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Evidence Production in Merger Control: The Role of Remedies*

Markus Dertwinkel-Kalt[†] Christian Wey[‡]

March 2016

Abstract

We analyze evidence production in merger control as a delegation problem under an inquisitorial and an adversarial competition policy system. Agents' incentives to produce evidence depend critically on the action set of the decision maker. In an inquisitorial system, allowing ex ante for a compromising remedy reduces incentives when compared with the case in which the merger can be either approved or prohibited. In an adversarial system, no such unambiguous results can be derived because the remedial option is never a best-fit for one of the parties. Comparison of both systems reveals that an adversarial system creates larger incentives when the conflict of interest between the involved parties is large. We relate our results to merger control in the US and the EU.

JEL-Classification: L13, L40, K21.

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1 Introduction

We analyze investigation effort and evidence production in merger control as a delegation problem. A merger proposal can be anti- or pro-competitive (i.e., social welfare reducing or increasing) depending on its efficiency type which is uncertain *ex ante*. The legislator (the “principal”) uses competition policy to maximize social welfare. Competition policy consists of (1) evidence production and (2) decision making. We suppose that an agent’s (costly) information acquisition is not contractible. The legislator thus delegates both tasks to one or several agents.

We distinguish between two alternative systems of evidence production: the inquisitorial and the adversarial system. In the inquisitorial system, both information gathering and decision making are delegated to an impartial agent (the “agency”). In the adversarial system, evidence is produced by two agents (the “advocates”): the merging firms’ advocate and the public prosecutor (“outsiders’ advocate”). The final decision is then made by an impartial court. The legislator and agents’ objectives are aligned in the following sense. In the inquisitorial system the objective of the agency is social welfare, while in the adversarial system the merging firms’ agent maximizes its clients’ profits and the public prosecutor maximizes outsiders’ (i.e., rival firms’ and consumers’) surplus. Moreover, the judge decides according to a social welfare standard. In both systems, an agent puts excessive weight on the information cost it has to bear, which leads to a principal-agency problem; that is, suboptimal evidence production.

We investigate how different action sets of the decision maker affect information acquisition, depending on the competition policy system. To be more precise, we compare the case in which the decision maker can either approve or prohibit the merger altogether when a merger can also be cleared conditional on a remedy. With regard to the remedial option we distinguish between a “remedy without a standard of proof” and a “remedy with a standard of proof.” In the former instance, a remedial solution can be applied without any production of evidence, while in the latter case it can only be used if evidence supports its optimality.¹

¹These two regimes mirror the fact that remedy regulations have been tightened over time both in the EU and the US; in particular, the informational burden for remedies has been increased. In the EU, the “First Notice on Remedies” was published on December 21, 2001, and the “Revised Notice on Remedies” on October 22, 2008 (see Lindsay and Berridge, 2012, p. 617). The latter specifies that in order to be acceptable remedies must be capable of being implemented effectively within a short period of time. With regard to the US, in 2004 the Antitrust Division of the DOJ issued the first-ever Antitrust Division Policy Guide to Merger Remedies, which was updated

Throughout our analysis we take the remedial option as a compromising choice which is optimal from an ex ante perspective; that is, whenever only the a priori information on the merger's efficiency type is available.

Our main results are the following. *First*, suppose that an extreme decision (i.e., either approval or prohibition) is always ex post optimal (i.e., when information is complete). Then, under an inquisitorial system, information incentives are unambiguously reduced through the introduction of remedies when compared to a no-remedy regime which forces the agency to either approve or prohibit the merger. Quite generally, an intermediate option (that is, allowing a merger conditional on remedies) represents a compromising choice which limits the negative effect of a false extreme decision. Because of this, allowing for remedies reduces the agency's incentives to obtain information on the merger's efficiency type. In contrast, in a scenario in which only extreme options are implementable, a false decision bears the risk of making a bad decision with strong negative effects. Therefore, the agency acquires more information in order to avoid such negative consequences. The superiority of a no-remedy regime over a remedy regime from a social welfare perspective depends on the shape of the information cost function. A regime without remedies is optimal from the principal's perspective whenever information costs are at a moderate level. If the information costs are either very low or very high then information acquisition does not change much when remedies are feasible or not. In those cases, it can be optimal to allow for a remedy which is the best choice in the absence of additional evidence production.

Second, requiring a standard of proof for the remedial option in the inquisitorial system leads to higher information (and higher social welfare) levels than an inquisitorial system where remedies cannot be implemented at all. As a consequence, requiring a standard of proof for the remedial solution is for the legislator the preferred incentive system, whenever a no-remedy regime is preferred over a remedy regime without a standard of proof.²

Third, the introduction of the remedy option (without a standard of proof) under an adversarial system is largely ambiguous and depends on the model's parameters. Intuitively, in an adversarial system neither party is satisfied with the remedy option, which spurs their incen-

in 2011 (see DOJ, 2011).

²If extreme options are always ex post optimal, then both remedy regimes with and without a standard of proof induce the same information levels.

tives to produce evidence in favor of their case. One advocate (the public prosecutor) wants to block the merger and the other one (the merging firms' defence lawyer) wants to get the merger approved, while the remedial choice serves as the default option of the neutral judge. Thus, in equilibrium both advocates gather information in order to persuade the agency that it is not the remedial option, but a full or no merger, respectively, which maximizes social welfare. If the remedial option is not feasible then the court's decision in the absence of evidence production (either prohibition or approval) perfectly serves the interests of one of the parties. In this case, only the counterparty engages in information acquisition so that banning the remedial option does, to some extent, tend to reduce information acquisition under an adversarial system. Moreover, introducing a standard of proof for the remedy does not necessarily improve information gathering in an adversarial system and therefore does not change our observations qualitatively.

Fourth, comparing the inquisitorial with the adversarial system (both using remedies without a standard of proof), information incentives are, *ceteris paribus*, the more likely to be higher in the adversarial system the more pronounced the conflict of interest between the parties becomes.

Our model is related to real-world merger control. Quite generally, competition law declares general principles for distinguishing lawful from unlawful practices which have to be applied and implemented by authorized agents.³ Antitrust cases are both highly fact-intense and fact-specific so that the gathering of information on the particular case at hand becomes critical for making correct decisions. This is particularly true for second-phase merger cases which raise serious competition concerns and thus require an in-depth analysis.^{4,5}

³For instance, under the EC Merger Regulation (EC, 2014), the Commission must make a prospective analysis of whether the concentration would “significantly impede effective competition, in the internal market or in a substantial part of it, in particular as a result of the creation or strengthening of a dominant position” (Articles 2(2) and (3)). This test is referred to as the “SIEC” test which is generally viewed as similar to the “SLC” test (substantial lessening of competition) which is used in the US.

⁴Our analysis best applies to second-phase mergers which are not approved after a short review process in the first review stage, but which are delegated by the antitrust authority to the second stage as the competitive effects are more ambiguous and harder to evaluate. If a decision on a merger case is already reached in the first review phase, typically, this is based on standard techniques such as the HHI, so that the need for evidence production is negligible.

⁵Given that certain turnover thresholds are met, the antitrust authority in charge must be notified of a merger deal. These merger cases are decided on an ex ante basis. In the EU the Commission is obliged to open a second-phase investigation when there exists “serious doubts” about the effects of the merger. In the US the

EU competition policy comes closest to our inquisitorial system, as both evidence production and decision making are in the hand of a single authority, the Commission. In the US, an impartial court makes the decision, while information gathering is delegated to a public prosecutor (either the DOJ or the FTC) and to the merging firms' advocate (defence lawyer).⁶ In both jurisdictions, remedies are feasible in merger control. If a merger creates substantial competition issues, but the parties propose remedies which satisfactorily resolve those issues, antitrust rules in the US and the EU state that the merger should be approved.⁷

The experiences with merger approvals conditional on a remedy throw some reassuring light on our analysis. *First*, there is some evidence that remedies are ineffectively used both in the EU and the US.⁸ Duso, Gugler, and Yurtoglu (2011), Duso, Gugler, and Szücs (2013), Kwoka and Moss (2011), and Kwoka (2013, 2015) present empirical evidence for the EU and the US which questions whether remedies effectively counter anti-competitive merger effects.⁹ At the same time, there is some indication that this is more of a problem in the EU. The FTC and the EC each produced a remedy review study (see FTC, 1999, and EC 2005, respectively).¹⁰ While the FTC Divestiture Study concluded that divestitures generally produce viable competitors in the relevant market (though it also mentioned several ineffective remedy cases), the EC Merger Remedies Study reported that (1) 79 percent of 84 divestiture cases raised one or more serious issues, and (2) 57 percent of the remedies analyzed were "effective," while the remaining cases were only "partially effective," "ineffective" or "unclear." Bergman et al. (2010) compare the second phase is entered when the reviewing agency issues a "second request" (see Kovacic, Mavroidis and Neven, 2014).

⁶A comparison of the US and EU competition policies alongside their differences with regard to the delegation of information acquisition ("proof taking") has already been suggested by Neven (2006), who contrasts the adversarial procedure in the US with the EU system which he describes as an "inquisitorial model with prosecutorial bias."

⁷The US Horizontal Merger Guidelines and the EC Merger Regulation allow for remedial offers to address competitive concerns (see DOJ, 2010, and EC, 2004, respectively).

⁸Theoretical works have also argued that divestitures can be harmful to competition (see, Farrell, 2003, Fridolfsson and Stennek, 2005; and Cabral, 2003). For instance, they may fail, if the buyer is not a vigorous competitor (Davies and Lyons, 2007).

