merger Guidelines ascertain that "mergers have the potential to generate significant efficiencies", they warn at the same time that "efficiencies are difficult to verify and quantify, in part because much of the information relating to efficiencies is uniquely in the possession of the merging firms"[1]. Thus the CA needs to make sure that enough cost savings will be passed on to consumers when a divestiture is settled upon, otherwise consumers' surplus will be better off without the merger.

Basically, out-of-court negotiation comes down to one of the following decisions: fight in court, fold or settle. In our model, it is nevertheless more complicated than a standard settlement concerning an action for damages, mainly on two accounts. First, given the prospective nature of the alleged competitive concern, the defendant merging partners have always the possibility to abandon their project before the competition-related injury actually occurs. Secondly, bilateral gains from negotiation are not taken for granted in our framework, in contrast with the standard settlement game with imperfect information (Bebchuk (1984)). Indeed, making sure that the negotiated remedy does not leave con-

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[1]See the Horizontal Merger Guidelines, available at http://www.usdoj.gov/atr/public/horiz_book/4.html.

sumers worse off than before merger places an individual rationality constraint on the CA as the uninformed party, which will not always allow it to proceed to making a settlement offer.

In terms of preliminary results, we identify the settlement likelihood and settlement divestiture level. Through backwards induction we obtain the efficiency gains pass-on rate threshold that justifies the CA's move to settle. In other words, the CA as an uninformed plaintiff will only make a settlement offer when the expected outcome is not worse than the status-quo.

Our main results shed light on the influence of various factors on the settlement likelihood and divestiture amount in merger antitrust cases. First, the role of the efficiencies' pass-on rate is analyzed: the higher the pass-on rate, the higher the settlement likelihood and the lower the required divestiture. Next, we look into the impact of the severity of a judge and the merging partners' bargaining power in the sale of divested assets respectively. We can do that because first we widen up the benchmark framework to allow for the possibility of court litigation when the settlement negotiation fails. We find that the higher the probability for the court to reject the firms' case, the higher the likelihood of the out-of-court settlement, but the effect on the settlement amount of divestiture is ambiguous, or rather, it depends on the actual distribution of merger projects. Then we go back to the basic setting and instead of the court litigation take into account the involvement of a third party in the sale of divested assets, their buyer. We establish that the higher the bargaining power of merging firms in the sale of divested assets to an outsider firm, the higher the likelihood of settlement, but again the impact on the settlement divestiture level turns out ambiguous.

Given our choice to model remedy negotiation as an imperfect information out-of-court settlement game, the model closest to ours from a formal point of view is that of Bebchuk (1984)[2]. As far as we know, our paper is the only theoretical contribution tackling merger control *and* merger remedies from this perspective. Some other papers mention the possibility for merger remedies to result from negotiation between the public agency and the private parties, but either in a purely informal way (Farrell (2003)), or in a framework where stress is laid on the costly investigation procedure available to the public agency during the bargaining process (Lyons and Medvedev (2007)). Coate and Klein (2004)

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[2]Choné et al. (2007) equally build on Bebchuk (1984), but their purpose is to analyze the impact of the introduction of a commitments procedure beside the jurisdictional trial in terms of efficiency and deterrence in antitrust contexts such as the abuse of dominant position cases.

provide the only empirical analysis on court litigation and settlement between the agency and the merging parties. Based on a maximum-likelihood estimation procedure, they investigate 172 merger challenges by the Federal Trade Commission from 1983 to 1999. They find that merger efficiencies, as well as reputation concerns on both sides represent motivations driving the decisions to fight, fold or settle.

As before mentioned, merger policy is prospective, i.e. it is meant to prevent the occurrence of mergers worsening the pre-merger situation. Consequently, information on what is likely to happen were the merger to go through is essential, and this information is both mainly in the possession of the merging firms, and hard to obtain for the CA. Hence, it comes as no surprise that most of the literature dealing with merger remedies has focused either on the information problem raised by the conditional approval procedure, or on the opportunity to have it at all within the tool-box of competition agencies on this account, given the incentives that are provided through a conditional approval in an imperfect information context.

In order to extract the merging firms' private information on the cost efficiency and thereby their competition impact of their project, the CA may employ a revelation mechanism, as suggested by Röller et al. (2001). Gonzalez (2003) and Cosnita and Tropeano (2005) respectively provide two such mechanisms, combining merger remedies with additional instruments within revealing contract menus. As far as the very opportunity to use merger fixes goes, it should be stressed that the practice preceded the theory. Remedies have been used as proper merger policy instruments starting with the Hart-Scott-Rodino Act (1976), but only recently have they been analyzed from the point of view of merger incentives they may provide. Basically, merger remedies are considered to give incentives for more mergers to be submitted. One reason to account for this conclusion is the hold-up problem affecting horizontal mergers. Such mergers always benefit non merging firms, and when the latter benefit more than the merging firms themselves, the insiders may decide to abandon the project, so the merger is held back. Fridolfsson and Stennek (2005) argue that merger remedies possibly help merging firms avoid this hold-up problem, by recovering part of the externality benefitting outsiders through the sale of the divestiture package. Therefore, merger remedies may actually provide incentives for more mergers being submitted[3]. Based on an empirical analysis, Barros et al. (2007) conclude that merger remedies signal a more lenient merger control, in contrast with a binary policy

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[3]A similar effect is exhibited in a spatial model by Cosnita (2006), where merger remedies may make some mergers more profitable thanks to the sale of divested assets.

relying on approvals and prohibitions only, and this is shown to encourage more mergers being submitted.

The remaining of the paper is organized as follows: first we present the general framework, then we tackle the benchmark case of divestiture out-of-court settlement in merger control. To further explore the primary insights thus obtained, we look into two extensions. The first deals with the possibility of court litigation when the settlement fails. The second explicitly takes into account a third party, the buyer of divested assets, in order to examine its impact on the terms of the settlement. The final section concludes and summarizes our results. All technical proofs are presented in the appendix.

2. The model

2.1. General framework: basic assumptions and notations

Players

The model we consider is very simple: it only involves two risk-neutral players, the merging firms and the CA. The former submit for appraisal to the latter a horizontal merger project. Generally speaking, the CA may clear the merger directly, ban it, or request an asset divestiture as a condition for approval. The model we build focuses on this third possibility, namely the settlement negotiation between the CA and the merging firms (also called insiders) regarding the amount of the divestiture.

