

## How to measure the deterrence effects of merger policy: frequency or composition?

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### **How to Measure the Deterrence Effects of Merger Policy: Frequency or Composition?**

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## ABSTRACT

### **How to Measure the Deterrence Effects of Merger Policy: Frequency or Composition?\***

by Pedro P. Barros, Joseph A. Clougherty, Jo Seldeslachts

We show that the number of merger proposals (frequency-based deterrence) is a more appropriate indicator of underlying changes in merger policy than the relative anti-competitiveness of merger proposals (composition-based deterrence). This has strong implications for the empirical analysis of the deterrence effects of merger policy enforcement, and potential implications regarding how to reduce anti-competitive merger proposals.

*Keywords: antitrust, deterrence, merger polic*

*JEL Classification: L40, L49, K21*

## ZUSAMMENFASSUNG

### **How to Measure the Deterrence Effects of Merger Policy: Frequency or Composition?**

Diese Studie vergleicht zwei Indikatoren zur Messung der Abschreckungswirkung von wettbewerbspolitischen Maßnahmen. Untersucht wird, welcher Indikator sich besser eignet, Veränderungen in der Strenge oder Laxheit von wettbewerbspolitischen Regimes abzubilden. Es lässt sich feststellen, dass der häufigkeitsbasierte Indikator, der die Anzahl von offiziellen Fusionsankündigungen misst, dazu besser geeignet ist als der zusammengesetzte Abschreckungsindikator, der die angekündigten Unternehmensfusionen im Hinblick auf ihre relative Wettbewerbsbeschränkung im Vergleich zu möglichen anderen Fusionen bewertet. Dieses Ergebnis hat Folgen für die empirische Analyse der Abschreckungseffekte, die eine effektive Fusionskontrolle haben sollte. Außerdem kann es Implikationen haben für die Frage, wie die offizielle Ankündigung von wettbewerbsreduzierenden Fusionen verhindert werden können

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## 1. Introduction

*“We firmly believe that deterrence is perhaps the single most important ultimate outcome of the Division’s work [but] we have not attempted to value ... the deterrence effects of our successful enforcement efforts”* (U.S. Department of Justice Antitrust Division, Congressional Submission for Fiscal Year 2001).<sup>1</sup>

Deterrence effects are essential for effective antitrust policy as authorities cannot vet all market behaviors for anti-competitive implications. Instead, antitrust authorities rely on firms internalizing certain rules and norms so that many anti-competitive actions are not taken in the first place (Joskow, 2002). While the deterrence effects of anti-cartel policy have received a good bit of scholarly attention (e.g., Feinberg, 1980; Block et al., 1981; Block and Feinstein, 1986; Clarke and Evenett, 2003), the deterrence effects of merger policy have received less study. Morgan (2001: 459) observes that “Although the deterrent effects of merger control cannot easily be quantified, it is usually argued that they may be more important than the direct effects”. Accordingly, many economists (e.g., Nelson and Sun, 2001; Davies and Majumdar, 2002; Joskow, 2002; Crandall and Winston, 2003; Baker, 2003) have essentially been calling for more empirical work on merger policy deterrence effects. In this vein, Aaronson (1992) points out that merger policy deterrence manifests in two different forms: frequency-based and composition-based deterrence. Composition-based deterrence involves merger proposals being shaped differently in order to avoid antitrust scrutiny (e.g., Stigler, 1966; Eckbo and Wier, 1985; Eckbo, 1992). Frequency-based deterrence involves merger plans being forsaken in order to avoid antitrust scrutiny (e.g., Seldeslachts et al., 2009).

The prevailing assumption throughout the small literature on merger policy deterrence effects is that frequency-based and composition-based deterrence go hand-and-hand; i.e., if one is present then the other also manifests. For instance, a survey-based study by the Dutch antitrust authority (NMa, 2005) found the existence of Dutch merger policy to lead to 7.5 fewer (frequency effects) and 15 altered (composition effects) merger proposals per year. Behind the hand-and-hand conjecture is the assumption that once certain types of anti-competitive mergers elicit antitrust scrutiny, then not all merging firms will be able to locate a suitable alternative merger. In other words, some firms will react to the foreclosure of certain merger activities by proposing different types of mergers, but others will simply react by ceasing merger activity altogether. Seldeslachts et al. (2009) cite these same rationales as suggesting that their cross-jurisdictional study on frequency-based deterrence can also be interpreted as indicating composition-based deterrence.