⁹See Heyer (2012), Papandropoulos and Tajana (2006), Davies and Lyons (2007), and Davies and Olczak (2010) for related works which criticize the use of remedies in merger control for being ineffective in practice.

¹⁰See also OECD (2011).

remedy practice in the US and the EU over the period 1998-2007 and they argue that the EU is more prone to accepting “weak remedies” which are considered to be “compromises” between merging firms and the authority. Those compromising remedies do not resolve the competitive concerns and fail to restore effective competition. This observation mirrors our result, that an inquisitorial systems tends to clear too many mergers with remedies which turn out to be inefficient ex post. At the same time, their study also reports that remedial solutions tend to be relatively more effective in the US: “The US appears more likely to insist on stronger remedies than the EU for investigations that raise competitive concerns” (Bergman et al., 2010, p. 2).

Second, with regard to the direct comparison of the adversarial and inquisitorial systems we show that the adversarial system creates larger information acquisition incentives when the parties’ conflict of interest becomes more pronounced (see Section 7). In those cases more evidence will be produced in the adversarial system than in the inquisitorial system. Bergman et al.’s (2010) analysis appears to support this finding. Also compatible with this finding, we indeed observe less extreme choices (in the form of prohibitions) in the EU than in the US which is consistent with less evidence production in the EU.

We proceed as follows. We review the closely related literature in Section 2. We present our model in Section 3, where we first describe the institutional environments (Section 3.1) and second, present the general set-up of our modeling approach (Section 3.2). In Sections 4 and 5 we analyze the inquisitorial and the adversarial systems, respectively. We discuss our results and provide an example in Section 6. Section 7 provides a comparison of the inquisitorial and the adversarial systems. Finally, Section 8 concludes.

2 Related Literature

Our approach is closely related to Szalay (2005) who examines a principal-agent model in which the agent collects information and then chooses a verifiable action. The agent’s effort is not contractible and the principal cannot design an incentive compatible contract based on ex post outcomes. The critical step in this analysis is to focus on the agent’s incentives as a result of the composition of her choice set. It is shown that it can be optimal to remove the intermediate choices from the agent’s action set to increase her incentives to acquire information.

The merger model is related to Cosnita-Langlais and Tropeano (2012) who analyze how

remedies and the efficiency claims of the merging parties are interrelated when the efficiency level is endogenous. Their model focuses on conditions under which remedies can signal the merger’s efficiency type.

We also contribute to the institutional comparison of an adversarial law enforcement system with an inquisitorial one. Dewatripont and Tirole (1999) argue in favor of advocates by showing that information acquisition incentives are generally lower under an inquisitorial system. In their model the inquisitorial system decides too often for an extreme option which is in stark contrast to our model. That difference is due to their key assumption, that the obtained information can be conflicting. The inquisitorial authority has insufficient incentives to gather a second piece of information which might stand in conflict with the initially obtained information. In our setup, in contrast, the agency already has too few incentives to obtain the very first piece of information with the relatively safe, intermediate option at hand. In a similar manner to Dewatripont and Tirole (1999), Shin (1998) proves the strict superiority of the adversarial system over the inquisitorial one if information is noisy and thus potentially conflicting. Similar to our study, Froeb and Kobayashi (2001) assume that the court is uneducated and incorporates a simple decision rule, and they find that neither system dominates the other one.

3 The Model

3.1 Institutional Environments and Remedies

A merger creates a situation of conflict in which merging firms want to get their proposal approved while outsiders (rival firms together with consumers) typically have an opposite interest and prefer to prevent the merger from taking place. We assume that the legislator (the “principal”) uses competition policy (in particular, merger control) to maximize social welfare.¹¹ A competition policy regime must balance the countervailing interests of the merging firms on the one hand and those of outsiders on the other.

The law and economics literature offers two frameworks to resolve such a problem of conflicting interests (see Spier, 2007) depending on whether investigation and decision making (adjudication) is integrated or separated (see also Ottow, 2015). In an inquisitorial system the

¹¹Farrell and Katz (2006) for arguments that competition policy aims at maximizing social welfare.

interests are bundled and balanced in the hand of one impartial authority. The agency collects and evaluates evidence and counterevidence for a legal case, and it decides on the merits of the case. In contrast, in an adversarial system countervailing interests are represented by advocates for either side; that is, a plaintiff and a defendant try to persuade a neutral judge. Both parties are responsible for producing evidence, while the judge is passive in this regard. Both the delegation of the evidence production to the involved parties and the role of the court are critical differences between both institutional environments, which also mirrors key differences between the US and the EU merger control systems (see Neven, 2006; Kovacic, Mavroidis, and Neven, 2014).¹² While we analyze two theoretical benchmarks of merger enforcement, our intention is to highlight critical differences between the Anglo American and Continental European competition enforcement systems. The inquisitorial system can be seen as an approximation of the European Commission's merger enforcement in the European Union (Neven, 2006; Posner, 1999; Christiansen, 2006). Both information acquisition and the final merger decision are bundled in the hand of the Commission which is supposed to act as an impartial authority. Accordingly, the Commission does not need to go to court to prohibit a merger proposal. However, it must put forward convincing evidence that the merger would be incompatible with the maintenance and development of effective competition.¹³

In contrast, the adversarial framework is a closer fit to the US system, where the antitrust agencies (Department of Justice and Federal Trade Commission) act as the plaintiffs standing before a neutral court (Neven, 2006).¹⁴ Under a system of advocates the court is the decision

¹²To block a proposed merger, the federal agency handling the case (whether the DOJ or the FTC) lacks the authority to issue prohibition decisions for proposed mergers on their own accord. Thus, in the US, judicial intervention is necessary to even halt a transaction (see Kovacic, Mavroidis, and Neven, 2014). In Europe, judicial participation in merger control only takes place through appeals from Commission decisions.

¹³The need to provide convincing evidence was made explicit by higher EC court judgments. In the annulment of three merger prohibitions by the Court of First Instance in 2002, the empirical analysis of the Commission was found to be insufficient. Interestingly, in 2006 the Court of First Instance overturned the authorization of the creation of Sony BMG (a joint venture) in its annulment of the Commission's decision which was found to have not met the requisite legal standards of evidence and proof (see, Van Rompuy, 2008). Thus, in second-phase merger cases, the Commission has the burden of proof both in case of prohibition and in case of approval.

¹⁴Lindsay and Berridge (2012, p. 64) state that a key difference between both systems is a more "particularised allocation of the burden of proof," such that "the Commission's investigation is inquisitorial and the Commission determines whether a merger should be approved." Ottow (2015) distinguishes two types of separated models:

maker which decides on the basis of the evidence it receives from the two parties.¹⁵ In that case, the merging firms themselves become active players by building up countervailing advocacy through the evidence they themselves produce. The merging firms hire an advocate and thus delegate the task of evidence production. The public prosecutor (the FTC or DOJ) acts as the second advocate which internalizes the objective of the outsiders (i.e., rival firms and consumers).

We distinguish between two types of remedy regimes: *first*, we analyze the case of remedies without a standard of proof and *second* we examine the case where remedies must meet a certain standard of proof. In the former case, a remedial solution can be implemented without any empirical justification, so that its use will be decided only in terms of expected values. In the latter case, a remedial solution can only be implemented whenever there is hard evidence that the remedy is indeed optimal; that is, information must be gathered and evaluated which proves the optimality of the remedy decision.

3.2 The General Setup

In the inquisitorial system, the legislator delegates the enforcement of merger control (evidence production and the final decision making) to an agent/agency (in short: A). In the adversarial system, the final judgment on a merger proposal is made by an impartial court, while evidence production is brought forward by two agents (or advocates): *first*, the outsiders' advocate (in short: AC) representing the consumers and outsider firms' interests and *second*, the firms' advocate (in short: AF) representing the merging firms' interests.

the “bifurcated judicial model” and the “bifurcated agency (or tribunal) model.” In the former the competition authority goes to a court and in the latter a specialized tribunal (typically part of the competition authority) decides. The former type mirrors the US system which is the focus of our analysis.

¹⁵While in the US most merger cases are decided not by trial but are rather resolved by settlements or abandoned before. Nevertheless, we can interpret our theoretical model of advocates as mirroring US merger policy. Note that going to court and therefore implementing the outcome which our model predicts serves as a threatpoint in the negotiation preceding a possible trial. As an alternative to our approach, which focuses on the trial outcome, we may assume that information acquisition is first, second are bilateral negotiations, and third the parties may go to the court. Then, all information is gathered during the first stage and the decision of the court is perfectly foreseeable. If proceeding to the third stage is not costly, then a merger outcome before a trial implements in equilibrium the same solution as the court would implement, both with and without the remedial option (even though such a settlement seems to be only plausible if the remedial option is feasible).

The legislator's and the agent's objectives are aligned in the following sense. In the inquisitorial system the objective of the agency is social welfare, while in the adversarial system the advocates' objectives represent different components of social welfare. Under both systems, every agent puts excessive weight on the information cost it has to bear.¹⁶ Moreover, the court's judgment is based on a social welfare standard in the adversarial system. We assume that the agency-problem between the merging firms and their advocate is the same as between the legislator and the agents. That is, we assume that AF fully internalizes the profit interests of the merging firms but overvalues its own information costs.

