

Corporate Leniency Programs and the Role of the Antitrust Authority in Detecting Collusion*

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Abstract

The design, implementation, and measurement of corporate leniency programs are examined with a focus on how these programs impact the discovery and penalization of cartels. This is followed with a broader discussion of detection by considering other ways in which an antitrust authority can play an active role in this critical first stage to fighting cartels.

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1 Introduction

It is a momentous time for the Fair Trade Commission of Japan (JFTC) in its battle against cartels. As of January 2006, the Japanese Antimonopoly Act went into effect which introduced a corporate leniency program and increased the severity of financial penalties for price-fixing, bid-rigging, and other collusive practices. The JFTC has been given significant instruments to reduce the extent of collusion in the Japanese economy.

In thinking about the battle against cartels, there are three essential stages. Cartels must be discovered, discovered cartels must be successfully prosecuted, and successfully prosecuted cartels must be penalized. Operating effectively in all three stages is crucial to disrupting existing cartels and deterring new cartels from forming. What has been the role of the antitrust authority with respect to these three tasks? In most countries, the antitrust authority has the exclusive power to penalize cartels. Typically, this is restricted to monetary penalties imposed on the corporation though a few countries allow for individual penalties including fines and even prison sentences. The U.S. is one of those few - along with Canada and, quite recently, the United Kingdom - and is also relatively unique in that penalties may also be imposed by non-government parties. Through private litigation, the customers of cartels can gain compensation for the damages inflicted and this is a significant source of financial retribution. Turning to the prosecution stage, the antitrust authority is once again the exclusive player in most countries with the exception of those countries that allow for private damage suits and, even there, the antitrust authority often plays a dominant role in getting a guilty plea or verdict. In sum, it is fair to say that the antitrust authority is the primary if not the exclusive source of prosecution and penalization.

It is a very different story, however, when it comes to the discovery of cartels. Here, the antitrust authority has historically played a minimal role. As is reflected in this statement from the early 1990s, the U.S. Department of Justice (DOJ) was a passive agent responding to complaints:

As a general rule, the [Antitrust] Division follows leads generated by disgruntled employees, unhappy customers, or witnesses from ongoing investigations. As such, it is very much a reactive agency with respect to the search for criminal antitrust violations. ... Customers, especially federal, state, and local procurement agencies, play a role in identifying suspicious pricing, bid, or shipment patterns. [McAnney, 1991, pp. 529, 530]

Going farther back in time, a classic study by Hay and Kelley (1974) examined DOJ price-fixing cases over the period of 1963 to 1972 and attributed only two out of 49 cases to an investigation by the Antitrust Division.

Table 1 (Hay and Kelley, 1974)

METHOD OF DETECTION IN 49 CASES^a

Method	Number of Cases
Grand Jury investigation in another case	12
Complaint by a competitor	10
Complaint by a customer	7
Complaint by Local, State or Federal Agency	6
Complaint by current or former employees	3
Complaint by Trade Association Official	2
Investigation of conduct or performance initiated by Antitrust Division	2
Newspaper account	2
Referred to Antitrust Division by the Federal Trade Commission	2
Complaint by anonymous informant	1
Merger investigation	1
Private suit	1
Total	49

^a This information was not available for the remainder of the cases in the sample.

Sources of detection were more commonly due to customer complaints (which includes government agencies in their procurement capacity), competitors (who are not party to the cartel and may feel they are being mistreated by the cartel), and incidental discovery because of another government investigation.¹

Though today it is still the case that the antitrust authority is not the primary agent in the discovery of cartels, it is most definitely playing a more active role than in

¹As reported by Aki Matsui, the Fair Trade Commission of Japan was much more effective during this time period in detecting cartels.

the past. A few years ago, Gary Spratling, who at the time was the Deputy Assistant Attorney General of the Antitrust Division, noted (Spratling, 2001):

... the Department of Justice's Antitrust Division ... has proactive efforts underway to detect international cartels. The proactive efforts are a targeted and focused undertaking, directed at markets in industries where the Division has information that collusion has occurred or where the Division has had leads or prosecution in adjacent industries.

This more active role can be traced to the revision of the Corporate Leniency Program in 1993. This program provides a tool with which the antitrust authority can be a more active participant in the detection of cartels.

In this paper, I'd like to discuss the antitrust authority as an active agent in the detection of collusion. It is comprised of two parts. First, I will explore corporate leniency programs by considering their design, implementation, and measurement. Here, I will be concerned not just with detection but also what it means with regards to penalization. Second, I will broaden the discussion of detection by considering other ways in which an antitrust authority can play an active role in this critical first stage to fighting cartels. Leniency programs are one way for an antitrust authority to generate cases but it is not the only avenue. In spite of the successes of the amnesty program in the U.S., cartels keep forming which means policies are still not sufficiently effective and aggressive. Hence, there remains a need for further policy improvements.

2 Design of a Corporate Leniency Program

When it comes to the design of a corporate leniency program, one wants to keep in mind the four ways in which a policy can fight collusion. First, it can help prosecute cartels by bringing forth evidence and thus making conviction more likely. Second, it can help detect cartels. Third, it can cause the desistance of cartels by making them less stable and thus more likely to collapse on their own. And, fourth, it

can deter cartel formation by making them less profitable. Thus, in designing a corporate leniency program, one wants to think about how it can help prosecute, detect, destabilize, and deter cartels.

My approach to discussing some design issues is to engage in a comparative analysis of the programs of Japan, the European Union (E.U.), and the United States (U.S.). To a large extent, policies vary in how they answer the following two questions. First, what are the criteria to be accepted into a leniency program? This deals with: i) the stage of the investigative process at which leniency can be received; ii) the number of firms that can receive leniency; and iii) restrictions on eligibility based on behavior during collusion (for example, whether the initiator of collusion is eligible). Second, to what extent are penalties waived when leniency is received?

2.1 Overview of Corporate Leniency Programs

In succinctly describing how these three government entities answer these questions, Table 2 depicts the fraction of government fines that are waived according to the order of a firm's application with respect to other firms and whether or not an investigation had been launched by the antitrust authority.²

Table 2 - Corporate Leniency Programs

		Amount of Leniency - Japan			
		Order			
		First	Second	Third	Fourth
Stage	Before Investigation	100%	50%	30%	0
	After Investigation	30%	30%	30%	0

		Amount of Leniency - E.U.			
		Order			
		First	Second	Third	Fourth
Stage	Before Investigation	100%	30-50%	20-30%	$\leq 20\%$
	After Investigation	30-100%	20-30%	$\leq 20\%$	$\leq 20\%$

²Of course, the process is much more complicated than this, for example, not all applications are accepted as it depends on providing adequate evidence and cooperating fully.

Amount of Leniency - U.S.

Order

		First	Second	Third	Fourth
Stage	Before Investigation	100%	0 [†]	0 [†]	0 [†]
	After Investigation	100%	0 [†]	0 [†]	0 [†]

[†]Officially, only one firm can receive a reduction in fines though, due to plea bargaining, other firms can receive a reduction in exchange for a guilty plea.

The U.S. program, which was initiated in 1978 but then substantially revised in 1993, is comprised of two sections. Section A applies when, at the time of the application, the Antitrust Division had no previous knowledge of collusion. Under Section A, the awarding of leniency is automatic and full. This means that all corporate and individual penalties (imposed by the government) are waived. The corporation is still liable for customer damages which, if a firm is found guilty, the court is mandated to triple. In practice, most cases are settled out of court and single damages are typical (Lande, 1991). In fact, for international cartels since 1990, Connor (2004) calculates private and public recovery in the U.S. was only 115% of actual damages. Historically, government fines have been minor compared to damages though have recently become much more substantial due to the 1991 revision of the Federal Sentencing Guidelines. And yet more recently, the Antitrust Criminal Penalty Enforcement and Reform Act of 2004 expanded leniency in that a firm is now only liable for single, rather than the usual treble, damages and those cartel members that did not receive leniency are liable for double damages for the firm that received leniency. Hence, the difference between having and not having leniency has been accentuated with partial liability for damages being shifted from the former to the latter. Under Section B of the corporate leniency program, full leniency can still be awarded even after an investigation has begun if the Antitrust Division is lacking sufficient evidence that is likely to result in a sustainable conviction and the firm provides evidence that significantly advances the government's case. In conclusion, there are two features of the U.S. program that are worth highlighting. First, leniency can be received either before or after an investigation. Second, leniency can be received only by the first firm to come

forward. As written down, leniency is then all or nothing and can only be received by one firm. However, as is elaborated upon later, implicitly partial leniency is available through plea bargaining.

The E.U., which initiated its policy in 1996 and then made important revisions in 2002, similarly has two sections.³ If a firm is accepted under Section A, it is then said to receive "immunity" and all fines are waived. Admittance under Section A requires that a firm is the first to provide evidence that allows the European Commission to start an investigation or, if an investigation is already in progress, is the first to provide evidence that enables them to find an infringement. Otherwise, Section B applies - which is referred to as providing "leniency" - and, in particular, is relevant when another firm has already been awarded immunity. A firm receives leniency under Section B if it delivers evidence representing "significant added value." The first firm awarded leniency (under Section B) receives a reduction in fines of 30-50%, the second firm a reduction of 20-30%, and subsequent firms no more than 20%. To be assured of having all fines waived, a firm must be the first firm to come forward and it must be prior to an investigation. Though full leniency can be received after an investigation, it is not assured. Partial leniency can be received either before or after an investigation and even if other firms have already received it.