It is the prevailing notion that frequency-based and composition-based deterrence go hand-in-hand that we would like to question here. We show that merger policy changes may manifest in divergent deterrence effects: with composition effects going in one direction and frequency effects going in another direction. For instance, reducing antitrust scrutiny can lead to a higher frequency of merger proposals but also to relatively fewer anti-competitive proposals. Moreover, we find the number of merger notifications (frequency effects) to be a reliable measure of deterrence, while the relative anti-competitiveness of merger proposals (composition effects) to be an unreliable measure.

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<sup>1</sup> See Nelson and Sun (2001) pages 939-940 for this exact quote and for additional claims by the FTC and DOJ regarding the pivotal importance of deterrence for effective merger policy.

In short, our model generates ambiguous predictions with regard to the composition of future merger proposals; but, clear predictions with regard to future merger notifications.

If merger notifications are a more appropriate indicator of underlying merger policy changes, then this has strong implications for the empirical analysis of deterrence effects. As Nelson and Sun (2001: 941) observe, a great need exists for empirical studies “that would allow one to estimate the deterrent effects of the agencies’ merger enforcement activities”. Accordingly, empiricists responding to the call – from Nelson and Sun, 2001; Davies and Majumdar, 2002; Joskow, 2002; Crandall and Winston, 2003; Baker, 2003 and others – to better estimate the deterrence role of merger policy enforcement should employ frequency-based measures as opposed to composition-based measures. In short, frequency-based effects are a more reliable indicator of underlining changes in the tenor of merger policy.

The paper proceeds as follows in order to formally show the above claim. Section 2 sets up and presents the basic model. Section 3 reports the main result by using the substitution of remedies for prohibitions as a relevant policy change. Section 4 concludes with some remarks and implications.

## 2. The model

We consider a setting where firms decide on two issues: first, whether to propose a potential merger; second, what characteristics should proposed mergers entail. To model the second decision in a simple fashion, we adopt a procedure similar to Barros (2003) and Lyons and Medvedev (2007) by including all relevant merger characteristics in a single index  $\eta$ . We use the convention that a higher  $\eta$  means a higher degree of restrictiveness: e.g., a low  $\eta$  can stand for a merger with asset divestitures to minimize market power concerns, while a high  $\eta$  can stand for a merger-to-monopoly. Accordingly, we define restrictiveness broadly: decisions over merger targets, geographic markets, contracts with suppliers and so on – are all subsumed in  $\eta$ . Naturally, anti-competitive effects positively depend on the proposed merger’s restrictiveness. For instance, a firm may acquire a direct competitor instead of a less-related target, thus increasing restrictiveness and thereby anti-competitive effects.

Firms notifying a merger also face a decision by the antitrust authority – a decision that will fall into one of three possibilities: prohibition, remedy, or clearance. Moreover, firms obtain different profit streams according to whether the merger is approved as notified (clearance), approved subject to conditions (remedy), or rejected (prohibition). We denote merging firms’ profits under a clearance by  $\Pi^C(\eta)$ , under a remedy by  $\Pi^R(\eta)$ , and profits under a prohibition are normalized to zero. We further assume  $\Pi^C(\eta) > \Pi^R(\eta)$ . Naturally, firms have a profit incentive to propose mergers with higher restrictiveness levels; accordingly, it is intuitive that

$$\frac{\partial \Pi^C}{\partial \eta}(\eta) > 0, \frac{\partial \Pi^R}{\partial \eta}(\eta) > 0. \quad (1)$$

Additionally, firm gains occur at a decreasing rate:

$$\frac{\partial^2 \Pi^C}{\partial \eta^2}(\eta) < 0, \frac{\partial^2 \Pi^R}{\partial \eta^2}(\eta) < 0. \quad (2)$$