Mergers differ in the efficiencies, e , which they generate. The distribution of efficiencies is given by the density function $f(e)$ on the interval $e \in [\underline{e}, \bar{e}]$, where \underline{e} denotes the lowest and \bar{e} the highest possible efficiency level. The prior distribution of efficiencies is common knowledge, while the specific efficiency level of a particular merger is the private information of the merging firms. An agent can acquire information on a merger's efficiency level by exerting costly effort to observe the true efficiency type with probability $\beta \in [0, 1]$.¹⁷ If the agent/advocate chooses a particular value β , it learns the true efficiency type with probability β and does not obtain any information on the merger type with counter probability $1 - \beta$.¹⁸ The information costs are given by the cost functions $C_A(\beta)$ (for the inquisitorial agency), $C_{AF}(\beta)$ (for the merging firms' advocate) and $C_{AC}(\beta)$ (for the outsiders' advocate).

We investigate the agents' choices of β in the inquisitorial and the adversarial system separately under two regimes: NR (*no-remedy regime*) and R (*remedy regime*). Suppose the in-

¹⁶It is a common assumption that bureaucrats are intrinsically motivated to serve the principal's objectives (Besley and Ghatak, 2005; Prendergast, 2007). Long-run motivation of the bureaucrats may also be provided by the fear of the restructuring of their institution in the case of its failure. Direct financial incentives, however, are almost unfeasible as bureaucrats are not paid according to their performance.

¹⁷A similar specification is used in Szalay (2005). We can also interpret β as the probability that a certain standard of evidence for the assessment of the merger's efficiency is met.

¹⁸We consider a setting in which gathered information is always correct. Note that our results also hold if acquired information is false with some probability. Formally, they hold if the following mechanism applies. A signal is obtained with probability β while no signal is obtained with probability $1 - \beta$. If a signal is observed, then it is correct with probability σ and false with probability $1 - \sigma$. The probabilities σ and $1 - \sigma$ do not depend on the effort level and σ is rather large. See also Sorgard (2009) for an analysis of optimal merger policy in the presence of type I and type II errors.

quisitorial system applies, then, under NR the agency can only approve or prohibit the merger altogether. Under regime R , the agency can also condition its approval on a remedial commitment. If the adversarial system applies, then the court can only prohibit or approve the merger proposal entirely if regime NR holds. Under R , the court can also condition the approval on a remedial solution. We assume that a unique remedy exists for every merger proposal (Cosnita-Langlais and Tropeano, 2012).¹⁹

Let X indicate the agency's merger decision, $X \in \{M, NM, R\}$, which can be an approval ($X = M$), a prohibition ($X = NM$) or an approval conditional on a remedy ($X = R$). Given a merger of a certain efficiency type e , let $SW^X(e)$ denote the change in social welfare when the agency adopts decision X . It follows that $SW^M(e)$ is the difference between post- and pre-merger social welfare levels, where social welfare denotes the sum of firms' profits and consumer surplus. Given the prior distribution of the efficiency level, the expected change of social welfare if decision X is adopted is given by $\overline{SW}^X = \int_{\underline{e}}^{\bar{e}} SW^X(e) f(e) de$.

Likewise, we can define $CS^X(e)$ and $\overline{CS}^X = \int_{\underline{e}}^{\bar{e}} CS^X(e) f(e) de$ where the latter is the change in expected consumer surplus if decision X is made. Analogously, denote $\Pi^X(e)$ the change in the merging firms' profits depending on efficiency e and decision X and $\overline{\Pi}^X := \int_{\underline{e}}^{\bar{e}} \Pi^X(e) f(e) de$. Denote $\Pi_O^X(e)$ the change in the rival firms' profits and $\overline{\Pi}_O^X := \int_{\underline{e}}^{\bar{e}} \Pi_O^X(e) f(e) de$. In addition, we define a merger's externalities as $\varepsilon^X(e) := CS^X(e) + \Pi_O^X(e)$ and $\overline{\varepsilon}^X := \overline{CS}^X + \overline{\Pi}_O^X$. Thus, the change in social welfare for a given type e is defined by

$$\begin{aligned} SW^X(e) &= \Pi^X(e) + CS^X(e) + \Pi_O^X(e) \\ &= \Pi^X(e) + \varepsilon^X(e), \end{aligned}$$

¹⁹In the case of structural remedies only a specific business unit or production plant may qualify as a remedial divestiture (Vasconcelos, 2010). Moreover, legal requirements reduce the set of possible remedies. For example, the remedy must be easily applicable and a divestiture only qualifies as a potential remedy if it is a "viable business" which can "operate on a stand-alone basis" (EC, 2008). Thus, wider packages may be required in order to satisfy viability (Motta et al., 2003; Davies and Lyons, 2007). In the case of vertical mergers and behavioral remedies, standard obligations not to foreclose outsiders and to supply them at a reasonable price quite naturally single out a remedy for a merger proposal. Finally, even if several remedies exist, not all of them are equally effective, so that the agency chooses the remedy it expects to be most effective in protecting social welfare.

while the following holds for the expected change in social welfare:

$$\begin{aligned}\overline{SW}^X &= \overline{\Pi}^X + \overline{CS}^X + \overline{\Pi}_O^X \\ &= \overline{\Pi}^X + \overline{\varepsilon}^X.\end{aligned}$$

If a merger is prohibited, social welfare and profits do not change, so that $\overline{SW}^{NM} = \overline{CS}^{NM} = \overline{\Pi}^{NM} = 0$ holds. For the inquisitorial system, we define the α -*distorted overall social welfare* W_α following decision X on a merger of efficiency e and information level β_A as

$$W_\alpha := SW^X(e) - \alpha C_A(\beta_A) \quad (\text{Inq})$$

For the adversarial system, we define the α -*distorted overall social welfare* W_α following decision X on a merger of efficiency e and information levels β_{AF} and β_{AC} by the advocates as

$$W_\alpha := SW^X(e) - \alpha(C_{AF}(\beta_{AF}) + C_{AC}(\beta_{AC})). \quad (\text{Adv})$$

In each case, we denote $W := W_1$ as the *overall social welfare*, which consists of the change in social welfare in the market under scrutiny and the information costs of the agency. We invoke the following assumptions concerning the objectives of the legislator and the agency (i.e., the agency in the inquisitorial system and the advocates in the adversarial system).

A1: *The legislator's objective is the maximization of overall social welfare W .*

A2^{inq}: *The agency's objective is the maximization of the α -distorted overall social welfare, that is, $SW^X(e) - \alpha C_A(\beta_A)$, for some $\alpha > 1$.*

A2^{adv}: *The AC's objective is the maximization of $\varepsilon(e) - \alpha C_{AC}(\beta_{AC})$ and the AF's objective is the maximization of $\Pi^X(e) - \alpha C_{AF}(\beta_{AF})$, for some $\alpha > 1$.*

These differences in the legislator's and the agents' objective functions give rise to a principal-agent problem. The principal-agent problem arises if the agency does not exert enough effort in order to maximize the legislator's objective, that is, if $\alpha > 1$. Note that the objectives of the advocates sum up to the α -distorted overall social welfare.²⁰

²⁰The AC-agent in the adversarial system corresponds to the roles of the FTC and the DOJ in the US. Interestingly, these agencies should focus only on the merger's externalities because the merging parties' interest is represented by their advocate AF (see Farrell, 2003, for a related observation). Farrell and Shapiro (1990) derive a well-known condition for a merger being welfare-improving in a Cournot oligopoly. This condition is derived exclusively from the merger's externalities on consumer surplus and rival firms' profits.

The next assumption specifies the functional form of the information acquisition costs of the agency and the advocates.

A3: *The information acquisition cost function $C(\beta)$ fulfills the Inada conditions $C(0) = 0$, $C'(\beta) > 0$, $C''(\beta) > 0$, $\lim_{\beta \rightarrow 1} C(\beta) = +\infty$, where $C \in \{C_A, C_{AF}, C_{AC}\}$.*²¹

Next, we impose the following assumptions on the pre- and the post-merger market outcomes.²²

A4: *Social welfare $SW^X(e)$ is continuous and strictly monotonically increasing in e for all $X \in \{M, R\}$. Let $SW^M(\underline{e}) < 0$ and $SW^M(\bar{e}) > 0$. Furthermore, assume that*

$$\frac{dSW^M(e)}{de} > \frac{dSW^R(e)}{de} > 0. \quad (1)$$

From Assumption A4 it follows that the function $SW^M(e)$ has at most one zero. $SW^R(e)$ has also at most one zero and intersects with $SW^M(e)$ at most once. Without loss of generality, we assume that all three points of intersection exist²³ and are denoted by e' (such that $SW^R(e) = 0$), e'' (such that $SW^R(e) = SW^M(e)$) and \hat{e} (such that $SW^M(e) = 0$), respectively. We denote $e_1 := \min\{e', \hat{e}\}$ and $e_2 := \max\{e'', \hat{e}\}$. Thus, from a social welfare perspective, a prohibition of the merger is optimal for $\underline{e} < e < e_1$, remedies are optimal for $e_1 < e < e_2$, and a full merger is optimal for $e_2 < e < \bar{e}$. Note that these intervals may be empty, for instance, if $e_2 < e_1$. From a social welfare perspective, for a merger with $e < \hat{e}$ a prohibition is preferred over an approval, while for $e > \hat{e}$ an approval is preferred over a prohibition. Due to continuity, for the threshold values e' , e'' and \hat{e} the decisions $\{NM, R\}$, $\{R, M\}$, and $\{NM, M\}$ give rise to the same levels of social welfare as long as $e'' > e'$.²⁴ We assume that there is zero probability mass on the threshold values e' , e'' and \hat{e} .²⁵ Condition (1) is intuitive: the (positive or negative) effect of a

²¹The Inada conditions represent standard assumptions imposed on production functions (Inada, 1963) and are also used in Szalay (2005) and Cosnita-Langlais and Tropeano (2012). They ensure uniqueness of the level of information acquired in equilibrium. Prominent examples of cost functions exhibiting these properties are $C(\beta) = \alpha\beta/(1 - \beta)$ or $C(\beta) = \alpha \ln(1/(1 - \beta))$ for $\alpha > 0$.

