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Rosa M. Abrantes-Metz* and D. Daniel Sokol**

Cartel detection has been an important part of antitrust scholarship and policy for some time. Most of the development of the literature on cartel detection has focused at the firm level. This should not be surprising since industrial organization studies firms and markets. Antitrust scholarship has not focused as much on compliance and corporate governance within a given firm. Understanding the internal workings of firms would allow for closer to optimal deterrence, as this understanding would allow for calibrating policy around the incentives within a given firm, its subunits and individuals who work therein, to comply with antitrust law.

Both theoretical and empirical work in a number of different fields, including economics, accounting, finance, organizational theory and sociology provide important insights indicating that a firm is not merely a single entity in its actions. Rather, a firm is made up of a number of various components, each of which has its own incentives that shape firm behavior. This chapter reviews both the antitrust and the non-antitrust literatures on compliance and corporate governance to provide a clearer picture of the extant literature and the theoretical and empirical gaps within the antitrust literature to better inform antitrust policy on detecting cartels. This chapter explores the scholarship both within and outside of antitrust to better understand internal detection of wrongdoing and improved compliance in the antitrust cartel context.

Organizational Environment

Cartels are somewhat distinct from other types of white collar crime such as accounting or tax fraud because cartel activity requires coordination across firms. Like other types of white collar crime, cartels require that illegal activity be undertaken within a given firm, which implicates issues of compliance and corporate governance. What makes cartels distinct from all other types of white collar crime is that for a cartel to succeed, there needs to be coordination both within a firm (vertical relations given levels of management and oversight) as well as across firms (horizontal relations among the cartel members). This chapter focuses exclusively on cartel vertical relations within a firm. Chapters in this Handbook by Choi and Gerlach 2013, Levenstein and Suslow 2013, Hendricks et al. 2013, Doane et al. 2013, and Green et al. 2013 address the horizontal issues of cartels.

A firm's environment and the amount of individual discretion affect decision-making for the entire organization and may constrain the decision-making of individuals within them (Finkelstein & Hambrick 1990). Understanding organizational structure and incentives may illuminate how to better structure more optimal corporate compliance to police against antitrust violations. We begin with an analysis of agency costs to better understand incentives within the firm.

A core part of non-antitrust literature in both economics and finance is the concept of agency costs (Jensen and Meckling 1976). Within a firm, the agent may have incentives that differ from those of management. Firms work to reduce this misalignment through improved monitoring. Strong monitoring can reduce this divergence but might deter agents from risk

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taking which in turn could benefit the firm. Sometimes even if at the board of directors level, the firm wants to comply with antitrust law, its agents may not (Kaplou 2011).

Corporate crime is an agency cost (Alexander and Cohen 1999). Agency costs and the ability of the firm to effectively monitor rogue agents also play into the importance of focusing antitrust cartel detection at the individual level rather than just at the firm level. For example, a manager may ignore risks because s/he believes that s/he will not get caught for cartel behavior. The inability of antitrust agencies to detect existing cartels (relative to individuals within firms), the relatively low levels of punishment for individuals who are discovered engaging in cartel behavior (Combe and Monnier 2011, Connor and Lande 2012), and the low level of cartel detection (Connor 2012, Ormosi 2011) may affect the risk/reward calculation of a particular manager in participating in a cartel.

The broader non-antitrust literature suggests that many firms behave illegally and consider many factors in their decision to comply or not to comply, based on the relative costs and benefits of compliance (Helland 1998). If cartel behavior goes undetected, both the individual and the company may benefit (and individuals can justify their involvement as somehow saving jobs in the company), because the harms are externalized (Siltaoja & Vehkaperä 2010) and both individual and company benefit from greater stock price based on the supra-competitive pricing of the cartel (Spagnolo 2008).

There is some general work on managerial incentives regarding managerial effort and industry competition, such as Scharfstein 1988 and Schmidt 1997. The work on managerial incentives specific to cartels is relatively sparse. Aubert 2007 analyzes the interaction of managerial incentives to collude in which collusion may be a substitute for increased managerial effort. The model shows that, due to incentives to collude, firms may behave inefficiently which in turn creates even more incentive to collude as firms cannot easily control the actions of their employees. Spagnolo 2000 provides a binding contract from the firm to the manager to support tacit collusion. Similarly, in another work (Spagnolo 2005) the author suggests that a firm might hire a manager with a preference for income smoothing, thus creating an incentive to “meet the numbers” via a cartel. Two recent works offer some policy solutions. Angelucci and Han 2010 suggest that for a cartel compliance program to be effective, managerial sanctions need to be low. Another solution may be to penalize shareholders through a dilution of shares so that if managers undertake cartel activity through poorly aligned incentives, shareholders will be punished but not to the point that the firm would go bankrupt due to high fines (Buccirossi and Spagnolo 2008). The empirical work to date of managerial incentives and cartel analyze managerial compensation among 796 Japanese firms from 1968 to 1992 (Wook 1999) and a sample of German firms involved in coal cartels from 1881-1913 (Burhop and Lubbers 2009).

Often bonuses are tied to performance, and successful collusion can reward individuals for this reason. The opposite might, however, be even more important - that the fear of being fired for poor performance makes a mid-level manager who is in fear of losing his/her job ending up participating in collusion. Adding to the profit motive for collusion, there might be a contractual undertaking by firms (where this is not outlawed) to pay the penalties levied on individual employees for their participation in cartel activity. This may be in the form of informal contracting for jurisdictions where such formal contracts may be illegal.

One recent empirical study reviews the specific pay mechanisms and other incentives used by firms to reward individual cartel members. In terms of stock options, cartel individual members are more likely to exercise stock options more rapidly than individuals in other firms (Gonzalez et al. 2013). Work has yet to be done that examines actual contractual incentives of individual members of cartels. It may be that one reason that such studies have not yet been undertaken is due to the nature of what evidence gets collected for criminal cases. Antitrust enforcers and private plaintiffs are concerned about the illegality of price fixing and the mechanisms used to undertake it across firms. The incentive mechanisms within firms do not establish proof of price fixing and hence are not important for cases. Research into the incentives used in performance contracts for such individuals and across industries would be useful.

The time horizon of individuals impacts their potential involvement in cartels. Sometimes the particular individuals involved in the cartel have moved on to other companies and are not around to deal with the negative consequences of their illegal activity (Connor and Lande 2012). There is evidence in the airline industry that financially weak firms are more likely to cause price wars and thus more likely to defect from a collusive arrangement. The conjectured reason for this is that they effectively have a short time horizon since there is a non-negligible probability they will exit the industry through bankruptcy or acquisition (Stephan 2010b). In other cases, the individuals remain within the company for a long time because they enjoy the rewards of their illegal activity, think that they will not be caught or because they know that even if they move to a different company, they will still be criminally liable but no longer have the ability to cover up their misdeeds.

Firm Indicia of Cartel Activity and Their Impact on Compliance

Since the mid 1990s, most criminal antitrust violations targeted by DOJ Antitrust involve international cartels. This focus on large firm international price fixing is important given that the size of the firm affects its propensity for criminality. One study using event history analysis finds that larger firms are more prone to criminal behavior overall (Baucus and Near 2001). Size may be a factor because, as organizations get larger, agency costs increase and monitoring becomes more difficult.

