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February 2009

Online at <http://mpa.ub.uni-muenchen.de/13450/>  
MPRA Paper No. 13450, posted 17. February 2009 / 01:26

# Compulsory or Voluntary Pre-merger Notification? Theory and Some Evidence\*

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\* We are thankful to Stephen King, Dan Sasaki, Philip Williams, and the seminar audience at Osaka University and the University of Tokyo for helpful discussions. The usual disclaimer applies.

# Compulsory or Voluntary Pre-merger Notification? Theory and Some Evidence

## Abstract

We compare the prevailing system of compulsory pre-merger notification with the Australian system of voluntary pre-merger notification. It is shown that, for a non-trivial set of parameter values, a perfect Bayesian equilibrium exists in mixed strategies in which the regulator investigates un-notified mergers with probability less than one and the parties choose notification with probability less than one. Thanks to the signaling opportunity that arises when notification is voluntary, voluntary notification leads to lower enforcement costs for the regulator and lower notification costs for the merging parties. Some of the theoretical predictions are supported by exploratory empirical tests using merger data from Australia. Overall, our results suggest that voluntary merger notification may achieve objectives similar to those achieved by compulsory systems at lower costs to the merging parties as well as to the regulator.

KEY WORDS: Merger regulation, pre-merger notification, abnormal returns

JEL CLASSIFICATION: D21, G34, K21, L40

# 1. Introduction

In a significant number of jurisdictions around the world, pre-merger notification is considered essential to allow governments either to stop anticompetitive mergers or to negotiate remedies with the parties. The fundamental rationale for such notification provisions is to give the regulatory bodies time to challenge mergers, and seek modifications if necessary, before they are realized. It also avoids the costly and complicated process of seeking an order through the courts to unscramble a merger after it has been consummated. While a handful of countries such as Argentina, Japan, and Russia have post-merger notification regimes, various pre-merger review policies have proliferated recently around the world, notably in new democracies and developing economies. According to Battistoni (2002), there are more than seventy jurisdictions around the world (excluding the U.S. and the E.U.) that have some form of pre-merger review, and the UNCTAD reports giving over 50 developing or transition economies technical assistance in the area of competition policy since 1980.

The dominant pre-merger notification model follows the Hart-Scott-Rodino Antitrust Improvements Act of 1976 (modified in 2000) of the United States (HSR Act), which requires certain types of transactions to be notified to the Federal Trade Commission and the Department of Justice. The stated purpose of the HSR Act is to give the regulators 30 days' notice of substantial mergers, which permits either agency to seek an injunction before consummation of a transaction. In the European Community, the requirements have been similar to those in the US since 1990.<sup>(1)</sup> The differences between the various notification procedures are mostly in such details as the thresholds for notification and the time allowed for consideration of the proposal.

Among the various merger notification systems, the US and European systems of compulsory notification have been much analyzed for their effectiveness, with a general consensus that the systems work reasonably well.<sup>(2)</sup> However, as systems

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<sup>(1)</sup> Battistoni (2002) provides details about modifications in the HSR Act that became effective in 2001. Aktas et al. (2004) provide details about the pre-merger notification procedure and control in the EC.

<sup>(2)</sup> See, for example, Baer (1997), Baer and Redcay (2001), and Blumenthal (1997) for related commentaries.

of compulsory pre-merger notification have multiplied throughout the world in recent years, increasing attention has been paid to the related issues of associated costs and requirements, especially involving mergers of multinational corporations. A recent study commissioned by the American Bar Association and International Competition Network estimated that the average external costs associated with complying with notification procedures for mergers covering multiple jurisdictions amounted to 3.28 million euros, with average review duration of approximately seven months.<sup>(3)</sup> In another study, Todaro and Walsh (2002) report that merger reviews often required filing of multiple applications in a myriad of different formats in many different languages. Additionally, despite the regulator's efforts to keep notification confidential, pre-merger notification may allow speculators and rival bidders to cash in on the entrepreneurial insight of the notifying firm, while it awaits clearance from the regulator. Finally, delays to completion of notified mergers also imply reduced incentives for entrepreneurs to find and exploit profitable opportunities.

In view of the costs and complexities associated with compulsory notification, the primary objective of this study is to analyze a system of voluntary notification and to examine whether compulsory notification is necessary for consumer protection and the efficient functioning of an antitrust merger policy. We address these issues by studying an *existing* voluntary merger notification regime. There are countries such as Australia, Chile, and the UK that have no legal rule requiring pre-merger notification.<sup>(4)</sup> In Australia, for example, the Trade Practices Act of 1974 proscribes mergers that substantially lessen competition, but it does not compel pre-merger notification. Instead, parties to a transaction are given the option of voluntary notification before they consummate the merger. The regulator, however, can challenge a completed merger that was not notified.

There are two main differences between the compulsory and voluntary notification regimes. First, the parties' notification decision under the voluntary notification regime signals private information regarding the merger, which the

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<sup>(3)</sup> Report on the Costs and Burdens of Multi-jurisdictional Merger Review, November 2004, International Competition Network ([www.internationalcompetitionnetwork.org](http://www.internationalcompetitionnetwork.org)).

<sup>(4)</sup> EC regulations, however, effectively over-ride the UK provisions, implying pre-merger notification in the UK (Aktas et al. (2004)).

regulator can utilize in its enforcement activities. The parties may choose to notify because they are less confident that their mergers will be left intact if they face the regulator's investigation; they would prefer negotiated settlement to costly legal battles. On the other hand, the parties may choose not to notify either because they are confident that their mergers do not cause anti-trust concerns or because, even when they are subject to regulatory investigation *ex post*, they are willing to face legal battles. However, compulsory notification deprives the parties of such a signaling opportunity. Second, under compulsory notification, the parties have the opportunity to negotiate with the regulator before the merger is consummated, thereby avoiding costly litigation.<sup>(5)</sup> Moreover the negotiation may result in an outcome with higher social welfare. This is the main rationale for, and the potential benefit of, compulsory notification. On the other hand, compulsory notification entails reviewing costs for the regulator (for each and every submission), and notification costs for for the merging parties themselves.<sup>(6)</sup> The available evidence suggests that significant part of these costs may be unnecessary.<sup>(7)</sup> Under voluntary notification, large part of such costs can be avoided, precisely because of the signaling opportunity discussed above. Therefore the choice of compulsory or voluntary notification should depend on weighing the potential benefits of higher social welfare from negotiation against the costs discussed above.

In light of the preceding discussion, we present a model where each merger is represented by private benefits to the merging parties and some proxy of the regulator's objectives, which is simply called social welfare. Both parameters are private information to the parties, which the regulator can learn only at some costs. The parties maximize private benefits less any costs involved, which include

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<sup>(5)</sup> As we discuss in Section 2.1, negotiation is also an option under voluntary notification if the regulator investigates a merger before completion.

<sup>(6)</sup> In case of the US, Tritell (2000) reports that the Federal Trade Commission and the Department of Justice receive about 4500-5000 notifications annually, about a three-fold increase compared to a decade ago. Among various notification costs are the filing fees under the HSR Act that range from US\$45,000 to US\$280,000 depending on the value of transaction, and the penalties for late filing, which could be as much as US\$11,000 per day for each day a filing should have been made.

<sup>(7)</sup> Fels and Walker (1994) report that a large number of mergers in Australia involve competitively neutral transactions, and the vast majority do not infringe the Trade Practices Act. The Australian evidence also suggests that there are only a few midnight mergers that have anti-competitive consequences. Until the mid-1990s, the Petersville/General Jones merger was the only example of such a merger (Industry Commission (1995)).

the costs of notification and litigation-related costs. The regulator maximizes social welfare less any enforcement costs. The extensive-form game starts with the parties' notification decision, in which the system of compulsory notification is embedded as a subgame that follows the parties' notification decision.

Our primary results are as follows. Under compulsory notification, we show that all mergers are separated into three groups: those with small private benefits are settled into negotiated outcomes; those with large private benefits but low social welfare are challenged by the regulator and contested in the court; those with large private benefits and high social welfare are cleared. Under voluntary notification, we show that a perfect Bayesian equilibrium exists in mixed strategies in which only the parties with small private benefits and low social welfare choose notification but with probability less than one and subsequently settle into negotiated outcomes, while the regulator investigates un-notified mergers with probability less than one. Given the regulator's investigation, the outcomes for un-notified mergers are: mergers with high social welfare are cleared; mergers with large private benefits but low social welfare are challenged by the regulator and contested in the court; mergers with small private benefits and low social welfare are challenged by the regulator and the parties do not offer defense. Comparing the two notification regimes, we find that all merging parties favor voluntary notification over compulsory notification, while regulatory burden is smaller under voluntary notification. It is also shown that voluntary notification does not lead to more litigation than compulsory notification. Our calibrated numerical examples demonstrate that, for a reasonable set of parameter values, the cost savings under voluntary notification outweigh the welfare gains from negotiation under compulsory notification.

We also conduct some exploratory empirical tests using merger data from Australia. Comparison of private benefits to parties measured by abnormal stock returns indicates that there is no significant difference between notified and un-notified mergers. It is also found that, for mergers that are not objected to by the regulator, notifying parties experience lower abnormal returns than those that choose not to notify. Although the empirical results are not unambiguous since a vast majority of notified mergers are cleared eventually, the difference may be attributed to both notification costs and the delay in waiting for clearance from

the regulator. At least some of these firms could avoid these costs by not notifying and just proceeding with the merger. Overall, our results suggest that voluntary merger notification does work and may achieve objectives similar to those achieved by compulsory systems at much lower costs to the parties as well as to the regulator.