²²Our assumptions are in line with the models which analyze structural remedies in oligopolistic markets; see Cabral (2003), Medvedev (2007), Vergé (2010), Vasconcelos (2010), and Dertwinkel-Kalt and Wey (2015).

²³We impose this assumption for notational ease while it does not compromise our analysis.

²⁴If $e' = e''$, the remedial option might be strictly worse than decision M or NM for all e .

²⁵We impose this assumption for brevity. Without this assumption, the levels of information acquisition depend on which of the decisions is implemented if two decisions give rise to the same level of social welfare.

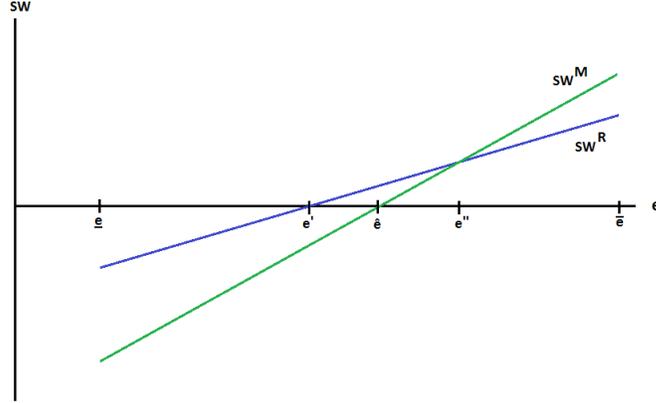


Figure 1: *Thresholds concerning SW for a continuous distribution of merger efficiencies*

merger's efficiency impacts on social welfare to a larger degree if the merger is fully implemented than if its effects are mitigated by remedies.²⁶

Those assumptions mirror the following market features. A prohibition is optimal from a social welfare perspective if the merger is rather inefficient. For a merger with relatively large efficiencies, an approval of the full merger is optimal. For a merger with an intermediate efficiency level e (that is, $e' < e < e''$) the implementation of the remedy is strictly preferred from a social welfare perspective. This setting is illustrated in Figure 1.

A5: A merger's profitability $\Pi^X(e)$ is continuous and strictly monotonically increasing in its efficiency, $\partial\Pi^X(e)/\partial e > 0$ for $X \in \{M, R\}$. While all mergers are profitable, $\Pi^X(\underline{e}) > 0$ for $X \in \{M, R\}$, full mergers are more profitable than mergers with remedies, that is, $\Pi^M(e) > \Pi^R(e)$ for all e .

Due to the profitability assumption A5, each merger type has an incentive to propose a full merger. However, a merger conditional on a remedy requirement is also strictly profitable.

A6: A merger's externalities $\varepsilon^X(e)$ are continuous and strictly monotonically increasing in its efficiency, $\partial\varepsilon^X(e)/\partial e > 0$ for $X \in \{M, R\}$. While all mergers have negative externalities, $\varepsilon^X(\underline{e}) < 0$ for $X \in \{M, R\}$, full mergers have higher negative externalities than mergers with remedies, that is, $\varepsilon^M(e) < \varepsilon^R(e)$ for all e .

Due to this assumption, outsiders are worse off through mergers, but prefer mergers with

²⁶The orderings can be replicated in standard Cournot models (see, e.g., Dertwinkel-Kalt and Wey, 2012).

a remedial obligation over a full merger. Indeed, mergers tend to increase prices and therefore reduce consumer surplus while this effect is lower for mergers with remedies (see Kwoka, 2013; Szücs, 2012).

A7: *Ex ante (i.e., based on the distribution of efficiencies) an approval conditional on a remedy is preferred from a social welfare perspective; that is, $\max\{\overline{SW}^M, \overline{SW}^{NM}\} < \overline{SW}^R$.*

According to A7, we invoke a “remedy-favouring assumption.” Ex ante, that is, before the acquisition of costly evidence, it is optimal to approve any merger proposal conditional on a remedy. This mirrors our motivation to interpret the decision to approve a merger conditional on remedies as an *intermediate option* which is optimal if no information is available (Szalay, 2005). In contrast, extreme decisions such as an unconditional approval or the outright prohibition of the merger bear the risk of making a “large” mistake with substantial social welfare losses. Hence, in the absence of any additional information, the remedy option represents a relatively “safe” choice.

4 Inquisitorial Regime

In order to analyze the inquisitorial system, we solve the following game by backward induction for subgame perfect Nash equilibria. In the first stage, the legislator decides on the agency’s action space; that is, it decides whether remedies are feasible (regime R) or not (regime NR). In the second stage, a merger is proposed. In the third stage, the agency decides on the quality of information β it acquires. Finally, in the fourth stage, the agency makes its final judgment on the merger proposal.²⁷ We start with the analysis of remedies without a standard of proof and then turn to the case in which remedies require a certain standard of proof.

Remedies without a standard of proof. The agency’s decision in the fourth stage depends on the availability of the remedial option and the information β it has acquired in the third stage. Suppose regime R applies. If the agency holds information on the merger’s type, then it decides according to the following decision rule. (1) If the merger type is $e \in [e_2, \bar{e}]$ then the merger is fully approved. (2) If the merger type is $e \in [e_1, e_2]$ then the merger is approved with a remedy. And, (3) if the merger type is $e \in [\underline{e}, e_1]$ then the merger is prohibited. Thus,

²⁷A fifth stage, in which firms can either accept the agency’s decision or decide to abandon the merger can be ignored as each decision by the agency (either with or without remedies) will be accepted by the proposing firms.

with information on the efficiency of the merger at hand, the agency always implements the (ex post) social welfare-maximizing solution. If, to the contrary, the agency does not hold any information, then the remedy is implemented due to our remedy-favoring assumption A7.

Next, suppose regime NR applies. Thus, if no information is held, then the merger is prohibited if $\max\{0, \overline{SW}^M\} = 0$ and it is approved if $\max\{0, \overline{SW}^M\} = \overline{SW}^M$. If information is held, the following decision rule applies. (1) If the merger type is $e \in [\hat{e}, \bar{e}]$ then the merger is fully approved. (2) If the merger type is $e \in [\underline{e}, \hat{e}]$ then the merger is prohibited.

In the third stage, the agency chooses the level of information $\beta \in [0, 1]$ in order to maximize its objective function W_α . Under regime R the equilibrium level of information acquisition β_R is given by the maximization of

$$\beta \left(\int_{\underline{e}}^{e_1} f(e)SW^{NM}(e)de + \int_{e_1}^{e_2} f(e)SW^R(e)de + \int_{e_2}^{\bar{e}} f(e)SW^M(e)de \right) + (1 - \beta)\overline{SW}^R - \alpha C_A(\beta).$$

Under regime NR , the equilibrium level β_{NR} is given by the maximization of

$$\beta \left(\int_{\underline{e}}^{\hat{e}} f(e)SW^{NM}(e)de + \int_{\hat{e}}^{\bar{e}} f(e)SW^M(e)de \right) + (1 - \beta) \max\{0, \overline{SW}^M\} - \alpha C_A(\beta). \quad (2)$$

Thus, β_{NR} and β_R follow from the rewritten first-order conditions

$$\int_{e_1}^{e_2} f(e)SW^R(e)de + \int_{e_2}^{\bar{e}} f(e)SW^M(e)de - \overline{SW}^R \stackrel{!}{=} \alpha C'_A(\beta_R), \text{ and} \quad (3)$$

$$\int_{\hat{e}}^{\bar{e}} f(e)SW^M(e)de - \max\{0, \overline{SW}^M\} \stackrel{!}{=} \alpha C'_A(\beta_{NR}), \quad (4)$$

respectively. From (3) and (4) we can easily infer under which circumstances the agency exerts more effort under regime NR than under R , so that $\beta_{NR} > \beta_R$. Note that the left-hand sides of both conditions are independent of β . Thus $\beta_{NR} > \beta_R$ holds if and only if the left-hand side of (4) exceeds the left-hand side of (3).

If $\max\{0, \overline{SW}^M\} = 0$ (i.e., if the merger is a priori not approvable), then $\beta_{NR} > \beta_R$ holds if

$$\int_{\hat{e}}^{\bar{e}} f(e)SW^M(e)de > - \int_{\underline{e}}^{e_1} f(e)SW^R(e)de + \int_{e_2}^{\bar{e}} f(e)[SW^M(e) - SW^R(e)]de,$$

or, equivalently, if

$$\int_{[\underline{e}, \bar{e}] \setminus [e_1, e_2]} f(e)SW^R(e)de + \int_{\hat{e}}^{e_2} f(e)SW^M(e)de > 0 \quad (5)$$

holds. If, to the contrary, $\max\{0, \overline{SW}^M\} = \overline{SW}^M$ (i.e., the merger is approvable), then $\beta_{NR} > \beta_R$ holds if

$$-\int_{\underline{e}}^{\hat{e}} f(e)SW^M(e)de + \int_{[\underline{e}, \bar{e}] \setminus [e_1, e_2]} f(e)SW^R(e)de > \int_{e_2}^{\bar{e}} f(e)SW^M(e)de$$

or, equivalently, if

$$\int_{[\underline{e}, \bar{e}] \setminus [e_1, e_2]} f(e)SW^R(e)de > \int_{[\underline{e}, \bar{e}] \setminus [\hat{e}, e_2]} f(e)SW^M(e)de \quad (6)$$

holds. To characterize the equilibrium information level chosen by the agency, we focus on two extreme cases $i \in \{I, II\}$ concerning the optimality of remedies for each merger type.