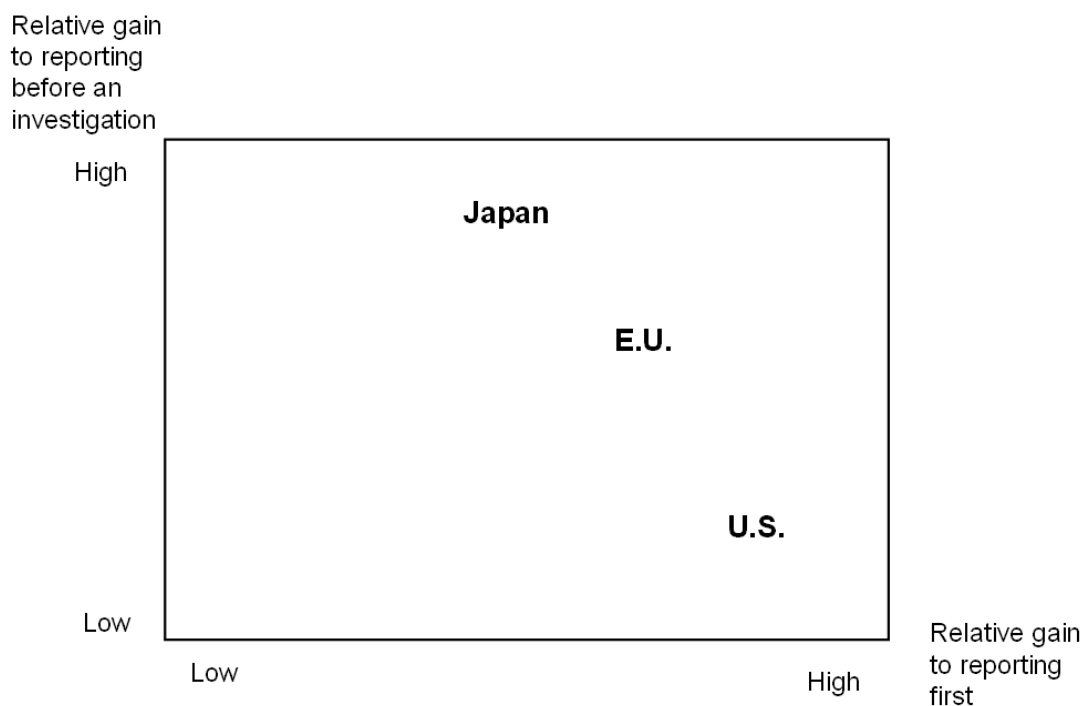
Compared to the previous two programs, the corporate leniency program in Japan most starkly distinguishes between a firm applying before and after an investigation. If an investigation by the Fair Trade Commission of Japan (JFTC) has not been launched, the first firm to be awarded leniency has all penalties waived. As many as two other firms can receive partial leniency. If, however, an investigation has begun then as many as three firms can receive leniency, but it is necessarily partial and does not discriminate between when a firm comes forward as each firm has 30% of their fines waived. In contrast to both the U.S. and the E.U., full leniency requires not only being the first to apply but also the application being received prior to an investigation. Partial leniency can be received either before or after an investigation

³A detailed review of E.U. policy with regards to fining and the use of the leniency program is provided in Gerardin and Henry (2005).

and even if other firms have received it.

Figure 1 summarizes this comparison as it identifies the position of these leniency programs with respect to the relative gain to reporting first and the relative gain to reporting before an investigation. The U.S. accentuates the former by only offering leniency to one firm (though let us not forget about plea bargaining) but moderates the latter by allowing full leniency to be awarded even after an investigation. In contrast, Japan moderates the relative gain from reporting first by allowing for partial leniency but accentuates the appeal to applying for leniency before an investigation begun which can be as great as the difference between having all fines waived and only 30% of fines waived. The E.U. lies somewhere in the middle.

Figure 1: Comparison of Corporate Leniency Programs



2.2 An Exploration into the Incentives to Apply for Leniency

The objective is to discuss how different policy designs might influence the incentives of firms to use the program and to what extent it enhances the discovery and penal-

ization of cartels. Starting with Motta and Polo (2003), there has recently been a growing body of work that theoretically models the impact of various leniency programs on the incentives of firms to collude and to apply for leniency. Rather than review that work, which is already nicely done in Spagnolo (2006), I will approach the matter from a different and more informal perspective. However, it is clear that some of my points draw on insight provided by that literature.

In examining the calculus of a cartel member regarding whether or not to apply for leniency, it is critical to identify the firm's primary alternative. If it does not apply, will the cartel be discovered? Is it that another firm will come forward? Is it that the antitrust authority will launch an investigation? Ideally, policy wants to increase the payoff to a firm from coming forward relative to its payoff if it does not and the latter depends on what the firm perceives to be the likely outcome if it chooses not to apply for leniency. What the calculus is apt to look like might then well vary according to the particular situation.

In evaluating the relative merits of these different programs - and other ones that one might consider - I will consider how incentives are affected in three scenarios. The first scenario I refer to as the No Knowledge phase which is when the antitrust authority has no knowledge that there is a cartel (and let us suppose the cartel members are cognizant of that) and thus there is no investigation. The probability of conviction is probably quite low in the absence of a firm using a corporate leniency program. The second scenario, which I refer to as the Pre-Investigation phase, is when the antitrust authority has knowledge or at least some suspicions that there is a cartel (and let us suppose the cartel members are aware of these suspicions) but there is not yet an investigation. The probability of conviction is probably not low but still modest. The third and final scenario is the Investigation phase and is when the antitrust authority has begun an investigation and thus necessarily suspects there is a cartel. The probability of conviction at that point is probably moderate but could be quite high.

Prior to considering each of these three scenarios, let me briefly describe one theoretical construct that will be useful for framing some of the discussion. In many

cases, the situation faced by cartel members is apt to be represented by what game theorists call a Coordination Game. In this game, each firm is contemplating whether or not to apply for leniency and there are at least two solutions (or equilibria) to it. One solution is for all firms to not apply for leniency in the hope that the government will not discover collusion or, if they have discovered it, their case will fail.⁴ To the dismay of the cartel members but the delight of the antitrust authority, there is always another solution in which firms race to report to the antitrust authority because each thinks one or more other firms intend to do so. If a firm expects some firm to receive leniency, it'll prefer that it be the one to get it and thus will try to preempt other firms. It is when there are multiple equilibria of this sort - one in which no firm reports to the antitrust authority and one in which firms race to report - that makes this a Coordination Game. If firms are at the "no report" equilibrium then a challenge of policy is to shift firms to the "race to report" equilibrium. Furthermore, when this situation is dynamic - as it surely is in reality - these incentives result in a waiting game among firms as each holds off applying in the hope that other firms will do the same but, upon recognition that it is imminent that another firm will report, a firm is ready to jump in and apply for leniency itself. DOJ officials like to refer to the latter as a "race to the courthouse" but it is important to recognize that it is preceded by this waiting game and the transition from "waiting" to "racing" is endogenous and, quite critically, can be influenced by the activities on the antitrust authority.

2.2.1 The No Knowledge Phase

This is obviously the pertinent phase when one thinks about leniency programs as a tool for discovering cartels, as distinct from helping to achieve a conviction. In considering the incentive effects of a leniency program, we are immediately faced with a puzzle: Why would a cartel member come forward and apply for leniency when the antitrust authority doesn't even suspect collusion? Given that firms chose

⁴If that is not an equilibrium - so that a firm would prefer to apply for leniency given all other firms do not - then the game faced by firms is described as a Prisoners' Dilemma and the only equilibrium is the one that is described next.

to form a cartel and presumably have been effectively colluding, what has changed to induce one of them to discontinue collusion and apply for leniency? Understanding the incentives of a firm in such a situation is critical to developing an appropriate policy for inducing spontaneous reporting.

Several events come to mind that might induce a cartel member to defect and inform the authorities of the cartel's existence in exchange for penalties being waived. A firm might experience a change in management (from those who had previously engaged in collusion) and the new management's assessment is that collusion is not the right strategy. This could be because they determine it is unprofitable for the firm - the increase in profit doesn't exceed the expected penalties - or they want to ensure that the previous management is assigned the liability of collusion as reflected in the accumulated penalties.

A second possibility is that collusion did not involve the highest level of management and collusion by these lower level managers has been discovered internally. If managers' compensation is contingent on performance, it may be in the best interests of these managers to collude with their counterparts at competing firms so as to improve their division's profit. However, the interests of the manager may not coincide with the interests of the firm. The manager is interested in increasing the division's profit in order to raise his compensation and thus fails to give adequate weight to the liability to the firm for penalties. In other words, these managers are being excessively rewarded because their superiors are unaware of the hidden cost to these higher profits. Once it is discovered, upper management may decide it is the best interests of the corporation to discontinue collusion in exchange for leniency.