Although there is a large body of empirical literature that employs stock market data to study the efficacy of regulatory regimes, a direct comparison of our paper with these studies may not be appropriate as they are based on European and US merger regimes where notification is compulsory. However, Aktas et al. (2004) and Fee and Thomas (2004) report that firms involved in transactions facing regulatory challenge experienced strong positive returns, which is consistent with some implication of our analysis. We discuss some of these studies in more detail in Section 4. While much attention has been paid to empirical analyses of merger policies, there is a paucity of theoretical studies that analyze the optimal merger notification policy. Motta and Vasconcelos (2005) study a dynamic merger game where the antitrust authority can be either myopic or forward looking. Lagerlöf and Heidhues (2005) analyze the merging parties' incentives to gather and strategically reveal efficiency-related information to the regulator. In both of the above studies, pre-merger notification is assumed compulsory. Although our theory is focused mainly on comparison of merger notification regimes, it is also related to work by Besanko and Spulber (1989), Hahn (2000), and Neven and Röller (2005), who model various aspects of regulatory decision making vis-à-vis mergers.

The remainder of the paper proceeds as follows. Section 2 begins by briefly describing the voluntary notification regime of Australia, which is followed by an extensive-form game of the merger process. Section 3 solves the game and shows by an example that, for a reasonable set of parameter values, voluntary notification dominates compulsory notification. Section 4 discusses empirical implications of the model and reports empirical results for Australian mergers. Section 5 concludes the paper.

## 2. A Model of Pre-Merger Notification

This section presents a model of pre-merger notification regime. While our model

can be applied to any voluntary notification regime, it is based on the merger process in Australia. This will help motivate the extensive form game laid out below.

### *2.1. Merger process in Australia*

In Australia, the Trade Practices Act of 1974 prohibits mergers that substantially lessen competition in a market. Pre-merger notification, however, is not compulsory. The Cooney Report of the Senate Standing Committee on Legal and Constitutional Affairs did propose in 1991 that merger notification be made compulsory in Australia, but its recommendations were not implemented. In the absence of pre-merger notification, the regulator - Australian Competition and Consumer Commission (ACCC) - can oppose anti-competitive mergers by seeking court orders that prohibit such transactions before consummation, or impose penalties, and/or force divestitures after completion. By contrast, both in the U.S. and Europe, firms can face substantial fines for not notifying the regulator. Merging parties in Australia can, however, voluntarily notify the ACCC of the impending merger and seek an informal opinion about its anti-competitive effects, although this does not provide immunity from the ACCC seeking court orders after consummation of the merger.<sup>(8)</sup>

The result is a system of quasi-compulsory pre-merger notification. The ACCC is considered a tough merger regulator who is willing to seek high penalties from the courts if the parties proceed with mergers without seeking informal clearance (Shekhar and Williams (2004)). The parties' incentives to notify thus increase in their belief that the merger would breach the anti-trust provisions and the expected penalties would be high.

Under this system of merger notification, the process can unfold in one of the two ways.<sup>(9)</sup> If the parties choose to proceed without notification, the ACCC can investigate the merger either on its own or by the request of third parties,

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<sup>(8)</sup> The only provision that grants immunity from prosecution for breaching the Trade Practices Act is an explicit authorization from the ACCC, which is granted if the regulator decides that the merger is of net benefit to the public. However, this path is seldom taken as only eight authorizations were sought between 1995 and 2001 (Williams and Woodbridge, 2004).

<sup>(9)</sup> Williams and Woodbridge (2004) provide a detailed description of this process.

often the competitors who will be affected by the merger. For a merger that has not been completed, the ACCC can decide to either leave it alone or raise anti-trust concerns. In the latter case, the parties can withdraw the transaction, or settle into a negotiated outcome, or proceed with the merger despite the ACCC's concerns. Should the parties choose the last option, it certainly leads to court proceedings initiated by the ACCC, which may eventually lead to unwinding of the merger. For a midnight merger that has been completed without notification, negotiation is no longer an option: the ACCC either clears the merger or issues court proceedings for breach of anti-trust provisions. Subsequently the parties can choose to contest the orders, with courts deciding the final outcome.

If the parties do notify the ACCC, then the ACCC can give clearance or raise antitrust concerns. The events that unfold subsequently are the same as those for a merger that the ACCC investigates before it is completed. If the parties expect the merger to raise anti-trust concerns, then they can make the option of negotiation certain through notification. Without notification, they run the risk of facing the ACCC's challenge after the merger has been consummated.

The recently concluded merger between Toll Holdings Ltd. and Patrick Corporation Ltd. illustrates the process. Toll initially chose not to notify the ACCC of its merger intentions but sought clearance after its market announcement on August 22, 2005. Its subsequent undertakings to address the ACCC's anti-trust concerns were deemed inadequate, leading the ACCC to eventually institute legal proceedings in the Federal Court opposing the merger. Finally on March 1, 2006 Toll offered a new set of undertakings under the direction of the Federal Court, which resulted in the ACCC discontinuing the legal proceedings.<sup>(10)</sup>

## *2.2. An extensive-form game of the merger process*

We represent a merger by two parameters:  $b$  denotes the private benefits for the parties to a merger;  $w$  denotes some proxy for welfare from the merger relevant for merger policy, which we simply call social welfare.<sup>(11)</sup> To simplify analysis, we

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<sup>(10)</sup> See <http://www.accc.gov.au/content/index.phtml/itemId/724185/fromItemId/633100>.

<sup>(11)</sup> For example,  $w$  can be the usual social welfare as in Besanko and Spulber (1989), or a weighted average of consumer surplus and producer surplus, which the regulator uses as a guideline for merger policy.

assume that  $b$  takes on either  $b_h$  or  $b_l$  with  $b_h > b_l \geq 0$ . Similarly  $w \in \{w_l, w_h\}$  with  $w_h > w_l$ . Note that we do not impose any sign restriction on  $w$ . Thus there are four types of potential mergers:  $(b_h, w_h)$ ,  $(b_h, w_l)$ ,  $(b_l, w_h)$  and  $(b_l, w_l)$ . Only the parties to a merger know their type, and the regulator's prior beliefs on the types are given by probabilities  $p$  for  $b_h$ , and  $q$  for  $w_h$ . Since  $b$  and  $w$  may not have any a priori relationship, we assume that  $p$  and  $q$  are independent.<sup>(12)</sup> Then the probability of a merger to be of  $(b_h, w_l)$ -type, for example, is  $p(1 - q)$ . The parties' objective is to maximize the private benefits less any costs involved. As is standard in the literature on regulation, the regulator is assumed to maximize social welfare less any enforcement costs.

We now describe the extensive form of the game, which is shown in Figure 1. In the left part of Figure 1 corresponding to no notification, we consider only the case where the regulator investigates the merger after it has been completed. For mergers that are not notified and investigated before completion, the subsequent events and the outcomes are essentially the same as those for notified mergers that raise anti-trust concerns.

In the first stage of the game, the parties decide whether or not to notify. If the parties do not notify, then the regulator may, at cost  $\gamma$ , investigate the merger ex post either on its own or by the request of third parties. The investigation reveals the type of merger for sure.<sup>(13)</sup> After the investigation, the regulator may give clearance or issue proceedings. If the merger is cleared after investigation, then the payoff for the parties is  $b$ , and that for the regulator is  $w - \gamma$ . In case the regulator issues proceedings, the parties may contest the regulator's decision, which is followed by litigation. We assume that the probability that the court finds contravention is fixed at  $\pi \in (0, 1)$ , which is exogenous and independent of whether or not the parties elect to notify. That the court does not behave strategically seems not only reasonable but is also standard in the literature on regulation. If the parties lose the antitrust case, then the merger is unravelled

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<sup>(12)</sup> As will become clear from our analysis, the case where  $w$  and  $b$  are correlated does not alter our qualitative results. It only changes the equilibrium probability of investigation by the regulator.

<sup>(13)</sup> More generally, the regulator could obtain some imperfect information about  $(b, w)$  after the investigation. As this will not alter our qualitative conclusions, we assume, for expositional simplicity, that the investigation reveals  $(b, w)$  completely.

and the parties pay  $f$ , the penalty for antitrust infringement, and  $c$ , the litigation cost which, under a simplified version of the Australian practice, is assumed to be the sum of the costs incurred in the litigation by both parties. Thus the expected payoff for the parties in case of litigation is  $\pi(-c - f) + (1 - \pi)b$ , and that for the regulator is  $(1 - \pi)w - c - \gamma$ . In the latter, we assume, as in Besanko and Spulber (1989), that the penalty does not enter the regulator's payoff since it is viewed as a pure transfer between firms and consumers. On the other hand, the litigation cost is subtracted from the regulator's payoff as a whole since it is social cost whether it is borne by the regulator or by the merging parties. If the parties do not contest the regulator's challenge, then the payoffs are  $-f$  for the parties and  $-\gamma$  for the regulator.

— **Figure 1 goes about here.** —

Next is the subgame in which the parties notify their intention of merger. Denote the cost of notification by  $n$ . This includes not only the direct cost incurred in the process of notification, such as preparing documents and filing, but also the reduced benefits due to notification delays and any information leakage that can be exploited by speculators or rival bidders. If the parties notify their intention of merger, the regulator reviews the case at cost  $\gamma' < \gamma$  and learns  $(b, w)$  for sure. Since notification provides the regulator with vast amount of information about the proposed merger, it seems reasonable to assume that the cost of review is lower than the cost of investigating a merger that was not notified. Based on the review, the regulator can either give clearance or raise concerns. If the parties' notification is cleared, then the game ends with payoffs  $b - n$  for the parties, and  $w - \gamma'$  for the regulator. If the regulator raises concerns, then the parties have three options. First, they may be given the choice of negotiation and asked to offer undertakings to overcome the concerns raised by the regulator. Should this course of action be taken, the parties' merger benefits are reduced to  $b(1 - \alpha)$  where  $0 < \alpha < 1$ . The regulator prefers the negotiated outcome to the status quo since the former leads to higher social welfare.<sup>(14)</sup> Second, the parties can proceed with the transaction

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<sup>(14)</sup> We do not need to specify how social welfare will change after negotiation. As will become clear, all we need is that the social welfare from negotiation is not smaller than that from the status quo.

despite the regulator’s concerns. In this case, the regulator may give clearance or challenge the merger in the court. Given that the regulator had not chosen to clear the merger in the first place when notification was given, we can deduce that the regulator will always challenge the merger that went ahead despite its express concerns. The expected payoffs in this case are  $\pi(-c - f) + (1 - \pi)b - n$  for the parties, and  $(1 - \pi)w - c - \gamma'$  for the regulator. The final option is to withdraw the transaction.