- *Special case I*: If $\underline{e} = e_1$ and $e_2 = \bar{e}$, then a remedy is optimal for all merger types.
- *Special case II*: If $e_2 = e_1 = \hat{e}$, then a remedy is not optimal for any merger type.

The equilibrium information acquisition levels chosen by the agency in the two cases are unique, regardless of the regime (R or NR).²⁸ We denote by $\beta_{r,i}^*$ the agency's optimal information level under regime $r \in \{R, NR\}$ and for case $i \in \{I, II\}$.

We focus on the agency's optimal information decisions in cases I and II to more clearly single out the trade-off associated with the remedial option. In case I a merger with remedies is always optimal, so that information acquisition is redundant. It follows that the legislator and agency's objectives are aligned. The agency does not acquire any evidence and makes the optimal merger decision. If remedies are feasible then the merger is cleared conditional on a remedy. If remedies are not feasible then the optimal merger decision is not available for any efficiency level, which results in a lower level of consumer surplus. Thus, the legislator chooses regime R in the first stage since allowing for an intermediate option (i.e., a remedy) induces optimal merger decisions by the agency. This result mirrors the often expressed view that remedies tend to improve the decision making of competition authorities (see EC, 2004/2008).

In case II the optimal merger decision critically depends on information about the exact merger type. Most importantly, an approval of a merger conditional on a remedy is never

²⁸The agency's first-order condition's left-hand side, given by (3) or (4), is constant, but strictly positive. It is strictly monotonically increasing in β on the right-hand side. Thus, either an interior solution exists or the unique corner solution applies with $\beta = 0$.

optimal ex post for any merger proposal. The acquisition of additional information is, therefore, a serious issue in this case. If remedies are not optimal for any type, then the removal of the intermediate option increases the agency's incentives to acquire information. This result is driven by the following intuition. If remedies are feasible, it may be optimal for the agency to exert very little effort and to apply remedies as the potential error which accompanies this decision is limited. If, however, remedies are not feasible then the potential error associated with an extreme decision might be so high that exerting more effort, that is, acquiring better information, is optimal for the agency. With better information at hand, the agency limits the potentially high costs associated with a false decision.

Besides this positive incentive effect of a removal of the remedy option, it also creates a real cost because the remedy is optimal on average (i.e., in the absence of concrete information concerning a proposal's type). By acquiring more information, remedies become less important since the range where they are optimal (i.e., the number of no-information scenarios) shrinks. In equilibrium, the positive surplus effect of an improved information level may overcompensate the welfare losses which result from the removal of the remedial option. In that case, the legislator optimally decides to remove the remedy option from the agency's action space.²⁹

Proposition 1. *i) In case I (i.e., remedies are optimal for every type), there is no incentive problem and the first-best solution is implemented, that is, $\beta = 0$. The legislator chooses regime R.*

ii) In case II (i.e., remedies are never optimal for any type), the agency acquires a higher information level under regime NR than under regime R. Overall social welfare is higher under NR if and only if the higher level of information is sufficient to counterbalance the additional information costs and the detrimental effects of the remedy's removal in the no-information scenario, that is, if

$$\begin{aligned}
& (\beta_{NR,II}^* - \beta_{R,II}^*) \times \int_{\hat{e}}^{\bar{e}} f(e) SW^M(e) de \\
& > C_A(\beta_{NR,II}^*) - C_A(\beta_{R,II}^*) + (1 - \beta_{R,II}^*) \times SW^R - (1 - \beta_{NR,II}^*) \times \max\{\overline{SW}^M, 0\}. \quad (7)
\end{aligned}$$

²⁹This preference of the legislator for extreme options mirrors the central finding of Szalay (2005).

Proof. If remedies are feasible, overall social welfare equals

$$\beta_{R,II}^* \left(\int_{\underline{e}}^{e_1} f(e)SW^{NM}(e)de + \int_{e_1}^{e_2} f(e)SW^R(e)de + \int_{e_2}^{\bar{e}} f(e)SW^M(e)de \right) + (1 - \beta_{R,II}^*)\overline{SW}^R - C_A(\beta_{R,II}^*).$$

If remedies are not feasible, overall social welfare equals

$$\beta_{NR,II}^* \left(\int_{\underline{e}}^{\hat{e}} f(e)SW^{NM}(e)de + \int_{\hat{e}}^{\bar{e}} f(e)SW^M(e)de \right) + (1 - \beta_{NR,II}^*) \max\{0, \overline{SW}^M\} - C_A(\beta_{NR,II}^*).$$

Overall social welfare is larger if remedies are not feasible if the difference between the two terms is below zero. Rearranging yields Inequation (7). \square

The second integral in (5) is always positive, whereas the first integral could be either positive or negative. However, the first integral is only negative if the negative impact of the remedial option for mergers with efficiencies in $[\underline{e}, e_1]$ outweighs the remedy's positive impact on consumer surplus for mergers with efficiencies in $[e_2, \bar{e}]$. Thus, information acquisition in general is likely to be higher under regime *NR*. Whether or not the additionally acquired information also gives rise to an increase in consumer surplus depends on the interplay between social welfare losses due to the removal of remedies and the gains in social welfare due to the higher information acquisition level.

The optimality of the extreme option regime *NR* depends on the exact shape of the information cost function C_A . If information is relatively cheap to obtain (C_A is flat) then the additional incentives arising from a restriction in the action set may not suffice to induce an overall positive effect on consumer surplus. This follows from the fact that a relatively large amount of information is already acquired when remedies are feasible. Similarly, if information is quite costly (C_A is steep), the agency's information level is relatively low under both regimes. However, regime *NR* is most likely to dominate regime *R* from a consumer point of view if the difference in information acquisition is sufficiently high between the regimes.

The removal of the remedial option tends to be optimal whenever information costs are at an intermediate level (C_A being neither too steep nor too flat). In those instances, much more information is acquired by the agency in the absence of the remedy option because it wants to avoid the possibly costly errors associated with an extreme decision (either prohibition or

unconditional approval). In other words, if remedies are feasible and information costs are neither too low nor too high, then the agency may abstain from acquiring information as the use of remedies tends to limit the costs associated with a false decision. Under those circumstances to spur the information acquisition incentives of the agency, the legislator finds the removal of the remedial option attractive.

Note that part *ii*) holds qualitatively not only when remedies are not ex post optimal, but also if the range where remedies are ex post optimal is rather small. Thus, the no-remedy regime can also outperform the remedy regime also if there is a certain range of merger efficiencies where the remedial solution is optimal.

We briefly mention the case in which the objectives of the legislator and the agency are perfectly aligned, that is, $\alpha = 1$. In this case, there is no principal-agent problem and the agency acquires the first-best level of information. It then also holds that adding an option (such as making the merger conditional on a remedy) can never worsen outcomes.

Remedies with a standard of proof. We now suppose that the legislator can opt for a third regime in which the remedy option can only be implemented whenever the agency has obtained evidence on its optimality. Let us denote this third regime by R^S . In this case, a remedy cannot be applied if no information on the exact merger type has been acquired, so that it cannot be used as an intermediate option. Rather, the agency must gather information and persuasively argue that the remedial solution is indeed optimal if it wants to implement it.³⁰ While under regime NR the agency chooses β_{NR} in order to maximize Condition (2), under regime R^S it chooses β_{RS} in order to maximize

$$\beta \left(\int_{\underline{e}}^{e_1} f(e)SW^{NM}(e)de + \int_{e_1}^{e_2} f(e)SW^R(e)de + \int_{e_2}^{\bar{e}} f(e)SW^M(e)de \right) + (1 - \beta) \max\{0, \overline{SW}^M\} - \alpha C_A(\beta). \quad (8)$$

Note that the equilibrium information level according to (8) is always weakly higher under the remedy regime with a standard of proof than under a no-remedy regime, that is, $\beta_{RS}^* \geq \beta_{NR}^*$ holds, as information becomes more valuable. In fact, should the agency discover that the

³⁰In the decision *EDP v Commission* the General court “ruled that if the notifying party submits commitments, the burden of showing that the concentration as amended by the commitments should be prohibited remains on the Commission” (Lindsay and Berridge, 2012, FN 137).

remedy is the optimal option, it can implement it under regime R^S while it has to implement only a second-best option under regime NR . Consequently, the remedy regime with a standard of proof always induces both a weakly higher information level and a weakly higher social welfare level.

Corollary 1. *If the legislator prefers regime NR over regime R then it also prefers regime R^S over regime R .*

The remedy regime with a standard of proof is appealing to the legislator for the following reasons: while it allows to implement the remedy if this represents the best available option, it eliminates the effort-frustrating effect of a remedy as a relatively safe intermediate option. Therefore, this regime always outperforms a no-remedy regime. Note that this point is not obvious: R^S still has the disadvantage that it does not allow for the ex ante optimal option –the remedy– if no information is available. As we have shown, however, it can be optimal to remove the ex-ante optimal option in order to provide better incentives to the agency. If regime NR outperforms regime R , then regime R^S also outperforms R all the more.

