Organisation de Coopération et de Développement Économiques
Organisation for Economic Co-operation and Development

18-Dec-2015

English - Or. English

DIRECTORATE FOR FINANCIAL AND ENTERPRISE AFFAIRS
COMPETITION COMMITTEE

DAF/COMP/GF(2015)12
Unclassified

Global Forum on Competition

SERIAL COLLUSION IN CONTEXT: REPEAT OFFENSES BY FIRM OR BY INDUSTRY?

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-- Session IV --

This paper by Valerie Suslow, Margaret Levenstein and Catarina Marvao, was submitted as background material for Session IV of the Global Forum on Competition to be held on 29-30 October 2015.

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JT03388513

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1. Introduction

1. We are in the third decade of efforts to combat cartels with leniency and amnesty policies. This policy is now part of the antitrust environment.[4] In this context, some have questioned whether these policies have effectively prevented recidivism by colluders or whether firms have learned to collude under, and even make strategic use of, leniency policies. In this paper, we distinguish between *industry* recidivism and *firm* recidivism. If "recidivism" is really an industry-level phenomenon, the appropriate policy measures are very different from what is necessary if individual firms, having been detected and punished for colluding, engage in the behavior again. More generally, we frame the recidivism question as one about post-cartel behavior: what kinds of policies do we need to assure effective competition emerges post-cartel breakup?

2. Our first step is to examine which industries seem prone to collusion. This allows us to distinguish recidivism from prevalence. Are there specific product or technology characteristics, such as barriers to entry, which make collusion easier in some industries and help explain its prevalence there? Does cartel prevalence reflect the instability of competition in industries, particularly over the business cycle, because there are high fixed costs? We also examine whether industry prevalence has changed with the onset of amnesty.

3. Our second step is to examine recidivism at the firm level. Are there firms that, having once been convicted of collusion, collude again? We examine patterns and search for commonalities that would explain this recidivism, including the possibility that firms are using leniency strategically. Finally, surely both industry and firm level analyses are relevant. We examine the relationship between firm and industry level repeat offenses, particularly with regard to multi-market collusive firms that may spread anti-competitive practices.

4. We shed light on these questions using two different data sets, one that includes all European Commission cartel cases post-leniency from 1998 to 2014 and the other that includes all U.S. Department of Justice Sherman Act, Section I price fixing cases, 1961-2013.[5]

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[4] See Marvão and Spagnolo (2015a) for an in-depth review on the available evidence of the effects of leniency policies as they are implemented by competition authorities and of the experimental evidence of what the effects could be if leniency policies were better implemented.

[5] The first EU leniency programme was put in place in 1996, but the data begin when the first leniency reduction was granted in 1998.

2. Industries that collude

5. Collusion occurs in all sectors, but there are discernable patterns. As we have written elsewhere, "… the list of industries with frequent cartel activity is long and diverse: agriculture; stone, glass, and machinery; chemical and agricultural food products; textiles; steel; and highway construction, street construction, and electrical contracting" (Levenstein and Suslow 2006, p. 57). Examples of studies in which particular industries stand out include: agriculture (Dick 1996, Posner 1970); stone, glass, and machinery (Audretsch 1989, Fölster and Peltzman 1997, Jacquemin, Nambu, and Dewez 1981, and Symeonidis 2002); chemical and agricultural food products (Connor 2002 and Levenstein and Suslow 2004); textiles and steel (Audretsch 1989, Dick 1996, Fölster and Peltzman 1997, Jacquemin et al. 1981, and Symeonidis 2002); and highway construction, street construction, and electrical contracting (Joyce 1989).[6]

6. We have created a new sample of cartels including all cases designated by the U.S. Justice Department as convictions under Section 1 of the Sherman Act, including those designated as price fixing, customer assignment, market division, and bid rigging.[7] Data were extracted from Commerce Clearing House (CCH) Trade Regulation reports. We find prosecutions of 524 distinct cartels during the period 1961-2013. For the purposes of this study, a cartel is defined by one or more indictments relating to a specific product and geographic area. In some cases, a cartel was clearly local in nature, and in others, the evidence suggests that it was national or international.

7. Table 1 presents the sectoral distribution of this sample of cartels. As in previous studies, this sample includes cartels in virtually every sector of the economy. Table 2 divides the sample at 1992 to distinguish between those cartels that *formed* before the U.S. adopted a stronger leniency program and those that formed while leniency was available. Construction and chemicals were frequently cartelized both before and after leniency. Other changes over the sample period reflect changes in the structure of the U.S. economy, so that, for example, "information" sector cartels comprise 1.3% of pre-leniency sample and 8.1% of post-leniency sample. There are other patterns in the prevalence of cartels across sectors. There are a large number of cartels in local markets in some industries, such as retail gasoline stations and dealers and ready-mix concrete. But while collusion in these local markets is frequently uncovered, it is not necessarily the same firms. In fact, these firms often operate in only one location or market, so that the repeated occurrence cannot reflect something about these particular firms, but rather something about the ease of or benefit to collusion in these markets. In some cases, publicly posted prices may make collusion easier (e.g., for gasoline stations). In other cases, such as ready-mix concrete, there are high transportation costs that create barriers to entry for more distant firms.

8. Table 3 presents the sectoral distribution of European Union cartels, similarly divided by start date, before and after the introduction of leniency in the EU. Construction appears to be less prevalent in this sample than in the U.S., but this probably reflects the difference in enforcement by jurisdiction in the two continents. Almost all price fixing cases in the U.S. are prosecuted at the federal level. In contrast, in the EU, cartels that are strictly within national boundaries are prosecuted by the relevant national competition authority. Hence, construction cartels rarely draw attention in Brussels. Like in the U.S., chemicals and transport cartels (both transport services and the manufacturing of transport equipment) are frequent areas of collusive activity. In Europe, collusion in the chemicals sector, not prosecuted until the leniency program was first used in 1998, was common before leniency and after. Figure 1 shows just how

[6] See Levenstein and Suslow 2006, fn 45, p. 57, for more detail about the sectoral breakdown of these samples.