Before we solve the game, we note that there are three main differences between notification and no notification. First, notification imposes additional notification costs to the parties. Therefore the parties with strong conviction that their merger would be cleared would opt for no notification. Second, the regulator should review all cases that have been notified, while investigation is optional in case of no notification. Although information provided through notification could reduce the regulator’s cost of reviewing each application, compulsory notification could drastically increase the regulator’s burden. Third, notification introduces the option of negotiation. Thus if the regulator’s challenge and the court-found contravention are highly likely, then the parties may be better off notifying and negotiating a settlement, rather than becoming embroiled in risky litigation.

### 3. Equilibria of the Merger Notification Game

#### 3.1. *Equilibrium outcome under compulsory notification*

In solving the whole game, we start with the subgame following the parties’ notification. The equilibrium outcome of this subgame will be equivalent to that for the game in which notification is compulsory. Let us first look at the parties’ decision given the regulator’s concerns. If they choose negotiation, then their payoff is  $b(1 - \alpha) - n$ . If they decide to go ahead with the merger, then the regulator challenges the merger for sure. Should the game reach this stage, the parties will always contest the regulator’s decision. The other option of “no contest” is strictly dominated since the payoff from negotiation is strictly larger than that from “merger and no contest”. Since the expected payoff from “merger and contest” is  $\pi(-c - f) + (1 - \pi)b - n$ , the parties will choose “negotiate” if

$\pi(-c-f) + (1-\pi)b - n \leq b(1-\alpha) - n$  or, equivalently,  $b \leq \frac{\pi(c+f)}{\alpha-\pi}$ , and “merger and contest” otherwise.<sup>(15)</sup> There are two cases to consider. First, if  $\alpha \leq \pi$ , then the parties will always choose “negotiate” since the probability of losing the antitrust case is large relative to the reduction in private benefits from negotiation. To this, the regulator’s best response is “raise concerns”. Second, if  $\alpha > \pi$ , then the parties will choose “negotiate” if  $b \leq \frac{\pi(c+f)}{\alpha-\pi}$ , and “merger and contest” otherwise. If the parties choose “negotiate”, then the regulator’s best response is “raise concerns”. However, if the parties choose “merger and contest”, then the regulator should choose “clear” if  $w - \gamma' \geq (1-\pi)w - c - \gamma'$  or, equivalently,  $w \geq -\frac{c}{\pi}$ , and “raise concerns” otherwise. Summarizing, we have

**Lemma 1:** The equilibrium outcome under compulsory notification can be described as:

- (a) If  $\alpha \leq \pi$ , then the regulator chooses “raise concerns” and the parties choose “negotiate”;
- (b) If  $\alpha > \pi$  and  $b \leq \frac{\pi(c+f)}{\alpha-\pi}$ , then the regulator chooses “raise concerns” and the parties choose “negotiate”;
- (c) If  $\alpha > \pi$ ,  $b > \frac{\pi(c+f)}{\alpha-\pi}$ , and  $w < -\frac{c}{\pi}$ , then the regulator chooses “raise concerns” and the parties choose “merger and contest”;
- (d) If  $\alpha > \pi$ ,  $b > \frac{\pi(c+f)}{\alpha-\pi}$ , and  $w \geq -\frac{c}{\pi}$ , then the regulator chooses “clear”.

In words, the equilibrium outcome under compulsory notification is always “negotiate” if the reduction in private benefits is small relative to the cost of losing the litigation ( $\alpha \leq \pi$ ). If  $\alpha > \pi$ , then all mergers are separated into three groups: those with small private benefits are settled into a negotiated outcome; those with large private benefits, but low social welfare are challenged by the regulator and contested in the court; those with large private benefits and high social welfare are cleared. Since the case where all parties settle into a negotiated outcome is less interesting (and contrary to evidence), henceforth we will focus on the case where  $\alpha > \pi$ . Moreover we maintain the following assumption.

*Assumption 1:*  $b_h > \frac{\pi(c+f)}{\alpha-\pi} \geq b_l$ ,  $w_h \geq -\frac{c}{\pi} \geq w_l$ .

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<sup>(15)</sup> As a tie-breaking rule, we assume that the parties, when indifferent, choose the option preferred by the regulator.

*Assumption 2:*  $n \leq b_l(1 - \alpha)$ .

Assumption 1 is sufficient for the parties with different types of mergers to behave differently under compulsory notification. Note that Assumption 1 implies  $\alpha > \pi$ . Assumption 2 ensures that notification cost is not too high to prevent  $(b_l, w_l)$ -type mergers from going ahead. Then from Lemma 1, the following is immediate.

**Proposition 2:** Given Assumptions 1 and 2, the equilibrium outcome under compulsory notification has (a)  $(b_h, w_h)$ -type mergers cleared, (b)  $(b_h, w_l)$ -type mergers challenged and contested in the court, and (c)  $(b_l, w_h)$ -type and  $(b_l, w_l)$ -type mergers settled into negotiated outcomes.

### 3.2. Equilibrium outcome under voluntary notification

The game starts with the parties' decision of whether or not to notify. In the previous section, we have already described the equilibrium outcome of the subgame that follows the parties' notification. Suppose now the parties chose not to notify. If the regulator chooses "investigate", then the regulator learns  $(b, w)$  for sure. If the regulator chooses "leave alone", then the regulator does not learn  $(b, w)$ , so its payoff is the expected welfare denoted by  $E_\mu(\tilde{w})$ , where the expectation is with respect to the regulator's beliefs  $\mu$  about the types of merger that went ahead. As this is the game of incomplete information, we solve the game for perfect Bayesian equilibria.

We start by analyzing the subgame following the regulator's investigation. If the regulator issues proceedings, then the parties will choose "contest" if  $\pi(-c - f) + (1 - \pi)b > -f$  or, equivalently,  $b > \frac{\pi c - (1 - \pi)f}{1 - \pi}$ . If the parties contest the regulator's challenge, then the regulator's best response is "issue proceedings" if  $(1 - \pi)w - c - \gamma \geq w - \gamma$  or, equivalently,  $w \leq -\frac{c}{\pi}$ , and "clear" otherwise. If the parties do not contest, then the regulator's best response is "issue proceedings" if  $w \leq 0$ , and "clear" otherwise. Since  $\frac{\pi(c+f)}{\alpha - \pi} > \frac{\pi c - (1 - \pi)f}{1 - \pi}$ , Assumption 1 is not sufficient for the parties with different merger types to behave differently in the subgame. Thus we make an additional assumption.

*Assumption 3:*  $b_l \leq \frac{\pi c - (1-\pi)f}{1-\pi}$ ,  $w_h \geq 0$ .

**Lemma 3:** Given Assumptions 1 to 3, the subgame following the regulator's investigation has the equilibrium outcome: (a)  $(b_h, w_h)$  and  $(b_l, w_h)$ -type mergers are cleared; (b)  $(b_h, w_l)$ -type mergers are challenged and contested in the court; (c)  $(b_l, w_l)$ -type mergers are challenged and the parties offer no defense.

We now solve for perfect Bayesian equilibria of the whole game. Denote the regulator's probability of investigating an un-notified merger by  $\sigma_r$ . First, we note from Lemma 3 that, given the regulator's investigation, the only parties that choose notification are those with  $(b_l, w_l)$ -type mergers. Consider the parties with  $(b_h, w_h)$ -type mergers. They are strictly better off by not notifying: their payoff from no notification is  $b_h$  regardless of  $\sigma_r$  while their payoff from notification is  $b_h - n$ . Similarly,  $(b_l, w_h)$ -type mergers will not be notified since  $b_l > b_l(1-\alpha) - n$ , the latter being the payoff from the negotiated outcome after notification. Consider now the parties with  $(b_h, w_l)$ -type mergers. If they notify, then their payoff is  $\pi(-c-f) + (1-\pi)b_h - n$  since their merger will be challenged and contested in the court. If they do not notify, then their expected payoff is  $\sigma_r[\pi(-c-f) + (1-\pi)b_h] + (1-\sigma_r)b_h$ . Thus they would not notify, either. Simply put, if they know that their merger will be challenged and contested after notification, then they are better off by not notifying. In the worst case where their merger is investigated, they will contest the regulator's challenge anyway, but save the cost of notification. Finally, the parties with  $(b_l, w_l)$ -type mergers may notify depending on  $\sigma_r$ . If they notify, then their payoff is  $b_l(1-\alpha) - n$ , that from negotiation. If they do not notify, their expected payoff is  $\sigma_r(-f) + (1-\sigma_r)b_l$ . Thus they will notify if  $\sigma_r > \frac{b_l\alpha+n}{b_l+f}$ , not notify if  $\sigma_r < \frac{b_l\alpha+n}{b_l+f}$ , and randomize notification if  $\sigma_r = \frac{b_l\alpha+n}{b_l+f}$ .<sup>(16)</sup>

Denote by  $\sigma_l$  the probability that the parties with  $(b_l, w_l)$ -type mergers choose notification. Given  $\sigma_l$ , let  $\mu_{ij}$  be the regulator's posterior belief that an un-notified merger is of  $(b_i, w_j)$ -type,  $i, j = h, l$ . Then we have

$$\mu_{hh} = \frac{pq}{(1-p)(1-q)(1-\sigma_l) + p + q - pq},$$

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<sup>(16)</sup> Note that  $\frac{b_l\alpha+n}{b_l+f} < 1$  by Assumption 2.