Pre-merger payoffs

Let $\overline{\Pi}$ be the pre-merger total joint profit of the insiders. To keep things as simple as possible, we assume that there are two perfectly symmetrical merging partners, each holding the same amount of assets before merger, and therefore making each a corresponding individual profit of π. This enables us to write $\overline{\Pi} = 2\pi$.

We assume that the CA follows a consumers' surplus standard in making its decision, and therefore denote by CS the level of consumers' surplus prevailing on the pre-merger market.

Post-merger payoffs

As mentioned in the introduction, despite the increase in market concentration as well as in market power for all firms on the market, the merger is also likely to lead to some efficiency gains materializing into cost savings. Accordingly, in our model the joint post-merger profit of the insiders will write $\alpha \cdot 2\pi$, where α is the parameter measuring the efficiency gains.

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Basically, α stands for the synergies that arise from the merger, i.e. substantial efficiency gains that would not have been obtained without it, and more generally, it measures the positive effect of an essential complementarity between the merger partners that allows them to lower their common cost. As Röller et al. (2001) argue, such synergies typically arise from the complementarity between technological or administrative capabilities of firms: for example, firms may own complementary patents, which if employed together will further improve the production process.

We assume that $\alpha > 1$, indicating that the efficiency gains translate into enough cost savings to make the merger internally profitable. In other words, we consider that only viable merger projects are submitted for approval.

These cost savings mitigate the market power increase of the merger, since they are partially passed on into the market price. Thus, the cost savings also benefit consumers, but less than the merging firms. Hence, we write the post-merger consumers' surplus as $\alpha \cdot \beta \cdot CS$, where $\beta \in (0,1)$ stands for the efficiency gains pass-on rate, which is public information. The pass-on rate stands for the proportion in which any cost savings will be passed on to consumers, given the prevailing market structure and price-elasticity of demand[4].

The essential point about the efficiency gains is that the merging firms are privately informed on their amount. The insiders are typically better informed than the public agency on the characteristics of their merger, as well as on the specific conditions of competition on their market. Moreover, they will put to profitable use this private information when their case is brought in front of the agency, by always arguing efficiency gains and cost savings in order to maximize their chances of approval.

Due to this information asymmetry, when presented with a given merger project, the CA cannot be sure that the post-merger consumer welfare $\alpha\beta CS$ exceeds that from before merger, CS. Consequently, it will only clear the merger provided that the insiders accept to divest a certain part of their joint assets, so as to diminish market concentration and prevent a price increase. We denote δ the part of assets divested, where $\delta \in [0,1]$, the latter condition indicating that at most, the asset divestiture will concern the assets of one insider only.

In terms of CA's payoff, we assume that the effect of the asset divestiture on consumers' surplus can be written as follows: $(\alpha\beta + \delta - \frac{\delta^2}{2})CS$. Basically, the implicit assumptions we

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[4]See Röller et al. (2001) for a discussion of the efficiencies' pass-on rate and its use in merger control enforcement.

make are that the CA's payoff is increasing and concave with the amount of the divestiture, so as to obtain for every level of cost savings α a unique amount of divestiture maximizing the CA's payoff. First of all, this is in accordance with the intuition derived from the practice of merger remedies, i.e. basically that consumers' surplus is increasing with the amount of transferred asset. Secondly, the concavity assumption is equally intuitive, since a given asset transfer is likely to lead to a larger competition relief when the post-merger surplus is low than high, so in other words, the positive impact of remedies on consumers' surplus becomes smaller and smaller when the amount of remedies increases.

For the merging firms, the divestiture δ has a negative impact, because it lowers their capital stock, which enters positively in their profit function. Denoting Π^M the insiders' post-merger joint profit, we assume that it writes $\Pi^M = \alpha(2\pi - \delta\pi)$. In other words, the merging firms' profit decreases with δ, and moreover, the extent to which they will benefit from their efficiency gains depends on the amount of assets they are left with.

Before going on to examine the benchmark case of our analysis, we present the timing of the settlement game we consider.

Timing of the game

At the first stage, the nature determines the level of the efficiency gains pass-on rate for the industry considered. On this base, the CA will decide whether it will ever engage in settlement negotiations with firms in this industry. In making this decision, the CA needs to ensure itself a resulting payoff superior to the pre-merger level, otherwise the optimal decision is to ban the merger.

At the second stage, the insiders plan their merger. They privately observe the level of efficiency gains it will generate, and they submit their merger project for approval to the CA.

At the third stage, provided it has decided on making a settlement offer at stage 1, the CA examines the project in light of its consumers' surplus maximization objective and will typically require the insiders to divest a certain fraction of assets as a condition for merger approval[5]. The only information available to the CA is that the efficiency

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[5] This corresponds to the settlement offer by the uniformed party in the standard model of pre-trial negotiation *à la* Bebchuk (1984).

We follow this modelling choice, although in reality, the privately informed defendants, the firms, may make the settlement offer. We choose to avoid for the time being this signaling framework and use instead this simpler framework. At the same time, it is worth mentioning that our framework is actually the same as the timing of the remedy bargaining game between the UK competition agency and the merging firms.

parameter α is distributed over a certain interval $[1, \overline{\alpha}]$ following a positive density function $f(\alpha)$ and a cumulative distribution function $F(\alpha)$, where $f > 0$ convex and non decreasing.

At the last stage, the insiders accept or reject the CA's request. If they accept the settlement proposal, assets are transferred to a third party, and the post-merger market equilibrium and the corresponding payoffs for the insiders and the CA obtain. If they reject the settlement proposal, we assume that the merger is banned and the payoffs obtained are the initial, status-quo ones[6].

2.2. Divestiture settlement in merger control: the benchmark

Solving the game backwards requires us to examine first the outcome of settlement offer made by the CA.