[7] This sample builds on data provided by Bryant and Eckard (1991) for the period (1961-1987). We are extremely grateful to Bryant and Eckard for their willingness to share their data with us. Their sample excluded bid rigging cases, and thus we went back to collect those from the CCH records. We also added cases from that period that had been appealed and therefore were not included in their original sample.

prone the EU chemical industry is to collusion. Using EU data on cartels fined between 1998 and 2014, this figure shows the years in which at least one (convicted) cartel was active in the chemical industry. There were 23 cartels and 106 firms, illustrating that the chemical industry – highly concentrated and with predominantly homogeneous products – is prone to collusion across many different firms. These cartels were broad in terms of their geographic impact - 16 were also convicted in the U.S. – and long in duration, as the average duration was 94 months. In 2001, the vitamins cartel, within the chemical industry, received the largest cartel fine imposed up to that time by the European Commission.

9. Figure 2 provides a different snapshot of repeat, multiple and single offenders.[8] The graph shows a high number of repeat and multiple offenders in chemicals (sector 7; 9% and 40%, respectively) and a surprisingly high proportion of repeat offenders in the manufacture of transport equipment (sector 14; 29%) and of electrical equipment (sector 12; 24%). The highest proportion of multiple offenders can be found in pharmaceuticals (sector 8; 86%) and refined petroleum products (sector 6; 60%). There is a high proportion of single cartel offender firms in the transportation and storage market (sector 20). This is a sector with a high incidence of collusion (83 convicted cartel members), but no observations of repeat offenders.

10. Government procurement cases arise frequently in the U.S. sample. Such cases include construction projects (roadways, buildings), school milk, medical supplies, and military services and supplies. Many "repeat industries" seem to be driven by the repeat customer — where the government is the customer. This may be the result of the design of public procurement auctions or rules requiring transparency; it could also be the result of public corruption. We focus on the price fixers, but many cartels target repeat customers. This is true not only of the government, but also seems to be the case for other customers who are large players in concentrated industries, such as auto and food manufacturers. While Stigler (1964) long ago noted that large customers could destabilize cartels with large orders that induce cartel members to cheat, in practice large customers seem to be less effective than expected at inducing competition – even when they actively try.

11. Are there predictable determinants of industry prevalence? Despite significant effort by both academics and enforcement agencies, the answer appears to be no. The determinants of cartel activity are varied and endogenous. For example, almost everyone agrees that, in theory, concentration should increase the likelihood of collusion. In a sample of international cartels from the 1990s and 2000s, two-thirds of the cartels were in industries with a 4-firm concentration ratio of 75% or higher (Levenstein and Suslow 2011, p. 470). But we have many examples of collusion in unconcentrated industries. Empirical attempts to establish a systematic relationship between concentration and collusion have been unsuccessful (Levenstein and Suslow 2006, pp. 57-61 and 2011, p. 481). This may reflect, at least in part, the endogeneity of concentration: high collusive prices encourage entry (Sutton 1991). But it also undoubtedly reflects diversity in firm and industry history and capabilities. For example, collusion in unconcentrated markets is often associated with active industry association involvement. The economic boundaries of the market also matter: cartels in industries such as construction and concrete are facilitated by the presence of large transportation costs that segment markets, so that the relevant competitors are smaller in number than may be immediately apparent.

12. Barriers to entry can increase concentration, but cartels themselves often actively build barriers to entry that may endure after the cartel's demise. All of these potential permutations have made it

[8] Multiple offenders are defined as firms that were fined for participation in more than one cartel by the EU, but whose offenses all pre-date the first fine. Repeat offenders are defined as firms that either start a cartel after investigation by the EU for participation in a different cartel or that continue a cartel after being fined by the EU for participation in a different cartel. Single offenders are defined as firms that have only been fined for participation in one cartel by the EU.

impossible to find a simple relationship between observed concentration and collusion. In some industries, it has been argued that high fixed costs make competition unstable, so that, absent collusion, firms price below long-run marginal cost and are unable to cover fixed costs (Pirrong 1992). If prices increase, firms enter, undermining the ability to maintain prices. This description of cycling between collusion and "ruinous competition" has characterized railroads and shipping, but an industry pattern of on-and-off collusion is not restricted to transport, as evidenced by Table 3, which shows repeated episodes of collusion in sugar, aluminum, and other industries.

13. Culture and history may also affect the frequency of collusive attempts in an industry. Spar (1994) argues that the cooperative culture necessary for survival for diamond miners facilitated collusion as the industry matured. Policy fluctuations can contribute to this problem. When there are periods of antitrust permissiveness, as was the case in the United States during the Great Depression, firms may gain experience with cooperation and collusion that can affect their ability to collude even when the legal environment becomes less accepting of cartels. Alexander (1994) and Chicu, Vickers, and Ziebarth (2013) find that the two-year long experiment with legal collusion under the National Industrial Recovery Act (NIRA) lowered the costs of cartel formation, especially organizational costs associated with coming to agreement about market sharing and enforcement, and made it easier for firms to reduce competition even after the overturn of NIRA.

14. One necessary, but not sufficient, condition for cartel success is that demand is inelastic at the competitive price. This is empirically challenging to capture if the observed prices have been affected by monopoly power, thus potentially raised to a level at which demand is elastic. The elasticity of demand that is relevant is the demand faced by the firms in the cartel (or potential cartel). This reflects the proximity of substitutes and the ease of entry as well as consumer preferences. In many cases, the direct consumer is a producer, so the downstream cost function and competitive intensity also influences the elasticity of demand for the cartelized product. For example, one of the most important consumers of vitamins are processed food manufacturers. Vitamins represent a small fraction of the cost of production, and competition among food manufacturers is relatively soft. As a result, for example, General Mills and Kellogg's appear to have been willing to pay millions of dollars in higher priced vitamins without significant efforts to find alternate suppliers or reduce their use of these inputs in the production of ready-to-eat cereal or other foods. This suggests that collusion will not be prevalent in industries with elastic demand, price sensitive consumers, or easy entry.[9]

15. Concentration also increases the ease of *tacit* collusion. One might expect that sufficient concentration would make explicit collusion unnecessary. In a market with a small number of stable firms, especially if pricing is relatively transparent and firms have similar costs, market participants should be able to anticipate one another's behavior and refrain from competing with little or no communication. This further suggests that industries with similar observable structures or underlying technology and costs may have very different collusive patterns depending on the particular firms in the industry. Hence we need to look at both firms and industries.