5 Advocates

In an adversarial environment the legislator delegates the evidence production to two advocates, while the decision is made by an impartial court. One advocate takes a stance for the outsiders (AC). The advocate AC gathers information to maximize the sum of the outsider firms' profits and consumer surplus minus α times its information acquisition costs. The other agent (AF) serves as an advocate for the merging parties. The advocate AF gathers and processes information in order to maximize the joint profits of the merging firms minus α times its information costs. We first suppose that the remedial option can be implemented without a standard of proof and then turn to the case where the remedial option must be justified by sufficient evidence.

Remedies without a standard of proof. A system of advocates does not mean that institutions are actually doubled. Instead, advocates represent countervailing interests. There is a sharp difference between the outsiders' (in particular, the consumers') and the merging firms' objectives. We impose Assumption $A2^{adv}$ instead of $A2^{inq}$. The advocate of the merging firms maximizes profits (minus its own information acquisition costs), so that according to Assumption $A5$, it prefers the full merger over the remedial solution over the prohibition. In contrast, the

outsiders' advocate maximizes the sum of consumer surplus and the rival firms' profits (minus its costs), which means that a prohibition is preferred over the remedy option over the approval of the merger.

Information is concealable, but not forgeable; that is, advocates could hide, but not forge information. As information is not noisy, the two advocates cannot hold conflicting evidence. A neutral court, which follows a social welfare standard, decides on a merger proposal based on the evidence provided by the advocates. If no information is submitted then the court decides what is best on average according to Assumption A7.³¹ This setting is as similar as possible to the inquisitorial setting, with the only difference being that the information acquisition is performed not by an impartial authority, but rather by advocates with countervailing objectives.

We consider the following game: *First*, the legislator decides on a regime, either NR or R . *Second*, a merger of type e is proposed. *Third*, both advocates decide simultaneously on their information levels β_{AF} and β_{AC} , respectively. Following their information decision they (privately) observe either e or nothing. *Fourth*, each advocate decides whether to provide its gathered information to the court as evidence. *Fifth*, a court decides on each proposal in order to maximize social welfare. If it receives information on the merger type e , it will choose action X for which $SW^X(e)$ is largest. Without any such information, it implements decision X for which the average effect on social welfare, that is, $\overline{SW^X}$, is largest.

For this game, we compare the levels of information the court receives at the last stage under the two regimes. We solve the game by backward induction. At the final stage, due to Assumption A7, the remedial option will be chosen in the absence of any evidence production. If, in contrast, information is available, the court implements what is optimal for that efficiency type. At the fourth stage, each advocate decides whether or not to give its information to the court. Without loss of generality, the merging firms' advocate AF will reveal information on $e \in (\hat{e}, \bar{e}]$, but will conceal information on $[\underline{e}, \hat{e})$, whereas the reverse is true for the outsiders' agent AC . This holds as knowledge of $e \in [\underline{e}, e_1)$ induces the court to prohibit the merger, while $e \in [e_1, e_2]$ leads to the remedial outcome (if remedies are feasible; otherwise, straightforward),

³¹Usually in adversarial systems, the court represents a neutral instance without expertise concerning the litigation. Therefore, it decides according to a simple decision rule (Froeb and Kobayashi, 2001; Dewatripont and Tirole, 1999). If the court is assumed to be a Bayesian updater, the court's decision rule will not change unless information costs between the advocates are very asymmetric.

and knowledge of $e \in (e_2, \bar{e}]$ induces an approval.³² We denote $\hat{X} = R$ under regime R and $\hat{X} = \arg \max_{X \in \{NM, M\}} \{\overline{SW}^X\}$ under regime NR .

Under regime R , advocate AF maximizes

$$E[1_{(e_2, \bar{e}]}(e) \times (\beta_{AF}\Pi^M(e) + (1 - \beta_{AF})\Pi^{\hat{X}}(e)) \\ + 1_{(e_1, e_2]}(e)\Pi^R(e) + 1_{[\underline{e}, e_1]}(e) \times (1 - \beta_{AC})\Pi^{\hat{X}}(e)|\beta] - \alpha C_{AF}(\beta_{AF}),$$

while advocate AC maximizes

$$E[1_{(e_2, \bar{e}]}(e) \times (\beta_{AF}\varepsilon^M(e) + (1 - \beta_{AF})\varepsilon^{\hat{X}}(e)) + 1_{(e_1, e_2]}(e)\Pi^R(e) \\ + 1_{[\underline{e}, e_1]}(e) \times (1 - \beta_{AC})\varepsilon^{\hat{X}}(e)|\beta] - \alpha C_{AC}(\beta_{AC}),$$

where $1_{(x, y]}(e)$ is the indicator variable which is 1 if $e \in (x, y]$ and zero otherwise.³³ The objective function, say of AF , can be interpreted as follows. The term in rectangular brackets reflects the expected change of the merging firms' profits for some merger proposal which has the following terms: First, suppose the efficiency type is high ($e \in (e_2, \bar{e}]$), so that the merger is optimal. If information is obtained (which happens with probability β_{AF}), then the merger will be implemented, so that $\Pi^M(e)$ is realized. If no information is obtained (which happens with probability $(1 - \beta_{AF})$), then the solution \hat{X} will be implemented with $\Pi^{\hat{X}}(e)$ following. Second, suppose a moderate efficiency level with $e \in (e_1, e_2]$. If the remedy is optimal, then $\Pi^R(e)$ is realized independently of information acquisition. Third, suppose a low efficiency level with $e \in [\underline{e}, e_1]$. In this case, the decision only depends on the information of the other advocate. If there is information about the true efficiency type, then with probability β_{AC} the merger will

³²This holds due to the following reasoning. Suppose regime NR applies. If AF holds the information that the merger is of type $e \in [\underline{e}, \hat{e})$, it would pass on this information only if the merger would anyway be denied in the absence of information. In that case, passing on information is redundant. Suppose regime R applies. Without information, the remedy is implemented, which is preferred over a denial. Therefore, AF will not forward any information on $e \in [\underline{e}, e_1)$ and passing on information on $[e_1, \hat{e})$ is redundant. Thus, without loss of generality, we may assume that AF forwards information on e under regime R if and only if $e \in (\hat{e}, \bar{e}]$. A similar logic applies to AC .

³³If a proposed merger is efficient then it will be approved with probability β_{AF} as AF will pass all information to the court such that the merger is implemented, independent of the other advocate's action. If a proposed merger is inefficient, then AF will never report to the court and the probability of a merger being denied depends on AC 's information level β_{AC} .

be blocked so that the profit change is zero, while with no information (which happens with probability $(1 - \beta_{AC})$), the ex ante optimal decision is made which leads to $\Pi^{\hat{X}}(e)$. Finally, the information costs time α are subtracted. The objective of agent AC can be interpreted in the same way.

Under regime NR , advocate AF maximizes

$$E[1_{(\hat{e}, \bar{e}]}(e) \times (\beta_{AF}\Pi^M(e) + (1 - \beta_{AF})\Pi^{\hat{X}}(e)) \\ + 1_{[\underline{e}, \hat{e}]}(e) \times (1 - \beta_{AC})\Pi^{\hat{X}}(e)|\beta] - \alpha C_{AF}(\beta_{AF}),$$

while advocate AC maximizes

$$E[1_{(\hat{e}, \bar{e}]}(e) \times (\beta_{AF}\varepsilon^M(e) + (1 - \beta_{AF})\varepsilon^{\hat{X}}(e)) \\ + 1_{[\underline{e}, \hat{e}]}(e) \times (1 - \beta_{AC})\varepsilon^{\hat{X}}(e)|\beta] - \alpha C_{AC}(\beta_{AC}).$$

Suppose case II , that is, $e_1 = e_2 = \hat{e}$. At stage three, advocate AF chooses β_{AF} to maximize

$$E\left(1_{(\hat{e}, \bar{e}]}(e) \times (\beta_{AF}\Pi^M(e) + (1 - \beta_{AF})\Pi^{\hat{X}}(e)) + 1_{[\underline{e}, \hat{e}]}(e) \times (1 - \beta_{AC})\Pi^{\hat{X}}(e)|\beta\right) \\ - \alpha C_{AF}(\beta_{AF}).$$

The outsiders' advocate AC chooses β_{AC} to maximize

$$E\left(1_{(\hat{e}, \bar{e}]}(e) \times (\beta_{AF}\varepsilon^M(e) + (1 - \beta_{AF})\varepsilon^{\hat{X}}(e)) + 1_{[\underline{e}, \hat{e}]}(e) \times (1 - \beta_{AC})\varepsilon^{\hat{X}}(e)\right) \\ - \alpha C_{AC}(\beta_{AC}).$$

Under regime R , this yields the first-order conditions

$$\int_{\hat{e}}^{\bar{e}} f(e) (\Pi^M(e) - \Pi^R(e)) de = \alpha C'_{AF}(\beta_{AF}) \text{ and } - \int_{\underline{e}}^{\hat{e}} f(e) \varepsilon^R(e) de = \alpha C'_{AC}(\beta_{AC})$$

and under NR it yields

$$\int_{\hat{e}}^{\bar{e}} f(e) (\Pi^M(e) - \Pi^{\hat{X}}(e)) de = \alpha C'_{AF}(\beta_{AF}) \text{ and } - \int_{\underline{e}}^{\hat{e}} f(e) \varepsilon^{\hat{X}}(e) de = \alpha C'_{AC}(\beta_{AC})$$

Given NR , only one advocate will exert effort as the left-hand side of the preceding first-order conditions is zero for one of the advocates. Under R both will exert effort as the left-hand side of the first-order condition is strictly positive for both agents. Thus, one of the advocates exerts more effort under R than under NR . The other advocate, however, exerts less effort under R

as its first-order condition's left-hand side is smaller in absolute value under R than under NR . Intuitively, under NR the court's prior exactly meets the objective of one of the advocates such that only one advocate is incentivized to provide information. Under R , however, both advocates are not satisfied with the remedy-prior such that both exert effort, one of which, however, to a lesser extent.