The crucial point in the negotiation is the fact that when requiring the divestiture, the CA implicitly operates a selection among the continuum of possible types of mergers, between those that will find it acceptable and those that will not. In other words, for a given divestiture request δ, a so-called "marginal type" can be defined as the merger project that is indifferent between agreeing to divest and refusing, i.e. keeping the status-quo payoff. Explicitly, the marginal type $\widetilde{\alpha}(\delta)$ is such that

$$\alpha(2\pi - \delta\pi) = 2\pi \tag{1}$$

$$\text{therefore } \widetilde{\alpha}(\delta) = \frac{2}{2 - \delta} \tag{2}$$

Hence, the CA maximizes the expected consumers' surplus over the whole distribution of merger types, knowing that all $\alpha > \widetilde{\alpha}(\delta)$ agree to divest, whereas $\alpha \leq \widetilde{\alpha}(\delta)$ refuse:

1	$\widetilde{\alpha}(\delta)$	$\overline{\alpha}$
refuse to settle/divest, with probability $F(\widetilde{\alpha}(\delta))$	agree to settle/divest, with probability $(1 - F(\widetilde{\alpha}(\delta)))$	

This comes down to the following programme on behalf of the competition agency:

$$\max_{\delta \geq 0} F(\widetilde{\alpha}(\delta))CS + (1 - F(\widetilde{\alpha}(\delta)))CS\left(\delta - \frac{\delta^2}{2} + \beta E(\alpha \mid \alpha > \widetilde{\alpha}(\delta))\right) \tag{3}$$

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[6]We change later on this assumption so as to discuss the outcome of the game when the insiders' refusal leads to litigation in court.

meaning that the CA will require a divestiture δ so as to maximize the expected consumers' surplus, knowing that its divestiture settlement offer will be accepted with probability $(1 - F(\widetilde{\alpha}(\delta)))$ but rejected with probability $F(\widetilde{\alpha}(\delta))$. Equivalently, the relevant equilibrium concept of our imperfect information game is the semi-separating Bayesian equilibrium.

2.2.1. The likelihood of settlement and the settlement divestiture

The CA's optimization problem yields the following result in terms of equilibrium:

Proposition 1. *The unique interior solution to the settlement game is defined by the following equilibrium likelihood of settlement* $\left(\frac{1-F}{f}\right)_{|\alpha^*}$ *and equilibrium settlement divestiture* δ^*:

$$\left(\frac{1-F}{f}\right)_{|\alpha^*} = \frac{\alpha^* \left(-2 - \alpha^* \left(-2 + \alpha^* - \beta\alpha^{*2}\right)\right)}{2\left(2 - \alpha^*\right)} \tag{4}$$

$$\delta^* = 2\left(\frac{\alpha^* - 1}{\alpha^*}\right) \tag{5}$$

The explicit function defining the latter is not available, due to the technical complexity of our formal setting. For this reason, but also in order to perform the comparative statics analysis, we choose to express the equilibrium based on α^*, which is the equilibrium marginal type, i.e. the one that is indifferent in equilibrium between accepting or not the CA's request to divest δ^*.

The equilibrium settlement offer in the form of the optimal divestiture δ^* requested by the CA needs to strike the balance between the marginal gain and the marginal cost of requesting a remedy. To see this, it is enough to consider the First Order Condition under the following form:

$$(1 - \delta)\left[1 - F(\widetilde{\alpha}(\delta))\right] = \frac{2f(\widetilde{\alpha}(\delta))}{(2 - \delta)^2}\left(\left(\beta\widetilde{\alpha}(\delta) - \frac{\delta^2}{2} + \delta\right) - 1\right) \tag{6}$$

The LHS term of the above equality is the marginal benefit of the settlement offer, given by the product between the positive marginal impact of the divestiture on the level of consumers' surplus $(1 - \delta)$, and the probability to see the merger materialize, i.e. for the settlement offer be accepted by the insiders $(1 - F(\alpha(\delta)))$. The RHS term stands for the marginal cost of the settlement offer, equal to the product between the marginal effect

of the divestiture on the probability to see the merger abandoned ($\frac{dF(\widetilde{\alpha}(\delta))}{d\delta} = \frac{2f(\widetilde{\alpha}(\delta))}{(2-\delta)^2}$), and the consumers' surplus loss in this case, given by ($\beta\widetilde{\alpha}(\delta) - \frac{\delta^2}{2} + \delta - 1$). This loss is the opportunity cost of the type II error, because the divestiture settlement offer is turned down by some merging firms, whose merger project would have improved consumers' surplus. In other words, the divestiture request leads some socially profitable mergers to be abandoned, and this is a loss for the CA. Basically, it is the opportunity cost of the settlement offer.

2.2.2. The opportunity of settlement

At the previous stage, the CA determines whether or not to make a settlement offer. As before mentioned, when making such an offer in the form of an asset divestiture request δ, the CA needs to take into account its own participation constraint. This means that a remedy may be settled upon only if this does not diminish the consumers' surplus w.r.t. the status-quo level. Otherwise, the optimal strategy for the CA is not to ask for divestiture and ban the merger.

Consequently, we have the following[7]:

Proposition 2. *There exists an industry pass-on rate threshold $\underline{\beta}$ such that for $\beta \geq \underline{\beta}$, the CA will settle by requesting a divestiture $\delta \geq 0$. For all markets $\beta < \underline{\beta}$ divestitures cannot restore competition, and therefore mergers will not be submitted.*

This conforms with the actual enforcement of merger control, since it justifies a selective strategy for the public agency: only mergers on certain markets may be considered for examination and approval. Basically, the pass-on rate depends on the intensity of the competition on the merger market, and sometimes, market competition can be such that in case of merger, a viable remedy may simply not exist. Consequently, some mergers would be banned without the possibility of remedy. The pass-on rate is publicly known, which implies that merging firms can anticipate the CA's move not to settle if a merger project is submitted. Thus, on some markets some mergers would never be submitted. This is actually consistent with real life unfolding of merger control, where certain merger proposals eventually fall through (meaning are not even submitted) because there is no viable remedy that could bring the merger project to satisfy the CA's objective.

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[7]Basically, this is a sufficient condition for the existence of an interior equilibrium.

Next we describe the effect of a change in the pass-on rate for the likelihood of settlement and the settlement divestiture.