3. Firms that collude

16. Some firms do have a history of repeated collusion. That does not mean that the cartel re-forms. A firm may conspire in a new industry or product line or with a new set of co-conspirators. For example,

[9] Using a sample of both U.S. and EU cases, Grout and Sonderegger (2005) estimate the likelihood of collusion in any industry, based on a variety of facilitating factors and rank industries by their estimated probability of collusion. This could be used to target competition authority resources to select industries. There are other econometric screens that focus on individual markets over time that offer alternative ways of targeting enforcement resources to where collusion is most likely.

in the U.S., the firm U.S. Steel was involved in six different conspiracies between 1948 and 1969, some of which involved traditional steel products and producers, as in a 1963 case in which U.S. Steel, Bethlehem Steel and others were convicted of conspiring to eliminate competition in the production of wheels, others were less finished steel products, and yet others were in plastics. Some involved the same co-conspirators, but others were an entirely new set of firms. VSL construction, though narrower in its product line, was similarly involved in multiple cartels across several decades with distinct, but overlapping partners. It founded a cartel in 1970 with five other firms, including Western Concrete and Prescon, to allocate contracts and rig bids for post-tension concrete construction projects in the western United States. It was also part of a similar arrangement beginning in 1974 with Western Concrete and Prescon as well as two other new co-conspirators. Twenty years later, VSL was involved in an international cartel to fix bids and allocate market shares in bridge construction projects. The co-conspirators in the 1990s had different names, but one suspects that the underlying behavior was similar.

17. In the EU, Akzo Nobel N.V. has been convicted for nine cartels, which lasted between 1987 and 2007, and in which its co-conspirators were mostly overlapping. For example, Akzo colluded with Arkema in six instances (although the latter changed its name during the period). Many of the other co-conspirators were also multiple offenders. While Akzo received a fine increase for repeat offenses in only one cartel, it has received seven leniency reductions, of which three were full immunity. Other repeat offenders are ABB and Degussa Evonik - both of which were convicted four times and received full immunity from fines twice – as well as Brugg and Sumitomo. The latter was convicted for seven cartels, of which five, in the automotive wire harness, were reported by Sumitomo.

18. There are cases where a firm's corporate culture encourages participation in cartels. In such a case, the leadership of the organization expects managers to collude, and we observe collusion in many markets in which the firm operates. Managers may learn to collude in one division and then take those practices to another. Firm norms and expectations of managerial behavior can encourage collusion, as the well-known ADM case illustrated (Eichenwald 2000). Van Driel (2000) analyzes the role that cultural and organizational factors played in a study of four European transportation cartels.

19. Firm structure can also influence the likelihood of collusion. The multi-market collusion literature focuses on the ability of firms to target punishments in particular markets. This is relevant when the same set of firms is colluding in multiple geographic locations or products. But multi-market firms may also encourage the spread of collusion if they have learned to collude in one market and share their "best practices" in another. This seems to have been the case, for example, in the spread of the vitamin cartel from vitamins A and E to other vitamins (Connor 2008). Multi-market collusion is encouraged not only by multi-product multinationals, but also multi-market relationships between what appear to be smaller firms in local markets. For example, if gas stations are owned by multi-market firms such as large oil firms or chains of stations, that may facilitate repeated collusion over time and/or across geographic locations.

4. What happens after cartel breakup? Is recidivism a significant occurrence?

20. The goal of competition enforcement against cartels is increased competition. The concern, implicit in the topic selected for the OECD Global Forum, is that while we have become better at detecting and intervening in cartels, we have been less successful – or at least less confident about success – at establishing workable competition post-cartel. One obvious possibility is that, having explicitly colluded in the past, firms will tacitly collude in the future. Having established norms, customer relationships, mechanisms for making prices transparent, etc., cartel members may find it much easier to engage in tacit collusion without explicit communication. In principle, cartels that are able to maintain the same arrangement without communication as they did under a formal cartel can have the same negative impact on consumers as a cartel, but escape legal scrutiny. Former cartel members may also respond to an

increased intensity of competition with merger (or exit). In this case, once again, post-cartel competition may not achieve the desired level. This is particularly worrisome if former co-conspirators merge post-cartel: having been unable to exert market power through explicit cooperative behavior, they instead create a dominant entity in the market.

21. A fourth post-cartel option is the path of serial collusion. There are cases where firms, having been convicted of illegal collusion, simply do the same thing again, in the same or different markets. In this case, the enforcement is not sufficient to achieve the hoped-for post-cartel behavior. This is true recidivism. The term recidivism has been used loosely, causing confusion and debate about how to measure it empirically.[10] Connor (2010) defines a recidivist cartel member as any firm fined more than once for a collusive agreement. His sample of international cartels contains 2114 "non-anonymous" cartel members during 1990-2009. As shown in Table 5, based on this definition, Connor labels approximately 18 percent of the firms in his sample recidivists. A subsequent paper by Werden et al. (2011) contests Connor's definition of recidivism, pointing out that his is instead a measure of repeat offenses. In some cases the so-called recidivists were actually firms active in more than one cartel simultaneously. Werden et al. use a different methodology and arrive at a starkly different conclusion:

> *Using as the starting point the day on which the first prison sentence was imposed on a non-U.S. defendant in an international cartel prosecution, we thoroughly reviewed the pertinent records. Although Professor Connor considered only international cartels, we imposed no similar restrictions. Nevertheless, we found not even a single instance of cartel recidivism within the United States. No company and no individual convicted in the U.S. of a cartel offense after July 23, 1999 subsequently joined a cartel prosecuted in the United States. Moreover, no company and no individual granted conditional leniency after July 23, 1999 subsequently joined a cartel prosecuted in the United States. (pp. 5-6).*

22. Marvão (2015) uses her EU cartel dataset to illustrate the differences in the alternative definitions (Table 5). These cartel data span from 1998, when the first leniency reduction was granted, through 2014. Of the 510 cartel member firms in this EU sample of 117 cartels, Marvão identifies 89 multiple offenders (a firm fined for collusion more than once), 10 recidivists (firms which initiated a cartel agreement after being investigated for another cartel), and 5 recidivists following the Werden et al. definition (firms which initiated a new cartel after being fined for another cartel). Even though the number of "true recidivists" is not zero, it is less than one percent of the entire sample.