One of the implicit costs of applying for leniency is the foregone profit from collusion. Hence, if, due to cost or demand shocks or entry, collusion becomes less profitable or collapses altogether then the incentive to go for leniency will be enhanced.⁵ Finally, even if the profit from collusion has not fallen, the penalties from

⁵Chen and Harrington (2005) show that this force can cause a leniency program to have the perverse effect of making a cartel *more* stable. If a firm that cheats on the cartel believes that it'll cause collusion to discontinue then it realizes that it may induce firms to use the leniency program.

being caught are steadily rising due to having colluded for a longer time. At some point, the accumulated liability in expected penalties may exceed the present value of the additional profit from colluding so that it is better for a firm to apply for leniency even though it means shutting down the cartel.⁶

The incentives for applying for leniency can be quite different in these situations according to whether the event is private information to a firm or is instead common knowledge to cartel members. If the event is common knowledge then each firm may be concerned that the new circumstances may induce another firm to apply for leniency and, even though it might be content to remain quiet if all other firms do so, it may apply in order to preempt other members of the cartel. One is then in a waiting game that might turn into a race to report. Alternatively, if the change in circumstances is unique to a firm and is private information to it then that firm need not be concerned about being preempted. In weighing the option of going for leniency, the alternative is then continuing to collude without much concern that another firm will apply for leniency. In considering the events mentioned above, a reduction in the profitability of collusion or the accumulation of penalties are likely to be common knowledge to the cartel, while a change in management may or may not be. Internal discovery of collusion is likely to be private information. Thus, the incentive to report could be quite different across these circumstances.

When the antitrust authority does not suspect that a cartel may be operating, the concern from a policy perspective is that the incentives to apply for leniency are likely to be weak. Applying means foregoing collusive profit when the prospect of discovery - in the absence of one of the cartel members coming forward - is quite low. A firm that is contemplating such an application may see the alternative to doing so to be continued collusion without discovery. Hence, less important than the

Thus, cheating will ensure that the antitrust authority is informed of collusion and, in expectation, this raises the penalties. In other words, the chances of being convicted are higher when a firm cheats because of the leniency program and this can deter a firm from cheating and thereby make a cartel more stable and result in longer cartel duration.

⁶If this future time at which the cartel is no longer stable is predictable then, by a backward induction argument, this would cause collusion to be unstable from its inception.

differential between being first and second to report is the differential being first to report and no firm reporting. In that case, the absolute size of leniency - as opposed to the relative size of leniency from being first or second - is critical. Secondly, the act of applying for leniency can serve to inform the antitrust authority of the possible existence of a cartel so a firm wants to be sure that its application will be accepted. This argues to a generous policy of admitting the first firm into the program when the antitrust authority has no knowledge of collusion. An optimal policy is then likely to be one that is generous in terms of awarding leniency and in the amount of leniency. Fortunately, all programs have this property. When there is no knowledge of collusion (and thus no investigation), most programs have automatic awarding of leniency and leniency is maximal.

An example for which a leniency program appeared instrumental in inducing spontaneous reporting is the monochloroacetic acid cartel. Upon acquiring the Hoechst chemicals business, the management of Clariant discovered that the business was engaging in collusion.⁷ The new management chose to inform the European and American authorities about the cartel. Without the benefit of avoiding penalties through the leniency program, it is quite possible that the new management would have discontinued collusion but not reported it to the authorities; thus allowing the other cartel members to escape punishment.

It is important to consider that maximal and automatic leniency may not be enough to induce use of the leniency program in many circumstances. As mentioned, the waiving of fines may not be sufficient when it means forgoing collusive profit and the probability of the antitrust authority discovering the cartel is low. But the incentives against applying for leniency may be even greater once one considers the implications for the company employees that actually come forward. Even if the corporation avoids fines, are those employees' careers affected? Do they suffer monetary and non-monetary penalties within the firm? Are their bonuses reduced? Are their chances for promotion harmed? Are they fired? Is their career in this

⁷"The Week: June 12, 2002," *Chemical Week*, 6/12/2002, Vol. 164, Issue 24.

industry terminated?⁸ There are then a variety of reasons to think that simply waiving all fines may be inadequate to induce usage of a leniency program when the authorities are unaware of collusion. We should then consider more generous programs to induce use of the leniency program under such circumstances. In this spirit, Spagnolo (2003) proposes and theoretically analyzes a program that would provide a financial reward (in addition to waiving all fines) to the first firm to receive leniency with the reward being financed by the fines collected from the other cartel members.

Finally, it is important to recognize that the evidence on spontaneous reporting through leniency programs is not well-documented. It is unclear to what extent firms do apply for leniency when the antitrust authority lacks any suspicion that a cartel exists. If leniency programs are really to be an instrument for cartel detection, as opposed to aiding prosecution, it is critical that we better document how discovery occurs and better understand why a firm, after effectively colluding for some length of time, would choose to apply for leniency. These are directions for future analysis.

2.2.2 The Pre-Investigation Phase (with Suspicion of Collusion)

Now consider a scenario in which the antitrust authority has some knowledge that there may be or is a cartel but has not yet launched an investigation. In contrast to the previous scenario, plausible alternative outcomes to a firm that contemplates applying for leniency are being preempted by another firm or the antitrust authority launching an investigation before it applies for leniency. This is then a waiting game that can change into a racing game. An important role for policy - both design and implementation - is inducing firms to stop waiting and start racing.

In that situation, with the cartel having been discovered, the primary objectives are to cause the cartel to collapse and to maximize expected penalties in order to deter future collusion in this and other industries. The trade-off associated with a leniency program is simple enough. Offering leniency lowers the penalty received by

⁸That there are individual penalties imposed by the government in the U.S. - fines and prison sentences - may actually give a manager a stronger incentive to go for leniency.

the firm that receives it; a firm is going to apply for leniency only if expects to pay lower fines from doing so. This expected reduction in penalties has the unfortunate implication that it can promote collusion as, when forming a cartel, firms recognize that they may be able to avoid some penalties if they are discovered in the future. On the other side of the ledger is that offering reduced penalties to one cartel member in exchange for their testimony can raise, in expectation, the penalties that are collected from the remaining cartel members; this tends to discourage collusion. Ultimately, one wants a leniency program to be designed so that, on net, expected penalties rise - the reduction in penalties from those firms that receive leniency is exceeded by the rise in expected penalties that don't get it.

One important dimension of a corporate leniency program that is pertinent to this analysis is the differential between being first to receive leniency and being second. The U.S. policy maximizes this differential in order to encourage a race among the cartel members; it offers maximum leniency to the first firm and no leniency for later firms. In contrast, both Japan and the E.U. provide partial leniency to the second and third firm. However, as noted earlier, this difference is not as extreme as it appears because the U.S. implicitly offers partial leniency through plea bargaining. Though, after a firm is accepted into the corporate leniency program, the DOJ is not committed to providing other cartel members with lower penalties in return for the provision of evidence and accepting a guilty plea, in practice it has the discretion to do so and indeed does so. By way of example, consider Hoffman LaRoche in the vitamins price-fixing case. According to the DOJ's sentencing guidelines, the fine should have fallen in the range of 1.3 to 2.6 billion dollars and, it should be added, there is already a lot of discretion in setting these bounds. The DOJ negotiated a fine of \$500 million which, while an impressively large penalty, was less than 40% of the lower bound!

Reducing the differential between being first and second into the program obviously weakens the incentive to be first and thus may make firms more inclined to wait; thereby reducing the probability of a race and *any* firm coming forward. Furthermore, one is reducing expected penalties further by offering leniency to more firms. If

there is a benefit in doing so it lies in the importance of having additional witnesses for prosecuting the remaining members of the cartel. The first witness surely has great value, especially when it delivers concrete evidence. A second witness can also be quite valuable for without them (or concrete evidence), it may come down to one firm saying there was a cartel and the remaining firms claiming the contrary. Such a situation may not lead to a conviction. But what does a third insider witness add to the prosecution's case? Do they really deliver value? This ought to be carefully investigated because providing leniency to them only encourages firms to wait and hold off reporting and, in addition, reduces expected penalties and thus promotes cartel formation. Ultimately, it is an empirical question as to what is the right amount of partial leniency and how many firms ought to be eligible for partial leniency.

A second key dimension in which leniency policies differ is the extent to which they promote a race between the cartel members and the antitrust authority. In the U.S., maximal leniency can be received whether or not an investigation has begun. Indeed, DOJ officials have expressed that the possibility of receiving leniency after an investigation has begun was an instrumental feature of the 1993 revision. In contrast, Japan creates a race with the antitrust authority by significantly reducing the amount of leniency after an investigation has begun. The appeal I see here is that it creates the possibility that the antitrust authority can actively "manage" the waiting/racing game. Furthermore, a waiting/racing game between cartel members and the antitrust authority may be quite complementary with the waiting/racing game among cartel members. Through its decision as to when to launch an investigation, an antitrust authority may be able to compress and intensify the race among cartel members. These points I'll address more fully when I discuss the implementation of a leniency program.

2.2.3 The Investigation Phase

Now we come to the third scenario. The antitrust authority has launched an investigation and would like to induce firms to come forward in order to provide evidence to help the prosecution's case against the remaining cartel members and conserv-

ing scarce government resources. The calculus is much the same as with the Pre-Investigation phase except that the probability of conviction - without an insider witness - is likely to be higher. A firm needs to weigh its payoff from applying now or waiting and possibly being preempted by another firm.

It is here that the policies of the U.S. and Japan differ the most. The U.S. continues to provide incentives to encourage a race among firms since maximum leniency can still be received by the first firm. On the other end of the spectrum, Japan provides little leniency - only 30% of fines are waived - and there is no difference between being first, second, and third. The E.U.'s policy lies between them. Which policy is right depends on how likely is a conviction without an insider witness, which itself depends on how strong is the antitrust authority's case when it launches an investigation. If the probability of conviction is typically relatively low then one needs to provide a strong incentive to induce a firm to come forward. In that case, the U.S. policy seems appropriate. If instead the antitrust authority's case is typically strong then weak incentives, such as with the Japanese policy, may be sufficient to induce firms to enter the program. (Of course, if the case is strong then there is much less of a reason to provide leniency in exchange for evidence.) The appropriateness of the policy then depends on the expected strength of the antitrust authority's case at the time the investigation is launched.