Organizational design issues may contribute to illegality. As organizations increase in complexity, firms develop various organizational structures in response (Tushman & O'Reilly 1997). The larger and more complex an organizational structure, the more difficult it is to coordinate various organizational subunits. Complexity of organizations also may increase agency costs (Chen and Hambrick 1995). Because of organizational size and complexity, it is possible to hide wrongdoing from government officials, and inside and outside gatekeepers such as in-house counsel or outside auditors. The more complex the organization, the higher the proclivity within the firm for illegal activity (McKendall and Wagner 1997).

Given the link between organizational structure and wrongdoing, it seems to be the case that the internal governance structure within a corporation affects the likelihood of successfully monitoring illegal behavior and enforcing compliance. For example, independent outside directors seem to be more effective than inside directors (members of the firm's management team) at policing against corporate fraud (Beasley 1996, 2000, Uzun, Szewczyk and Varma 2004) and opportunistic grants of stock options (Bebchuk et al. 2009). Gonzales et al. 2013 note

that cartel member firms are more likely to have busy directors (directors on many boards) than a typical board.

Violations of antitrust law may occur because of organizational failure rather than profit seeking on the part of management (Beckenstein and Gabel 1986). Some firms have a strong compliance culture because incentives have been put into place to reward strong antitrust compliance. These incentives may take the form of pay incentives, organizational structures that allow for effective monitoring by legal and compliance staff and the overall creation of certain corporate cultures. For other firms, the social norms may work towards non-compliance for many of the same reasons. When individuals are rewarded for unlawful behavior, when monitoring by compliance staff is not strong, or where country-level norms push toward cartel behavior, these norms reinforce cartel behavior (Sokol 2012).

Incentive Pay

Firms may change the incentives for illegality for their employees via a focus in incentive pay on long-term rather than short-term gain (Bebchuk and Fried 2004). There is a principal-agent problem in firms in which the agents (employees) veer from what is in the shareholders' best interest in order to maximize the individual employee's best interest. One way in which firms reduce the agency cost problem is through incentive-based pay.

It is more likely that firms that promote short-term gains for pay have individuals who may undertake criminal behavior to "meet the numbers" as pay may be linked to performance. This is not to suggest that all pay for performance is problematic. If officers and directors have an equity stake in the firm, they have incentives to monitor the firm for illegal activity when the illegal behavior threatens firm returns (Alexander and Cohen 1999). In some cases pay for performance better aligns managers' incentives with those of the firm (Baber et al. 1996, Morgan and Poulsen 2001).

Only when incentive based pay is too large may this incentive problem lead to illegal behavior. Non-linearities in payoffs, theory would suggest, encourages fraud. It may be that fraud happens in industries with highly specialized knowledge and high variance, and maybe incentive contracts work in such an environment. Work in the area of corporate wrongdoing in other regulatory fields offers some theoretical and empirical basis on what seems to be correlated with wrongdoing. There is some theoretical support for the incentives behind this behavior (Fudenberg and Tirole 1995, Hermalin and Weisbach 2012). A number of empirical findings show that CEOs whose pay is incentive-based are more likely to commit fraud by misreporting material information or manipulating earnings (Berhstresser and Phillippon 2006, Peng and Roel 2008, John, Ryan and Tian 2009, Burns and Kedia 2006, Schnatterly 2003). CFO bonuses and stock options have also been empirically linked to manipulation of earnings (Oberholzer-Gee and Wulf 2012), and in the backdating of stock options (Lie 2005). A similar relationship of too much pay for performance is linked to corporate tax avoidance (Desai and Dharmapala 2006, 2009).

The role of incentives in shaping behavior has been extended to cartels. If managers receive bonuses passed on certain profitability metrics, this may encourage members to meet their performance based metric by any means necessary – including becoming involved in a cartel (Buccirossi and Spagnolo 2008). Managers might be willing to risk joining a cartel if too

much of pay is linked to performance, as the short term incentive of a significant payout will increase (Gonzalez et al. 2013), especially if the risk of detection is low both inside the firm from compliance officers and outside of the firm by antitrust enforcers.

Enforcement and the Impact on firm behavior

In public speeches and in the unwillingness to provide credit for penalty mitigation to companies for strong compliance programs, both the US DOJ and DG Competition in effect utilize a strict liability framework for cartel enforcement. Put differently, the fact that a cartel is detected is indicia of a failed compliance program. This strict liability theory involving cartels and compliance contradicts the main academic literature in the area of entity liability and punishment. Arlen and Kraakman 1997 advocate a mixed regime of negligence and strict liability. A mixed regime is preferable. A strict liability regime will not ensure compliance in circumstances where the increased likelihood of uncovering harm by the compliance program outweighs the firm's ability to prevent such harm. As such, the firm has a disincentive for any sort of compliance program that would monitor firm behavior. Therefore, some sort of negligence regime needs to be incorporated into a composite approach to also punish behavior where an entity has demonstrated a "failure to discharge its policing duties."

The strict liability regime for antitrust shapes incentives within the firm to continue with criminality because there is very limited benefit to proactively spending on serious compliance when the firm (and individuals therein) benefit from non-detection. A system that enforces individual liability only raises the individual's expected cost of liability for wrongdoing but not necessarily that of the firm. By contrast, company-level liability imposes costs not on the individual but on the shareholders of the company (Arlen 2012). Thus, even if firms want to comply with the antitrust laws, individuals within firms may have a different set of calculations that may trigger illegal behavior. These "bad apples" may act illegally no matter how strong the corporate monitoring and compliance program implemented.

The amount of compliance that a firm is willing to take for antitrust or other areas of potential wrongdoing result from the nature of legal duties involving corporate governance of a firm. One aspect of the sometimes anemic cartel compliance efforts by firms is that corporate law does not provide sufficient incentives to create the sort of internal compliance process that may actually create effective compliance for antitrust. These incentives suggest why antitrust compliance seems to encourage only weak compliance.

Corporate boards under Delaware law have very weak legal duties to monitor the firms' actions. The scope for violating such duties is narrow. Given the high threshold for liability under *Caremark*,¹ there seems to be little incentive for a serious pro-active compliance program beyond the minimum required under corporate law. Empirical work on board liability shows that in practice, there are limited financial penalties for weak monitoring by the board (Black 2006). The one exception to this set of incentives is that the scope of liability, should a court find the board of directors to be liable, would make the violation of corporate law for non-compliance non-exculpable (Bainbridge 2009).

¹ *In re Caremark Int'l Inc. Derivative Litig.*, 698 A.2d 959 (Del. Ch. 1996).

The lack of strong corporate compliance mechanisms overall shapes the nature of firm compliance in antitrust. Many compliance programs are merely weak or cosmetic and companies have incentives to undertake only cosmetic compliance since self reporting may hurt the firm (Arlen 2011). The same seems to hold true in the antitrust context (Sokol 2012).

Senior Management Within an Organization

A crucial dimension of better incentives (and to the power of various policies) for compliance takes into account the distinction between managerial incentives and shareholder incentives and between the incentives of a middle manager and those of a senior manager. This next part examines the interrelationships between different individuals within the firm and across firms to better understand what might constitute effective compliance in the antitrust setting.

Senior management is an important component of firm governance and compliance (Hambrick 2007, Hambrick and Mason 1984). Different management styles affect corporate decision-making in a number of areas, such as investment and financial policy, tax compliance, and organizational strategy (Bertrand and Schoar 2003; Dyreng et al. 2010). The focus on senior management in antitrust is particularly important. The majority of individual defendants in cartel cases have been at the level of a company's corporate officers (Gallo et al. 2000; Stephan 2009).