23. Table 5 also reports preliminary analysis of recidivism using the DOJ dataset compiled by Levenstein and Suslow (2015), spanning 1961-2013. There were 113 "multiple offender" firms, but only 14 firms were recidivists who were in a cartel formed after the indictment date of a previous cartel in which the firm participated. Of these 14 firms, five that had been previously indicted were caught in the 1990s, but none of the 14 was indicted again by the DOJ in the 2000s. Once more, recidivism occurs in less than one percent of the sample in Levenstein and Suslow (2015).[11] This suggests that the low level of recidivism found by Werden et al. pre-dates the adoption of leniency and amnesty policies. The lesson is that consistent enforcement is effective. Recidivism arises when there are lapses in enforcement; not surprisingly, some firms take advantage of these lapses to return to old behaviors.

[10] Maltz (1984), for example, discusses several definitions of recidivism and their adequacy in diverse contexts.

[11] Note that the calculations for Levenstein and Suslow (2015) are preliminary. Although these numbers might change somewhat as data collection proceeds, we believe that the estimate of multiple offenders and recidivists is a lower bound. In particular, we have not attempted to account for changes in firm names over this lengthy period, of which there likely were many.

24. It is instructive to take an in-depth look at two illustrative EU cases of recidivism (Table 6). One of the most interesting illustrations is Akzo, which took part in nine (convicted) cartels. Its first conviction, in 2001, for its participation in a price-fixing cartel on sodium gluconate between 1987 and 1995, led to a fine of €9 Million (including a 20% leniency reduction), well below 10% of its (relevant) turnover. Two years later, Akzo reported to the EU a cartel in organic peroxide. In 2004, it formed a new cartel in calcium carbide, while it was being prosecuted for yet another cartel in choline chloride. Of the nine fines imposed between 2001 and 2009 Akzo was granted immunity from fines in three instances and leniency reductions between 20% and 40% in four other cartels.

25. ABB participated in the gas insulated switchgear cartel beginning in 1988, where it was granted immunity from fines, and in the pre-insulated pipe cartel beginning 1990. The latter cartel was investigated in 1997 and fined in 1998. Yet, ABB formed two other cartels beginning 1999. Its latest fine was in 2014, for a cartel in power cables, where, once again, it was the first reporter and was therefore granted immunity from fines. It is worth noting that in each of these four cartels, at least one other co-conspirator was a repeat offender. It appears that these firms have not only learned to collude, but that they have also learned when to report, and may even take turns in doing so.

5. Anti-Cartel and Post-Cartel Policy Tools

26. Anti-cartel policies alone are not sufficient to promote competition. In order to prevent recidivism we must design and implement effective post-cartel policies. One might think that in light of the empirical evidence above, which suggests that we detect very little true cartel recidivism, it is not necessary to dwell on post-cartel policies. However, as we also discussed above, firms with cartel experience may turn to other options once caught. In addition, there are industries in which cartels are more prevalent. We need to understand why this is in order to select the appropriate policy tool. We consider several policy tools here, with brief commentary on each. (This is not meant to be a full discussion.)

a. Company Fines and Leniency

27. Over the last quarter century the magnitude of fines for price fixing has increased substantially. The intent of this increase in fines is to provide deterrence to future collusion. Connor and Lande (2005) argued that the size of fines is still substantially below what is necessary to provide deterrence, given the potential profits of collusion. The fragmentation of enforcement can contribute to this problem. Global cartels may pay substantial fines in some jurisdictions, but still profit from collusion overall because of the ability to raise prices where enforcement is weak (Clarke and Evenett 2003). There is also a limit to the size that fines can reach without undermining the viability of punished firms, particularly during downturns (Levenstein and Suslow 2010). There is no point to fining a firm out of business if the goal is to increase competition.

28. Theoretical research has emphasized the strong potential for well-designed and well-run leniency programs to improve cartel detection and deterrence, as cartel members fear being turned in by their co-conspirators.[12] However, it has also been shown that poorly implemented leniency programs may have a perverse effect. An overly generous leniency program which offers fine reductions to several cartel members may make a competition authority appear very successful in terms of the number of convicted firms, at the cost of reduced social welfare, through decreased cartel deterrence, increased prosecution costs, and the potential that the cartel uses the threat of reporting to the authorities to enforce collusive discipline. Spagnolo and Marvão (2015b) note that, for the EU, the average leniency reduction is 45% and leniency reductions are granted to 52% of convicted cartel members.

[12] For a survey, see Spagnolo (2008).

29. In addition, Marvão (2015) shows that repeat offenders fined by the European Commission appear to receive larger leniency reductions, which suggests that firms can learn the 'rules of the game,' colluding repeatedly and reporting the cartel to reduce their penalties. Leniency reductions are larger for firms in cartels with a wide geographic impact. This suggests that firms, especially with multi-market contact can use leniency policies to facilitate further collusion. This is exacerbated by the policy of giving multiple cartel members partial leniency, even when the group is known to have previously colluded.

b. Individual Accountability

30. Imposing tougher sanctions on individuals may help to reach levels of deterrence not feasible with firm fines, especially when combined with leniency. C*riminal* sanctions may be a more effective remedy for misbehavior than a substantial increase in monetary fines. According to Berzins and Sofo (2008), the senior management of firms is involved in cartel agreements in 80% of the cases[13] and, according to Ashton and Pressey (2012) the highest level of management is involved in 47% of cartels.[14] Evidence from recent EU cartels indicates that senior management does not suffer from their participation in – and leadership of –cartels. For example, Robert Koehler became CEO of SGL Carbon in 2012, after being convicted in 1999 of price-fixing in the graphite electrodes cartel.