I have additional concerns about the Japanese policy in the Investigation phase. First, is a 30% reduction sufficient to induce a firm to come forward? It would seem that a (risk-neutral) firm would not do so unless the probability of conviction is at least 70% which is rather high if no firm has yet admitted guilt.⁹ Here, it is worth noting that an investigation starts when the JFTC conducts a raid of a company to secure evidence of collusion. As an investigation then begins relatively late in the process for the case of Japan, it may indeed be that the probability of conviction is sufficiently high so as to induce firms to use the leniency program in spite of the low fraction of fines that are waived. Time will tell whether 30% is sufficient. Second,

⁹As receiving leniency means avoiding the legal expenses associated with fighting it out in court, the probability of a firm losing need not be as high as 70% in order for it to choose leniency.

the lack of a differential in leniency in being first or second or third weakens the race among cartel members during the Investigation phase; it is the differential between being early and late to the authority's office that will create a race. To see this most clearly, suppose a cartel has only two or three firms and conviction seems unlikely unless a firm comes forward. If an investigation is in place, what is the incentive to report? A firm can simply wait and see if another firm reports and, if one does, then report itself. There would seem to be little risk in waiting and this may neutralize the race among cartel members and potentially result in no firm applying for leniency.

2.2.4 The Omnibus Question

In conclusion, there is one notable feature to the U.S. program that deserves special attention. This is the Omnibus Question which is arguably the most important tool the DOJ has for discovering collusion. At the conclusion of a witness interview under the leniency program, the DOJ asks: "Do you have any information whatsoever, direct or indirect, relating to price-fixing, bid rigging, etc. with respect to other products in this industry or in any other industry?" Failure to answer the question truthfully means a loss of amnesty. This appears to be an important method of detection for the DOJ as exemplified with the sodium gluconate cartel which was revealed by defendants in the lysine and citric acid investigations (First, 2001).

I would argue that the power of the Omnibus Question lies with the incentives it creates for the individual manager rather than the corporation. This employee - having been involved in collusion - is likely to no longer have a position at this company or, at a minimum, is unlikely to have much of a future there. Individual interests may not be well-aligned with company interests. Though revealing the company is colluding in some other markets may cause additional financial harm to the company, this employee is apt to be much more concerned with jeopardizing the amnesty they've received from prison sentences and individual fines. Having already revealed their part in collusion, I suspect there is a strong incentive to avoid perjury and tell all to the authorities. The Omnibus Question can then be a powerful tool for cartel detection.

Of course, in Japan, the lack of individual penalties means this logic is not obviously applicable. Furthermore, it is unclear what the employee's status would be within the company. It may still be true that the employee's future in the company depends on protecting the company's collusion in other markets. Nevertheless, the Omnibus Question could be effective if it puts an employee in the position of risking perjury by not revealing their knowledge of collusion in other markets. In that case, individual penalties are present so there might still be that powerful incentive to reveal all. In any case, developing policies to promote the discovery of other markets in which a firm is engaged in collusion is critical. As is well-documented, recidivism of this sort is common. For example, since 1990, Mitsubishi has been sanctioned or is under investigation for colluding in ten distinct markets that range from graphite electrodes to fax paper, while Takeda Chemicals has been involved in eight cartels (Connor, 2003).

3 Implementation of a Corporate Leniency Program

The effectiveness of a policy can be sensitive to how it is implemented. In this section, I discuss three issues related to implementation: i) predictability of a corporate leniency program; ii) timing of an investigation; and iii) advertising to influence expectations of firms.

3.1 Predictability

DOJ officials have emphasized that the application process should be transparent and predictable. This is clearly important and especially if firms are to apply for leniency when the antitrust authority lacks any knowledge of collusion. I don't have much to add to that point other than to say that the antitrust authority can still be rather stringent in requiring that a firm fully cooperate if it is to receive leniency. Denying or revoking leniency due to lack of cooperation need not disrupt the predictability of the process. What is important is that firms believe it is within their control to receive leniency. If they realize that if they provide substantive evidence and fully

cooperate that they will receive leniency then that should be enough.

An issue that has been less discussed is the predictability of fines. The prospect of leniency impacts behavior only to the extent that a firm has a reasonably good idea of how much it'll save in fines. This is a relatively straightforward matter when leniency is full - then all penalties are waived - but can be problematic when leniency is partial. The partial leniency system under the E.U. system has considerable uncertainty attached to it as regards fines (for details, see Geradin and Henry, 2005). There is uncertainty as to both the base fine and the percentage of fines to be waived. The latter may be justified on the grounds that how much leniency is offered ought to depend on the extent to which a firm provides evidence that advances the antitrust authority's case. The case for leaving the extent of fines up for discretion is not so obvious. And if the antitrust authority has considerable discretion as to setting the base fine then what does it mean to have, say, 50% of fines waived? An antitrust authority that wants to assess 10 million Euros in fines can either make the base fine 20 million Euros and award leniency of 50% or make the base fine 12.5 million Euros and award leniency of 20%. While that may be a caricature of what is in place, the point is that discretion over the base fine increases a firm's uncertainty over what is gained by applying for partial leniency.

In comparison, the JFTC seems to have a system that is more predictable in that the fine is a percentage of turnover or sales. Though focusing on the incremental profit from collusion rather than firm revenue would go more to influencing incentives in the right way (as is done with private damages in the U.S.), estimating the additional profit due to collusion is difficult as it involves coming up with a "but for" price (which is the price that would have occurred had it not been for collusion).¹⁰ That is a difficult, contentious, and unpredictable exercise. Having the penalties proportional to sales is more straightforward, easier to implement, and more predictable.

However, is unpredictability of the amount of fines bad? It would seem so on at least two grounds. First, managers are likely to be risk averse and an appealing

¹⁰Standard estimation methods can also create some perverse effects and cause post-cartel prices to exceed competitive prices (Harrington, 2004).

key feature to a predictable leniency program is that it provides a less risky option. Applying for leniency means paying a modest fine for sure compared to the lottery associated with not applying in which case the firm either pays no fine - if it is not convicted - or incurs a high fine - if it is convicted. The more unpredictable is the amount of fines under leniency, the smaller is the reduction in risk from applying for it. Second, the intent of a leniency program is for the antitrust authority to influence the cost-benefit calculation faced by firms and manipulate it so as to induce them to come forward with evidence. The more uncertainty there is in applying for leniency, the more managers' behavior is based on their own subjective beliefs and thus the less control the antitrust authority has over that cost-benefit calculation. Finally, there is the advantage to the antitrust authority having less ex post discretion over the setting of fines in that it is committed to imposing harsh penalties even if it requires using a lot of prosecutorial resources. When given discretion, an antitrust authority may be tempted to agree to lower penalties in order to close the case and move onto another one. Though there can be merit to such an action, if cartel formation is to be deterred it'll be because of the severity of the penalties. Committing the government to fight to impose high penalties may better serve the long-run objective of deterring cartel formation.

3.2 Timing

Returning to the three scenarios described earlier, it would seem - under the Japanese leniency program - that the most critical role for an antitrust authority is during the Pre-Investigation stage. The differential between being the first to report and doing so prior to rather than after an investigation has begun is large; the difference is 70% of fines. The Pre-Investigation phase - the time between when the JFTC suspects collusion and when it starts a formal investigation - should then not be pre-determined according to some regimented procedure but rather strategically timed to encourage firms to come forward.

What is the best manner in which to "manage" this phase? To begin, if the antitrust authority is suspicious then it should consider revealing these suspicions

prior to beginning an investigation. If firms assign a relatively low probability to conviction when they believe the antitrust authority is unaware of collusion then the applications for leniency are unlikely to occur unless firms know the antitrust authority has some knowledge that there may be a cartel. And, once an investigation is begun, the incentives for applying for leniency are weak since only 30% of fines are waived and there is no differential between being first, second, and third. The cost to that strategy is that it may give the cartel members the opportunity to destroy incriminating documents. To what extent such documents routinely exist may then determine which approach is better.

Rather than simply wait for firms to come to them for leniency, the antitrust authority may want to approach individual cartel members and encourage them to enter the program. This has several advantages. First, it can influence which firm receives leniency. In particular, it makes sense to approach smaller firms because fewer fines are waived and, more importantly, higher (proportional) penalties for bigger firms is desirable because they are more likely to have initiated and organized the cartel. Less anticipated leniency for the initiator of a cartel will help discourage future cartel formation. Second, if each firm knows the antitrust authority approaches a firm in private, it can help sow suspicions among the cartel members. A firm that is not approached by the antitrust authority may be concerned that it is talking with another firm about entering the leniency program and that concern may induce it to come forward first.

The timing of an investigation could be an effective instrument in encouraging firms to apply for leniency. Recall that cartel members are in a waiting game; each is holding off applying for leniency because the other firms are currently doing so, but at anytime a firm could decide that other firms are about to apply in which case it races to preempt them. The antitrust authority should try to shift firms' expectations about other firms' behavior so as to transit firms from waiting to racing. Hence, the Pre-Investigation phase shouldn't be too short as one wants to give firms enough time to "sweat it out" and develop concerns about being preempted. The antitrust authority may even want to pre-announce the timing of an investigation. By pre-

announcing the start date, firms realize it is now or never to get full leniency and, just as important, they realize that all other firms know it is now or never. As the time approaches until an investigation, there is apt to be a strong temptation to apply out of fear that other firms are preparing to do so.