The distinctiveness of criminality within top management of an organization may be due to the large amount of power that top management possesses and how it impacts firm culture (Schein 2010). Therefore, the preferences of top management will affect strategic outcomes of a corporation (Chatterjee and Hambrick 2007; Camerer and Lovallo 1999). Some work suggests that longer CEO tenure (Miller 2001) and top management team tenure (Finkelstein and Hambrick 1990) negatively affect the strategic dynamics of a corporation (Henderson et al., 2006). As any stability usually favors cooperative outcomes (Stigler 1964), then more stable firm management in an industry should facilitate collusion. Moreover, younger managers may be "trained" by the older generation to participate in cartels (Geiss 1967).

Top management's crimes differ from others within an organization, because the board of directors more closely monitors senior management than other parts of the firm. There are various internal control devices to better align the incentives of shareholders and management, so as to improve the quality of oversight and reduce incentives for cartel activity. For example, companies might issue debt to constrain management from over-investment (Harvey, Lins, Roper 2004). Separation of the CEO and Chairman position improves the board's ability to monitor the CEO (Efendi, Srivastava and Swanson 2007, Core 2003) as does independent directors who have financial expertise (Agrawal and Chadha 2005). Similarly, providing equity for directors might give rise to improved monitoring of management by directors by better aligning director interests with shareholder interests (Jensen 1993, Ertugrul and Hegde 2008). Moreover, board diversity serves to better monitor CEOs, based on CEO turnover (Adams & Ferreira 2009, Weisbach 1988).

One cartel related article (Simpson and Koper 1997) that analyzes 43 antitrust offenders over 22 years finds that certain top management variables correlate more with antitrust illegality (CEOs with finance and administrative backgrounds, less top level turnover, and firm reliance on a single product market) than others. More recent finance based work on cartels (Gonzalez et al. 2013) suggests that cartel members firms (1) tend to file an abnormally large amount of financial

restatements, (2) have less effective monitoring due to foreign or busy (too many board positions) directors, (3) directors who resign are less likely to be replaced, and (4) auditing firms are switched less often than the norm.

In the antitrust context, the tone of senior management matters to compliance within the organization. From a pro-compliance standpoint, if the CEO mandates antitrust training, middle managers are more likely to take such compliance seriously. The CEO must project a sincere desire to comply. This will set the tone for the entire organization in terms of its antitrust compliance. The CEO must be fully committed to the antitrust compliance program and be consistent in such commitment (ABA 2010). The more powerful the messenger, the more likely that others within the organization will conform to the message because of the CEO's ability to offer compliant managers greater resources, legitimacy and power (Oliver 1991). Therefore, the involvement by top management in criminal activities may merit tougher penalties, since senior management involvement signals compliance weakness and a corrupt culture overall, including at the level of board of directors.

Middle Management and Other Employees

Within the firm, middle management may not have the same incentives for compliance as senior management does. For example, in a divisional organizational model, each divisional unit may try to maximize the short-term profitability of that particular division instead of the entity as a whole (Shin and Stulz 1998). This suggests that organizational structure may be a contributing cause for misalignment of incentives.

Culture also implicates the behavior of middle managers. To become successful leaders in companies, middle management and lower level employees may mimic the behavior of senior management (Haunschild and Miner 1997). This may include behavior such as cartel involvement if such cartel participation allows these middle managers to move up the ranks within the firm.

Middle managers may be under significant pressure to meet various performance targets (Alexander and Cohen 1996). The financial rewards or possibilities for prestige or promotion for managers for divisional results may be different than for the firm as a whole (Berger and Ofek 1995). A cartel participant may rationally risk criminality because he/she wants to save jobs in his/her group or division. The cartel participant believes that as long as other firms do the same during a time of economic downturn, a cartel will naturally break up when the economy improves. For other potential cartelists, the fear of being caught and punished is a deterrent. However, this deterrent does not apply to others who are genuine sociopaths, or are desperate, angry, and/or scared of losing a job if they do not participate in a cartel. In yet other cases, the cartel participant may be convinced that he/she is smarter than everyone else.

Culture

Norm Creation

Antitrust scholarship has overlooked the importance of firm culture on compliance. Beyond the legal regime, there are other incentives within the firm that influence compliance regarding cartel policy. For a cartel to avoid detection by a participating firm's employees, there needs to be some level of management that actively participates in the cartel and other

employees who either are unaware of or who turn a blind eye to such behavior. As noted above, incentives within the firm shape firm behavior and the behavior of its agents. Thus, firm culture creates direct incentives for criminality. A compliance program, if not made part of a corporation's culture will be viewed antagonistically by mid-level management. Such managers may view it as "a system to beat in pursuit of sales and commission."

Illegal activity may become embedded in an organization over time and become a part of organization culture (Aguilera et al., 2007; Bettenhausen and Murnighan, 1985). Unethical changes within an organization may be subtle and gradual, such that individuals do not realize that they are engaging in illegal behavior (Ashforth and Anand, 2003). Over time, organizations reach a tipping point in their culture in which illegality becomes a defining element of the organization itself (Maclean and Behnam 2010). There is some evidence that firms exhibiting an illegal culture will manifest that culture in a number of different areas, such as tax, accounting and securities (Aboub et al. 1995). Additionally, rapid growth and unrealistic company performance forecasts are factors that indicate an increased likelihood of accounting fraud (Summers and Sweeney 1998).

Culture plays out within the cartel and compliance culture of various firms. There are different types of cartelists among individuals and firms. Each of the types of cartelists possesses its own unique traits based on nationality and size of the company. According to Sokol's survey (2012), non-U.S. firms, including Global Fortune 500 firms, seem not to have a strong cartel compliance culture. Respondents suggested that cartel crimes are accepted as part of doing business in many foreign firms, although in recent years respondents suggested that European firms have improved their awareness that cartel activity could lead to significant penalties and have begun a process of changing their internal tolerance of such activity. This is far less the case for Asian firms.

The perception by society that illegal acts are immoral may also create increased deterrence within the firm based on a pro-compliance culture. There are social costs for individuals for wrongdoing, such as stigma (Rasmusen 1996). These costs amount to shaming penalties. These issues implicate corporate culture, which addresses issues of norms and customs (Hermalin 2012).

Through more effective use of moral shaming, norms can be changed within companies and society at large. This can be done through changing incentives, such as highlighting the ethical value of compliance. This both decreases the cost of detection because others will be on the lookout and raises the potential cost to participation in illegal activity. This happens because those who might try to engage in illegal activity will see that it will hurt them given that such behavior will not be tolerated within the company. The more that people within the company who view cartel behavior and other white collar crimes on par with capital crimes, the greater the moral outrage that others will feel toward the perpetrators of such crime and the more stigma that will attach to the perpetrator. The mere threat of such stigma should be able to deter some individuals from participating in cartel activity.

Culture and Stock Based Cartel Event Studies

Stigma may be felt at the company level in terms of negative stock market returns due to the loss of "branding." Reputation effects (via a drop in stock price) may have a significant

effect on whether or not to undertake crime. The deterrent effect may be even greater than that of jail or of civil penalties. This work has its origins in Klein and Leffler (1981). More recent empirical work in other areas of regulation suggest two possible reputational effects. Finance empirical work shows that the reputational loss for financial misreporting and fraud is greater than the penalties via the legal system (Karpoff and Lott 1993, Karpoff et al. 2008, Engalin 2012). In contrast, in the environmental realm, the legal penalties imposed matter far more for optimal deterrence than do reputational penalties (Karpoff et al. 2005).