$$\begin{aligned}
\mu_{lh} &= \frac{(1-p)q}{(1-p)(1-q)(1-\sigma_l) + p + q - pq}, \\
\mu_{hl} &= \frac{p(1-q)}{(1-p)(1-q)(1-\sigma_l) + p + q - pq}, \\
\mu_{hh} &= \frac{(1-p)(1-q)(1-\sigma_l)}{(1-p)(1-q)(1-\sigma_l) + p + q - pq}.
\end{aligned} \tag{1}$$

From the previous discussion, we know that the notification decision by the parties with  $(b_l, w_l)$ -type mergers is given by

$$\sigma_l = 1 \text{ if } \sigma_r > \frac{b_l\alpha + n}{b_l + f}, \quad \in [0, 1] \text{ if } \sigma_r = \frac{b_l\alpha + n}{b_l + f}, \quad = 0 \text{ if } \sigma_r < \frac{b_l\alpha + n}{b_l + f}. \tag{2}$$

Given Lemma 3, the regulator's investigation decision solves the following problem:

$$\begin{aligned}
\text{Max}_{\sigma_r} \quad & \sigma_r [(\mu_{hh} + \mu_{lh})w_h + \mu_{hl}((1-\pi)w_l - c) - \gamma] \\
& + (1 - \sigma_r) [(\mu_{hh} + \mu_{lh})w_h + (\mu_{hl} + \mu_{ll})w_l].
\end{aligned} \tag{3}$$

Thus the regulator will choose  $\sigma_r$  such that

$$\sigma_r = 1 \text{ if } \mu_{hl} > \hat{\mu}, \quad \in [0, 1] \text{ if } \mu_{hl} = \hat{\mu}, \quad = 0 \text{ if } \mu_{hl} < \hat{\mu} \tag{4}$$

where  $\hat{\mu} = -\frac{\mu_{ll}w_l + \gamma}{\pi w_l + c}$ . As is clear from (4), the regulator's investigation decision depends on its belief on mergers with  $(b_h, w_l)$ -type: if it is believed that more of these types of mergers can go unchecked without investigation, the regulator will increase its investigation effort. The following proposition, which is proved in the appendix, solves for the entire set of perfect Bayesian equilibria.

**Proposition 4:** Suppose Assumptions 1 to 3 hold. Then in all perfect Bayesian equilibria under voluntary notification, none of the parties except  $(b_l, w_l)$ -type mergers choose notification and the outcomes for all un-notified mergers following the regulator's investigation are as in Lemma 3. The probability of notification by the parties with  $(b_l, w_l)$ -type mergers ( $\sigma_l$ ), the regulator's investigation probability ( $\sigma_r$ ) and beliefs are given by:

- (a) if  $w_l < \hat{w}$ , then  $\sigma_l = \sigma_r = 1$  and beliefs are as in (1) given  $\sigma_l = 1$ ;
- (b) if  $w_l = \hat{w}$ , then  $\sigma_l = 1, \sigma_r \in \left(\frac{b_l\alpha + n}{b_l + f}, 1\right]$  and beliefs are as in (1) given  $\sigma_l = 1$ ;

- (c) if  $\hat{w} < w_l < \tilde{w}$ , then  $\sigma_l = 1 + \frac{p(1-q)(\pi w_l + c + \gamma) + q\gamma}{(1-p)(1-q)(w_l + \gamma)} \in (0, 1)$ ,  $\sigma_r = \frac{b_l \alpha + n}{b_l + f}$  and beliefs are as in (1) given  $\sigma_l$ ;
- (d) if  $w_l = \tilde{w}$ , then  $\sigma_l = 0$ ,  $\sigma_r \in [0, \frac{b_l \alpha + n}{b_l + f})$  and beliefs are as in (1) given  $\sigma_l = 0$ ;
- (e) if  $w_l > \tilde{w}$ , then  $\sigma_l = \sigma_r = 0$  and beliefs are as in (1) given  $\sigma_l = 0$ ;
- where  $\hat{w} \equiv -\frac{p(1-q)c + (p+q-pq)\gamma}{\pi p(1-q)} < \tilde{w} \equiv -\frac{p(1-q)c + \gamma}{(1-q)(1-p+p\pi)}$ .

In the first two types of equilibria, the social cost of undesirable merger ( $w_l$ ) is large relative to the threshold value ( $\hat{w}$ ), inducing the regulator to investigate un-notified mergers with high probability. To this, the parties with  $(b_l, w_l)$ -type mergers notify with probability one, hence separating themselves from other types of mergers. The separating equilibria are more likely if  $\hat{w}$  increases; the derivatives of  $\hat{w}$  with respect to relevant parameters show that  $\hat{w}$  increases in  $p$  but decreases in  $q, c$ , and  $\gamma$ . Thus the separating equilibria are more likely if the proportion of mergers with large private benefits ( $p$ ) is large, the proportion of mergers with positive social welfare ( $q$ ) is small, and the costs of investigation and litigation are small. As  $p$  increases, there are more mergers with large private benefits, which are not notified. This prompts the regulator to increase its investigation effort, which in turn induces the parties with  $(b_l, w_l)$ -type mergers to notify. The comparative statics results with respect to the other three parameters are intuitively clear. In separating equilibria, the benefits of signalling under voluntary notification may not be large: while merging parties can save notification costs, the regulator's investigation costs can remain significant since it has to review all notified mergers and investigate ex post a large proportion of un-notified mergers.

In the last two types of equilibria, called pooling equilibria, the social cost of undesirable merger is not that large relative to the threshold value ( $\tilde{w}$ ), and the regulator investigates un-notified mergers with low probability. Consequently, none of the parties choose notification. The pooling equilibria are more likely if  $\tilde{w}$  decreases; the derivatives of  $\tilde{w}$  with respect to relevant parameters show that  $\tilde{w}$  decreases in  $p, q, c$ , and  $\gamma$ . Thus the pooling equilibria are more likely if the proportion of mergers with large private benefits is large, the proportion of mergers with positive social welfare is large, and the costs of investigation and litigation are large. That the likelihood of pooling equilibria increases in  $p$  is due to the fact that, as  $p$  increases, the proportion of mergers that will be potentially notified,

i.e.,  $(b_l, w_l)$ -type mergers, decreases. Again the comparative statics results with respect to the other three parameters are intuitively clear. While pooling equilibria are certainly a theoretical possibility, the existence of various merger policies and enforcement authorities suggests that the conditions for the pooling equilibria are unlikely to hold in reality.

In view of reality, we may say that the third type of equilibrium, called the hybrid equilibrium, is the most interesting and realistic case: the parties with  $(b_l, w_l)$ -type mergers choose notification with probability less than one and the regulator investigates un-notified mergers with probability less than one. The hybrid equilibrium is more likely if  $\tilde{w} - \hat{w}$  increases. Differentiating  $\tilde{w} - \hat{w}$  with respect to relevant parameters shows that  $\tilde{w} - \hat{w}$  increases in  $q, c, \gamma$  and decreases in  $p$ . Thus the hybrid equilibrium is more likely to exist as there are more mergers with small private benefits, the proportion of mergers with positive social welfare increases, and the costs of litigation and investigation increase.

Before closing this section, we present numerical examples illustrating the three types of equilibria under voluntary notification. Parameter values for our base model are constructed as follows. First, we start with a merger with negative social welfare ( $w_l$ ) valued at \$2 million. A typical legal cost ( $c$ ) involved in antitrust litigation is around 15% of un-trebled damages, which in our base case becomes \$0.3 million. The cost of investigating a merger ( $\gamma$ ) is hard to quantify and we approximate the lower bound of this cost based on the budget allocated by the US Federal Trade Commission for its Objective 2.1, which is ‘identifying anticompetitive mergers and practices that cause the greatest consumer injury’.<sup>(17)</sup> The budget allocated for this objective in 2008 was around \$11 million and, given that the Federal Trade Commission receives about 4,500 merger notifications a year, the cost per merger proposal becomes \$2,500. Since there will be other costs such as those incurred by the Department of Justice and other regulatory bodies, we set the base value for investigation cost at \$5,000. Next are the proportions of mergers with large private benefits ( $p$ ) and high social welfare ( $q$ ). We infer this information from the Australian merger data we use for the empirical analysis of

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<sup>(17)</sup> “Fiscal Year 2008 Congressional Justification of Budget Summary, Federal Trade Commission” available at <http://www.ftc.gov/ftc/oed/fmo/budgetsummary08.pdf>.

this paper.<sup>(18)</sup> Given the total observation of 850 merger proposals, 547 proposals are notified, out of which 35 proposals reach negotiated outcomes. According to our theory, all notified mergers should reach negotiated settlement under voluntary notification, implying that the proportion of  $(b_l, w_l)$ -type mergers should be  $(1 - p)(1 - q) = 35/850 = 0.041$ .<sup>(19)</sup> For the remaining 303 un-notified proposals, 8 are eventually objected to by the regulator. These are  $(b_h, w_l)$ -type mergers, implying  $p(1 - q) = 8/850 = 0.0094$ . Solving these two leads us to  $p = 0.19$  and  $q = 0.95$ . Finally we set  $\pi = 0.97$ . Thus parameter values for our base model are  $c = 0.3$ ,  $\gamma = 0.05$ ,  $p = 0.19$ ,  $q = 0.95$  and  $\pi = 0.97$ . This base model admits the hybrid equilibrium since, given the parameter values, we have  $\hat{w} = -5.52 < w_l = -2 < \tilde{w} = -1.06$ .<sup>(20)</sup>

In Figure 2, the dotted line plots the values of  $\tilde{w}$  and the solid line plots the values of  $\hat{w}$  as various parameter values change. In the first example, we change the value of  $p$  from 0.1 to 0.28. The figure confirms that the hybrid equilibrium is more likely at low values of  $p$  while, as  $p$  increases, the other two types of equilibrium become more likely. Moreover, if the legal cost is proportional to the size of  $w_l$ , say 15%, then the only equilibrium consistent with our theory is the hybrid equilibrium at all values of  $p$  in the range. This is because the implied value of  $w_l$  is -2, which is within the interval  $(\hat{w}, \tilde{w})$  at all values of  $p$ . In the second example, we change the value of  $q$  from 0.8 to 0.97. In the third example, the value of  $c$  is changed from 0.2 to 0.38 while, in the last example, the value of  $\gamma$  is changed from 0.03 to 0.12. As explained above, the pattern of how different types of equilibria emerge is similar when  $q$ ,  $c$  and  $\gamma$  change. Overall the examples illustrate how voluntary notification leads to different types of equilibria depending on various parameter values, something that cannot be observed under compulsory notification.