3.3 Advertising

As mentioned, a critical task is to alter firms' expectations. If a cartel member thinks that detection and conviction is likely then it'll be more inclined to apply for leniency. If a cartel member thinks that another member is likely to apply for leniency then it'll be more inclined to apply for leniency and preempt it. What can the antitrust authority do to move beliefs in this direction? It can advertise - remind firms that the antitrust authority is watching, that fellow cartel members may use the leniency program, that the antitrust authority has caught price-fixers. The antitrust authority can appear at trade association meetings, continually remind managers about the corporate leniency program, and advertise the program's successes. On the latter point, spillovers of an analogous variety have been documented. In the case of the market for white pan bread, price-cost margins fell for cities in a region for which the DOJ had filed an action that year in some other city in that same region (Block et al, 1981). This suggests that filing an action in one market may induce firms to stop colluding in other markets. The antitrust authority can magnify that process by actively disseminating information. Such activities could be highly complementary to the incentives created by a corporate leniency program.

4 Measurement of the Effect of a Corporate Leniency Program

Having instituted a corporate leniency program, it is critical that we measure its impact. What has worked and what has not? How can it be improved? If we measure impact by usage then the 1993 revision in the U.S. clearly made a difference. Usage rose significantly as the rate of leniency applications jumped more than 20-fold

from about one application per year to about two per month. A similarly striking rise occurred in the E.U. with the 2002 revision of the original program put in place in 1996.

To what can one attribute this rise in usage? In the case of the U.S., James Griffin - who, at the time, was the Deputy Assistant Attorney General at the DOJ - emphasized three changes: i) amnesty is automatic if there is no pre-existing investigation; ii) amnesty may still be available even if cooperation begins after the investigation is underway; and iii) all officers, directors, and employees who cooperate are protected from criminal prosecution. He probably should have also mentioned the increase in government fines due to the revision of the Federal Sentencing Guidelines in 1991.

While the DOJ continues to receive many leniency applications, at the same time cartels keep forming. The DRAM cartel - another major prosecutorial success for the DOJ - was formed in mid-1999. This is after the leniency program was used in the successful prosecution of cartels in the markets for lysine, graphite electrodes, and vitamins.

This leads us to a more basic question: Should we interpret the rise in usage as success? If all firms were to receive maximal leniency regardless of the circumstances then usage would surely go up but to what extent have we just provided a good deal for price-fixers? So, what do we mean by success? Success should be measured by the degree to which the rate of collusion in the economy is reduced. An absence of applicants to a leniency program can then be consistent with success - if it is due to there being no cartels - while a high rate of applications can be consistent with failure - as there are many cartels and leniency is attractive to colluders. We'd like a leniency program to increase the probability of successful prosecution, increase the probability of detection, makes cartels less stable and thereby reduce cartel duration, and reduce the rate of cartel formation.

It seems clear that corporate leniency programs in the U.S. and E.U. (and elsewhere) have been instrumental in the prosecution of cartels. Perhaps exemplifying this point is the graphite electrodes industry. The European Commission opened an investigation in 1983 in response to some information that there was a cartel among

the manufacturers of graphite electrodes.¹¹ The file was closed three years later due to lack of evidence. Maybe there was not a cartel or maybe there was and the cartel members were effective about hiding evidence and none admitted to it. Indeed, why should a firm have admitted to it? What would it have gained by doing so? The story was quite different when the industry was investigated again in 1997. This time one of the manufacturers applied for leniency and cooperated with the authorities. The investigation was successful with fines imposed of almost 220 million Euros. There are surely many cases in which use of the leniency program "broke" the case and thus was highly instrumental in prosecution.

Unfortunately, there is a fundamental data problem when one turns to assessing the impact of a corporate leniency program on the rate of collusion. To measure the efficacy of a leniency program, one needs to observe the population of cartels. However, since collusion is illegal, cartels hide themselves. As a result, we do not observe the population of cartels but rather the population of *discovered* cartels. To see what kind of difficulties this creates, consider trying to measure the effect of a corporate leniency program on the frequency of cartels. Suppose, in actuality, the policy results in a higher rate of discovery. Holding fixed the number of cartels, we ought to then see more discovered cartels. The problem is that the number of cartels is not fixed. It may change for exogenous reasons but, even more relevant, it may change because the leniency program is working. If the program is resulting in a higher rate of discovery - along with higher expected penalties - this can cause marginally stable cartels to collapse and some cartels not to form; this means fewer cartels. An efficacious leniency program is then raising the rate of discovery but reducing the number of cartels so the net effect on the number of discovered cartels is ambiguous. A leniency program could then be having a substantive effect on cartel formation, yet there is no measurable impact on the rate of discovered cartels. Alternatively, the lack of a measurable change in the rate of discovered cartels may just reflect the program is not working. And if the rate of discovered cartels rises,

¹¹This discussion is based on information in the *Official Journal of the European Communities*, 16.4.2002, Case COMP/E-1/36.490, Graphite electrodes.

this could be because the program is working or it is actually making collusion easier - since leniency reduces penalties (and I noted one argument for how leniency may enhance cartel stability) - and more cartels are being discovered because there are more cartels in the economy.

To make this point more concretely, the number of cartels convicted by the European Commission rose from 2.5 per year over 1990-95 to 4.75 during 1996-2003 (Brenner, 2005). To what can we attribute this rise? Is it because the corporate leniency program instituted in 1996 made discovery and prosecution easier? Is it because the integration within the E.U. opened up markets, intensified competition, and thereby induced more cartels to form? It just isn't clear what we can infer from a higher rate of conviction.

This poses a major challenge to learning the effectiveness of new policies. What is needed is research to develop methods for indirectly measuring the impact of antitrust policies on the rate of cartel formation and the discovery of cartels. I have engaged in some preliminary work along these lines and have the tentative finding that cartel duration may serve as a yardstick for assessing the impact of a policy change (Harrington, 2005). An anti-cartel policy that is effective may reflect itself in the *duration* of discovered cartels. More specifically, if the program is working then we ought to observe, in response to the policy change, that cartel duration goes up in the short-run but down in the long-run. The explanation is as follows. In response to a more aggressive and efficacious policy, cartels with traits that make them marginally stable (for example, volatile demand, many firms, threat of entry) will collapse on their own since the policy change now makes collusion unprofitable. The surviving population of cartels is then comprised of relatively more stable cartels and, by virtue of being more stable, have higher duration. In response to the policy change, the duration of (surviving) cartels is then higher. When these cartels are discovered, one then observes higher cartel duration. In sum, the duration of discovered cartels goes up if the new policy is effective because it has induced marginally stable cartels (which necessarily have shorter duration) to collapse and thus avoid discovery. In the long-run, the distribution on cartel duration will converge to the new stationary

distribution which entails shorter cartel duration since all cartels are relatively less stable by virtue of this more aggressive policy. An important challenge for scholars is to develop indirect methods for measuring the impact of antitrust policy. Otherwise, we'll be flying blind when it comes to designing policy and assessing what works and what does not.

5 Expanding the Set of Agents Induced to Report

Leniency programs are all about inducing those with the best information about collusion - the cartel members themselves - to come forward and cooperate. In this spirit, it makes sense to think about how to induce other agents who might have some information to report their suspicions to the authorities. Three sets of agents come to mind: i) buyers; ii) employees of the colluding firms who are not themselves participating in the conspiracy; and iii) competing firms who are not members of the cartel. Due to their proximity to the cartel, all these agents may have information that could lead them to suspect a cartel has formed.

5.1 Buyers

In many cartels, the buyers are not final consumers but rather industrial buyers. For example, Tyson Foods purchased vitamins from colluding firms such as Hoffman LaRoche and BASF. As industrial buyers will have very good information on the time series of prices, they witness the change in price due to collusion. If firms start steadily raising prices, a buyer may become suspicious, especially when there do not appear to be cost and demand factors to rationalize the price increases. Or a buyer, in response to a higher price from their usual supplier, notices that another supplier is no longer willing to bid for their business or offers a bid that is ridiculously high. Such behavior could emerge from a customer allocation scheme and similarly might make buyers suspicious that firms are coordinating their behavior. Or they might notice that firms' price changes are much more coordinated than they were in prior years; perhaps now firms change their prices within a few days of each other, where before it occurred

over a longer period of time. Even if buyers are not particularly sophisticated and not consciously looking for collusion, sufficiently inexplicable behavior or behavior sufficiently out of line with the past may create suspicions.

If a buyer does suspect, wouldn't they necessarily report it to the antitrust authorities? And, in that case, what is the need for policies designed to further encourage it? Might it induce them to report every time price rises? Indeed, there are strong benefits from reporting suspected collusion. Buyers can benefit from lower input prices if the cartel is dismantled. Furthermore, in the U.S., the prospect of collecting damages for past collusion can be a strong financial reward to report suspected collusion.¹² And there have been documented cases of it. The European Commission investigated the stainless steel industry (and found collusion) because buyers complained to the Commission about a sharp increase in prices. Though we do not know the specifics of their complaints, reportedly the cartels in graphite electrodes¹³ and thermal facsimile paper¹⁴ were also begun because of buyer complaints.

However, there may be costs to reporting that offset lower input prices. Due to the incompleteness of contracts, any business relationship is built upon a certain amount of trust and cooperation. That trust could be harmed if a buyer "turned in" a seller. Sellers may also choose to retaliate to discourage future reporting. This could be done by limitations on supply, less preferential treatment when inventories are low, and discriminatory pricing. To weaken incentives more, some buyers might be better off with higher input prices as it can give them an advantage over their competitors. For example, a firm that has a technology that uses less of this input will experience a relative cost advantage when the price of the input is raised. While

¹²However, see Schinkel, Tuinstra, and Rüggeberg (2005) for an argument whereby buyers will not report because they have effectively been bribed by the colluding firms. The bribery takes the form of restricting input supply which serves to restrict supply in the downstream market and thereby raise the prices that buyers receive for their product.