Antitrust studies of reputational effects on stock performance have been limited and the results mixed. Motchenkova and van der Laan (2005) provide a theoretical model that generates reputational loss for large firms across jurisdictions for cartel activities. Bosch and Eckard 1991 examined the stock returns for firms involved in price fixing during the period 1962-80. Their analysis suggested that the majority of the loss in stock value was due to the readjustment effect of what had been monopoly profits moving to the competitive price. More recent studies have not been undertaken to examine the reputation effect of US cartel enforcement since that time, even though there have been significant changes both to enforcement (the introduction of the leniency program), as well as the establishment of the importance of cartel enforcement.

A study on Dutch listed firms that were the target of competition actions of both cartel and dominance cases from 1998-2008 as well as EC level cases concerning Dutch cartels from the same time period finds that the reputational loss, taking into account the legal costs and readjustment effect of the profit stream, is a more significant deterrent than the legal effect (Van den Broek et al., 2012). Though information about a massive Dutch construction cartel was already publicly available (and financial penalties already built into the stock price), one study found that after a television show about the Dutch construction cartel appeared, the stock price of firms mentioned in the television show fell by 10 percent, which suggests as reputational penalty (Graafland 2004). At the EU level, the most recent work that examines the impact of cartel compliance (most of the observations) are papers by Langu et al. 2010 and Gunster and van Dijk 2010. Langu et al. found that fines account for between a quarter to a third of the stock price drop with the remainder due readjustment effect and almost none for potential reputation effects. Gunster and van Dijk find a -5% stock return around the time of the dawn raid and a -2% drop at the time of a final decision. They do not distinguish the loss among fines, the readjustment effect of the profit stream and reputational effects.

Other antitrust related work on the impact of cartel enforcement on stock returns focuses on the long term effect of stock prices. This line of work suggests that from a temporal perspective, companies might be willing to take a reputation hit because of a more limited effect of cartel enforcement. Thompson and Kaserman 2001, using the Bosch and Eckard data set found that 85 percent of firms in their sample (on a market adjusted basis) returned to the pre-indictment stock price within a year of the antitrust action. A more recent paper by Golub et al. 2005 uses a newer data set (1981-2001) and finds that the stock price returned to the pre-indictment level in a time period similar to that of Thompson and Kaiserman. To our knowledge, no study has examined the long term effect of stock prices focusing only on the period since the introduction of the leniency program.

Compliance Culture

Some of the lack of stigma for cartel cases is more directly tied to a poor compliance culture by cartel member firms. To date, there has not been a comprehensive study of the consequence for cartel participants akin to the work regarding managers involved in financial misrepresentations. Karpoff et al. 2008 tracked the outcomes of 2,206 individuals for all 788 SEC and DOJ financial representations from 1978-2006. The one antitrust work on this topic, Connor and Lande 2012 reveals alarming statistics about the acceptance of illegal cartel behavior, although only with a small percentage (34%) of a total of 103 managers who went to jail for cartel crimes between 1995 and 2010. Of that group of 25, nine (26%) remain employed by the same company for which they went to jail for their cartel activity and another nine (26%) work for a different firm but within the same industry.

Where there are no explicit restrictions (such as through the terms of a company's plea agreement) to rehire convicted felons (as cartel convictions are felonies) who participated in cartel activities, social shaming could increase on some level the cost of participating in such activity. US antitrust is different than other areas of related law (such as securities law) where convicted (or civilly sanctioned) offenders with some frequency are barred from the industry or where companies can be debarred from doing business with the government. In the United Kingdom, there is director debarment for cartel offenses. However, the effect of director debarment on firms has not been studied empirically in detail, largely because there has only been one debarment.

Blowing the whistle on cartel crimes requires employees to feel empowered within the organization. Employee incentives may not be aligned with the firm in terms of compliance because an employee or mid-level manager risks losing his/her job if she comes forward with information of illegal activity (Dyck et al. 2010). Thus, in many cases, the cost of informing outweighs the benefit of remaining silent. The misalignment of incentives between employees and firm replicate themselves in the cartel context. Where the cartel compliance culture at a firm is weak, there is little incentive for employees to come forward to report on others within the organization.

Scholarship on the effectiveness of cartel compliance in the United States suggests that antitrust compliance programs are not effectively integrated within firm culture. Instead, only a select group of managers (such as at the senior management and general counsel level) understand the importance of antitrust compliance, whereas much of mid-level management and employees do not seem sensitive to the importance of such compliance generally, seem to forget their training; or seem insensitive to the particular nuances of what type of collaboration across competitors is illegal (Sokol 2012). Subsequent generations of employees and managers get trained by their more senior colleagues in industry practices and thereby pass on company and industry norms. In many cases entire industries become recidivists when a generation retires and the next generation relearns how to coordinate with competitors (Levenstein and Suslow 2006).

Survey Evidence on Compliance

The question of whether or not compliance is effective in embedding antitrust knowledge and to what extent this knowledge deters activity among individuals within a given firm remains unknown except through survey evidence. Some of this is quantitative and some is qualitative. A number of articles and reports have surveyed practitioners, whether lawyers both in-house and at law firms or businesspeople more generally. Parker 2011a provides a review of such studies

up to 2009. Studies in the UK have surveyed companies about competition compliance and awareness. These include both academic studies (Rodger 2000, 2005, 2009) and government studies (OFT 2007, 2011). Rodger's studies involved surveys that tracked compliance with the UK Competition Act of 1998 including some detailed analysis of some particular companies' compliance efforts. The 2007 OFT study found that both businesses and their lawyers were most concerned with criminal sanctions for cartel offenses. The study also listed the most common compliance methods and noted that larger businesses tended to be the most compliant. The 2011 OFT study involved 2,009 telephone interviews across seven different industries in the United Kingdom. Compliance seemed to be uneven across all sectors. For a significant minority of firms, there is knowledge of competition law but there still no compliance. Larger companies are more likely to be aware of competition law than smaller firms.

In the United States, there have been two studies that survey antitrust lawyers on compliance issues (Beckenstein and Gabel 1983, Sokol 2012). The Beckenstein and Gabel study surveyed members of the ABA Section of Antitrust Law to understand compliance by its members. The Sokol study interviews antitrust practitioners (both members of the ABA Section of Antitrust Law as well as Chambers ranked U.S. cartel practitioners) in both quantitative and qualitative surveys and finds certain structural limitations in organizational behavior within firms which have prevented antitrust compliance programs from becoming embedded in a way that would reduce cartel activity.

Twenty Swiss antitrust lawyers were the subject of an article (Hüschelrath et al. 2011) that illustrates the deterrent effects of enhancements to Swiss cartel policy – increased fines and increased evidence gathering. The lawyers represented attempts to get at what sort of effect internal to foreign companies as well as smaller and medium sized Swiss companies, some of which have limited or no international exposure. The study noted the difficulty of getting top management to be involved in the successful creation and implementation of a compliance program.

In Australia, Christine Parker has been the author or co-author of a number of studies on competition compliance. Overall she and her co-authors find that cartel enforcement has changed social norms in Australia but that some compliance is only half-hearted or has certain implementation problems (Parker and Nielson 2006, Parker, Ainsworth, and Stepanenko 2004, Parker and Platania-Phung 2012).