— **Figure 2 goes about here.** —

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(18) Detailed figures are reported in Table 2 in Section 4.2.

(19) As shown in Table 2, a majority of notified mergers are not objected to by the regulator, implying that the parties' notification decisions involve factors that are beyond the model of this paper.

(20) If we assume all 547 notified mergers are of  $(b_l, w_l)$ -type instead, then we have  $p = 0.014$  and  $q = 0.347$  in our base case. Calculating  $\hat{w}$  and  $\tilde{w}$  again, we are led to  $\hat{w} = -2.32$  and  $\tilde{w} = -0.08$ . Given  $w_l = -2$ , this implies once more that the base case admits the hybrid equilibrium.

The above examples illustrate the case where the social cost of undesirable merger is not very large relative to the costs of investigation and litigation. Given the parameter values of our base example, the maximum social cost of anticompetitive merger that admits the hybrid equilibrium is \$5.52 million compared to the litigation cost of \$0.3 million and investigation cost of \$0.05 million. If the social cost of undesirable merger becomes considerably larger, however, then one would expect the separating equilibria instead. For example, if  $w_l = -\$10$  million in our base case, then we are led to the separating equilibria whether the litigation cost stays at \$0.3 million or increases to \$1.5 million, a 15% of the damages. In the end, which type of equilibrium is more likely under voluntary notification is an empirical issue. We note, however, that the Australian experience of voluntary notification suggests that it is very unlikely for an anticompetitive merger with significant social costs to reach completion without the regulator's challenge. For mergers with considerable social costs, the regulator can always resort to legal remedies.

### *3.3. Comparing compulsory and voluntary notification regimes*

One of the key differences between the compulsory and voluntary notification regimes is that, under the former, the parties have the opportunity to negotiate with the regulator before the merger is consummated, thereby avoiding costly litigation. This is the main rationale for, and the potential benefits of compulsory notification. On the other hand, the regulator would insist on the negotiated outcome at the cost to the merging parties even if there is only a small gain in social welfare. Indeed, as Proposition 2 shows, all mergers with low private benefits are negotiated under compulsory notification. Then it is straightforward to see that all parties to a merger would prefer voluntary notification to compulsory notification.

How do the benefits from compulsory notification weigh up against its costs? The main costs of compulsory notification are the costs for the regulator of reviewing each and every submission from merging parties, and the costs of notification for the merging parties. As we mentioned earlier, the available evidence suggests that significant part of these costs may be unnecessary. Under voluntary notification, large part of such costs can be avoided. For example, in the hybrid

equilibrium of Proposition 4, only  $(b_l, w_l)$ -type mergers are notified and reviewed, and the others are randomly investigated ex post. Voluntary notification certainly benefits the merging parties by alleviating their notification burden if their transactions are not likely to raise antitrust concerns. While the regulator's cost of investigating a merger ex post ( $\gamma$  in our notation) could be higher than that of reviewing a notified merger ( $\gamma'$  in our notation), the number of cases to be investigated ex post could be considerably lower than the total number of mergers, all of which have to be reviewed under compulsory notification. In the hybrid equilibrium under voluntary notification, the proportion of un-notified mergers to be investigated ex post is  $\frac{b_l \alpha + n}{b_l + f}$ .

Then, does voluntary notification increase the likelihood of litigation? In our analysis, only the parties with  $(b_h, w_l)$ -type mergers proceed with the merger, and contest the regulator's challenge in the court. Given the choice of notification, these parties will opt for no notification since, even with the regulator's investigation, the same outcome is expected, but without notification cost. All other types of mergers are either cleared or reach out-of-court settlement. In case of compulsory notification,  $(b_h, w_l)$ -type mergers are always contested in the court. Since  $(b_h, w_l)$ -type mergers are investigated with probability at most one when notification is an option, the likelihood of litigation is actually smaller under voluntary notification.

Finally, we compare social welfare and associated costs under the two notification regimes. The option of negotiation certainly opens up a potential for higher social welfare under compulsory notification. The benefits of higher social welfare come primarily from three types of mergers. First, the parties with  $(b_l, w_h)$ -type mergers choose not to notify under voluntary notification, with resulting social welfare  $w_h$ . Under compulsory notification, they choose negotiated settlement, which leads to higher social welfare. Second, the parties with  $(b_l, w_l)$ -type mergers may choose not to notify under voluntary notification. If they are not investigated ex post, then the resulting social welfare is  $w_l$ , lower than that from the negotiated settlement under compulsory notification. Third,  $(b_h, w_l)$ -type mergers are contested in the court under compulsory notification while, under voluntary notification, they will be only when they are investigated ex post. Insofar as the regulator investigates un-notified mergers with probability less than one, there is

potential welfare loss from leaving socially undesirable  $(b_h, w_l)$ -type mergers uncontested. In the end, the choice between compulsory or voluntary notification should depend on weighing the potential benefits of higher social welfare from negotiation against the costs discussed above. Needless to say, voluntary notification will dominate compulsory notification if the reduction in various costs outweighs the increase in welfare from negotiation.

To see more clearly the cost and benefit comparison of the two notification regimes, we revisit the numerical example presented in Section 3.2. We continue to set parameter values at  $c = 0.3$ ,  $\gamma = 0.05$ ,  $p = 0.19$ ,  $q = 0.95$ ,  $w_l = -2$ ,  $\pi = 0.97$ , while the remaining parameter values are set at  $\gamma' = 0.04$ ,  $b_l = 2$ ,  $n = 0.6$ ,  $\alpha = 0.5$  and, assuming treble damages,  $f = 6$ . These parameter values satisfy Assumptions 1 to 3. Given this, the unique equilibrium is the hybrid-type since  $\hat{w} = -5.52$  and  $\tilde{w} = -1.06$ , and is given by  $\sigma_l = 0.996$  and  $\sigma_r = 0.2$ . We now calculate the reduction in various costs per merger when the notification regime changes from the compulsory one to the voluntary one. First, the reduction in notification costs is  $n[pq + p(1 - q) + (1 - p)q + (1 - \sigma_l)(1 - p)(1 - q)] = 0.576$ . The first three terms inside the brackets correspond to all but  $(b_l, w_l)$ -type mergers that are not notified under voluntary notification, while the last term corresponds to  $(b_l, w_l)$ -type mergers that are notified with probability  $\sigma_l$ . Second, the reduction in the regulator's investigation costs is  $\gamma - \{\gamma'\sigma_l(1 - p)(1 - q) + \gamma\sigma_r[pq + p(1 - q) + (1 - p)q + (1 - \sigma_l)(1 - p)(1 - q)]\} = 0.038$ . The first term inside the curly brackets is the cost of investigating  $(b_l, w_l)$ -type mergers that are notified with probability  $\sigma_l$  and the remaining terms correspond to the costs of investigating un-notified mergers with probability  $\sigma_r$ . Third, the reduction in litigation costs is  $c(1 - \sigma_r)p(1 - q) = 0.002$  since  $(b_h, w_l)$ -type mergers are taken to the court with probability one under compulsory notification, but with probability  $\sigma_r$  under voluntary notification. Altogether total reduction in costs is 0.617.

Next, we calculate the reduced welfare under voluntary notification. It comes from three types of mergers. First,  $(b_l, w_l)$ -type mergers are negotiated with probability one under compulsory notification but only with probability  $\sigma_l$  under voluntary notification. Suppose an increase in welfare from negotiation is  $\delta_l$  for this type of merger. Then total welfare under compulsory notification is  $w_l + \delta_l$ . Under voluntary notification, it is notified and negotiated with probability  $\sigma_l$ , resulting

in welfare of  $w_l + \delta_l$ . When it is not notified, there are two possibilities. First, it is investigated with probability  $\sigma_r$ , in which case the merger is unravelled, leading to zero welfare. Second, if it is not investigated with probability  $1 - \sigma_r$ , the resulting welfare is  $w_l$ . In sum, total welfare from a  $(b_l, w_l)$ -type merger under voluntary notification is  $\sigma_l(w_l + \delta_l) + (1 - \sigma_l)(1 - \sigma_r)w_l$ . Thus the difference in welfare is  $(1 - \sigma_l)(\sigma_r w_l + \delta_l)$  and, since the proportion of  $(b_l, w_l)$ -type mergers is  $(1 - p)(1 - q)$ , the change in welfare is  $(1 - p)(1 - q)(1 - \sigma_l)(\sigma_r w_l + \delta_l)$ . Given  $\sigma_l = 0.996$ , this is close to zero if  $\delta_l$  is not too large. So we ignore this term. The second source of welfare loss is from  $(b_l, w_h)$ -type mergers. They are negotiated with probability one under compulsory notification but always cleared under voluntary notification with or without investigation. If an increase in social welfare from negotiation is  $\delta_h$  for this type of merger, then the reduced welfare under voluntary notification is  $\delta_h(1 - p)q$ . Finally,  $(b_h, w_l)$ -type mergers are contested in the court with probability one under compulsory notification, leading to expected welfare of  $(1 - \pi)w_l$ . Under voluntary notification, they are investigated and contested in the court with probability  $\sigma_r$ , or left uncontested with probability  $1 - \sigma_r$ . Thus expected welfare under voluntary notification for a  $(b_h, w_l)$ -type merger is  $\sigma_r(1 - \pi)w_l + (1 - \sigma_r)w_l$ , and the difference in welfare under the two notification regimes is  $-\pi(1 - \sigma_r)w_l$ . Given that the proportion of  $(b_h, w_l)$ -type mergers is  $p(1 - q)$ , the change in welfare is  $-p(1 - q)\pi(1 - \sigma_r)w_l = 0.015$ . Clearly the total welfare loss under voluntary notification relative to compulsory notification depends on the size of  $\delta_h$ . If  $\delta_h = 0.783$ , then  $\delta_h(1 - p)q = 0.602$  so that the total welfare loss under voluntary notification is 0.617, which offsets the total reduction in various costs calculated above. Therefore for all  $\delta_h \leq 0.783$ , voluntary notification dominates compulsory notification.