The antitrust authority must provide a market impact assessment for each merger; hence, some uncertainty exists for firms with respect to the ultimate antitrust decision. Davies and Majumdar (2002) observe that firms are unsure as to whether a proposed merger will be deemed too anti-competitive, since merger policy – unlike anti-cartel policy – exhibits uncertainty with respect to where the competitive/anti-competitive boundary lines are drawn. In short, merger policy exhibits too much complexity to generate ‘per se’ rules. To model this uncertainty, consider the antitrust decision as resulting from a comparison of the restrictiveness level implicit in the merger notification with the maximum restrictiveness level (denoted by  $\hat{\eta}$ ) the authority is willing to accept. Therefore, the antitrust authority’s judgment with respect to admissible restrictiveness levels is ex-ante unclear when firms decide on merger proposals. Firms’ uncertainty regarding  $\hat{\eta}$  is described by a probability distribution  $F(\hat{\eta} \leq \eta) = F(\eta)$  – denoting the probability that the antitrust authority’s critical threshold is smaller than the firm’s chosen  $\eta$ .<sup>2</sup>

Akin to D’Antoni and Galbiati (2007), the antitrust authority is better informed than the merging parties about the potential negative welfare implications of the merger. Accordingly, whenever  $\eta$  is below  $\hat{\eta}$ , the merger is cleared by the antitrust authority: an event occurring with probability  $1 - F(\eta)$ . Furthermore, when  $\eta$  is above  $\hat{\eta}$ , two situations may occur: the merger elicits a prohibition or a remedy from the antitrust authority. The remedy option is taken when the proposed restrictiveness level is not particularly high: when  $\eta$  is above  $\hat{\eta}$  but below  $\hat{\eta} + \alpha$ . The parameter  $\alpha$  – the remedy solution range – denotes the extra level of restrictiveness the authority is willing to accept as long as remedies are imposed. The prohibition option is taken when  $\eta$  is above  $\hat{\eta} + \alpha$ . Hence,  $\alpha$  also denotes the authority’s permissiveness in the sense that a larger  $\alpha$  eliminates the prohibition option.

Assuming a cost  $K$  of setting a merger proposal, we can define the problem of choosing the restrictiveness level as:

$$\max_{\eta} V = \Pi^R(\eta) \times (F(\eta) - F(\eta - \alpha)) + \Pi^C(\eta)(1 - F(\eta)) - K. \quad (3)$$

Accordingly, the decision to propose a merger – the first decision noted above – is characterized by proposing a merger with restrictiveness  $\eta$  if  $V(\eta) > 0$ ,

$\eta \in \arg \max_{\eta'} V(\eta')$ ; but otherwise firms do not propose a merger. Furthermore, the

optimal level of merger restrictiveness is given by the solution to

$$\begin{aligned} \frac{\partial V}{\partial \eta} = 0 &\Leftrightarrow f(\eta)(\Pi^C(\eta) - \Pi^R(\eta)) + f(\eta - \alpha)\Pi^R(\eta) = \\ &= \frac{\partial \Pi^R}{\partial \eta} [F(\eta) - F(\eta - \alpha)] + \frac{\partial \Pi^C}{\partial \eta} [1 - F(\eta)] \end{aligned} \quad (4)$$

The left-hand side of equation 4 shows the marginal cost (profit losses due to an intervention becoming more likely by the antitrust authority) while the right-hand side shows the marginal benefit (increase in expected profits) of increasing  $\eta$ .

<sup>2</sup> In terms of the model, the  $F(\cdot)$  function entering merging firms’ objective function is the result of a Bayesian updating process based on observing merger policy enforcement as well as (imperfect) knowledge regarding the  $\eta$  of proposed mergers. Indeed, Sah (1991) shows that if firms are Bayesian updaters, then a change in policy indicates a change in deterrence.

### 3. Deterrence effects

We can now address the impact of policy changes on deterrence by considering the substitution of remedies for prohibitions – a policy change which amounts to an increased  $\alpha$  in our framework.<sup>3</sup> The influential U.S. Federal Trade Commission (1999) study – which found divestitures to generally create viable competitors – legitimized the use of remedies and led to the FTC issuing guidelines for remedies in 1999, the EC following suit by issuing guidelines in 2001, and the U.S. Department of Justice (DOJ) in 2004 (Duso, Gugler and Yurtoglu, 2007). Accordingly, this policy shift led to remedies being increasingly employed in the cross-national context for merger policy. For instance, the European Commission has generally refrained from blocking mergers (Morgan and McGuire, 2004), and has instead increasingly relied on remedies to deal with anti-competitive mergers (Morgan, 2001, 2002). See figure 1 where the average ratio of remedies to prohibitions for the US, UK, Germany, EU and Canada indicates some two remedies for every prohibition in 1994, and a rising to around five remedies for every prohibition from 1999 to 2004. Accordingly, the trend toward remedies being applied where prohibitions were once applied has been manifest over the last fifteen years. Such a policy evolution likely induces a change in antitrust scrutiny levels since the penalty involved with remedies (elimination of some merger profits) is less than the penalty involved with prohibitions (elimination of all merger profits). Becker's (1968) seminal contribution to the literature suggests then that the deterrence role of competition policy would erode due to remedies involving smaller penalties than prohibitions: with firms naturally attempting to pass more restrictive mergers through the antitrust review process.