Some cartel studies that implicate cartel culture and effectiveness of compliance involve interviews with cartel participants. The most famous such work is the study by Geis 1967 of executives involved in the heavy electrical equipment cartel. He quotes industry leaders who said that they committed no wrong doing because the activity was viewed as legitimate in the industry. That is, executives in their view were conforming, not breaking the rules. Herling 1962 provides a robust overview of the same conspiracy and its members. Similarly, Baker and Faulkner 1993 reviewed the court records from the heavy electrical equipment cartel to understand the motivations of individual cartel members. According to their analysis, the cartel was built around non-detection rather than efficiency of the cartel. John Fuller 1962 provides a journalistic account of these court proceedings to understand the internal mechanisms of the cartel and its members.

Although no cartel members were interviewed by Genesove and Mullin (2001), they reviewed weekly notes from the 1927-36 sugar refining cartel. They explored the mechanisms of the cartel creation process across firms, including how individuals at the firms coordinated with each other, in full knowledge and the reasoning that underpinned the actions of particular firms and the individuals who represented them at the cartel meetings.

The folding carton cartel of the 1970s is the subject of work by Sonnenfeld 1981 and Lawrence and Sonnenfeld 1978. These works provide detailed interviews with executives of companies that were involved in the cartel to understand the motivation for the involvement. A more recent study by O’Kane 2011 interviews a single cartel member in the marine hose conspiracy. Australian qualitative interview research is rich. A number of studies examine cartels, their individual participants and their outside lawyers. (Parker, Ainsworth, and Natalie Stepanenko 2004, Parker 2006, Parker et al., 2011, Parker 2012a, 2012b).

The Use of Bounties as Incentives to Induce Detection by Individuals

The preceding discussion on compliance and culture suggests that there must be some level of trust based on the norms and culture of a firm. Leniency can destabilize this trust. However, most of the success of the leniency program around the world has been with leniency applicants at the firm level. Individuals rarely have been leniency applicants.

Creating mistrust within firms could lead to the breakdown of cartels. Yet, blowing the whistle on illegal behavior, such as cartels, is not easy. To do so presents significant risks. As Dyck et al. 2010 note, that employees who blow the whistle face significant costs in their companies for doing so. Bowen et al. 2010 correlate whistle-blowing to situations where: (i) firms tend to be large companies with significant goodwill but with poor governance; (ii) firms tend to have blurry lines of communication within the firm, in part because of personnel changes; and (iii) these tend to be concentrated in industries in which there are significant government purchases. Similarly, there is little incentive for employees to come forward for cartel information without a reward since cartel compliance cultures at many firms are weak (Sokol 2012).

Detection may be increased through individual financial incentives within the firm of blowing the whistle. An antitrust whistle-blowing bounty has been discussed in a few articles (Aubert et al. 2006, Kovacic 2001, Spagnolo 2008). Whistle-blowing is not foreign to the U.S. enforcement scheme outside of antitrust. The *qui tam* statute enables whistle-blowers to receive between fifteen to thirty percent of the money recovered by the government (Kovacic 2001).

A bounty may be able to work in conjunction with leniency to improve detection, as the South Korean experience suggests (Spagnolo 2008, Sokol 2011). What has not been established is the impact of whistle-blowing on the internal dynamics of companies which have been the subject of antitrust whistle-blowing nor of multinationals that might do business in the United Kingdom or Korea, such as the break-down of trust within the firm. Moreover, cartel bounties may create high administrative costs because employees may over-report information. Business may become paralyzed if managers fear that every possible decision might subject them to discipline internally or from antitrust authorities. These drawbacks have not yet been quantified or thoroughly modeled within the antitrust scholarship.

The Use of Empirical Screens in Antitrust Compliance and Their Relevance for Corporate Governance

Despite their success in many respects, antitrust compliance programs seem to play a minor role in detecting and possibly deterring antitrust violations relative to other detection methods. Why may that be the case? There are a variety of reasons. At the top, as noted earlier, is that key jurisdictions (e.g., the United States and the European Union) do not offer credit to corporations for their compliance programs in case antitrust violations are found. Were such credit offered, it would increase the incentive for corporations to enhance their compliance programs.

This section explores the potential use of screening methodologies to improve antitrust compliance. It begins with an overview of empirical screens and detection of illegal behavior externally to the corporation. It then discusses the use of screens for internal monitoring and compliance.

The ability of flagging unlawful behavior through economic and statistical analyses is commonly known as screening. A screen is a statistical test based on an econometric model and a theory of the alleged illegal behavior, designed to identify whether manipulation, collusion, fraud or any type of cheating for that matter, may exist in a particular market, who may be involved, and how long it may have lasted. Screens use commonly available data such as prices, bids, quotes, spreads, market shares, volumes, and other data to identify patterns that are anomalous or highly improbable.

Over the last few years, economic analysis in general, and empirical screens in particular, have become increasingly important in cases of conspiracies and manipulations, a trend detailed in Abrantes-Metz & Bajari 2009, 2010, Harrington 2006, 2008, Hüscherlath 2010, and Laitenberger & Hüscherlath 2011. Competition authorities and other agencies worldwide have begun using screens to detect possible market conspiracies and manipulations, and so have defendants and plaintiffs at initial stages of litigation.

Broadly speaking, screens used in the literature employ two strategies. The first is to search for improbable events. This type of screen is similar to looking for a cheat in a casino. For example, the probability that a gambler at a Las Vegas casino will place a winning bet in a roulette is roughly .5 percent. During her shift, a roulette dealer may see a handful of players win 5, or even 7, times in a row. However, the probability of winning 20 times in a row is almost zero (though not impossible). If a pit boss sees this occur, he may not be able to prove that cheating has occurred, but he would be well advised to watch closely or risk losing a lot of money. One set of collusive screens generalizes this idea by looking for events that are improbable unless firms in the industry have coordinated their actions.

The second type of screen uses the idea of a control group. A somewhat extreme example illustrates the idea. In the 1980s, organized crime in New York City operated a concrete club that rigged bids on contracts over \$2 million. During the 1980s, the price of concrete was 70 percent higher in New York City than other U.S. cities. While it is true that the price of many goods and services is higher in New York City, relatively few of those prices are 70 percent higher than in other large cities. Prices that are anomalous compared to other markets

suggest a competition problem. In this simple example, we are forming a control group for New York by using prices in other cities as a basis for comparison. Most collusion is not this blatant.

When designing and implementing screens, there are two golden rules to keep in mind, which should be obvious when stated, but which may sometimes be forgotten. First, “one size does not fit all”, and second, “if you put garbage in, you get garbage out.” Screens can be very powerful, but these are econometric tools with all the usual caveats, and they may potentially be misused. Screens, just like any empirical technique, can be effective only when properly applied; otherwise they risk producing nonsense. See the discussion in Doane et al. 2013 in this Handbook.

The first screening rule states that a screen needs to be designed or at least adjusted to the situation at hand. Just because a given set of variables and model specifications prove highly effective when estimating the demand for bread does not mean that those same variables or specifications work when estimating the demand for cars. In turn, the second screening rule states that, as is always the case in empirical work, a screen is only as good as the choices of what is put into it (Abrantes-Metz 2012 discusses in further detail issues related to the development of screens).