While the above example illustrates potential benefits of voluntary notification, the comparison of the costs and benefits is ultimately an empirical issue, which requires, among others, estimating various parameter values. Although various costs and private benefits can be reasonably estimated, we are not aware of studies that satisfactorily - or even unsatisfactorily - estimate social cost/welfare of merger, let alone the change in social cost/welfare from negotiation. The latter is likely to be due to the paucity of jurisdictions with voluntary merger notification. In the next section, we offer some exploratory empirical results from Australia

where merger notification is voluntary.

## 4. Empirical Analysis

### 4.1. Empirical implications and prior studies

In the previous section, we have characterized equilibrium outcomes from the two notification regimes. In case of voluntary notification, we have also identified conditions under which the hybrid equilibrium exists. In view of reality, we focus on the hybrid equilibrium. Then our main theoretical results are summarized in Table 1.

— **Table 1 goes about here.** —

Table 1 leads to the following implications. First, only the mergers with small private benefits and low social welfare are notified, and subsequently settled into negotiated outcomes. No other types of mergers are notified. Among these, mergers with high social welfare are cleared after investigation, and those with large private benefits but low social welfare are challenged by the regulator and contested in the court. Second, mergers that are not notified are investigated with a positive probability, which increases in the cost of notification and decreases in the penalty for antitrust infringement. Third, mergers with large private benefits are either cleared or contested in the court under compulsory notification. Fourth, voluntary notification does not lead to more litigation than compulsory notification.

To test whether our predictions have empirical support, we need to measure the three primary components of our model. These are private benefits to merging parties, costs (both notification and investigative), and social benefits. There is an extensive literature that estimates benefits to merging parties.<sup>(21)</sup> This literature essentially relies on the traditional event-study methodology to estimate abnormal returns - which are considered equivalent to private benefits - to merging parties

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<sup>(21)</sup> See, for example, Eckbo (1992), Brady and Feinberg (2000), Aktas et al. (2004), Fee and Thomas (2004), and Shahrur (2005).

around announcement dates and on the announcement of regulatory challenges. As indicated in Bruner (2002), bulk of this evidence indicates statistically significant positive returns to targets, whereas bidders typically experience small negative returns on merger announcement. The combined abnormal returns are typically positive, although much of the gain is limited to target shareholders.

Measuring a merger's associated notification and enforcement costs and social benefits proves to be more elusive. As mentioned earlier, a study commissioned by International Competition Network has estimated average notification costs over multiple jurisdictions to be as much as 3.28 million euros. As several fee-charging jurisdictions do so to recover the cost of merger review,<sup>(22)</sup> this estimate may be considered a proxy for enforcement costs as well. Social benefits can comprise effects on all other parties including customers, suppliers, and rivals. In a study of anti-trust challenge of steel companies' merger in 1901, Mullins et al. (1995) find that railroads (who were major customers of steel mills) experienced positive abnormal returns, suggesting that proposed merger would have resulted in negative social benefit. Ivaldi and Verboven (2005) explore use of simulation to assess anti-competitive effects of Volvo-Scania merger that was proposed in 1999 but disallowed by the European Commission. Finally, recent studies by Shahrur (2005) and Fee and Thomas (2004) present results that imply that overall effects of mergers on other parties are ambiguous. Notably, neither of the two studies directly measures social benefits per se, focus only on limited samples of horizontal takeovers, and use input-output tables to identify the other parties.

#### *4.2. Data & Results*

In light of the preceding discussion, the issues related to measurement of costs and social benefits of mergers remain largely unresolved. Therefore in what follows we only conduct analyses that measure private benefits to the merging parties. Our primary unit of analysis is solely whether or not firms choose to notify the regulator of an impending merger. As observed by Aktas et al. (2004), if markets are informationally efficient, then announcement returns must incorporate the likelihood

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<sup>(22)</sup> See Merger Notification Filing Fees, April 2005. Available at International Competition Network ([www.internationalcompetitionnetwork.org](http://www.internationalcompetitionnetwork.org).)

of regulatory response to the proposal. In Australia, the regulatory response itself may be conditioned on the choice exercised by the parties.<sup>(23)</sup> Further, announcement returns may also be influenced by other relevant factors that may need to be controlled for.<sup>(24)</sup> As we are unable to isolate the effects of merger-related costs and the regulatory factors on announcement returns, our empirical results must be interpreted in view of these observations and may be considered as indicative only. Nevertheless, our results do suggest that the voluntary notification regime in Australia leads to the results similar to what have been obtained in other studies where notification is compulsory.

We begin with a sample of mergers used by Shekhar and Williams (2004). They compile a sample of 850 mergers between January 1996 and June 2002 from the ACCC's public register. To conduct an event study to measure private benefits of mergers, we collect price data from SIRCA for all sample companies that are publicly traded in Australia.<sup>(25)</sup> We also note the event date as the earliest date a merger proposal can be identified publicly. The final sample consists of 126 self-reported transactions and 44 transactions reported by other sources. Table 2 reports the summary statistics.

— **Table 2 goes about here.** —

Table 2 shows that notified mergers are more likely to be objected to by the ACCC, but also more likely to proceed to completion after negotiation. It also shows that a significant number of mergers (36%) are not notified, indicating significant possible savings in notification costs.<sup>(26)</sup> A majority of mergers that are not notified and investigated ex post are not objected to by the ACCC. Finally a small number of un-notified mergers reach negotiated settlements. These

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<sup>(23)</sup> This further encompasses other consequences associated with the choice such as notification costs, delays in achieving regulatory approval, litigation costs involved in challenging regulatory decisions, etc.

<sup>(24)</sup> Bruner (2002) provides a detailed survey of studies that have analyzed these “deal-specific” factors such as form of the offer, business overlap etc.

<sup>(25)</sup> Similar to issues faced by Aktas et al. (2004), a large number of mergers in the original sample involve either a merger between private parties or firms with no readily available price data. Several mergers involve a foreign acquirer, and others involve foreign parents who own privately-held subsidiaries that operate in Australia.

<sup>(26)</sup> Shekhar and Williams (2004) also report that notified mergers take longer to complete. Average delay to completion is 72 days for notified mergers and 66 days for un-notified mergers.

are mergers that are not notified initially but investigated by the ACCC before completion.

Consistent with previous literature, we treat merger-related abnormal returns to be appropriate proxies for private benefits to the firms involved. To estimate the private benefits, we estimate the market model for all companies and calculate the abnormal returns around the event date. The abnormal return is defined as the difference between the actual return and the estimated return as

$$AR_{it} = \tilde{R}_{it} - [\alpha_i + \beta_i R_{mt} + \epsilon_{it}] \quad (5)$$

where company  $i$ 's equilibrium return at time  $t$ , is described as a function of a constant  $\alpha_i$ , the corresponding market returns  $R_{mt}$ , and an error term  $\epsilon_{it}$ . We used the daily return on the All Ordinaries Accumulated Index as the proxy for the market return. The market model is estimated for each firm by using daily returns for a period of approximately 255 days and stopping 15 days before the event date.<sup>(27)</sup>

The results for cumulative average abnormal returns (CAARs) for various intervals around the event date are reported in Table 3. In the table, returns are computed for 148 notifying firms and 50 non-notifying firms for which price data are available. The reported portfolio CAARs are computed by using equally weighted abnormal returns for firms as computed from the market model. Panel A of Table 3 is based on the full sample, and Panels B and C are based on sub-samples.<sup>(28)</sup>

As noted earlier, current literature provides little guidance in how merger-related costs and welfare benefits may be measured. Abstracting away from these

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<sup>(27)</sup> Stopping 15 days before the event date ensures that the equilibrium returns model is not contaminated by unusual price movements due to rumors, information leakage, and so on, which are related to the impending merger announcement.

<sup>(28)</sup> We also re-ran the tests reported in Table 3 using three different weighting schemes as follows. First, we used weights estimated by using the constituent firms' end-of-month market value of equity, measured approximately three months before the event date. Second, we used weights based on the inverse of the measured standard deviation of firm raw returns, where returns are calculated over the estimation period. Third, we used weights based on the inverse of the measured standard deviation of residuals for firm returns, where residuals are calculated over the estimation period. In all three cases, inferences pertaining to differences in average returns (for each pair of sub-samples) remain unchanged. The details are available upon request from the authors. However, we note that, in short-horizon event studies such as ours, standardizing abnormal returns typically makes little difference to the test statistic (Brown and Warner (1985), Kothari and Warner (2007)).

issues, our primary interest therefore lies in testing whether the perceived private benefits due to the merger are indeed different for firms in light of their reporting choice. In Panel A, we report average returns for all notified and un-notified mergers. Although all returns are positive, there is no statistically significant difference between mean returns of the two portfolios, suggesting that on average, neither of the two groups is better or worse off by choosing alternative notification method. In other words, estimated private benefits from proposed mergers are similar across the two sub-samples. For our sample, returns to notified mergers are conditioned by increased likelihood of regulatory objection and of a negotiated settlement. Returns to un-notified mergers are also subject to similar concerns, albeit with lower likelihood but conditioned on lower likelihood of reaching a settlement.