2.2.3. Comparative statics

Graphically, the equilibrium presented in Proposition 1 may be pictured as follows[8]:
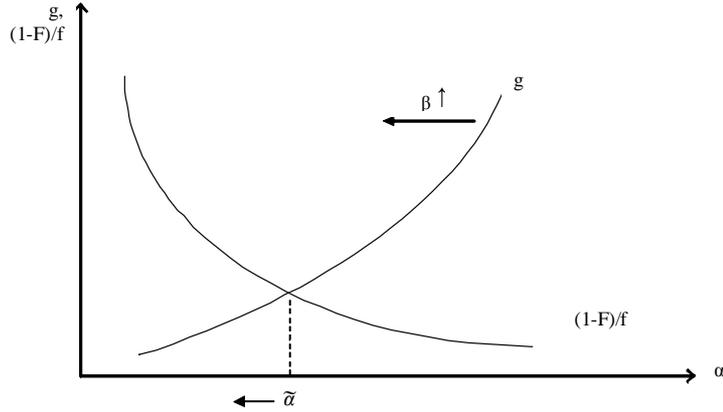
where $g(\alpha)$ stands for the RHS term of (4). The following comparative statics result obtains:

Proposition 3. *An increase in the pass-on rate leads to a higher likelihood of merger approval or settlement, and a lower settlement divestiture.*

The intuition runs as follows: a higher pass-on rate guarantees that consumers will benefit more from the merger's cost savings through lower prices. This means that the opportunity cost of the settlement offer is higher, because the consumers' surplus increase that would be foregone in case the merger is withheld would be higher. Hence, the CA becomes more lenient when the pass-on rate is higher. Moreover, the amount of the divestiture requested to allow the merger is lower. Indeed, the asset transfer is supposed to make up for the competition concern of the merger, but the latter depends on the amount of efficiency gains passed on to consumers. With a higher pass-on rate, the competition concern is lower, and therefore the necessary remedy too.

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[8]The LHS of (4) is the inverse of the hazard rate. Thanks to $f > 0$ and increasing, $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))}$ is strictly decreasing with the marginal type. We follow the standard assumption in the literature that $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))}$ is also convexe.

2.3. Divestiture settlement: further developments

In this section, we take up the study of two possible extensions of our benchmark analysis. First we look into the implications of a possible court litigation following the merging firms' rejection of the CA's settlement offer. Then we consider the outcome of a third party involvement in the negotiation. Explicitly, we take into account the role played by the buyer of divested assets, because the divestiture implied by the settlement agreement is actually carried out as a sale of divested assets to an outsider firm.

2.3.1. Divestiture settlement before court litigation

So far we assumed that whenever the settlement could not be reached, the merger was simply prohibited without other possible issue, meaning that the status-quo market situation was maintained. In what follows we change this hypothesis to take into account the outcome of litigation as an alternative for the out-of-court settlement.

Litigation in merger cases does happen in real life, and is much more common in the US than in Europe.

American merger control is primarily a judicial procedure, where any move on behalf of the public agency, be it the Federal Trade Commission or the Department of Justice, needs to be validated by a judge. Explicitly, to prohibit a proposed merger, the Federal Trade Commission or the Department of Justice must obtain an injunction from a federal district court, and if necessary, defend that injunction in the relevant court of appeal. In terms of merger control enforcement, this means not only that the decision to challenge any merger notified under the Hart-Scott-Rodino Act may end up in court litigation, but also that any divestiture injunction needs to be upheld by the ruling of a court of justice. One may therefore conclude that strategically speaking, merging partners likely to be subject to the enforcement of the US merger policy actively take into account the possibility for a court of justice to decide the eventual outcome of their merger plan, both at the end of the usual procedure and as the result of a possible appeal.

In contrast, European merger control as well as the enforcement of merger policy by the National Competition Agencies of the European countries rely on administrative law. Basically, the decisions delivered by either the European or the National Competition Authorities are not subject to a court ruling, even if they may afterwards be challenged through a possible court appeal. Although this rarely happens, the impact may actually be all the more important. All in all, the Court of First Instance overruled only four of

the European Commission's decisions to ban mergers since the European merger policy came into effect[9]. Arguably, this prompted a(n even) more cautious attitude on behalf of the Commission towards merger prohibitions, which one might easily interpret as an incentive to settle and request merger fixes instead.

Although merger litigation is more frequent in the US than Europe, and hence not equally representative for the enforcement of the two main merger policies in the world respectively, we believe that it is worth examining, and not merely so as to fill in this gap in the theoretical literature dealing with merger policy and enforcement. Allowing for litigation in a framework where the public agency and the merging firms may settle on an amount of divested assets comes down to acknowledging that this outside option may affect the incentives to settle (or not) of both sides. This is what we examine in this section, by looking into the impact of the court hearing on the outcome of the settlement: the probability of an out-of-court agreement, and the amount of the settlement divestiture offer.

Formally, the game needs to incorporate a supplementary stage, because in case the agreement is not reached, the former status-quo outcome will be replaced by a lottery which models the merging firms taking to court the CA's decision to prohibit their merger plan. Explicitly, we assume that with probability p the judge will uphold the CA's decision to ban the merger. With the complementary probability $1 - p$ the judge will on the contrary allow the merger partners to go ahead with their merger, without any merger remedy whatsoever[10]. Without any l.o.g., we do not assume any additional cost of going to court[11].

Below we give the modified game tree, in which p stands actually for the judge's severity w.r.t. the merger:

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[9]Specifically, this was the case for the Airtours/First Choice, Schneider/Legrand, Tetra Laval/Sidel and World Com/Sprint mergers. The European Court of Justice confirmed thes overruling, as well as that of the merger approval for Sony and BMG, which is to date the only example of a merger approval by the Commission that ended in litigation.

[10]We actually choose the highest possible gap between the respective payoffs on the branches of this binary lottery. In other words, in our framework the incentives to settle (or not) are highest. Consequently, our results are the most clear-cut w.r.t. any other that may be obtained from such a further litigation stage.

[11]Any additional cost of going to court, such as for instance the delay before the court decision (i.e. the opportunity cost of waiting for the judge to decide), will only increase the gains from negotiation, therefore the attractiveness of the settlement with respect to the litigation. See also Bebchuk (1984) for this intuition.
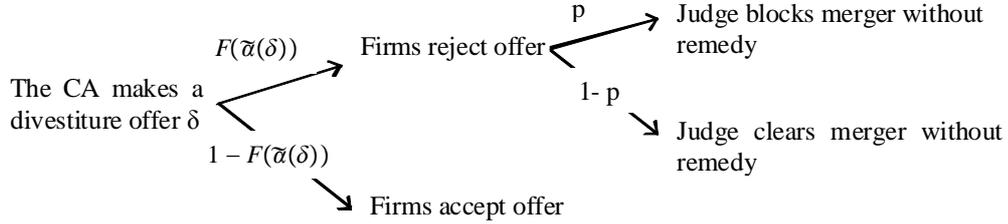
Basically, allowing for court litigation in our framework comes down to modifying the outside option of both parties w.r.t. the settlement offer. This implies that the informed party's reply to the uninformed party's settlement offer will be changed. In formal terms, the expression of the marginal type $\widetilde{\alpha}(\delta)$ which is just indifferent between accepting and rejecting the CA's settlement offer of a divestiture δ will take into account the possibility that with probability $1 - p$, the judge will clear the merger without conditions.