In general, six requirements are key to developing and implementing a good screen: (i) an understanding of the market at hand, including the nature of competition and the potential incentives to cheat—both internally and externally—to a firm; (ii) a view of the likely nature of cheating; (iii) a view of how cheating will affect market outcomes; (iv) a set of statistics that can capture both the implications of cheating as well as ordinary, natural relationships between key market variables; (v) empirical or theoretical support for the screen; and (vi) the identification of an appropriate non-tainted benchmark against which the evidence of cheating can be compared.

Even a screen based on a solid theory of cheating and properly designed and implemented can still produce erroneous conclusions, just as is the case with any other statistical test: it may indicate that cheating may have existed where one did not (type I error), or it may fail to flag cheating which did exist (type II error). Again, just as we would not argue that statistical tests are useless because they have margins of error, we should apply the same standards to screens. The hope is that types I and II errors will not occur with high likelihood, though there is certainly a trade-off between the two.

Types of Screens, Their Users and Successes in the Detection of Illegal Behavior

There are different types of screens used in a variety of markets, and this section reviews some of the most commonly applied. It starts by focusing on screens developed to detect bid rigging, a popular application of these methods since the strict rules of competitive bidding help to identify colluders. Next, it discusses screens when either only price data are available, or some measure of cost is also available, including variance screens, which search for pockets of high or low variances in prices. Screens based on market shares are discussed next, followed by purely mathematical screens such as Benford’s law which describes the rates at which certain digits occur in many data sets. Though these screens have been applied at the industry level, there is reason to believe, based on the more regular use of screens in areas such as accounting

fraud and FCPA, that firms can undertake cartel related screening as a form of monitoring its own employees.

Bid Rigging

Bid rigging in competitive tenders is a productive setting to apply screens for three reasons. First, competitive tenders are widely used not only for public sector procurement but also in financial markets, privatization of public assets, real estate and many other transactions. Second, bid rigging is a common antitrust offense, representing a significant portion of all international cartels uncovered and associated with long lasting cartels (Abrantes-Metz et al., 2013). Third, markets that use competitive bidding are frequently rich in data. In many countries, statutes require the public disclosure of bids.

There is a large body of empirical literature on collusion in auctions that implements various types of screens. While these papers span a wide variety of industries, researchers have identified common patterns when collusion is known or suspected.

In sealed auctions, firms submit their bids simultaneously, and these are often read at a previously set date. In the public sector, the lowest bidder is usually awarded the contract. When firms do not know about each others' bids, they cannot take them into consideration when determining their own bid. Hence, each individual bid will likely primarily reflect market conditions such as costs and local market power. As a result, competitive bidding implies that bids will be independent after controlling for information that is observed by all of the bidders.

When firms collude, by contrast, they need to coordinate their actions. This coordination is another common factor across bids of members that is observed or known to all of them, and extends beyond the common factors given by costs and market power. This additional common factor is expected to increase the correlation across bids, as implied by an effective coordination. Therefore, collusive bids are highly correlated, even after controlling for costs and market power variables.

The question then becomes "How much positive correlation across bids is high enough to raise suspicion of collusion?" The answer is "It depends." Sometimes the correlation is so high that the likelihood that it could have been attained without explicit coordination is almost zero. A famous example is the bids received by the Tennessee Valley Authority to install conductor cables in the 1950s, in which seven firms submitted (presumably sealed) identical bids of \$198,438,24. It is highly unlikely that independent bidders could have arrived at bid values identical to the eighth significant digit if acting independently.

Other times, the correlation across bids is significantly higher across bidders in one particular market, say market A, than across bidders in another particular comparable market, say market B. If such difference in correlations between the two markets cannot be explained by a relevant legitimate market condition observable to firms in A but not observable to firms in B, then it is more likely that it can be explained by explicitly coordinated behavior across bidders in market A. But if the decision to submit bids is independent, then such a high degree of correlation is too large and too persistent to be likely only due to randomness or idiosyncrasies.

This type of pattern was illustrated in an examination of a set of bids submitted to supply school milk in Ohio between 1980 and 1990, set forth by expert reports for the prosecution on

behalf of *State of Ohio v. Louis Trauth Dairies, Inc.*, in which several patterns in the data were found too improbable to have been reached by a competitive bidding system (Porter and Zona 1999).²

Economic theory predicts that bids should closely reflect costs in competitive markets. When firms collude, they break the relationship between bids and costs, with the objective of attaining higher than competitive profits. Therefore, another set of bid rigging screens look for disconnects between bids and costs, which can be evaluated, for example, by comparing the relationship between bids and costs in the allegedly tainted market, against that of the untainted markets.

In contrast with the example of the price of concrete in New York discussed earlier, an examination of bids by highway contractors in the upper Midwest during the 1990s tended to disprove the existence of conspiracy (Bajari and Ye 2003). When computing the ratio of the winning bid to the cost estimate, the authors found it was almost equal to one, suggesting that bids were comparable to properly deflated bids from other markets, and representing evidence consistent with competitive markets for most of the bids. Nevertheless, the authors also found evidence consistent with collusion for two out of the 11 firms studied, the same two firms who had been previously sanctioned for bid rigging.

In addition to the work of academics and consultants as discussed above, the U.S. Department of Justice Antitrust Division has proposed a number of bidding patterns as being suggestive of collusion. All of these either look for bids that appear too improbable to have been independently submitted or for bids which do not reflect costs and other legitimate market factors in a way compatible with competition.

Red flags for bid rigging suggested by the U.S. Department of Justice are:³

1. The same company always wins a particular procurement. This pattern may be more suspicious if one or more companies continually submit unsuccessful bids.
2. The same suppliers submit bids and each company seems to take a turn being the successful bidder.
3. Some bids are much higher than published price lists, previous bids by the same firms, or engineering cost estimates.
4. Fewer than the normal number of competitors submit bids.
5. A company appears to be bidding substantially higher on some bids than on other bids, with no apparent cost differences to account for the disparity.
6. Bid prices drop whenever a new or infrequent bidder submits a bid.
7. A successful bidder subcontracts work to competitors that submitted unsuccessful bids on the same project.

². Other studies of the same nature have also been performed in markets suspected of collusion. Those include paving contracts (Porter and Zona 1993), Canadian timber, List et al., 2004), and Russian oil and gas leases, (Marshall and Marx 2009).

³. The U.S. Department of Justice has identified a set of pricing patterns that are intended to help identify collusive behavior. See U.S. Dep't of Justice, Antitrust Division, *An Antitrust Primer: Price Fixing, Bid Rigging, and Market Allocation Schemes: What They Are and What to Look For*, at <http://www.usdoj.gov/atr/public/guidelines/primer-ncu.htm> ("DOJ Antitrust Primer").

8. A company withdraws its successful bid and subsequently is subcontracted work by the new winning contractor.

When studying whether bidding patterns are the product of collusive agreements, it is important to realize that the failure to control for relevant components of costs or competitive factors will likely provide erroneous evidence that collusion existed and/or that it materially impacted competition.

Price Fixing

Successful collusion will cause prices to be higher than the non-cooperative oligopoly prices that would prevail absent collusion. With successful collusion, prices are also likely to be less volatile. Finally, prices may behave in otherwise unusual ways when collusion is initiated, when there are episodes of cheating and punishment (*e.g.*, price wars), and when collusion ends. But there may be alternative explanations for unusual patterns that may warrant a thorough investigation.