¹³Ferromin International Trade Corporation, et. al. vs. UCAR, et. al., In the United States District Court for the Eastern District of Pennsylvania, Second amended complaint, filed May 1, 1999, at paragraph 50.

¹⁴John Clifford and Bill Rowley, "Tackling Cross-Border Conspiracy," *International Corporate Law*, May 1995.

its cost rises, the cost of its competitors rises more. In that case, a firm could find their profit higher under collusion. Though this can't be true for all input buyers, it could be true for some in which case they do not have an incentive to report their suspicions about collusion to the authorities. Of course, by the same argument, the firms that are put at a cost disadvantage now have an accentuated incentive to report if they think collusion is behind the rise in input prices.

Even if the buyers do have an incentive to report their suspicions, if it is costly to do so - for example, a buyer has to pull together the evidence and make a convincing case to the antitrust authority - then, due to a free rider effect, this will tend to be underprovided. A buyer who reports and causes the collapse of the cartel will benefit all buyers as all will be better off with lower prices; yet only that buyer incurs the cost. This means that there will be an underprovision of investigatory services performed by buyers.

It is then not entirely clear that buyers, who are first-hand witnesses to what is happening with prices, have sufficiently strong incentives to report suspicions about collusion. If one feels comfortable "rewarding" a cartel member for coming forward under the leniency program by waiving fines, it should not be difficult to accept the idea of rewarding an input supplier (or any party not part of the cartel) who provides valuable information with financial rewards. This could be considered at both the individual level - an employee of the company buying inputs from a cartel - and the corporate level - the company for which that employee works. Such a reward scheme might also replicate the financial benefit in the U.S. from customer damages and that system is thought to be fairly effective.

5.2 Uninvolved Company Employees

A second set of individuals who are apt to have relevant information are employees of a colluding firm who are not themselves engaged in the collusion. When coordination is taking place among upper level management, which has proven to be the case with many global cartels, sales representatives will be uninvolved yet have relevant information. Like the input buyers, they witness the change in prices and indeed

have even more direct information in some cases. For example, a sales representative might be told not to bid for some company's business - which could be part of a customer allocation scheme - or told not to deviate from the price list under any circumstances when previously it was allowed to do so when it thought the business would be lost. Administrative staff for a colluding executive may stumble across evidence of clandestine meetings in the form of expenses, a manager personally handling certain appointments, and other suspicious behavior.

To make these points more concrete, let us point out that apparently some employees suspected the upper management of Christie's and Sotheby's were colluding:

Sotheby's submits that some of its personnel across Europe commented when interviewed by Sotheby's outside legal counsel that they had a "feeling" that the introduction of the fixed vendor's commission structure may have arisen out of some sort of understanding with Christie's. Such suspicions were supported "by the fact that London had given strict instructions (i) not to depart from the published commission structure (ii) to assemble and forward data regarding clients to whom Sotheby's had already made oral or written commitments at lower rates (so-called "grandfather lists") and (iii) to monitor and report any discounts offered by Christie's in contravention of its published rates to senior management in London. [Fine Art Auction Houses (2002), p. 36.]

Another example comes from the carbonless paper cartel:

The following recollection of a Sappi employee ... from February 1993 regarding his then superiors' and colleagues' participation in the cartel meetings confirms that prices were agreed at the official AEMCP meetings or at meetings held on the occasion of these meetings: However, he admits that he had very strong suspicions, close to a degree of knowledge, that [two Sappi employees] had been to meetings with competitors. He recalls that one or other of them would come back from meetings, including AEMCP meetings, with a very definite view on the price increases

that were to be implemented and that they were relatively unconcerned by competitor reactions. [Carbonless Paper (2001), p. 20]

Compared to buyers, it is a much greater challenge to motivate these employees to report. If their accusations are not substantiated by the antitrust authority, the superior has considerable range to punish them. And even if they are substantiated, such reporting could be construed as being disloyal to the company. An employee may then be harmed in terms of fewer promotions, lower bonuses, and being ostracized if not fired in addition to feeling guilty for what they have done. A policy then needs to be designed whereby not only the individual benefits financially but also the company so that one can reasonably argue that it is in the company's interest to report suspicions about collusion. One suggestion is for the antitrust authority to give a company the opportunity to receive full leniency (under the usual conditions) when one of its employees reports that it thinks the company is engaged in collusion. The employee - who should be eligible for financial rewards - might then be perceived as acting in the company's best interests and avoid both monetary and non-pecuniary sanctions within the firm.

5.3 Non-cartel Competitors

Finally, a firm who competes in this market but is not a member of the cartel also has access to information about what its competitors are doing which might allow it to infer or suspect that there is some collusion. The problem I see here is that either such a firm significantly benefits from collusion - in which case it'll be difficult to design a policy to induce them to report - or they are significantly harmed by it - in which case they already have an incentive to report their suspicions. Let me elaborate on these two points.

If the cartel is content to have this firm outside of the cartel then that firm has the best of all worlds. Its competitors restrain supply and raise prices, while it is left to produce and price as it wishes. It experiences a rise in its demand from its competitors' higher prices and it can maximally benefit from it by raising price - but

still undercutting its rivals' prices - and expanding supply. As it significantly profits from its rivals colluding, it could prove difficult to design a program - short of offering excessively large financial rewards - that would induce it to forego those profits by informing the authorities of their suspicions.

Returning to Table 1 of Hay and Kelley (1974), it is rather interesting in light of the previous discussion that 20% of the cartels were discovered by a complaint by a competitor. This is because cartel members are often *not* content to allow non-cartel members to expand supply in response to their coordinated contraction of supply. The cartel may act in an anti-competitive manner against them so as to limit their supply - by buying up input, for example - or even engage in selective price wars (perhaps with respect to particular customers) so as to induce them to exit. In that case, a firm that suspects some of its competitors are coordinating to act anti-competitively against it has plenty of incentive to report its suspicions to the antitrust authority in which case there is no need for a policy to promote such behavior.

6 A More Activist Detection Policy for an Antitrust Authority: Screening for Cartels

One of the exciting features of a corporate leniency program is that it introduces the antitrust authority as an active player in the detection of cartels. Historically, antitrust authorities were passive in this regard as they responded to complaints rather than searching for suspected cases of collusion. Now that the antitrust authority is beginning to play a role in the discovery of cartels, I would like to propose broadening this role.

It is useful to partition the discovery process into three stages. First, there is the *screening* of industries; the purpose of which is to identify markets where collusion is suspected and thus are worthy of scrutiny. Second, there is the *verification* of collusion which entails systematically trying to exclude competition as an explanation for observed behavior and to provide evidence in support of collusion. In terms of

data requirements and econometric modelling, verification is a much more demanding process than screening as it requires controlling for demand and cost factors and any other variables necessary to distinguish collusion from competition. Third, the *prosecution* of collusion is the development of economic evidence that is sufficient to persuade a court or some other administrative body that there has been a violation of the law. One may interpret this exercise as the same as verification though with a different set of standards.

In considering an expanded role for the antitrust authority in this process, my plan is to focus the discussion on the screening of industries for collusion. One is then thinking of a situation in which there is no prior knowledge of collusion. Screening methods are then intended to identify industries for which collusion is sufficiently likely that they warrant closer inspection using verification methods. There are two general methods for engaging in screening: structural and behavioral.¹⁵ A *structural* approach is based on identifying markets with traits thought to be conducive to the formation of a cartel.¹⁶ The theoretical literature and, to some extent, the empirical literature finds that collusion is more likely or more extensive with fewer firms, more homogeneous products, more excess capacity, and more stable demand.¹⁷ A structural approach involves measuring industries in terms of these traits and then, in principle, investigating those that score high with the hope of finding evidence of collusion.

The weakness to a structural approach is that, in most economies, there is a high chance of false positives - the indicators suggest collusion is relatively likely but in fact there is no cartel. To see why this would be the case, imagine the "ideal" market for collusion: two firms, homogeneous products, stable demand, no large buyers, excess capacity, and so forth. Even though such a market would surely be flagged by a structural investigative tool, my own prior belief is that a very high fraction of those markets are not cartelized. Based on what we know (which, admittedly,

¹⁵A more detailed discussion of these issues is provided in Harrington (2006). I would also recommend reading Porter (2005).

¹⁶Grout and Sonderegger (2005) is representative of the structural approach.

¹⁷See, for example, Symeonidis (2003) and Motta (2004).

is only discovered cartels), the frequency of collusion in most economies is rather low. Hence, given a low prior probability of collusion, the posterior probability - conditional on all those structural variables taking values conducive to collusion - is still probably quite low. In other words, I think the likelihood of false positives with a structural approach is high. At the heart of this problem is omitted variables. There are multiple equilibria - some involving collusion, some not - and non-observed variables can influence whether firms settle upon a collusive equilibrium.

The structural approach is based on data about the industry which makes it more likely that a cartel *will form*. This is to be contrasted with the *behavioral* approach which uses data that is itself evidence that a cartel *has formed*. Within the behavioral approach, one looks for evidence either of the means by which firms coordinate or of the end result of that coordination. The means of coordination is some form of direct communication and, indeed, many cartels have been detected by virtue of evidence of that communication. This could entail a person party to the cartel coming forward (perhaps under a leniency program) or an uninvolved employee who stumbles across evidence or the discovery of documents associated with a tentative merger. Leniency programs encourage discovery through the means of coordination.