31. The involvement of senior management is particularly evident in the financial sector cartels in which firms fixed rates such as Libor, Euribor, and Forex. High level executives played a central role in these conspiracies and should arguably be individually punished. However, monetary penalties imposed on bankers are unlikely to suffice as they can be partially hedged in the market. Furthermore, bankers may be particularly skilled at hiding their wealth, and companies may indemnify them for their losses (Buccirossi and Spagnolo, 2008 and Spagnolo, 2012). Ginsburg and Wright (2010) highlight the importance of holding executives personally liable, so that they do not reap the gains from collusion while pushing the costs onto uninformed shareholders. The U.S. Justice Department has increasingly made use of criminal prosecutions of individual defendants, and several other jurisdictions have taken steps to follow suit.[15]

32. Aside from monetary and criminal penalties, which are clearly not sufficient in certain cases, additional tools can be used to hold individuals responsible. One policy is to disqualify senior executives from employment in their sector or role, as permitted in the legislation of several countries. In the EU, a CEO can only be fired and banned from another position if he or she directly ran the cartel. Thus a CEO could escape punishment by rewarding (e.g., with high salary) employee managers for colluding while implicitly agreeing not to communicate about the collusion with their own managers. Another alternative is to exclude convicted colluders from receiving government contracts. Eric Havian, former assistant U.S. Attorney, recently wrote, "We need to use better methods to deter corporate misbehavior. Exclusion needs to be dusted off, modernized and used more frequently."[16] This is a potentially serious sanction with ongoing implications so that firms cannot simply treat fines as a cost of doing business.

[13] Berzins and Sofo's calculations are based on 69 publicly available cases from Australia, Canada, Denmark, EC, Ireland, Japan, Korea, Netherlands, New Zealand, UK, and US, between 2000 and 2006.

[14] Ashton and Pressey use data on 56 cartels convicted by the EC between 1990 and 2009.

[15] "Individuals now face potential imprisonment for cartel activity in Australia, Brazil, Canada, Iceland, Indonesia, Israel, Japan, Korea, Norway, Russia, Thailand, and Zambia, in addition to in the US and a majority of EU member states" Shaffer et al. (2015).

[16] "How to Punish Corporate Fraudsters" *New York Times* October 22, 2015.

c. Follow-On Damages

33. Private damage suits may provide additional deterrence. In such a suit, a private party which has been injured by cartel activity, typically a purchaser of an allegedly price-fixed product, may initiate a civil suit to redress cartel behavior. Often, follow-on damage actions take the form of class actions, through which one plaintiff sues on behalf of all other claimants. In the US, public and private law enforcement have coexisted since the Sherman Act, and private litigation plays a major role in the enforcement of antitrust law. The amount of damages a firm is liable for in the US can be significant and is often larger than the cartel fine imposed by the competition authority. The private award is set equal to treble damages for all but a reporting cartel member (who is entitled to immunity from fines, through the leniency program, and who is privately liable for single damages only). Access to private damage is relatively new and implemented differently in the EU. Private damages are mostly processed through the Brussels-based Cartel Damage Claims firm. They have only handled claims in four cartel cases, and of these, only one has been closed (cement cartel in Germany) to date.

34. Whether public and private enforcement serve complementary purposes or not has generated a long legal debate, particularly in the EU. While they are typically complementary, the case of anti-cartel enforcement is one area where antitrust enforcement may engender conflicts between private and public enforcement, due to the existence of leniency programs. Private action for damages may undermine leniency programs since a leniency application increases the risk of a successful damage claim by the cartel's victims.

35. The recently adopted EU Directive on damages (November 2014) aims to find a balance between public and private enforcement, by preventing the use of leniency statements in subsequent actions for damages. Buccirossi et al. (2015) show that this compromise is not necessary, i.e., limiting the cartel victims' ability to recover their losses is not necessary to preserve the effectiveness of a leniency program and may be counterproductive. They further show that the effectiveness of damage actions can be improved through a legal regime in which the civil liability of the immunity recipient is minimized and full access to all evidence collected by the competition authority is granted to claimants.

d. Structural Remedies

36. There has been almost no discussion of the use of structural remedies to prevent cartels. Structural remedies such as disclosure, divestiture of assets, selling minority shares in competitors, or licensure of intellectual property to competitors may change the nature of competition in the market and make collusion more difficult. Article 7 of EU Regulation 1/2003 states that "*Where the Commission (…) finds that there is an infringement of Article [101] or of Article [102] of the Treaty, it may by decision require the undertakings and associations of undertakings concerned to bring such infringement to an end. For this purpose, it may impose on them any behavioral or structural remedies which are proportionate to the infringement committed and necessary to bring the infringement effectively to an end.*" Competition authorities have used structural interventions in response to merger applications or anti-competitive behavior by dominant firms. Even in the former, the concern is almost always that the merger would create a dominant firm, not that it would increase the ease of collusion. We do not know of any cases in which a cartel prosecution was followed by a structural remedy designed to prevent collusion in the future. To the contrary, competition authorities have repeatedly permitted mergers among former cartel participants, in many cases without review, let alone structural intervention.[17]

[17] Davies et al. (2014) examine mergers among former cartel conspirators and conclude: "Surprisingly, only 25 (29%) of the 85 mergers for which we have sufficient market share data were investigated by the EC. Of these, 18 were cleared without remedies, and of the 7 where remedies were agreed, only 1 had any impact on the cartel market,

37. Motta et al. (2007) argues that the EC has focused on ensuring viable competitors in the market, while disregarding that such market structure may lead to tacit collusion (i.e., collective dominance). The authors further argue that the use of structural remedies is risky as they are irreversible, whereas behavioral remedies are less effective but also less risky in the sense that they require continuous monitoring by the authorities and can be modified. If the chosen structural remedy is efficient, then it can have a longer impact than behavioral remedies and with little or no monitoring involved. The challenging question is what structural remedies might actually deter collusion, especially in light of the inability of research to identify structures systematically related to collusion (as discussed above).