In a 2006 paper, Abrantes-Metz et al. propose a price fixing screen based on low price variance. The authors used prices and costs of frozen perch fillets purchased by the Defense Personal Support Center between 1987 and 1989. Data extended from a collusive agreement, through its break and the move into competition. During the first period there was collusion in the form of bid rigging among sellers of frozen perch fillets which led to the fixing of prices. This behavior was uncovered by the Department of Justice and at the time such investigation became known, the cartel broke apart. The authors illustrate four expected features of collusion:

1. The average price was higher with coordination than with competition, after taking account of differences in the cost of fresh perch.⁴
2. Prices dropped suddenly when the conspiracy collapsed.
3. Prices were more stable, and less responsive to demand and supply shocks with conspiracy than under competition.
4. Prices followed costs more closely when competition prevailed than when the conspiracy was in effect.⁵

These above features and others are used by competition authorities around the world to assist in the detection of price fixing conspiracies, and in particular, feature 3 above relating to low price variance under collusion.

Red flags for price rigging suggested by the Department of Justice are:

- 1 Prices remain identical for long periods of time;
- 2 Prices previously were different (and start becoming identical);
- 3 Price increases do not appear to be explainable by increased costs;
- 4 Discounts are eliminated, especially in a market where discounts historically were given; or
- 5 Vendors are charging higher prices to local customers than to distant customers.

⁴. According to some estimates, the average cartel raises prices by 25%. *See* Connor 2007.

⁵. Kim and Cotterill 2008 found that under collusion the pass-through rate for processed cheese was 21% to 31% while under competition the range was 73% to 103%.

Market Shares

Another type of screen uses data on market shares. The literature and evidence from uncovered cartels demonstrate that these may attempt to collude by fixing market shares (Harrington 2006, 2007). Two screens are suggested by the literature: (i) market shares that appear to be too stable over time; and (ii) market shares for all firms in a particular market are negatively correlated over time. The first screen will detect an agreement by the cartels to divide the market. Examples of cartels with stable market share agreements include cartels in copper plumbing tubes, organic peroxides, and several vitamins (A, E, and folic acid, in particular). The second screen is suggested by dynamic models of collusion (Athey and Bagwell 2001 and Athey, Bagwell and Sanchirico 2004). In these models, if a cartel member deviates from the collusive agreement, it will need to compensate other cartel members in subsequent time periods. As a result, abnormally high shares for a particular firm in one period should be followed by a reduction in shares in the following period.

Screens Based on Mathematical Laws

Benford's law is a mathematical formula that describes the regularly occurring distribution of digits in many data sets. Studies have shown that the law applies to many diverse data sets, including populations of cities, electricity usage, word frequency, and the daily returns to the Dow Jones. Because Benford's law is a naturally occurring pattern in those data, violations of the law can be used to detect irregularities. In the past, violations have been used to detect data tampering, manipulation of financial ratios, and tax evasion. For example, Varian 1972 uses Benford's law to check the validity of purported scientific data in social sciences, Nigrini 1996 applies to taxpayer evasion, while Judge and Schechter 2009 use this law to detect problems in survey data. Most recently, Abrantes-Metz et al. 2011, used Benford's law to test for unusual patterns in USD LIBOR, a matter now commonly known as the LIBOR conspiracy and manipulation.

Other collusive markers used to screen for conspiracies are discussed in Harrington 2006.

Screens Successes

Economic analysis and empirical screening do trigger antitrust cases, such as an Italian cartel in baby milk and a Dutch cartel in the shrimp industry. Screens are also being successfully used to identify potential anticompetitive behavior in gasoline markets by the U.S. Federal Trade Commission, and to prioritize complaints in the Brazilian gasoline retail market, leading to raids and the finding of direct evidence of collusion (Ragazzo 2012). In Mexico, the competition authority flagged a conspiracy in pharmaceutical markets through the use of bid rigging screens (Mena Labarthe 2012). Market monitoring and screening programs have been adopted by several other competition authorities, such as the European Commission and the South African Competition Authority. Most recently, per a press article dated September 15 of 2012, a Canadian reporter raised the flag for possible bid-rigging in the pavement of roads in Quebec, Canada, by pointing to a variety of patterns that seemed unexpected under a competitive setting. Since then, investigations have been launched and senior officials have resigned. The matter is still developing.

Screens have successfully detected cartels in U.S. financial markets. Academics applied screens to NASDAQ inside spreads (the lowest selling offer minus the highest buying offer

among all dealers) in 1994 and found these to be abnormally high when specific stocks were trading only at even and not at odd eighths, thus effectively raising dealers' profit margins. The abnormal pattern of odd eighths avoidance was published in May 27, 1994 in a paper by Christie and Shultz. Immediately after its publication, NASDAQ spreads significantly shrank, suggesting (if not revealing) a conspiracy among dealers and triggering regulatory investigations.

Most recently, the U.S. Department of Justice, the Securities and Exchange Commission, the Commodities Futures Trading Commission and other regulatory agencies worldwide are investigating the possibility of a conspiracy to manipulate the U.S. dollar LIBOR ("LIBOR") by several major banks, as well as LIBOR denominated in other currencies, and similar benchmarks including Euribor in Europe and TIBOR in Japan. These investigations followed the application of empirical screens by the Wall Street Journal in April and May of 2008 and by Abrantes-Metz, Kraten, Metz and Seow in August of 2008. We will focus on this example in the last section of this chapter.

Screens in Internal Monitoring

As useful as screens have proven to be in the detection of illegal behavior by entities external to the corporation, the same tools used to provide circumstantial evidence of possible wrong doing can be just as well internally applied by corporations (Abrantes-Metz and Bajari 2009). For example, there is in principle no reason why screens could not have detected the NASDAQ odd eighths avoidance of inside spreads by NASDAQ itself, had these been internally used to monitor spreads by the exchange. Similarly, screens could have been used by LIBOR submitters to monitor possible wrongdoing in these submissions and potentially have avoided the exposure and liability currently faced by these institutions.

Screens can have a variety of other specific applications internally to corporations. They could be used by managers to monitor for fraud in accounting and reimbursement statements, collusion on employee compensation surveys or other forms of data manipulation. Furthermore, screens could be used to detect price fixing in purchasing or procurement. Next we will describe some potential applications below. However, note that the methods we have discussed in the section below can be very powerful and applied to detect a much wider range of attempts by employees or suppliers to manipulate data.

A first example is the manipulation of financial statements or other forms of accounting fraud. In many industries, managers are under intense pressure to produce revenues and earnings that meet or exceed analysts' forecasts. This is particularly true for managers with compensation that is heavily dependent on stock options. If the companies fail to meet these targets, even by a small amount, share prices may fall considerably.

The screens discussed above could be useful in identifying this sort of fraud. For example, if a company is falsifying accounting statements not to miss analysts' forecasts, it may smooth these out over time, and in this way produce revenues and earnings that are less volatile than those of comparable companies. This suggests using a variance screen on revenues, earnings and stock prices. Additionally, Benford's law could be applied to the accounting statements and share prices used to detect falsified accounting statements. In fact, this law has been used by accountants for several decades to flag potential data manipulations. As Gonzalez

et al. 2013 have noted, cartel behavior might lead to income smoothing, hence screens that examine accounting irregularities could detect such manipulation based on cartel activity.