The level of information the court receives by the advocates in equilibrium can be measured by

$$\mathcal{I} := (1 - F(\hat{e}))\beta_{AF} + F(\hat{e})\beta_{AC}, \quad (9)$$

where $F(x) = \int_{\underline{e}}^x f(e)de$. If $0 = \overline{SW}^{NM} > \overline{SW}^M$, the level of information is higher under NR if and only if $(1 - F(\hat{e})) \times (\beta_{AF}^{NR} - \beta_{AF}^R) > F(\hat{e}) \times \beta_{AC}^R$.³⁴ If $\overline{SW}^M > \overline{SW}^{NM} = 0$, then it is higher under NR if and only if $F(\hat{e}) \times (\beta_{AC}^{NR} - \beta_{AC}^R) > (1 - F(\hat{e})) \times \beta_{AF}^R$. Thus, unlike in the inquisitorial system, in case II information acquisition is not necessarily weakened through the introduction of the remedial option.

Proposition 2. *In case I (remedies are always optimal) remedies induce the first-best solution in which no advocate exerts effort and the optimal solution is implemented. Obviously, regime R is strictly preferred over regime NR in this case. In case II, the information produced and revealed depends on whether remedies are feasible or not:*

- *Suppose $SW^M > 0$, so that both parties produce evidence if remedies are feasible, while only AC does so if remedies are not feasible. Then, information provision I is lower if remedies are feasible if and only if $F(\hat{e}) \times (\beta_{AC}^{NR} - \beta_{AC}^R) > (1 - F(\hat{e})) \times \beta_{AF}^R$.*
- *Suppose $0 > SW^M$, so that both parties produce evidence if remedies are feasible, while only AF does so if remedies are not feasible. Then, information provision I is lower if remedies are feasible if and only if $(1 - F(\hat{e})) \times (\beta_{AF}^{NR} - \beta_{AF}^R) > F(\hat{e}) \times \beta_{AC}^R$.*

Independent of the prior in the NR regime, only one advocate will acquire information if remedies are not feasible as one advocate's objective is met by the prior of the court. Under R ,

³⁴Furthermore, information is more balanced under regime R . On the contrary, if the court only receives information from one advocate, its decision might be biased on average. However, we will not extend this analysis here, so we stick to the court's decision rule at the fifth stage. If we assume that the court has rational beliefs concerning the distortedness of the information it gets, a Nash equilibrium of the advocates and the court in pure strategies does not exist.

both advocates exert effort as neither of them are satisfied with the court’s prior (the remedial solution): one advocate will exert more and one will exert less effort than under regime NR . Under which regime more effort is produced depends largely on the shape of the cost function.

Corollary 2. *Comparing evidence production under the inquisitorial and the adversarial system gives:*

1. *Case I: Information acquisition plays no role and both regimes perform equally.*
2. *Case II: Allowing for a remedial option reduces evidence production in an inquisitorial system. In an adversarial regime evidence production can be either lower or higher when a remedial option is introduced.*

In fact, this result is quite general and implied by the logic of adversarial conflict resolution in court. Intermediate options tend to frustrate the incentives of a non-partisan authority which aggregates different objectives and may implement compromising options excessively in order to reduce effort costs. In an adversarial system, in which the advocates have rather “extreme” objectives, in contrast, both advocates are not satisfied with the implementation of an intermediate solution, such that both will exert effort if the default choice is the compromising option. Therefore, the introduction of compromising options can be expected to lessen effort incentives in inquisitorial, but not in adversarial systems.

Remedies with a standard of proof. As before, we consider a third regime R^S according to which a remedy can only be implemented if hard evidence has been gathered that it represents a better alternative to prohibiting or approving the proposed merger. In the adversarial system, however, Corollary 1 does not hold. To see this, assume first that without information the proposal is blocked. Then, AC will never exert effort, while AF maximizes

$$E \left(1_{(e_2, \bar{e}]}(e) \times \beta_{AF} \Pi^M(e) + 1_{[e_1, e_2]}(e) \times \beta_{AF} \Pi^R(e) \middle| \beta \right) - \alpha C_{AF}(\beta_{AF}).$$

Note that the second term in AF ’s objective function is $1_{[e_1, e_2]}(e) \times \beta_{AF} \Pi^R(e)$, while it is $1_{[\bar{e}, e_2]}(e) \times \beta_{AF} \Pi^M(e)$ under regime NR . Therefore, it is ambiguous under which system AF gathers more information. Second, if in the absence of information a merger proposal is approved,

a similar reasoning applies according to which it is ambiguous whether AC gathers more or less information than under regime NR . To conclude, in the adversarial system a standard of proof for the remedies does not have to outperform the no-remedy regime, that is, Corollary 1 does not hold.

6 Discussion and Example

As we have seen in the previous analysis, the remedial option does not distort evidence production unambiguously downward in an adversarial system as compared to an inquisitorial system. With that, we qualify the finding by Szalay (2005) in case there is not a single unbiased agent but rather several agents with countervailing interests, each of which represents different components of the principal's objective function. Our result is in the spirit of Dewatripont and Tirole (1999), even though the underlying mechanism is entirely different. Dewatripont and Tirole argue that an inquisitorial regime has less information acquisition incentives due to the agency's aversion to producing two countervailing pieces of evidence. Accordingly, an inquisitorial agency would stop its information acquisition too early. In our setup, the inquisitorial regime has less incentive to acquire information due to the fact that the inquisitorial agency considers the remedial option to be the *ex ante* optimal decision, which does not apply to agents in an adversarial setting. Overall, we can interpret intermediate options as more valuable in an adversarial than in an inquisitorial system.

In the special case in which $\alpha = 1$, the principal and the agency's objectives are perfectly aligned and the inquisitorial regime gives the first-best outcome, independent of the optimality of extreme options or of remedies. As the legislator cannot induce truth-telling by the agents in the adversarial setup, in this case the inquisitorial setup is superior from a social welfare perspective (at least as long as the advocates cannot acquire information much more cheaply than the agency).

We finally present an example to show that our assumptions are compatible with a standard imperfect competition setting. For instance, consider a symmetric Cournot market with two firms, each of which holds two production plants. Firm i produces quantity q_i at costs $C_i(q_i) = e^i \times q_i^2 / K_i$, where K_i denotes the firm's capital stock and e^i denotes firm i 's productive efficiency. Initially, both firms have $K_i = 2$ and $e^i = 1$. The inverse demand function is given by $p = 1 - Q$

with $Q = q_1 + q_2$. The two firms may merge to become a monopolist holding four production plants, whereby synergy e may be realized. We assume that the distribution of efficiencies is discrete, that is, two types of mergers are feasible with either a high efficiency level ($e_{M,h} = 0.5$) or a low efficiency level ($e_{M,l} = 0.7$). If the merger is subject to a remedy, then the merged entity sells one production plant to an entrant firm. However, the remedial obligation lowers realized efficiencies, such that $e_{R,h} = 0.8$ holds for the high efficiency type and $e_{R,l} = 0.9$ for the low efficiency type. The remedy is sold by the merged entity to an entrant via a take-it or leave-it offer, so it could extract the entrant firm's entire profits. Then, AC represents the consumers as a merger affects consumer surplus but not the profits of any rival firm. Each merger type is equally likely and occurs with probability $1/2$.

In this setting, in the absence of precise information on a merger's type, the implementation of a merger with the remedy is the social planner's optimal decision. For consumers and firms, the remedial option is neither the optimal nor the worst decision, but the intermediate one. Consumers strictly prefer the merger to be blocked over the remedial option, which is preferred over an approval. The firm's preference ordering is reversed for both merger types (see Table 1).

	CS	W	Π	$E(W)$
no merger	.1250	.3125	.1875	.3125
M , high	.0988	.3210	.2222	.3121
M , low	.0905	.3033	.2128	.3121
R , high	.1232	.3162	.1930	.3132
R , low	.1197	.3101	.1904	.3132

Table 1: *Values of consumer surplus [CS], social welfare [W], and firms' profits [Π] for both merger-synergies [high/low] and both merger implementations [full/with remedy]. In the last column, the expected social welfare, if the merger-synergy is unknown, is stated.*

Our model of information acquisition can be applied to various other market settings, that differ with respect to horizontal and vertical mergers and with respect to structural and behavioral remedies; see, for example, our former working paper Dertwinkel-Kalt and Wey (2014). There, we consider the case of a structural remedy in case of a horizontal merger as structural remedies are used to restore effective competition when the merging parties have considerable

market power (Heyer, 2012; Motta et al., 2003). In addition, we analyze a vertical merger scenario in which a behavioral remedy can be applied to prevent foreclosure.³⁵ Finally, we have provided a full example in which it is optimal for the legislator to remove the remedial option from the agency’s choice set as it severely lowers the incentives to acquire information.

7 Comparison of the Institutional Systems

So far, we have only analyzed the effects of remedies on outcomes within a given institutional system. In this subsection we investigate the complementary question of which institutional system is desirable from an overall social welfare perspective if remedies are feasible.

With regard to case *I* (remedy is always ex post optimal) both the adversarial and the inquisitorial systems yield the same outcomes as no agent engages in evidence production. No advocate can convince the court to deviate from its prior, no matter what piece of information is acquired, such that mergers are implemented anyway and information acquisition is wasteful.