e. Consent Decrees

38. Consent decrees involve behavioral and structural remedies. Epstein (2007, p. 14) calls consent decrees in cartel cases "the gold standard of antitrust enforcement." These consent decrees lower the cost of prosecuting recidivists, by making it easier to intervene if a cartel member violates the consent decree. In the U.S., consent decrees were routinely used by the DOJ in the 1960s and 1970s. In 1980, for example, in the US v. Rea Construction, a concrete firm, a ten-year consent decree enjoined the defendant "from fixing prices, rigging bids, or allocating customers or territories on contracts for asphalt or concrete paving projects." In addition, it included a provision to conduct inspections. Another example from the same year, in US v Rockwell Int'l, Singer Co., Textron Inc., in a case related to gas-meters, a ten-year consent decree prohibited "fixing the prices, discounts or other terms or conditions…Exchange of information concerning bids, prices, or production…." These decrees permitted the DOJ to require documents or hold defendants in contempt if they violated the consent decree. The DOJ maintained staff to monitor these agreements. This practice was abandoned in 1980 because of concerns that they were not effective and used substantial resources.[18]

39. More recently, in September 2007, the Brazilian Administrative Council for Economic Defence (CADE) enacted Resolution No. 46, which allows for the use of consent decrees with the aim to settle cartel investigations. The first two consent decrees were executed in 2007, with Lafarge in the Brazil cement cartel case; and in 2009, with Manuli Rubber Industries Spa and Bridgestone Corporation, in the worldwide marine hose cartel (ICN 2008). Analysis of both past practice and future potential use of consent decrees and other kinds of monitoring and behavioral remedies is warranted.

f. Monitoring and screening

40. Some antitrust authorities have implemented monitoring and screening techniques to identify anticompetitive behavior absent a leniency application. These initiatives involve competition authorities analyzing or monitoring the characteristics of products or market structures which are thought to be more prone to collusion. These screens take different forms. Watch lists include detailed assessments of firms and markets that the authorities believe are likely to collude. Watch lists are maintained by the Australian Competition Authority ("Cartel Intelligence Project," described in OECD 2013, p. 81) and in the UK ("Predicting cartels" by Grout and Sonderegger, 2005). In Chile, the *National Economic Prosecutor Office* (FNE) identifies industries (and behaviors) which are more prone to collusion and directs the cases to court, in case of sufficient evidence of collusive behavior (OECD 2013, p. 97).

41. Price observatories in Europe are administrative bodies that monitor price evolution in food and agricultural products. Price observatories have been implemented in several countries, including Belgium,

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whilst the other 6 only impacted on the parties' activities in other markets" (p. 28, footnote omitted). See also Marx & Zhou (2015) for further analysis of post-cartel mergers.

[18] Many thanks to Donald Klawiter for providing background on these consent decrees (email correspondence September 2015).

Spain and France, in order to "determine the reasons for the growing volatility in the prices of agricultural products and to introduce transparency in the price structure in the different stages of the food production chains" (Oosterkamp et al. 2013, p. 9). Spain has proposed to notify the competition authority when abnormal price patterns are observed (p. 11). While these observatories could be used to detect anticompetitive behavior (as well as for addressing agriculture-specific problems), they can also be used by firms to undermine competition. This was the alleged result of a decision by the Danish antitrust authority "to gather and regularly publish statistics on transactions prices of individual firms for two grades of ready-mixed concrete in three regions of Denmark" (Albaek et al. 1997). Subsequently "average prices of the reported grades of concrete increased by 15-20 percent within less than a year as compared to annual inflation rates of a mere 1-2 percent" (Albaek et al. 1997 p. 430). The competition authority apparently recognized the problems associated with such a policy, and "stopped the publication of concrete prices" in 1996 (p. 430). The risks associated with European price observatories are noted in Oosterkamp et al. (2013):

> *In concentrated markets there may be too much transparency. When prices that are too current and too business-specific are made known, the players can attune prices to another, even without actually meeting. The dairy market described by the Federal Cartel Office (Bundeskartellamt, 2012) is a classic case in point. The effect that greater transparency will have on prices therefore depends on the actual market context (p. 14).*

42. A third type of monitoring is a statistical screen. Statistical screens are tests which compare patterns of price, volume, market share or other factors with benchmarks in order to detect the presence of collusion in a specific market. Abrantes-Metz (2013) discusses several pro-active detection tools for cartels, of which she argues statistical screens are the most effective. Statistical screening techniques have drawn increasing attention as complements to leniency policies (Harrington 2006). Abrantes-Metz et al. (2012, p. 138) argue that their screens of inside spreads flagged the NASDAQ and LIBOR conspiracies. Their study, performed in 2008, showed that over some time periods, the volatility of the LIBOR rate was improbably low and that the bids were improbably uniform.

43. A number of competition authorities are now using statistical screens and apparently successfully detecting cartels that had escaped leniency-induced defection. In the U.S., the Federal Trade Commission implemented a gasoline price monitoring program which performs systematic screens of gasoline prices, to scan for possible cartels (Abrantes-Metz et al. 2006). A similar approach has been introduced in the gasoline retail market in Brazil (Ragazzo 2012). In Korea, the public procurement authority notifies the competition authority (KFTC) of public tenders which pass the bid-rigging indicator analysis system. Around 80 notifications to KFTC are provided each month (OECD 2013, pp. 62-64). A similar method has been implemented in the pharmaceutical sector in Mexico, through price and market share screening of bids. As a result, several investigations have been initiated, some of which led to convictions for collusive behavior (Mena-Labarthe 2012). The Swedish Competition Authority reviewed 97,000 public procurement contracts (2009-2013) in order to establish a screening tool able to detect collusion (Konkurrensverket 2015, p. 3).

44. Implementing sophisticated screens requires antitrust agency resources to examine the data and interpret its results, as well as to evaluate the efficiency of alternative screening techniques. Screens also have an inherent risk of generating false positives (where no cartel exists or where collusion is tacit) and false negatives (where the cartel is not identified). Screens demand an extensive amount of data, as econometric techniques require a sufficiently large amount of relevant information. However, using screens on industries or firms which have been identified as prone to collude may help identify collusion and, in particular, recidivism.

6. Concluding Remarks

45. While literal recidivism, that is, the formation of a cartel after having been convicted of illegal collusion, appears to be relatively rare, at least as detected by U.S. and EU competition authorities, there remain policy gaps that could improve competition after anti-cartel intervention. First and foremost, consistency in anti-cartel policy is critical. Reversion to weak enforcement, either in terms of the likelihood of prosecution or the severity of punishments, encourages recidivism. Second, there are a variety of post-cartel policies that can and should be explored for their ability to increase the likelihood that workable competition, rather than tacit collusion or single firm dominance, will emerge. These include consent decrees or other post-cartel behavioral monitoring and remedies, structural remedies such as increased scrutiny of merger applications, and statistical screens of prices and other market variables. All of these reduce the reliance of competition authorities on leniency-driven self-reports, which will in turn make leniency more effective and less amenable to strategic use by firms determined to collude.