Screens can be used to detect bid rigging or price fixing in purchasing or procurement. Many institutional bodies, like the federal Government, may rely on a large network of suppliers. Manufacturing companies, big box retailers and HMO's are all examples of firms that may rely on a network of thousands of suppliers. Many companies use a competitive process to keep supplier margins competitive. However, suppliers often operate in concentrated industries and may be tempted to collude in order to earn profits above the competitive level. The methods we have described above could be applied to screen for outright supplier collusion or excessive supplier costs.

A recent study by Hüscherlath and Veith 2011 illustrates the power of these techniques if applied internally to corporations. In particular, this study provides evidence on how screens, had these been used internally by buyer companies, could have detected the explicit collusive agreement in the upstream German cement markets before such a cartel was identified by the German Competition Authority. The authors use a data set with 340,000 market transactions from 36 smaller and larger customers of German cement producers, and apply a screen that searches for structural changes in prices paid by buyers, which could not be explained by legitimate market conditions. This application correctly identified the ongoing cartel (ex-post), establishing the power of screens applied by buyers to internally detect this illegal behavior, and well ahead of its uncovering by the German Competition Authority.

After having described *how* screens can be used internally to corporations to flag the possibility of illegal behavior, in the next subsection we turn to *why*, *when* and *how* they should be used in this setting to enhance antitrust compliance.

Why, When and How to Use Screens in Antitrust Compliance

The history of major international cartels, and to some extent the smaller local conspiracies, suggests that compliance training, while a necessary tool, is not sufficient. Screens may assist in the compliance setting to identify the high-risk areas of a business and allow for better targeting of audits to those areas and to assist to monitor these risks in a more efficient way. They employ techniques designed to highlight which parts of the company merit closer scrutiny, where there should be intensive reviews, and which units may call for intensive monitoring of internal communications and other direct actions. Screens can fulfill this role by looking at certain quantifiable red flags and applying statistical analysis to determine the priority areas for further focus, and in this way allow for a more efficient allocation of resources.

To date, there is a lack of theoretical work that links the use of antitrust screens with compliance to solve agency cost problems. A firm would use screens to be the first to detect any possible wrongdoing so it could fully benefit from, for example, leniency applications in the case of cartel behavior relative to other cartel members.

The first consideration on whether to use screens for internal detection of wrongdoing is data availability. What types of data are available and for how long? Additionally, can other data start being collected so that screens can be applied moving forward? Other considerations include: Has the company been involved in a conspiracy before? Is this an industry where

competition problems tend to exist, (i.e., history of violations or an industry with other characteristics such as overcapacity)? Are there several opportunities to rig bids and reach agreements with competitors (i.e., are frequent trade association meetings and other industry gatherings common)? When several of these conditions are satisfied (and potentially others as well), then the company should engage in internal screening. This process does not have to apply to all areas within the company, simply to those where cheating is more likely, but expertise will be required in the development and implementation of these tools.

As explained earlier and in more detail in the last section with respect to LIBOR, there have been multiple examples of entities external do the company detecting cartels through the use of screens. In terms of cartel detection through internal compliance programs and the use of screens, though we are not aware of any example, there are three points that should be stressed: first, the successful external screens just mentioned could have, in every case, been developed internally first, meaning there is no *a priori* reason an aggressive compliance screening program would not be successful; second, corporations are not yet employing screens in their compliance programs, so there are not many chances for successful detections; and third, a strong compliance screen may deter inappropriate behavior, and such successes by their nature could never be identified.

LIBOR Detection Through Screening and Its Relevance for Corporate Governance

There is a growing literature on the use of screens and detection regarding LIBOR. Such behavior was first flagged through screening by the Wall Street Journal (WSJ) in April and May of 2008 and by Abrantes-Metz et. al. 2008. The WSJ noted that LIBOR submissions seemed too low with respect to submitters credit default swaps after the beginning of the financial crisis. Abrantes-Metz et. al. 2008 noted that: LIBOR was constant day-in and day-out for many months prior to the financial crisis, while other comparable rates such as the Federal Funds Effective Rate were not; most banks' quotes were identical to each other, while other market indicators, such as their pricing in the capital markets, indicated differences (even if slight) across banks; LIBOR did not respond to increasing risk at least since late Spring and early Summer of 2007; The authors saw signs of possible collusion dating back to prior to financial crisis.⁶

Other research on LIBOR has been conducted by Snider & Youle 2009, 2010, by Abrantes-Metz et al. 2011, and by Abrantes-Metz and Metz 2012. Snider and Youle present findings supporting their claim that the banks' LIBOR quotes are difficult to rationalize by observable cost measures for the period under study, including a given bank's quotes in other currency panels. They also introduce a model in which banks' possession of LIBOR indexed contracts induces them to produce LIBOR quotes that are clustered around discontinuities, and using this model the authors show that there was a severe clustering in the US dollar LIBOR for the three month maturity throughout 2009. Snider et. al. further try to quantify gains from such behavior and present results showing large exposures to LIBOR by several banks through their interest rate derivative portfolios, allegedly enabling to profit from the rapid decline of LIBOR starting in late Summer 2007. The authors argue that these exposures may be the incentive behind a deliberate misreporting of LIBOR quotes by the banks.

⁶ This study was later published in 2011.

Abrantes-Metz et al. 2011 show that Benford's law was violated for the US dollar LIBOR most noticeably from early 2006 through the Summer of 2007, but with continuing anomalous patterns throughout 2009. Abrantes-Metz and Metz 2012 followed with an analyses similar to bid rigging to explain that, given that LIBOR quotes are submitted sealed; that they are supposed to be idiosyncratic to each of the banks as forecasts of their own interbank borrowing costs, and the fact that though all very highly rated, these banks are not completely identical to each other in terms of portfolios, exposures to different markets, and other differentiating factors, simultaneous moves by a large number of submitters from one day to the following to the exact same submission number are more consistent with explicit rather than with tacit collusion.

The literature on LIBOR offers some lessons for antitrust compliance and the use of screens for internal firm detection. There seems to have existed an unawareness of the incentives to cheat and the clearly anomalous data patterns by benchmark administrators, regulators and banks management themselves. The auditing procedures at the banks applied to LIBOR submissions were either inexistent or clearly inadequate. Had such internal mechanisms based on screens been in place, banks would have been able to have been the first to detect illegal behavior in such submissions, and hopefully to deter future illegal behavior in the same, (Abrantes-Metz and Sokol 2012).

Research has yet to focus on the role of risk assessment and program evaluation. LIBOR illustrates that significant international cartel activity may occur even in situations where other types of sophisticated internal compliance mechanisms, including screens, such as for insider trading and accounting fraud may be used. The specific relationship between antitrust compliance and other types of compliance remain understudied in the corporate governance literature. Relatedly, the role of internal detection in the M&A context of acquired (target) firms based on insufficient compliance remains an area for future study.

Conclusion

This chapter provides an analysis of internal firm compliance and detection of antitrust cartel activity. Whereas there has been less antitrust literature devoted to internal firm incentives and compliance, a number of more recent works have incorporated insights from finance, management and accounting to enrich understandings of antitrust issues. This trend of cross-pollination of ideas and empirical approaches will continue. Regarding policy, insights into internal detection may better inform sentencing policy and the refinement of incentives for cartel detection by agencies around the world. We note that a number of agencies are increasing their reliance on econometric screens. As more agencies do so, firms who value high levels of antitrust compliance may do so as well as a way to better mitigate their antitrust risk profile.

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