Now suppose that extreme options are always optimal (case *II*). First of all, the adversarial system exhibits an inherent inefficiency as both advocates will not reveal the full set of information they have. Truth-telling cannot be induced as each advocate will always only reveal the information which serves its objective. In particular, *AC* provides information on low-efficient types $e \in [e, \hat{e}]$ while *AF* provides information on high-efficient types $e \in (\hat{e}, \bar{e}]$. As remedies are only ex ante, but not ex post optimal, the frequency of remedies stands in a one-to-one relationship to the amount of revealed information.

Which institutional system produces more information on the highly efficient types depends on the following trade-off. On the one hand, information on a highly efficient merger, that is, $e \in (\hat{e}, \bar{e}]$, is more valuable to the merging firms’ advocate than to the (inquisitorial) agency as this information gives surplus $\Pi^M(e) - \Pi^R(e)$ to *AF*, but only surplus $SW^M(e) - SW^R(e) =$

³⁵Foreclosure may protect the merged firm’s incentive to provide a public good, which is otherwise challenged by the free-riding incentives of a rival downstream firm. A vertical restraint may help to overcome the underprovision of a public good-like service (Telser, 1960). An example for this is informative advertising which has a public good property by expanding market demand for all downstream firms (“retailers”). In such an environment, an effective way to increase the provision of the public good is a vertical merger combined with the foreclosure of downstream competitors. Consequently, a behavioral remedy in the form of an obligation to deliver at reasonable terms can eliminate the vertical merger’s positive effects on the provision of the public good.

$\Pi^M(e) - \Pi^R(e) - (\varepsilon^R(e) - \varepsilon^M(e)) < \Pi^M(e) - \Pi^R(e)$ to the agency AC . That means that AF has a higher incentive to search for the information that a proposed merger is efficient as, unlike the agency, it does not internalize the merger's negative externalities. On the other hand, AF 's incentive to acquire information is reduced by the fact that the acquired piece of information may be the “wrong” kind of information; namely, information $e \in [\underline{e}, \hat{e}]$ is useless to it as AF will not reveal information on a low-efficient merger type. In contrast, all information is valuable to the agency.

Analogously, it is ambiguous in which institutional system more information on the low-efficient merger types is revealed. On the one hand, information on a low-efficient merger, that is, $e \in [\underline{e}, \hat{e}]$, is more valuable to AC than to the agency as $\varepsilon^{NM}(e) - \varepsilon^R(e) > \varepsilon^{NM}(e) - \varepsilon^R(e) - (\Pi^R(e) - \Pi^{NM}(e)) = SW^M(e) - SW^R(e)$. On the other hand, AC will not use information on $e \in (\hat{e}, \bar{e}]$, which reduces its incentive to acquire information in the first place.

Thus, we cannot decide in general in which institutional framework more information is revealed or more remedies are applied. *Ceteris paribus*, the more the parties' objectives differ, that is, the larger the differences $\Pi^M(e) - \Pi^R(e) - (SW^M(e) - SW^R(e))$, for $e \in (\hat{e}, \bar{e}]$ and $\varepsilon^{NM}(e) - \varepsilon^R(e) - (SW^{NM}(e) - SW^R(e))$, for $e \in [\underline{e}, \hat{e}]$, the larger the advocates' incentives to acquire information and the more likely it is that the adversarial system provides more information than the inquisitorial one. In particular, suppose two scenarios (we index outcomes with a prime in the second scenario) such that $\Pi'^M(e) = \Pi^M(e) + \gamma(e)$ and $\varepsilon'^M(e) = \varepsilon^M(e) - \gamma(e)$, for a function $\gamma(e) > 0$, while the scenarios are identical in all other regards (in particular, $SW'(e) = SW(e)$ holds for all e). We can interpret the function $\gamma(e)$ as measuring the conflict of interest between both advocates. Then, in an inquisitorial system the level of revealed information is the same in the two scenarios. However, in an adversarial system more information is acquired in the second scenario. Thus, the larger the conflict of interest between the advocates' objectives the more likely it is that the adversarial regime will dominate the inquisitorial one. In this regard it is interesting to note that a full prohibition of a merger in the EU in the second stage of investigation has become very rare, while blocked second-phase mergers happen more regularly in the US. One can speculate whether this may be due to larger incentives for evidence production in the US in those merger cases where the conflict of interest between the agency and the merging firms is large.

Finally, suppose that the same amount of information is revealed in both institutional sys-

tems, that is, $\beta_A = \beta_{AF} = \beta_{AC}$. Then, typically, the inquisitorial system is superior as it excludes the inefficiency which comes from the lack of truth-telling in the adversarial system. Only if the advocates can acquire information much more cheaply than the agency (for instance, because they are specialized in finding evidence of the specific kind of information they are looking for), the adversarial system could be superior for $\beta_A = \beta_{AF} = \beta_{AC}$.

8 Conclusion

The general view toward remedies is a positive one, particularly among bureaucrats of competition authorities themselves. The European legislation, for instance, describes remedies as an effective way to restore competition (EC, 2008, Article 22). Accordingly, remedies have become an integral part of merger control in the EU, while they have a much longer history in the US. At the same time, several studies have such taken a critical stance on remedies that used remedies often fail to restore effective competition. For instance, Kwoka (2015) shows in his meta analysis on US mergers that a very large fraction of carefully studied mergers reveals that those mergers resulted in higher prices even when a remedy was imposed. Similarly, Davies and Lyons (2007) find that remedies often do not restore effective competition in the EU and they conclude that more thorough investigations are needed in the case of problematic mergers which require an in-depth analysis.

In our model we focused on the need to obtain case-based evidence which is critical for making correct decisions. We incorporated key features of competition policy into our basic set-up. While agents' objectives may be very well aligned with the objectives of the principal, we assumed a delegation problem associated with the investigation efforts agents are willing to exert. We have analyzed two enforcement systems (inquisitorial and adversarial) which mirror key differences of the delegation of evidence production in the EU and the US competition policy systems, respectively.

With regard to EU merger control, our main result is that remedies reduce information acquisition under an inquisitorial enforcement system when compared with a regime that does not allow for such a compromising choice. Concerning a US-type adversarial system our results are ambiguous in general, so that the feasibility of a remedy option can increase or decrease evidence production.

Our results are in line with Bergman et al. (2010) who performed a careful case analysis of EU and US merger decisions which were subject to an in-depth investigation. They concluded that the EU is more prone to accepting “weak remedies” which are considered to be “compromises” between merging firms and the authority; those weak remedies do not resolve the competitive concerns and fail to restore effective competition. This observation mirrors our result that an inquisitorial system tends to clear too many mergers with remedies which are insufficient to fully counter the anti-competitive concerns. At the same time, their study also reports that remedial solutions tend to be relatively more effective in the US: “the US appears more likely to insist on stronger remedies than the EU for investigations that raise competitive concerns” (Bergman et al., 2010, p. 2). Overall, those observations about remedies in practice are compatible with our main results; in particular, that remedies reduce incentives for evidence production (and thus lead to an excessive use of remedies) in the inquisitorial system but not necessarily in the adversarial system.

We have shown that merger control should unambiguously improve even beyond the “no-remedy” regime in the inquisitorial system when a remedy solution is based on hard evidence which proves its optimality. Considering a standard of proof mirrors the evolution in the EU toward a stricter remedy regime. While these regulatory changes are reassuring (they mirror that remedies have been used too often without standard of proof) there are no empirical studies which analyze how remedy practice has improved since then. Yet, Bergman et al. (2010) have already observed some improvement in the used remedies in the EU after the so-called Monti reforms in 2002. Future research and/or studies by competition authorities (which may update works like Bergman et al., 2010, Duso, Gugler, and Yurtoglu, 2011, Duso, Gugler, and Szücs, 2013, and Kwoka, 2015) may inform us whether or not those reforms have made remedial solutions more effective.

With regard to the direct comparison of the adversarial and inquisitorial systems we have shown that the adversarial system creates larger information acquisition incentives when the parties’ conflict of interest becomes more pronounced. Which means, in those cases more evidence is produced in the adversarial system. Compatible with this finding we indeed observe less extreme choices (in the form of prohibitions) in the EU than in the US which may reflect less evidence production in the EU.

Of course, there may be other determinants besides the evidence production we have focused

on. For instance, there are still substantive differences in the competitive assessment (SIEC and dominance tests in the EU vs. SLC test in the US) and there are procedural differences (for instance, concerning notification requirements and the use of remedies in the initial investigation stage) as well as differences in the objectives, experiences, and resources of the authorities.

Even though all of that is possibly critical, our analysis that points at the underlying evidence production problem presents a parsimonious and instructive approach for understanding current deficiencies in merger control decisions which may also be helpful for designing better institutional environments. In some jurisdictions inquisitorial enforcement systems explicitly incorporated adversarial elements into their decision making procedures, which can be interpreted as devices that counter inquisitorial bias in merger investigations and reinforce evidence production. For instance, the EU Commission institutionalized “devils advocates” and parallel investigation by the Chief Economist team in certain critical cases (see Kovacic, Mavroidis, and Neven, 2014). Another example is functional separation between investigation and decision making by means of a specialized tribunal as within the French competition authority (see Ottow, 2015).

Finally, another important question concerns the endogeneity of projects chosen for in-depth investigation and the associated problem of endogenous (opportunity) costs of effort within the authority. Considering the interplay between project choices and informational effort from a delegation perspective is an interesting venue for further research.

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