\*\*\* Insert Figure 1 around here \*\*\*

We now consider the impact of the policy change on the two magnitudes of interest: frequency and composition of notified mergers. First, a straightforward comparative statics exercise establishes that

$$\text{sign} \frac{d\eta}{d\alpha} = \text{sign} \frac{\partial^2 \mathcal{V}}{\partial \eta \partial \alpha}, \quad (5)$$

and it turns out that

$$\frac{\partial^2 \mathcal{V}}{\partial \eta \partial \alpha} = \Pi^R(\eta) \frac{\partial^2 f(\eta - \alpha)}{\partial \alpha \partial (\eta - \alpha)} + f(\eta - \alpha) \frac{\partial \Pi^R}{\partial \eta}. \quad (6)$$

The first term on the right-hand-side,  $\partial^2 f(\eta - \alpha) / \partial \alpha \partial (\eta - \alpha)$ , can be either positive or negative as it depends on the shape of  $f(\cdot)$  in the range of  $\eta - \alpha$ . With the second term

being positive  $\frac{\partial \Pi^R}{\partial \eta}(\eta) > 0$ , the indeterminate first term results in an ambiguous total

effect. The first term is actually zero for the uniform distribution; thus, moving toward a

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<sup>3</sup> For brevity, we will not investigate other policy changes (e.g., substituting clearances for remedies or prohibitions for clearances), yet such changes could be addressed in a similar framework to exhibit merger notifications being a more reliable deterrence indicator, as briefly shown in Seldeslachts et al. (2007). We restrict ourselves in this paper to the most relevant policy change in both the US and EU.



more lenient merger policy (substituting remedies for prohibitions) results in more restrictive mergers being proposed – the expected effect. Yet for a sufficiently negative  $\partial f(\eta - \alpha) / \partial \eta - \alpha$ , the reverse effect (i.e., fewer restrictive mergers being proposed) can result.<sup>4</sup> This happens when increased restrictiveness induces, at the margin, a significant drop in the probability of a merger eliciting a remedy and a significant increase in the probability of eliciting a prohibition. We next explain this effect in more detail.

The indeterminate sign of  $\partial f(\eta - \alpha) / \partial \eta - \alpha$  owes to the change in  $\alpha$  involving two different effects. First, by increasing  $\alpha$ , the authority applies remedies to some mergers that previously incurred prohibitions; thus, merging firms are more likely to obtain the remedies profit stream. Second, when the remedies profit stream is positively correlated with restrictiveness, the marginal benefit from a higher  $\eta$  increases. The importance of this extra higher- $\alpha$ -induced incentive to increasing  $\eta$ , however, depends on how often firms expect to be in this range; indeed, the number of cases to which this applies is likely to be smaller for a higher  $\eta$ . Thus, when the marginal impact of restrictiveness on the remedies profit stream is small but increasing  $\eta$  significantly enhances the probability of incurring a prohibition, then merging firms may prefer to reduce restrictiveness in order to increase the probability of eliciting a remedy as opposed to a prohibition.

Accordingly, our model generates ambiguous predictions with regard to the composition of future merger notifications. The equilibrium effect on composition-based deterrence is unclear, thus implying that replacing prohibitions with remedies could lead to less – not more – restrictiveness in future merger notifications.