Alternatively, a behavioral approach can focus on the market impact of that coordination; suspicions may emanate from the pattern of firms' prices or quantities or some other aspect of market behavior. I've mentioned buyers becoming suspicious because of an inexplicable increase in prices. Though, historically, the U.S. government has not played an active role in screening industries, there have been some recent attempts. At the Bureau of Economics of the U.S. Federal Trade Commission, former Director Jonathan Baker used price increases after an industry-specific trough in demand to identify the exercise of market power (*FTC History*, 2003, pp. 108-110), while former Director Luke Froeb made progress in developing a screen in terms of the price variance (Abrantes-Metz, Froeb, Geweke, and Taylor, 2005). I think more can be done along these lines and that, as argued later, the development of a leniency program provides *more* of a reason - not less of one - to engage in screening. My ensuing remarks are speculative and tentative but then their purpose is to ignite

a discussion of screening that would take place among economists in government, consulting, and academia.

In thinking about a workable policy of systematic and ubiquitous screening of industries for collusion, three criteria come to mind. First, evidence of collusion should be discernible by just looking at prices, market shares, or other easily available data. Second, the test should be routinizable so that it can be conducted with minimal human input. These two criteria indicate that one is imagining an empirical exercise far removed from the typical industry analysis involving data on price, quantity, and cost and demand shifters and then performing many modifications to a sophisticated econometric model. The third criterion is that the screen should be difficult or costly for the cartel to beat. Let me limit my attention here to the first two criteria; a discussion of the last one is provided in Harrington (2006).

The objective is to screen industries as a matter of course, even where there is no suspicion, clue, or hint of collusion. To be practical, screening must then rely on easily available data which, in many cases, will mean exclusively price data. However, in some instances, quantity and some cost or demand shifters may also be accessible at low cost. Consider a product with a primary input that trades on commodity markets. An example is raw sugar used in the production of refined sugar (Genesove and Mullin, 1998). If cartel members manufacture in one country and sell in another - such as with the vitamins cartel - then exchange rate fluctuations provide an easily available cost shifter.

Though high frequency price data is not often easily available, there is a growing number of possibilities. The government has access to price data from procurement. Online price data is another source. There is a growing amount of online retailing and many scholars have already "scraped" data off of web pages. Shopbots can perform some of this work. Furthermore, some web sites are beginning to collect price data from conventional retailers. Some markets - like financial markets, electric power, and many commodity markets - offer high-frequency data that, at a price, is available.

With this data, the empirical exercise must be simple enough to be largely automated. One possibility is looking for collusive markers such as low price variance,

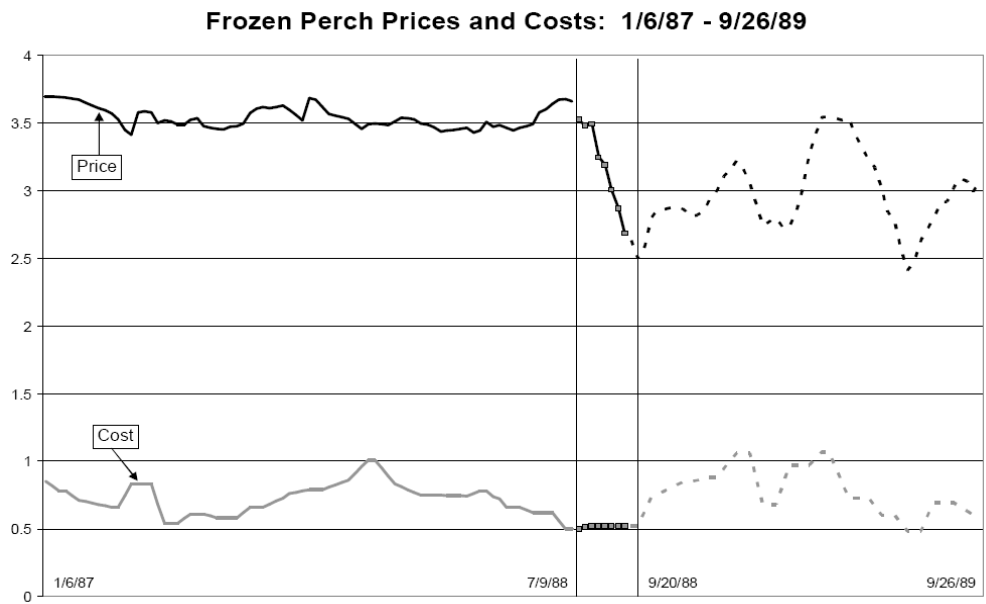
low market share variance, high correlation in bids at an auction, negative correlation in market shares, negative correlation in price and quantity, and so forth. Relative to competition, under collusion: i) a firm's market share is more negatively correlated over time; ii) market shares are more stable under collusion; iii) prices are more strongly positively correlated across firms; and iv) the variance of price is lower.¹⁸

To elaborate by way of example, let us consider using the variance of price as a screen. There is some theoretical work to suggest that collusion results in a lower price variance. Harrington and Chen (2004) model the collusive price path and show that it has a transition phase - in which price rises largely irrespective of cost - and a stationary phase - in which price is responsive to cost. While price is sensitive to cost in the stationary phase, the impact of cost shocks on price is muted and takes a longer time to pass through, relative to non-collusive pricing. As a result, the variance of price is lower with collusion. There is also some empirical work in support of this prediction. Examining collusion at auctions of frozen perch, Abrantes-Metz et al (2005) find that the price variance was lower during the period of collusion compared to after the cartel collapsed (excluding the transition from collusion to non-collusion).¹⁹ Figure 2 is reproduced from their paper and shows that the price-generating process is quite different in the post-cartel phase and, in particular, price is less sensitive to cost. A screen could then monitor the price variance and seek to determine whether it is low relative to some benchmark.

¹⁸Details are provided in Harrington (2006).

¹⁹Bolotova, Connor, and Miller (2005) also provide a case in which the price variance was lower under collusion.

Figure 2: Collusion and the Variance of Price (Abrantes-Metz et al, 2005)

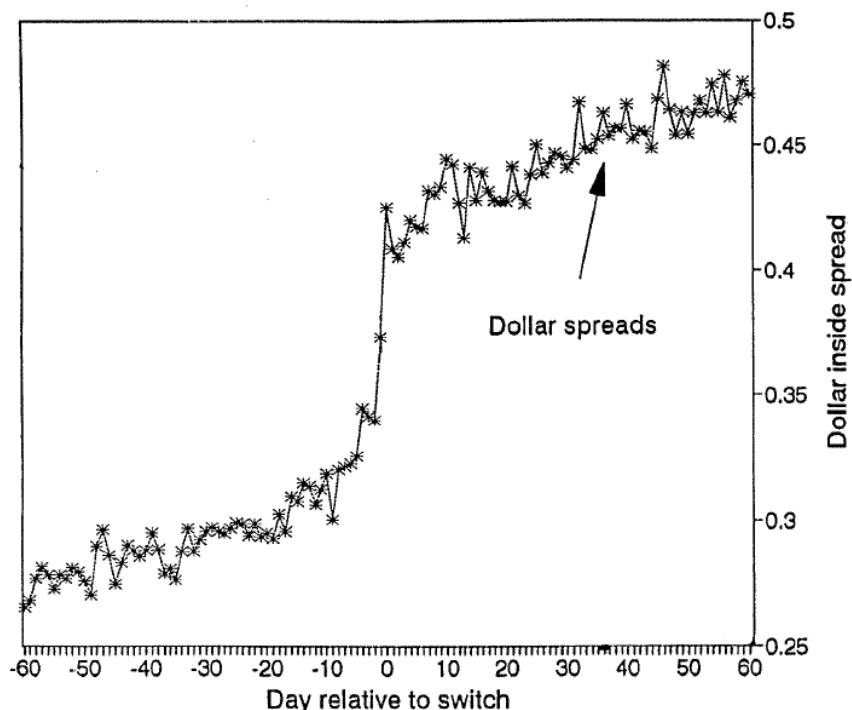


A second screening approach is to identify structural breaks in the stochastic process producing prices or some other measure of firm behavior. Such a break could be associated with the formation of a cartel but also its demise (as in the case in Figure 2). Collusion necessarily entails a change in the price-generating process and possibly in the market share process and, furthermore, the change could be rather abrupt and detectable. Has average price changed? Has the relationship between a firm's price and cost changed? Has the relationship among firms' prices changed? Has the variance of price and market share changed? I suspect that this method is the most promising but it does require continual monitoring so that the transition from competition to collusion can be identified.

To see that the idea of screening by looking for a structural break is implementable, consider the recent episode of collusion in some Nasdaq security markets. In those markets, collusion took the form of avoiding the quoting of odd-eighths so that a market maker would post a bid price of, say, \$10 or $10 \frac{1}{4}$ but not $10 \frac{1}{8}$. This resulted in a minimum bid-ask spread of $\frac{1}{4}$. Figure 3 (which is based on a figure from Christie and Schultz, 1999) shows that there is a sharp change in the dollar

spread - which effectively measures the price-cost margin - surrounding the switch from quoting all eighths to largely avoiding odd-eighths. Screening for a structural change in the spread-generating process would have probably picked it up.