The new indifference condition for the merging firms thus writes

$$\alpha(2\pi - \delta\pi) = p2\pi + (1 - p)2\alpha\pi \tag{7}$$

which yields a marginal type

$$\widetilde{\alpha}(\delta, p) = \frac{2p}{2p - \delta} \tag{8}$$

The participation constraint on behalf of the public agency will equally be modified:

$$CS(\alpha\beta + \delta - \frac{\delta^2}{2}) \geq p \cdot CS + (1 - p) \cdot CS \cdot \alpha\beta \tag{9}$$

or equivalently,

$$\delta - \frac{\delta^2}{2} - p(1 - \alpha\beta) \geq 0 \tag{10}$$

The next result summarizes the outcome of these changes in terms of settlement likelihood and divestiture level[12]:

Proposition 4. *The unique interior equilibrium of the settlement game before court litigation is characterized by the following likelihood of settlement and equilibrium settlement divestiture respectively:*

$$\left(\frac{1 - F}{f}\right)_{|\alpha^*} = -\frac{\alpha^* \left[-2p(-1 + \alpha^*)^2 + \alpha^*(-2 + \alpha^* + \alpha^{*2}\beta)\right]}{4p(-1 + \alpha^*) - 2\alpha^*} \tag{11}$$

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[12]To simplify, given the technical complexity of our framework, in the remainder of this section we only consider the case where $\alpha\beta > 1$.

and

$$\delta^* = \frac{2(\alpha^* - 1)p}{\alpha^*} \tag{12}$$

This preliminary result allows us to perform the comparative statics to assess the impact of the court litigation:

Proposition 5. *An increase in the severity of the court regarding the merger (higher p) leads to a higher probability of out-of-court settlement, but the effect on the divestiture settlement amount is ambiguous.*

The comparative statics result on the settlement likelihood is quite intuitive. Basically, the court litigation makes the settlement even more attractive for the merger partners, by increasing its opportunity cost to its maximum. In case the merging firms reject the divestiture offer, the possible gain is enhanced, amounting to the joint merged profit without any costly remedy whatsoever. By the same token, the possible cost of going to court is also higher, since when the judge upholds the CA's former decision to ban the merger, the merger partners forego any profit enhancing efficiency gains. In this context, it comes as no surprise that the higher the probability p of a negative outcome of the hearing, the higher the incentive for firms to settle out of court. Graphically, the equilibrium marginal type moves to the left, hence an increase in the interval of types that agree to settle and therefore in the probability of settlement.

However, the same increase in the judge's severity does not yield clear-cut predictions w.r.t. the level of equilibrium divestiture. On the one hand, the positive relationship between the marginal type and the settlement divestiture level indicates that the lower the marginal type (or, equivalently, the higher the settlement likelihood), the lower the equilibrium settlement divestiture. After all, decreasing the amount of divested assets facilitates the agreement for the merging firms. But on the other hand, this is only an indirect effect, that has to be weighted against the direct effect of the court's severity on the amount of divestiture. Indeed, the higher the probability for the judge to turn down the firms' case, the easier it is for the CA to request and obtain a higher divestiture in order to clear the merger, simply because the pending menace (or potential loss) for firms is higher. Given our reduced form framework, we cannot sign the outcome of these two opposing effects, but it goes without saying that it all depends on the precise distribution of types (the shape of the cumulative distribution function $F(\alpha)$) and the choice of functional forms retained.

2.3.2. Divestiture settlement with a sale price for the divested assets

In this second development of our benchmark framework we model a more realistic divestiture stage of our game. The divestiture out-of-court settlement is actually a three-party negotiation, because the buyer of divested assets is equally involved besides the public agency and the merging partners which are selling the assets.

The divestiture process typically unfolds as follows. Basically, merging parties are always given first the opportunity to sell the remedy package at the best price and terms they are able to negotiate with a potential purchaser, subject though to final approval by the competition agency. If they cannot complete the divestiture during the specified sale period, an independent trustee is appointed to complete the sale at the best price and terms that, in the trustees' discretion, can be reasonably obtained to alleviate the competition concerns[13].

The point about this third party involvement is that on the one hand, another participation constraint becomes relevant for the equilibrium of the settlement game: the outsider firm buying the divested assets will only agree to do so if the resulting revenue is not lower than the initial profit. On the other hand, the divestiture brings about a revenue transfer from the buyer to the seller, thus augmenting the merged firms' payoff.

For simplicity, we assume that the package of divested assets δ is to be transferred to a unique remaining industry firm (the outsider), which was in all respects identical to each insider before merger. Hence, the outsider firm made an individual pre-merger profit of π. Following the merger and the divestiture, we write the outsider's payoff as follows: $\Pi^o = \pi + \delta\pi - \alpha\beta\delta\pi$. In other words, the divestiture has a direct positive impact on the outsider's profit, through the increase in capital holdings ($+\delta\pi$), but at the same time, there is an indirect effect depending on the efficiency gains obtained by the merging firms ($-\alpha\beta\delta\pi$). More precisely, we explicitly model a situation where the positive effect of efficiency gains on consumers' surplus (amounting to $\alpha\beta$) is symmetrically incurred by the outsider[14]. Basically, the efficiency gains hurt the outsider (by making this firm less cost efficient relatively to the insiders), and the amount to which it benefits from the asset

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[13]See the DOJ's Antitrust Division Policy Guide to Merger Remedies, October 2004, available on http://www.usdoj.gov, as well as the European Commission Notice on remedies acceptable under Council Regulation, No 4064/89 and under Commission Regulation (EC) No 447/98, OJEC C 68, 02.03.2001

[14]In this we follow Neven and Röller (2005) to the extent that they have shown that in both Cournot and Bertrand three-firm perfectly symmetric markets with flat marginal cost curves, the merger's cost savings lead to symmetrical but opposed variations in consumers' surplus and outsider's profit respectively.

transfer δ depends on how efficient the insiders are: the more efficient the merger entity, the less the outsider benefits from the asset transfer it receives ($\frac{\partial^2}{\partial \delta \partial \alpha} \Pi^o < 0$).