— **Table 3 goes about here.** —

In Panel B, we report the abnormal returns for firms in the two groups conditioned on the ACCC raising no objection to the proposal. As shown previously in Table 2, and consistent with full sample results in Shekhar and Williams (2004), a larger proportion of sample firms involved in un-notified mergers do not face regulatory objections. All returns are positive and statistically significant over all intervals, but of interest to us is the difference between returns for the two sub-samples. Parametric *t*-tests indicate no difference, although non-parametric tests suggest that un-notified mergers experience higher abnormal returns over the longest interval. This is consistent with our theoretical findings: the parties that choose no notification have private benefits at least as large as those of the parties that choose notification. Another possible interpretation is that lower returns for notified group may be attributed to both the notification costs already incurred and to the delay in merger completion as parties must now wait for the ACCC's clearance before consummation. As a vast majority of notified mergers are eventually cleared, a greater proportion of notifying firms could consider the other alternative available if they are reasonably confident that their transactions are not likely to raise antitrust concerns.

In Panel C, we report the abnormal returns for objected mergers. Notified and objected mergers experience positive abnormal returns, and these results are somewhat consistent with those reported for compulsory notification regimes in

Europe and US, as both Aktas et al.(2004) and Fee and Thomas (2004) report strong positive returns for objected mergers in their respective samples. In general, these positive returns are consistent with the notion that a negotiated settlement with regulator is likely. The one un-notified, objected merger in our sample exhibits negative returns, a result that is contrary to our theoretical predictions: mergers that are not notified but challenged have high private benefits and low social welfare. However the sample size in Panel C precludes even a basic statistical test for the difference in mean returns.

## 5. Summary and Conclusion

In this paper, we have compared the prevailing system of compulsory pre-merger notification with the Australian system of voluntary pre-merger notification. Under voluntary notification, we have shown that, for a non-trivial set of parameter values, a perfect Bayesian equilibrium exists in mixed strategies in which the regulator investigates un-notified mergers with probability less than one and all mergers are divided into three groups: only those with small private benefits and low social welfare are notified and settled into negotiated outcomes; those with high social welfare are not notified and, even if investigated ex post by the regulator, cleared; those with large private benefits and low social welfare are not notified and, when investigated ex post by the regulator, challenged at the court. These outcomes are similar to those when notification is compulsory. The main difference is that, under compulsory notification, all mergers with small private benefits are settled into negotiated outcomes. On the other hand, voluntary notification leads to substantial savings in the enforcement costs for the regulator and the notification costs for the merging parties. Moreover, voluntary notification does not lead to more litigation than compulsory notification. Therefore the choice of compulsory or voluntary notification should depend on weighing the potential benefits of higher social welfare from negotiation against the reduction in various costs related to enforcement, notification, and litigation.

We have also conducted exploratory tests of our empirical implications for merger data from Australia where there is no legal requirement for pre-merger notification. Previously reported results support our contention that notified mergers

are more likely to enter into negotiated outcomes. Estimation of private benefits to parties via abnormal market returns indicates that there is no significant difference between notified and un-notified mergers. It is also found that, for mergers that are not objected to by the ACCC, notifying parties experience lower abnormal returns than those that choose not to notify. Although the empirical results are not unambiguous since a vast majority of notified mergers are cleared eventually, the difference may be attributed to both notification costs and the delay in waiting for clearance from the ACCC. At least some of these firms could avoid these costs by not notifying and just proceeding with the merger. It is also possible that firms feel compelled to notify - play it safe - as the ACCC's antitrust guidelines are not clear and their implementation is not yet deeply rooted in precedence. However, notification does not guarantee a negotiated settlement, although instances of litigation are rare.

To have a more accurate assessment of the voluntary notification vis-à-vis the compulsory notification regimes, more work needs to be done to incorporate the measures of social welfare, enforcement costs for the regulator, and notification-related costs for the parties. However, our theoretical predictions, empirical findings on the market reaction, the rarity of litigation or contentious mergers that went ahead without notification, all seem to suggest that the voluntary notification system in Australia may achieve objectives similar to those of a compulsory notification system at lower overall costs to all the involved parties.

#### **Appendix: Proof of Proposition 4**

We divide the solution to the regulator's problem (4) into three cases.

(Case 1):  $\mu_{hl} > \hat{\mu}$ . Then  $\sigma_r = 1$ , which implies  $\sigma_l = 1$  from (2). Then from (1), we have  $\mu_{hl} = \frac{p(1-q)}{p+q-pq}$ ,  $\mu_{ll} = 0$  and, therefore,  $\hat{\mu} = -\frac{\gamma}{\pi w_l + c}$ . Thus  $\mu_{hl} > \hat{\mu}$  is equivalent to  $w_l < -\frac{p(1-q)c + (p+q-pq)\gamma}{\pi p(1-q)} \equiv \hat{w}$ . In sum, if  $w_l < \hat{w}$ , then an equilibrium exists where  $\sigma_l = \sigma_r = 1$  and the regulator's beliefs are as in (1) given  $\sigma_l = 1$ .

(Case 2):  $\mu_{hl} = \hat{\mu}$ . Then  $\sigma_r \in [0, 1]$ . We divide this case further into three cases based on (2), the parties' notification decision.

(Case 2-1):  $\sigma_r > \frac{b_l \alpha + n}{b_l + f}$ . Then  $\sigma_l = 1$  and the regulator's beliefs are the same as in (Case 1), and  $\mu_{hl} = \hat{\mu}$  implies  $w_l = \hat{w}$ . Therefore, if  $w_l = \hat{w}$ , then an equilibrium exists where  $\sigma_l = 1$ ,  $\frac{b_l \alpha + n}{b_l + f} < \sigma_r \leq 1$ , and the regulator's beliefs are as in (1) given  $\sigma_l = 1$ .

(Case 2-2):  $\sigma_r = \frac{b_l \alpha + n}{b_l + f}$ . Then  $\sigma_l \in [0, 1]$  and the regulator's beliefs are as in (1). Solving  $\mu_{hl} = \hat{\mu}$  for  $\sigma_l$  leads us to  $\sigma_l = 1 + \frac{p(1-q)(\pi w_l + c + \gamma) + q\gamma}{(1-p)(1-q)(w_l + \gamma)}$ . Since  $\sigma_l \in [0, 1]$ , we must have  $\frac{p(1-q)(\pi w_l + c + \gamma) + q\gamma}{(1-p)(1-q)(w_l + \gamma)} \in [-1, 0]$ . Solving the inequalities gives us  $w_l \in [\hat{w}, \tilde{w}]$  where  $\hat{w}$  is as defined in (Case 1) and  $\tilde{w} \equiv -\frac{p(1-q)c + \gamma}{(1-q)(1-p + p\pi)}$ . It remains to show  $\hat{w} < \tilde{w}$  so that  $[\hat{w}, \tilde{w}]$  is not empty. For this, direct calculation leads to  $\pi p(1-q)(1-p + p\pi)(\tilde{w} - \hat{w}) = p(1-p)(1-q)c + \gamma(1-p)[p(1-\pi) + q(1-p + p\pi)] > 0$ . In sum, if  $\hat{w} \leq w_l \leq \tilde{w}$ , then an equilibrium exists where  $\sigma_l = 1 + \frac{p(1-q)(\pi w_l + c + \gamma) + q\gamma}{(1-p)(1-q)(w_l + \gamma)}$ ,  $\sigma_r = \frac{b_l \alpha + n}{b_l + f}$ , and the regulator's beliefs are as in (1) given the above  $\sigma_l$ .

(Case 2-3):  $\sigma_r < \frac{b_l \alpha + n}{b_l + f}$ . Then  $\sigma_l = 0$  and the regulator's beliefs are equal to its prior. In this case, we have  $\mu_{hl} = \hat{\mu}$  if  $w_l = \tilde{w}$ . Therefore, if  $w_l = \tilde{w}$ , then an equilibrium exists where  $\sigma_l = 0$ ,  $0 \leq \sigma_r < \frac{b_l \alpha + n}{b_l + f}$ , and the regulator's beliefs are as in (1) given  $\sigma_l = 0$ .

(Case 3):  $\mu_{hl} < \hat{\mu}$ . Then  $\sigma_r = 0$ , which implies  $\sigma_l = 0$  from (2). Then the regulator's beliefs are again equal to its prior. Given this, it is easy to show  $\mu_{hl} < \hat{\mu}$  if  $w_l > \hat{w}_l$ . Therefore, if  $w_l > \tilde{w}$ , then an equilibrium exists where  $\sigma_l = \sigma_r = 0$  and the regulator's beliefs are as in (1) given  $\sigma_l = 0$ . ■

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Figure 1 - Extensive Form of the Australian Regulatory Game