Figure 3: Collusion and Bid-Ask Spreads



For skeptics who think that screening cannot work, I have two responses. First, screening is used for various other forms of illegal activity such as tax evasion, insider trading on security markets, and credit card fraud. It appears to be working there. Though the available data is much greater in those cases than it would generally be for someone screening for collusion, this leads me to my second point. We have never really tried to engage in cartel screening. Solutions to challenging problems are not found until we seriously apply ourselves to solving them. The skeptics may ultimately be right but their views reflect a pessimistic assessment based on the existing body of knowledge. Innovation is the creation of new knowledge and, by its definition, is not anticipated. Who knows what innovations in screening methods may arise once we apply ourselves. So, I intend to ignore the skeptics until after we've seriously tried to develop and implement methods for screening. At that point, we can evaluate whether or not this quest - while surely noble - is quixotic.

Another skeptical response could also be: Why bother with screening with leniency programs proving so effective? As discussed in Section 4, the "success" of a leniency program is not so easily evaluated and we should be cautious before drawing any conclusions. My "gut" tells me that the U.S. Corporate Leniency Program has indeed worked but I would feel much more confident with a systematic study that substantiated the feeling in my gut. Putting that point aside, an active and even mildly effective screening policy is highly complementary with having a leniency program. If an antitrust authority identifies an industry for further scrutiny through some form of screening and conveys these suspicions to the suspected firms, it could well induce one or more cartel members to come forward and apply leniency. In other words, screening can serve to shift the environment from the No Knowledge phase to the Pre-Investigation stage and thereby provide much stronger incentives to a firm to apply for leniency. Thus, the development of a leniency program makes the case for screening more, not less, compelling.

In closing, I have two suggestions in relation to screening for antitrust authorities and, in particular, the JFTC since they are starting down the path of a more aggressive policy against cartels. First, and following up on the previous discussion, to more actively monitor firm behavior towards discovering cartels. Second, to act not only as a detector, prosecutor, and punisher of cartels but also as a collector and disseminator of information about cartels.

On the topic of screening, an antitrust authority can, at a minimum, engage in this activity when it comes to government purchases. Presumably, such data ought to be accessible.²⁰ A second natural screening target is firms that have previously been found guilty of colluding. Recidivism is serious. Collusion may re-emerge in a market or a company involved in colluding in one market may be engaged in similar practices in other markets. This problem seems especially severe in Japan as, over 1993-2002, 10.2% of Japanese cases involved firms previously sanctioned which compares to only 3.2% for the E.U. (Suwazono, 2005). To aid in monitoring, behavioral remedies ought

²⁰Back in the 1950s, the DOJ collected reports of identical bids at government procurement auctions (Joint Executive Committee, 1961).

to be considered. Specifically, I would recommend requiring the provision of price data by the convicted firms which can then be screened by the authorities.²¹ This information can be periodically cross-checked with buyers to confirm its authenticity.

7 Concluding Remarks

Antitrust authorities act as a detector, prosecutor, and penalizer of cartels. I would encourage them to also serve as a collector and disseminator of information about cartels. The better that cartels are understood, the more effective we can be in designing policies against them. I would then encourage antitrust authorities to put as much data in the public domain as is feasible so that it can be used to build a library of cartels. In particular, it would be highly useful to learn a cartel's operating practices - how price is set, how market shares are allocated, how enforcement is conducted, what information is exchanged, how frequent are meetings, and so forth. On this point, the European Commission is more informative than the Antitrust Division of the U.S. Department of Justice which suggests to me the latter can do better. Furthermore, the availability of this information to the antitrust authority has noticeably increased with the introduction of a corporate leniency program as then the actual members of the cartel are cooperating in the provision of such information. Knowing exactly how a cartel operates is essential to developing better models of collusion and better policies. Here, the government and the academic community must work together.

²¹The use of behavioral remedies is not new to antitrust and has been used in monopolization cases (for example, Microsoft) but also in price-fixing cases. In the early 1990s, several U.S. airlines agreed to a ten-year consent decree whereby they were prohibited from preannouncing price increases except when they are heavily publicized.

References

- [1] Abrantes-Metz, Rosa M., Luke M. Froeb, John Geweke, and Christopher T. Taylor, “A Variance Screen for Collusion,” FTC Bureau of Economics Working Paper No. 275, March 2005 (*International Journal of Industrial Organization*, forthcoming).
- [2] Bolotova, Yuliya, John M. Connor, and Douglas J. Miller, “The Impact of Collusion on Price Behavior: Empirical Results from Two Recent Cases,” Department of Agricultural Economics, Purdue University, pdf copy, April 2005.
- [3] Brenner, Steffen, “An Empirical Study of the European Corporate Leniency Program,” Humboldt-University Berlin, pdf copy, March 2005.
- [4] “Carbonless Paper,” Commission of the European Communities, COMP/E-1/36.212, December 20, 2001.
- [5] Chen, Joe and Joseph E. Harrington, Jr., “The Impact of the Corporate Leniency Program on Cartel Formation and the Cartel Price Path,” in *Political Economy of Antitrust*, Vivek Ghosal and Johan Stenneck, editors, Elsevier, forthcoming (April 2005).
- [6] Christie, William G. and Paul H. Schultz, “The Initiation and Withdrawal of Odd-Eighth Quotes Among Nasdaq Stocks: An Empirical Analysis,” *Journal of Financial Economics*, 52 (1999), 409-442.
- [7] Connor, John M., “International Price Fixing: Resurgence and Deterrence,” First Workshop of the Research Training Network: Competition Policy in International Markets, Toulouse, France, October 2003.
- [8] Connor, John M., “Effectiveness of Antitrust Sanctions on Modern International Cartels,” Purdue University, working paper, 2004.
- [9] “Fine Art Auction Houses,” Commission of the European Communities, COMP/E-2/37.784, October 30, 2002.

- [10] First, Harry, "The Vitamins Case: Cartel Prosecutions and the Coming of International Competition Law," *Antitrust Law Journal*, 68 (2001), 711-734.
- [11] *FTC History: Bureau of Economics Contributions to Law Enforcement, Research, and Economic Knowledge and Policy*, Transcript of Roundtable with Former Directors of the Bureau of Economics, September 4, 2003 <<http://www.ftc.gov/be/workshops/directorsconference/index.htm>>.
- [12] Geradin, Damien and David Henry, "The EC Fining Policy for Violations of Competition Law: An Empirical Review of the Commission Decisional Practice and the Community Courts' Judgements," paper prepared for the conference *Remedies and Sanctions in Competition Policy*, University of Amsterdam, February 2005.
- [13] Grout, Paul A. and Silvia Sonderegger, "Predicting Cartels," Office of Fair Trading, Economic discussion paper, March 2005.
- [14] Harrington, Joseph E. Jr., "Post-Cartel Pricing during Litigation," *Journal of Industrial Economics*, 52 (2004), 517-533.
- [15] Harrington, Joseph E. Jr., "A Stochastic Population Model of Cartel Births and Deaths," Johns Hopkins University, working paper, February 2006.
- [16] Harrington, Joseph E. Jr., "Detecting Cartels," in *Handbook of Antitrust Economics*, P. Buccirossi, ed., The MIT Press, forthcoming (2006).
- [17] Harrington, Joseph E. Jr. and Joe Chen, "Cartel Pricing Dynamics with Cost Variability and Endogenous Buyer Detection," Johns Hopkins University and University of Tokyo, April 2004 (*International Journal of Industrial Organization*, forthcoming).
- [18] Hay, George and Daniel Kelly, "An Empirical Survey of Price Fixing Conspiracies," *Journal of Law and Economics*, 17 (1974), 13-38.

- [19] Joint Economic Committee, U. S. Congress, "93 Lots of Bids Involving Identical Bids, Reported to the Department of Justice by the Federal Procurement Agencies in the Years 1955-1960," August 1961.
- [20] Lande, R.H. 1993. Are Antitrust 'Treble' Damages Really Single Damages? *Ohio State Law Journal* 54, 115-174.
- [21] McAnney, Joseph W., "The Justice Department's Crusade Against Price-Fixing: Initiative or Reaction?," *Antitrust Bulletin*, Fall 1991, 521-542.
- [22] Motta, Massimo, *Competition Policy: Theory and Practice*, Cambridge, England: Cambridge University Press, 2004.
- [23] Motta, Massimo and Michele Polo, "Leniency Programs and Cartel Prosecution," *International Journal of Industrial Organization*, 21 (2003), 347-379.
- [24] Porter, Robert H., "Detecting Collusion," *Review of Industrial Organization*, 26 (2005), 147-167.
- [25] Schinkel, Maarten Pieter, Jan Tuinstra, and Jakob Rüggeberg, "Illinois Walls: How Barring Indirect Purchaser Suits Facilitates Collusion," Universiteit van Amsterdam, pdf copy, May 2005.
- [26] Spagnolo, Giancarlo, "*Divide et Impera*: Optimal Deterrence Mechanisms Against Cartels and Organized Crime," University of Mannheim, pdf copy, March 2003.
- [27] Spagnolo, Giancarlo, "Leniency and Whistleblowers in Antitrust," in *Handbook of Antitrust Economics*, P. Buccirossi, ed., The MIT Press, forthcoming (2006).
- [28] Spratling, Gary R., "Detection and Deterrence: Rewarding Informants for Reporting Violations," *George Washington Law Review*, October/December 2001.
- [29] Suwazono, Sadaaki, "The Features of the Newly Revised Anti-Monopoly Act - Japan's Experience of Making Competition Policy Stronger," Speech before APEC Competition Policy Deregulation Group, May 24, 2005.

- [30] Symeonidis, George, "In Which Industries is Collusion More Likely? Evidence from the UK," *Journal of Industrial Economics*, 51 (2003), 45-74.