In this framework, the sale of the divested assets will therefore take place for a price depending on the outsider's willingness to pay (WTP) for them. The outsider's WTP equals the difference in payoffs after and before merger with divestiture:

$$WTP = \Pi^o - \pi = \pi + \delta\pi - \alpha\beta\delta\pi - \pi = \delta\pi - \alpha\beta\delta\pi \tag{13}$$

The actual sale price is likely to depend on the respective bargaining power of the parties involved in the sale, the seller and the buyer of divested assets. We assume that the insiders' bargaining power amounts to $\gamma \in [0, 1]$. Thus, the asset sale price P will write $P = \gamma(\delta\pi - \alpha\beta\delta\pi) = \gamma(1 - \alpha\beta)\delta\pi$.

It is straightforward to notice that the sale of divested assets will actually take place only if the sale price is positive. This is in line with the actual unfolding of the real life divestiture proceedings, because a negative price would have the insiders pay the outsider firm in order for it to take over the divested assets. Here, a negative sale price would obtain if $1 - \alpha\beta < 0$, meaning that the submitted merger is directly beneficial for consumers' surplus, thus affecting negatively the outsider firm through the drop in market price it would eventually cause in the industry. Such a negative sale price would stand for a compensation paid by the insiders to the outsider for the pro-competitive effect of their merger.

Given this discussion on the sale price of divested assets, in what follows we restrict the analysis to the case ensuring that the price paid is positive, i.e. $1 - \alpha\beta > 0$. To put it differently, we only examine the out-of-court divestiture settlement over anti-competitive merger projects, that would decrease consumers' surplus without the application of a merger divestiture remedy. Such mergers benefit the remaining firms on the market (through their price increase effect, which is basically a positive externality for the outsider). Consequently, when asked to take over the divested assets, the outsider will be willing to pay a positive price for them, which corresponds to the fact that the merger allows him to make a higher profit.

Taking into account the sale of divested assets, the indifference condition for the merging firms now write:

$$\Pi^M + P = \overline{\Pi} \Leftrightarrow \alpha(2\pi - \delta\pi) + \gamma(1 - \alpha\beta)\delta\pi = 2\pi \tag{14}$$

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which yields a marginal type indifferent between settling and not that is defined by

$$\widetilde{\alpha}(\delta) = \frac{2 - \gamma\delta}{2 - \delta - \beta\delta\gamma} \tag{15}$$

Note that the CA's participation constraint is unchanged w.r.t. the benchmark case, $(\alpha\beta + \delta - \frac{\delta^2}{2})CS \geq CS$.

The next result summarizes the changes in the settlement likelihood and divestiture level due to the sale of divested assets to the outsider firm:

Proposition 6. *The unique interior equilibrium of the settlement game with divestiture sale is given by the following settlement likelihood and settlement divestiture amount:*

$$\left(\frac{1-F}{f}\right)_{|\alpha^*} =$$

$$\frac{1}{2}\frac{(\alpha^* - \gamma + \alpha^*\beta\gamma)\left(\begin{array}{c} 2\alpha^* + 2\gamma - 2\alpha^*\beta\gamma - (\alpha^*)^2 - \gamma^2 + (\alpha^*)^3\beta + 3\alpha^*\beta\gamma^2 \\ -2(\alpha^*)^2\beta\gamma + 2(\alpha^*)^3\beta^2\gamma - 3(\alpha^*)^2\beta^2\gamma^2 + (\alpha^*)^3\beta^3\gamma^2 - 2 \end{array}\right)}{(\alpha\beta\gamma - \gamma + 1)^2(\alpha\beta\gamma - \gamma - \alpha + 2)} \tag{16}$$

and

$$\delta^* = \frac{2(\alpha^* - 1)}{\alpha^* - \gamma(1 - \alpha^*\beta)} \tag{17}$$

This preliminary result enables the following comparative statics on the impact of the bargaining power in the sale of divested assets for the equilibrium settlement probability and settlement divestiture:

Proposition 7. *An increase in the bargaining power of the merging firms (higher γ) leads to a higher probability of out-of-court divestiture settlement, but the effect on the equilibrium divestiture settlement is ambiguous.*

As before, it turns out that the first comparative statics result is quite intuitive. Remember that we only deal now with anti-competitive merger projects, which, were they to be cleared without divestiture, would increase the market price. Thus, the mergers projects we consider here are those that exert a positive externality on the payoff of the outsider firm. The sale price of the divested assets enables the insiders to recover some of this externality, and thus it relaxes their individual rationality constraint by increasing their post-divestiture payoff. Hence, the higher their bargaining power, the higher the

payoff resulting from a given divestiture, and the easier to accept the settlement offer made by the CA, as indicated by the higher settlement probability.

In turn, the impact of a change in the insiders' bargaining power on the level equilibrium divestiture δ^* is not clear-cut, because it obtains from two opposing effects. On the one hand, the above mentioned effect on the settlement likelihood yields an indirect negative impact on the settlement divestiture level. Indeed, the marginal type is lower when the bargaining power increases on behalf of the merging parties, and there is a positive relationship between the level of the marginal type and the divestiture amount. To put it short, a higher probability of settlement goes with a lower divestiture amount, because the latter makes it easier to settle. Actually, precisely because they enjoy a higher bargaining power, the insiders would rather take advantage and transfer less assets, because the divestiture is still costly after all, since it lowers the capital stock. But on the other hand, the direct effect of the higher bargaining power is to increase the amount of divested assets transferred to the outsider. This is related to the already mentioned externality that the anti-competitive merger exerts on the outsider's payoff. By transferring more assets, the insiders get paid more in return (since the sale price increases with δ), so basically they recover more of this externality. It goes without saying that the functional (reduced) forms retained, as well as the shape of the types' distribution play a role in this ambiguity.

3. Conclusion

In this paper we perform a pre-trial analysis for the negotiation of asset divestitures in merger control cases. The framework we consider takes into account the fact that the competition agency making the out-of-court divestiture settlement offer is uninformed w.r.t. the actual competitive potential of the merger project submitted for approval, or rather less informed than the merging partners themselves. Modelling the conditional approval of mergers, i.e. the asset divestiture negotiation between the public agency and the insiders, as an out-of-court settlement game allows us to establish the settlement likelihood (or probability of merger approval) and the settlement divestiture level in equilibrium. We then go on to obtain comparative statics results, by examining the impact on the settlement equilibrium of various parameters, such as the extent to which the merger benefits consumers, the probability for the merger to be blocked later on as a result of a possible court litigation, and finally the bargaining power of merging partners in the sale of divested assets.