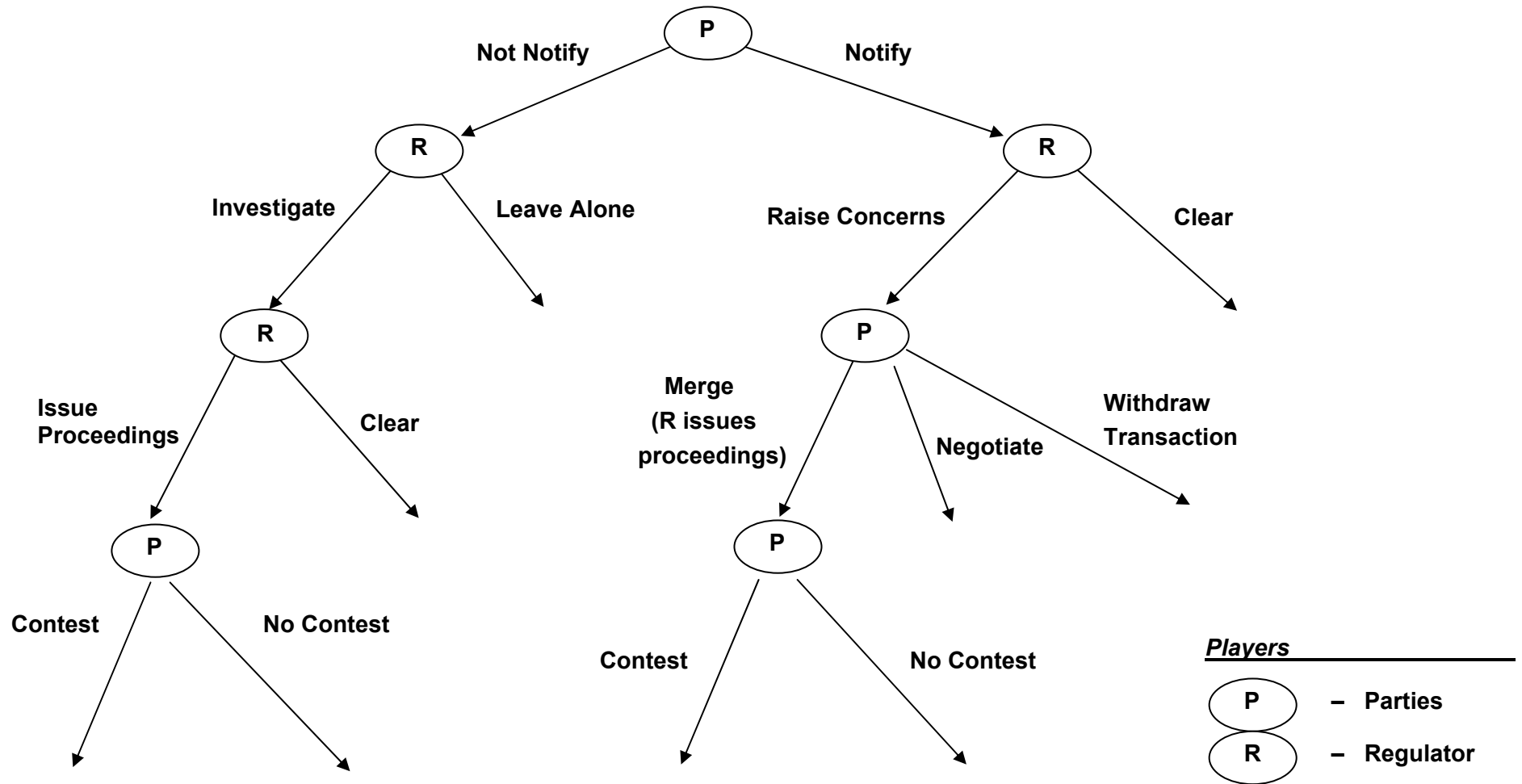
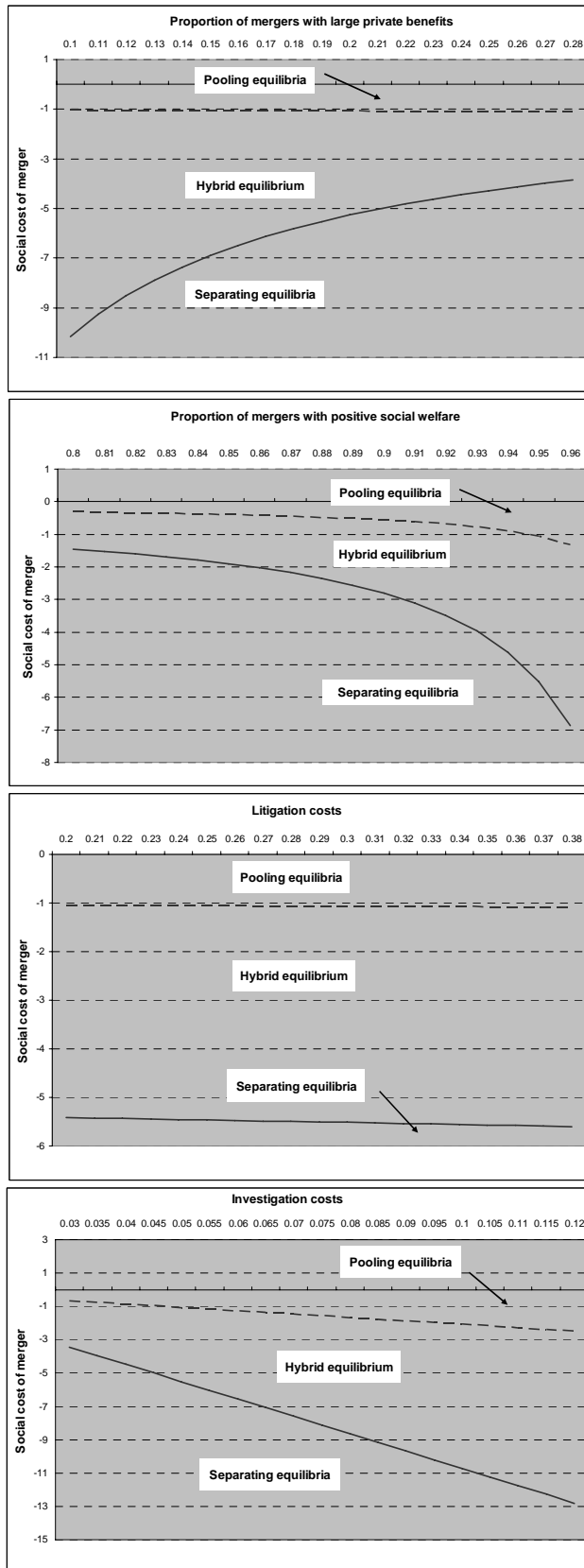


Figure 2 – Equilibria under voluntary notification



**Table 1: Outcomes under Two Notification Regimes**

	Compulsory notification (Proposition 2)	Voluntary notification (Proposition 4)
$(b_l, w_l)$	negotiation	notification/negotiation or no notification/no defense
$(b_l, w_h)$	negotiation	no notification/clear
$(b_h, w_l)$	court challenge	no notification/court challenge
$(b_h, w_h)$	clear	no notification/clear

**Table 2** – Summary statistics of merger proposals considered (and decided upon) by the ACCC over the period of January 1996 – June 2002. Data are collected from information disclosed on the ACCC public register. The proposals are classified according to the identity of the notifying party. The companies proposing the merger must be one of the notifying parties for the transaction to be classified under “Initiated by Parties”. If notification is received from sources other than the companies in question, the proposal is classified as “Initiated by Others”. Mergers are classified as Objected if the ACCC raised concerns, and Not Objected otherwise. Panel A is for the full sample whereas Panel B reports the summary statistics for transactions where stock price data are available for at least one of the merging firms and the firm is listed in Australia.

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*Panel A - All Merger Proposals*

	<u>N</u>	<u>Not Objected</u>	<u>Objected</u>	<u>Renegotiated</u>	<u>Withdrawn</u>
Initiated by Parties	547	499 (91.22%)	48 (8.77%)	35 (6.39%)	13 (2.37%)
Initiated by Others	303	295 (97.35%)	8 (2.64%)	2 (0.66%)	6 (1.98%)

*Panel B - Merger Proposals by firms with price data available*

	<u>N</u>	<u>Not Objected</u>	<u>Objected</u>	<u>Renegotiated</u>	<u>Withdrawn</u>
Initiated by Parties	126	102 (81%)	24 (19%)	17 (13.49%)	7 (5.55%)
Initiated by Others	44	43 (97.72%)	1 (2.27%)	0 (0%)	1 (2.27%)

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Panel A is based on summary statistics presented in Shekhar and Williams (2004).

**Table 3** – Cumulative average abnormal returns around the event date for equally weighted portfolios of all firms. Portfolios consist of all firms (acquirers and targets) for whom price data is available. Notified consists of all firms that notify ACCC of their merger plans, whereas Not Notified consists of firms that do not. If ACCC raises concerns, mergers are classified as Objected, Not objected otherwise. Abnormal returns are the residuals of the market model, which is estimated using up to one year’s returns prior to event date. Returns significantly different from zero are *italicized*. Test statistics for difference of means (t-statistics for parametric test and z-statistic for Wilcoxon rank test) are also reported. \*, \*\*, and \*\*\* denote statistical significance at 10%, 5%, and 1% levels respectively.

**Panel A - Notified vs. Not Notified mergers, all firms**

Interval	(-1, 1)	(-1, 0)	(0, 0)	(0, 1)	(-2, 2)
Notified (N=148)	4.83%	2.7%	2.44%	4.55%	5.32%
Not Notified (N=50)	5.32%	5.08%	3.65%	3.84%	7.57%
<i>t-statistic</i>	0.26	1.48	0.9	-0.44	1.06
<i>z-statistic</i>	0.24	1.46	0.48	-0.124	0.897

**Panel B - Notified vs. Not Notified mergers, not objected mergers only**

Interval	(-1, 1)	(-1, 0)	(0, 0)	(0, 1)	(-2, 2)
Notified (N=120)	3.75%	2.75%	2.58%	3.51%	4.12%
Not Notified (N=49)	5.59%	5.32%	3.85%	4.07%	7.88%
<i>t-statistic</i>	-0.98	-1.55	-0.91	-0.34	-1.75
<i>z-statistic</i>	1.05	1.89*	0.824	0.594	1.716*

**Panel C - Notified vs. Not Notified mergers, objected mergers only**

Interval	(-1, 1)	(-1, 0)	(0, 0)	(0, 1)	(-2, 2)
Notified (N=28)	9.34%	2.435%	1.67%	9.015%	10.39%
Not Notified (N=1)	-8.24%	-7.0%	-6.23%	-7.48%	-7.81%
<i>t-statistic</i>	-	-	-	-	-
<i>z-statistic</i>	-1.61	-1.58	-1.576	-1.6	-1.61