46. Future research would provide the basis for better informed post-cartel policies. If firms who are serial offenders are learning to collude, then repeat offenses should be associated with longer-lived cartels. If serial offenders continue to form cartels after getting caught but they are not learning (or the industry characteristics are not conducive), then repeat offenses should be associated with shorter-lived cartels. Research evaluating the effectiveness of post-cartel policies such as consent decrees, criminal prosecutions of individual executives, and exclusion of executives from the industry, could also enhance the toolbox of competition authorities in formulating policies to establish and maintain competition.

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Table 1

Sectoral Distribution of Cartels, 1961-2013

2-Digit NAICS Code	Industry Definition*	Frequency	Percentage
21	Mining, Quarrying, and Oil and Gas Extraction	7	1.87
22	Utilities	2	0.53
23	Construction	43	11.47
31-33	Manufacturing	243	64.80
42	Wholesale Trade	14	3.73
44-45	Retail Trade	14	3.73
48-49	Transportation and Warehousing	17	4.53
51	Information	10	2.67
52	Finance and Insurance	2	0.53
53	Real Estate and Rental and Leasing	5	1.33
54	Professional, Scientific and Technical Services	1	0.27
56	Administrative, Support, Waste Management and Remediation Services	7	1.87
62	Health Care and Social Assistance	2	0.53
71	Arts Education and Recreation	1	0.27
72	Accommodation and Food Services	2	0.53
81	Other Services (Except Public Administration)	3	0.80
92	Public Administration	2	0.53
Total		375	100%

Source: Levenstein and Suslow (2015), U.S. Department of Justice Sherman Act Section 1 cases, 1961-2013.

Table 2

Sectoral Distribution of US Cartels, before and after leniency, 1961-2013

		Start Year	
NAICS	Industry	1961-1992	1993-2013
	Non-manufacturing		
21	Mining, Quarrying, and Oil and Gas Extraction	2.3%	0.0%
22	Utilities	0.3%	1.4%
23	Construction	10.4%	14.9%
42	Wholesale Trade	2.9%	6.8%
44-45	Retail Trade	3.9%	2.7%
48-49	Transportation and Warehousing	3.6%	8.1%
51	Information	1.3%	8.1%
52	Finance and Insurance	0.3%	1.4%
53	Real Estate and Rental and Leasing	1.3%	1.4%
54	Professional, Scientific and Technical Services	1.9%	1.4%
56	Administrative, Support, Waste Management	0.6%	1.4%
62	Health and Social Assistance	0.3%	0.0%
71	Arts, Education, and Recreation	0.3%	0.0%
72	Accommodation and Food Services	0.6%	1.4%
81	Other Services (Except Public Administration)	0.3%	1.4%
92	Public Administration	2.3%	1.4%
	Manufacturing		
311	Food manufacturing	15.3%	1.4%
312	Beverage and tobacco product manufacturing	9.1%	1.4%
313	Textile mills	0.3%	1.4%
314	Textile product mills	0.3%	1.4%
315	Apparel manufacturing	1.0%	0.0%
316	Leather and allied product manufacturing	0.3%	0.0%

321	Wood product manufacturing	1.0%	0.0%
322	Paper manufacturing	1.3%	0.0%
323	Printing and related support activities	0.3%	0.0%
324	Petroleum and coal products manufacturing	2.6%	0.0%
325	Chemical manufacturing	8.8%	13.5%
326	Plastics and rubber products manufacturing	1.0%	2.7%
327	Nonmetallic mineral product manufacturing	4.9%	4.1%
331	Primary metal manufacturing	6.2%	1.4%
332	Fabricated metal product manufacturing	5.2%	2.7%
333	Machinery manufacturing	1.0%	6.8%
334	Computer and electronic product manufacturing	1.3%	5.4%
335	Electrical equipment and component manufacturing	2.9%	5.4%
336	Transportation equipment manufacturing	2.9%	1.4%
337	Furniture and related product manufacturing	0.3%	0.0%
339	Miscellaneous manufacturing	1.3%	0.0%
Total	Total number of prosecuted cartels formed during period	308	74

Table 3

Sectoral Distribution of EU Cartels, before and after leniency, 1969-2010

		Start year	
NACE	Industry	1969-1997	1998-2010
	Non-manufacturing		
1-3	Agriculture, Forestry, Fishing	0%	6.7%
36-39	Water supply, sewerage, waste management	1.4%	0%
41-43	Construction	0%	2.2%
45-47	Wholesale Trade	1.4%	4.4%
49-53	Transportation and Warehousing	4.2%	13.3%
64-66	Information	2.8%	6.7%
90-93	Arts, entertainment and recreation	1.4%	0%
	Manufacturing		
10-12	Food, Beverage and tobacco product	9.9%	0%
13-15	Textiles, apparel, leather and related	2.8%	11.1%
16-18	Wood and paper products and printing	1.4%	2.2%
19	Petroleum and coal products	2.8%	0%
20	Chemical	26.8%	8.9%
21	Pharmaceuticals, medicinal chemical and botanical	12.7%	0%
22-23	Plastics and rubber products	7.0%	4.4%
24-25	Primary metal	5.6%	4.4%
26	Computer and electronic product	2.8%	8.9%
27	Electrical equipment and component	2.8%	8.9%
28	Machinery	9.9%	4.4%
29-30	Transportation equipment	0%	13.3%
31-33	Other manufacturing	4.2%	4.4%
Total	Total number of prosecuted cartels formed during period	71	45

Table 4

Episodes of collusion in selected industries

Industry	Length of Cartel Episodes (years)						
Aluminum	5 [1901]	2 [1906]	2 [1912]	3 [1923]	4 [1926]	5 [1931]	
Coffee	1 [1957]	1 [1958]	3 [1959]				
Copper	2 [1888]	4 [1918]	6 [1926]	4 [1935]	19 [1968]		
Steel	4 [1926]	0.5 [1930]	0.2 [1931]	6 [1933]			
Sugar**	2 [1926]	4 [1931]	2 [1937]	2 [1959]	5 [1968]	3 [1974]	3 [1978]
Sulfur	3 [1907]	10 [1922]	5 [1934]	11 [1947]			
Tin	2 [1929]	3 [1931]	2 [1935]				

Source: Levenstein & Suslow (2006, Table 3), drawing on Eckbo (1976) and Griffin (1989). The first year of each cartel episode is shown in superscript.