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Appendix

Proof of Proposition 1. Given the definition of the marginal type, $\widetilde{\alpha}(\delta) = \frac{2}{2-\delta}$, and since $\delta \in [0, 1]$, one obtains $\widetilde{\alpha}(\delta) \in [1, 2]$.

Taking the First Order Condition (FOC) on

$$\max_{\delta} F(\widetilde{\alpha}(\delta))CS + (1 - F(\widetilde{\alpha}(\delta)))CS \left(\delta - \frac{\delta^2}{2} + \beta E(\alpha \mid \alpha > \widetilde{\alpha}(\delta))\right), \text{ where } E(\alpha \mid \alpha >$$

$\widetilde{\alpha}(\delta)) = \int\limits_{\widetilde{\alpha}(\delta)}^{2} \frac{\alpha f(\alpha)d\alpha}{1 - F(\widetilde{\alpha}(\delta))}$, yields $[1 - F(\widetilde{\alpha}(\delta))](1-\delta) + f(\widetilde{\alpha}(\delta))\frac{\partial \widetilde{\alpha}(\delta)}{\partial \delta}\left(1 - \left(\beta\widetilde{\alpha}(\delta) - \frac{\delta^2}{2} + \delta\right)\right) =$

0. Reorganizing the terms as an equality obtains $\frac{1 - F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))} = \frac{2\left(\beta\widetilde{\alpha}(\delta) - \frac{\delta^2}{2} + \delta - 1\right)}{(1-\delta)(2-\delta)^2}$.

The Second Order Condition (SOC) writes

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$-f\frac{\partial\widetilde{\alpha}(\delta)}{\partial\delta}(1-\delta)-(1-F)+\frac{2f}{(2-\delta)^2}\left(-\beta\frac{\partial\widetilde{\alpha}(\delta)}{\partial\delta}+\delta-1\right)+\left(2f'\frac{\partial\widetilde{\alpha}(\delta)}{\partial\delta}(2-\delta)^2-2f2(-1)(2-\delta)\right)<0$, thanks to $\left(1-\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta\right)\right)<0$, $f>0$ and non decreasing and the monotonicity of the marginal type (through the implicit functions theorem): $\frac{\partial\widetilde{\alpha}(\delta)}{\partial\delta}=-\frac{\frac{\partial}{\partial\delta}(\alpha(2\pi-\delta\pi)-2\pi)}{\frac{\partial}{\partial\alpha}(\alpha(2\pi-\delta\pi)-2\pi)}=\frac{\widetilde{\alpha}}{2-\delta}=\frac{2}{(2-\delta)^2}>0$.

Consequently, the FOC yields a unique solution δ^*.

However, the non-linearity of the FOC prevents us from deriving explicitly δ^*, hence we write δ^* from the expression of the marginal type in equilibrium: $\widetilde{\alpha}(\delta)=\frac{2}{2-\delta}\Rightarrow\delta^*=2\left(\frac{\alpha^*-1}{\alpha^*}\right)$. ∎

Proof of Proposition 2. In order to decide at the previous stage whether the CA will make a settlement offer, its participation condition needs to be more closely examined: $(\alpha\beta+\delta-\frac{\delta^2}{2})CS>CS\Leftrightarrow\alpha\beta+\delta-\frac{\delta^2}{2}-1>0$.

Either $\alpha\beta\geq1$, meaning the submitted mergers are pro-competitive, in which case there is no further constraint to be considered on the level of divestiture: $\delta\in[0,1]\Leftrightarrow\alpha\in[1,2]$. Equivalently, α must satisfy $\alpha\beta\geq1\Leftrightarrow\alpha\geq\frac{1}{\beta}$, and $\alpha<2$. It is enough to have $\beta>1/2$ in order for these inequalities to be compatible.

Or $\alpha\beta<1$, which requires that $\delta\in[1-\sqrt{2\alpha\beta-1},1]$. A necessary condition to look for a positive divestiture requires that $\alpha\beta>\frac{1}{2}$. Since $\alpha>1$, a sufficient condition for the CA's participation constraint to hold is that $\beta\geq1/2$. Note that $\delta^*=2\left(\frac{\alpha^*-1}{\alpha^*}\right)\in[1-\sqrt{2\alpha\beta-1},1]$ for $\alpha\in[1,2]$ and $\beta\in[1/2,1]$.

To sum up, a sufficient condition for the CA's participation constraint to hold is $\beta>1/2\equiv\underline{\beta}$. When the CA's participation cannot hold, the CA will never make a settlement offer, the solution of the game is a corner one, and it comes down to banning the merger directly without possibility of remedy. ∎

Proof of Proposition 3. It is straightforward to obtain that

$g(\widetilde{\alpha}(\delta))_{|\alpha^*}=\left(\frac{\widetilde{\alpha}(\delta)\left[-2-\widetilde{\alpha}(\delta)\left(-2+\widetilde{\alpha}(\delta)-\beta\widetilde{\alpha}(\delta)^2\right)\right]}{2(2-\widetilde{\alpha}(\delta))}\right)_{|\alpha^*}$ increases with β. Graphically, this corresponds to a shift leftward of the g curve, and therefore a lower marginal type in equilibrium and an increase in the probability of approval. Since $\widetilde{\alpha}(\delta)$ is lower in equilibrium for a higher β, and $\delta^*=2\left(\frac{\alpha^*-1}{\alpha^*}\right)$ is increasing with α^*, the equilibrium settlement divestiture δ^* is lower for higher β. ∎

Proof of Proposition 4. The FOC on the modified programme of the CA yields $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))}=\frac{-2p\left(-\beta\widetilde{\alpha}(\delta)p+\frac{\delta^2}{2}-\delta+p\right)}{(1-\delta)(2p-\delta)^2}$, where the RHS term is >0 because we restrict to the

case where $\alpha\beta > 1$. In other words, as the participation constraint of the CA is always satisfied, $\delta - \frac{\delta^2}{2} - p(1-\alpha\beta) \geq 0$, the existence of the interior solution is ensured.