The predictions on the number of future merger notifications – frequency-based deterrence – suggest a less ambiguous effect. By direct application of the envelope theorem:

$$\frac{\partial \mathcal{V}(\eta)}{\partial \alpha} = \Pi^R(\eta) f(\eta - \alpha) > 0. \quad (7)$$

Increasing  $\alpha$  thus leads to an increased expected value for proposing mergers. This dynamic owes to there being a lower probability of eliciting a ‘zero-payoff’ prohibition. The equilibrium effect on frequency-based deterrence is clear; thus, substituting remedies for prohibitions leads to an unambiguous increase in the number of merger notifications. Hence, the number of mergers represents a natural variable of interest when it comes to measuring deterrence effects.

#### 4. Concluding remarks

We show that the empirical assessment of merger policy enforcement should be conducted by looking at the number – not the composition – of merger notifications. The frequency of mergers captures in a clean way how firms react to competition policy changes, and thus helps trace back the underlying policy change. The message that empiricists should employ frequency-based measures as opposed to composition-based

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<sup>4</sup> For example, if we take  $F$  to be a negative exponential density, the effect would be negative. But if  $F$  is a density with an increasing hazard rate (e.g., a normal distribution), then the effect would be positive. It is *a priori* unclear as to which density would prevail. Thus, this is ultimately an empirical question that would probably be hard to measure.

measures of deterrence is highlighted by the fact that many economists have been calling for more empirical work on merger policy deterrence effects. Our main point then is simple but important, as it is imperative that empiricists look for deterrence in the right place.

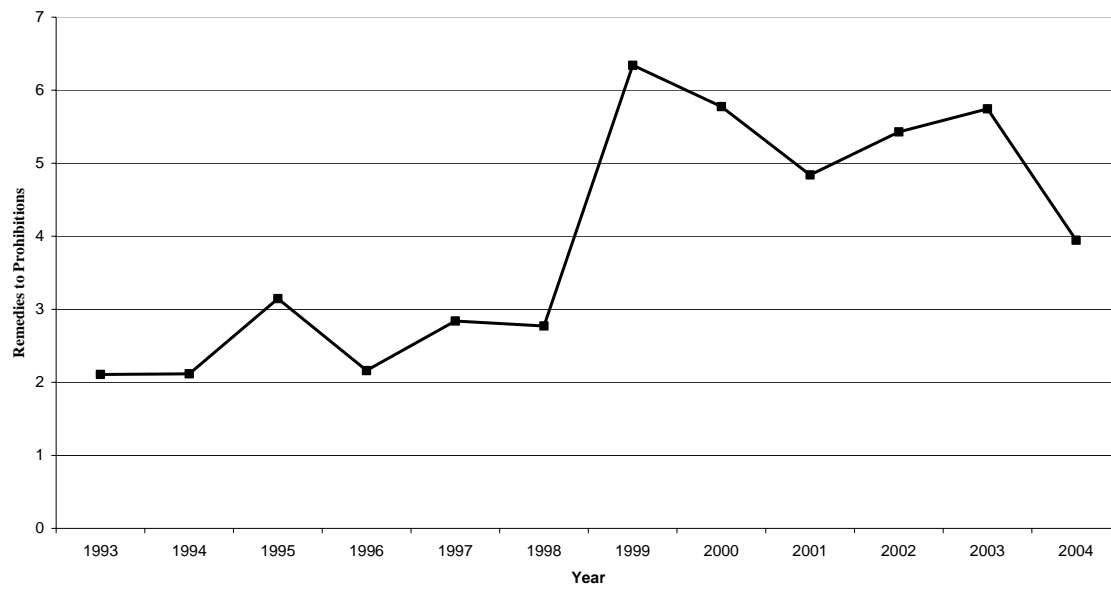
The propensity for merger policy toughness and composition-based deterrence to not always involve the expected positive relationship yields additional implications beyond the merits of employing frequency-based deterrence measures. If antitrust authorities are ultimately concerned about the composition of merger notifications (i.e., minimizing the number of anti-competitive merger proposals), then our analysis suggests that less – not more – vigorous merger policy may sometimes be the means to reduce anti-competitive merger proposals. For example, substituting remedies for prohibitions – and not prohibitions for remedies – might sometimes induce fewer anti-competitive merger notifications. More generally, our analysis indicates that tougher merger policy may not always generate the intended increase in composition-based deterrence.

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Figure 1: The Average Across Five Antitrust Jurisdictions (US, UK, Germany, EU & Canada) for the Ratio of 'Remedies to Prohibitions'



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