Table 5

Definitions and Extent of Recidivism

Author	**Scope**	Sample Period	**Definition and Number of Repeat Offenses***		
			Multiple convictions	Recidivism	
			At least two cartel fines	Starts new cartel after investigation for another cartel	Starts new cartel after fined for another cartel
Connor (2010)	World *Pre- and post-leniency*	1990-2009	389/2114		
Werden et al. (2011)	US *Post-leniency*	1999-2011			0
Marvão (2015)	EU *Post-leniency*	1998-2014	89/510	10/510	5/510
Levenstein & Suslow (2015)	US *Pre- and post-leniency*	1961-2013	113/2054	14/2054	NA

Table 6

Illustrative Cases: Serial Offenders Fined in the EU

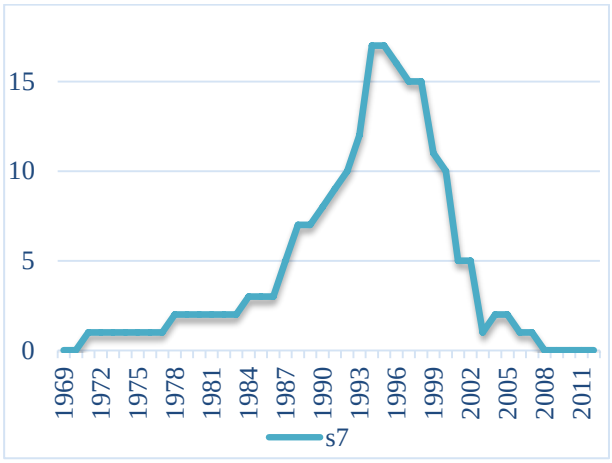
AKZO NOBEL										
Case	Product	Start	End	Invest.	Fine	Lred	PAID (M€)	NRO	NMO	Firms
36756	Sodium Gluconate	1987	1995	1997	2001	0.20	9.00	1	3	6
37857	Organic peroxide	1971	1999	2003	2003	1.00	0.00	2	3	7
37533	Choline chloride	1992	1998	1999	2004	0.30	2.99	1	2	3
37773	MCAA acid	1984	1999	2004	2005	0.25	0.00	1	2	4
38620	Hydrogen peroxide	1994	2000	2002	2006	0.40	12.60	3	8	9
38695	Sodium Chlorate	1994	2000	2003	2008	1.00	0.00	1	3	6
38589	Heat stabilizers (1)	1987	2000	2003	2009		21.80	1	6	8
38589	Heat stabilizers (2)	1991	2000	2003	2009		18.80	1	6	8
39396	Calcium Carbide	2004	2007	2006	2009	1.00	17.40	0	2	11
ABB										
Case	Product	Start	End	Invest.	Fine	Lred	PAID (M€)	NRO	NMO	Firms
35691	Pre-insulated pipe cartel	1990	1996	1997	1998		7.00	2	2	10
38899	Gas insulated switchgear	1988	2004	2004	2007	1.00	0.00	3	9	11
39129	Power transformers	1999	2003	2004	2009		33.75	2	7	7
39610	Power cables	1999	2009	2009	2014	1.00	0.00	5	6	18

Label	Definition
Invest	Investigation year
Lred	Leniency reduction
NRO	Number of repeat offenders in cartel
NMO	Number of multiple offenders in cartel
Firms	Number of firms in cartel

Source: Marvão (2015)

Figure 1

Prevalence of Chemicals Cartels in EU

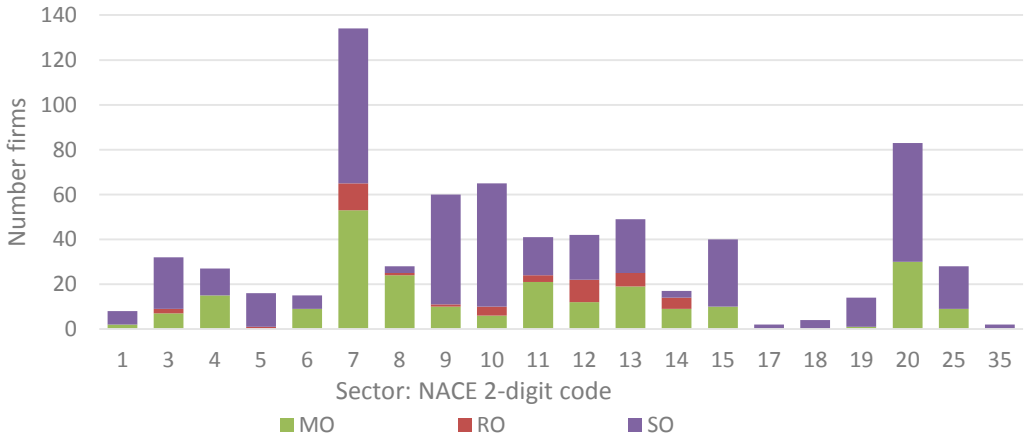


Number of cartels active in the chemical sector in a given year for cartels convicted by the European Commission in 1998-2014, based on the years of cartel activity for which the firm was fined.

Source: Marvão (2015)

Figure 2

Distribution of Cartel Members per Sector: EU (1999-2015)



Number of cartel members in cartels convicted by the European Commission in 1998-2014, per sector, according to 2-digit NACE codes.

Multiple offenders (MO) are firms that were fined for participation in more than one cartel by the EU, but whose offenses all pre-date the first fine. Repeat offenders (RO) are firms that either start a cartel after investigation by the EU for participation in a different cartel or that continue a cartel after being fined by the EU for participation in a different cartel. Single offenders (SO) are firms that have only been fined for participation in one cartel by the EU.

Source: Marvão (2015)