Replacing $\delta = \frac{-2(1-\alpha)p}{\alpha}$ from the expression defining the new marginal type obtains $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))} = -\frac{\widetilde{\alpha}(\delta)\left[-2p(-1+\widetilde{\alpha}(\delta))^2+\widetilde{\alpha}(\delta)(-2+\widetilde{\alpha}(\delta)+\widetilde{\alpha}(\delta)^2\beta)\right]}{4p(-1+\widetilde{\alpha}(\delta))-2\widetilde{\alpha}(\delta)}$.

Instead of taking the SOC to show the uniqueness of the interior solution, we use a different method.

Starting from $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))} = \frac{-2p\left(-\beta\widetilde{\alpha}(\delta)p+\frac{\delta^2}{2}-\delta+p\right)}{(1-\delta)(2p-\delta)^2}$, let $h(\cdot) = \frac{-2p\left(-\beta\widetilde{\alpha}(\delta)p+\frac{\delta^2}{2}-\delta+p\right)}{(1-\delta)(2p-\delta)^2} = \frac{h_1(\alpha)}{h_2(\alpha)}$.

One has $\frac{\partial}{\partial\delta}h_2(\alpha) = -3(\delta-2p)(\delta-\frac{2(1+p)}{3}) < 0, \forall\delta = \frac{-2(1-\alpha)p}{\alpha} \geq 0$ and $p \in [0,1]$.

Since $\delta = \frac{-2(1-\alpha)p}{\alpha}$ increases with α, one obtains $h_2(\alpha)$ decreasing with α.

Also, $\frac{\partial}{\partial\alpha}h_1(\alpha) = 2p\left[\beta p + (1-\delta)\frac{\partial\delta}{\partial\alpha}\right] > 0$, therefore $h(\alpha) = \frac{h_1(\alpha)}{h_2(\alpha)}$ increases with α.

$f > 0$ convex and non decreasing guarantees $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))}$ decreasing with α, thus the uniqueness of the interior solution obtains. ∎

Proof of Proposition 5. $\quad h(\cdot) = -\frac{\widetilde{\alpha}(\delta)\left[-2p(-1+\widetilde{\alpha}(\delta))^2+\widetilde{\alpha}(\delta)(-2+\widetilde{\alpha}(\delta)+\widetilde{\alpha}(\delta)^2\beta)\right]}{4p(-1+\widetilde{\alpha}(\delta))-2\widetilde{\alpha}(\delta)}$ leads to $\frac{\partial}{\partial p}h(\cdot) = \frac{(\alpha-1)\alpha^2(\alpha^2\beta-1)}{(-2p(\alpha-1)+\alpha)^2} > 0$ under our assumptions. Following the same graphical reasoning, an increase in p would shift $h(\cdot)$ leftward, leading to a lower marginal type in equilibrium and a higher probability of settlement. At the same time, the increase in p has a direct positive effect on the settlement divestiture, since $\frac{\partial}{\partial p}\delta^* = \frac{\partial}{\partial p}\left(\frac{-2(1-\alpha^*)p}{\alpha^*}\right) > 0$, but also an indirect negative effect due to the monotonicity of the marginal type, $\frac{\partial\widetilde{\alpha}(\delta)}{\partial\delta} > 0$, which tends to lower δ^* when the increase in p leads to a lower marginal type in equilibrium. ∎

Proof of Proposition 6. Note first of all that for $\widetilde{\alpha}(\delta) = \frac{2-\gamma\delta}{2-\delta-\beta\delta\gamma} \in [1,2]$ and $\beta \geq \frac{1}{2}$, $\delta^* = \frac{2(\alpha^*-1)}{\alpha^*-\gamma(1-\alpha^*\beta)} \in [0,1]$.

The FOC still writes $[1 - F(\widetilde{\alpha}(\delta))](1-\delta)+\frac{2f(\widetilde{\alpha}(\delta))}{(2-\delta)^2}\left(1-\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta\right)\right) = 0$, yielding $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))} = \frac{2\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta-1\right)}{(1-\delta)(2-\delta)^2}$ by reorganizing the terms. Since $\frac{\partial}{\partial\delta}\left((1-\delta)(2-\delta)^2\right) < 0$, and $\frac{\partial\delta}{\partial\alpha} > 0$ from $\widetilde{\alpha}(\delta) = \frac{2-\gamma\delta}{2-\delta-\beta\delta\gamma}$, one has $(1-\delta)(2-\delta)^2$ decreasing with α. This yields $\frac{2\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta-1\right)}{(1-\delta)(2-\delta)^2}$ increasing with α, because $\frac{\partial}{\partial\alpha}\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta-1\right) = 2\left[\beta+(1-\delta)\frac{\partial\delta}{\partial\alpha}\right] > 0$. The interior solution is unique, since $\frac{1-F(\widetilde{\alpha}(\delta))}{f(\widetilde{\alpha}(\delta))}$ is decreasing with α following our assumptions on f. ∎

Proof of Proposition 7. The comparative statics result obtains from the analysis of the RHS term of the FOC, $\frac{2\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta-1\right)}{(1-\delta)(2-\delta)^2}$. The numerator increases with γ, because $\frac{\partial}{\partial\delta}\left(\beta\widetilde{\alpha}(\delta)-\frac{\delta^2}{2}+\delta-1\right)>0$, but $\frac{\partial}{\partial\gamma}\delta(\alpha)=\frac{\partial}{\partial\gamma}\left(\frac{2(\alpha-1)}{\alpha-\gamma(1-\alpha\beta)}\right)=-2\frac{(\alpha-1)(\alpha\beta-1)}{(\alpha-\gamma+\alpha\beta\gamma)^2}>0$. The denominator decreases with δ, $\frac{\partial}{\partial\delta}\left((1-\delta)(2-\delta)^2\right)<0$, and since $\frac{\partial}{\partial\gamma}\delta(\alpha)>0$, one obtains that the denominator decreases with γ. To sum up, the RHS term of the FOC increases with γ. Following the same graphical reasoning as before, an increase in γ leads therefore to a lower marginal type and a higher probability of settlement. In terms of equilibrium divestiture though, the final outcome is again ambiguous, because the indirect effect of an increase in γ through $\widetilde{\alpha}(\delta)$ is that of an decrease in δ, since $\widetilde{\alpha}(\delta)$ increases with δ, but the direct effect of an increase in γ on δ is positive: $\frac{\partial}{\partial\gamma}\delta(\alpha)>0$. ∎