



# Integrating Norms, Knowledge, and Social Ties into the Deterrence Model of Cartels: A Survey Study of Business Executives

Loet van Stekelenburg<sup>1,2</sup> · Peter T. Dijkstra<sup>1</sup> ·  
Elianne F. van Steenbergen<sup>2,3</sup> · Jessanne Mastop<sup>1</sup> · Naomi Ellemers<sup>2</sup>

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## Abstract

We expand the rational choice theory of crime, as applied to cartels, with three psychological factors—personal norms, social norms and social ties—and knowledge of competition law. Through a survey of Dutch businesses, we find that adding psychological factors substantially increases the explanatory power of the model: All predict attitudes toward future cartel behavior, with personal norms as the strongest (negative) predictor. Better knowledge of competition law relates to stronger deterrence and norms against collusion. We conclude that psychological factors and knowledge of the law are likely necessary to understand and prevent potential cartel behavior.

**Keywords** Cartels · Competition law · Deterrence · Compliance · Survey

**JEL Classification** D91 · K21 · L41

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✉ Loet van Stekelenburg  
loet.van.stekelenburg@acm.nl

Peter T. Dijkstra  
peter.dijkstra@acm.nl

Elianne F. van Steenbergen  
e.f.vansteenbergen@uu.nl

Jessanne Mastop  
jessanne.mastop@acm.nl

Naomi Ellemers  
n.ellemers@uu.nl

<sup>1</sup> Netherlands Authority for Consumers and Markets (ACM), PO Box 16326, 2500 BH The Hague, The Netherlands

<sup>2</sup> Utrecht University, Heidelberglaan 1, 3584 CS Utrecht, The Netherlands

<sup>3</sup> Dutch Authority for the Financial Markets (AFM), Autoriteit Financiële Markten, Postbus 11723, 1001 GS Amsterdam, The Netherlands

## 1 Introduction

Cartel enforcement exists worldwide, with the International Competition Network (ICN) including a total of 141 members (from 129 jurisdictions) (International Competition Network, 2022). One thing that unites these agencies is the objective on which their enforcement is based: attaining optimal deterrence through fines (International Competition Network (ICN), 2005). The rationale behind this shared strategy is that businesses consider the costs and benefits of potential cartel behavior and use this information to make a *rational choice* to either comply or not comply with competition law. For that reason, competition agencies try to reach compliance through *general deterrence*. General deterrence theory poses that individuals do not need to experience the negative consequences of committing a crime themselves. Any penalty can give individuals risk information as to the potential punishment. Business executives—key decision makers such as owners, CEOs, and managers—then take these risks into account when making their cost–benefit analysis.

In practice this means that competition authorities try to demonstrate that collusion does not pay by detecting and punishing cartel behavior. In line with this enforcement strategy, most research on the fight against cartels has focused on optimizing deterrence—for example, by finding the most effective level of fines—or evaluating its effectiveness (Buccirosi et al., 2014). In this paper, we argue that this focus on the costs and benefits of cartel behavior is too narrow. To better understand cartel behavior, we propose that it is crucial to include psychological factors. We argue that competition authorities can more effectively combat cartels by also implementing these factors in their approach. To this end we expand the general deterrence model of crime as applied to cartels.

More specifically, we expand the rational choice theory of crime as applied to cartels in three ways: First, we measure deterrence as *perceptions* of detection risk, penalty severity, and profitability in the minds of individual business executives. In a day-to-day context, agents do not have objective knowledge of the chance of detection, the precise fine, or gains. This means that any decision is made based on the perceptions that individuals have of the risks and rewards of collusion.

Second, we argue that business executives do not decide to form a cartel based on a cost–benefit analysis alone. We propose that business executives are also influenced by their social context. We therefore consider three psychological variables: moral objections to cartel behavior (personal norms); the perceived prevalence of cartel behavior (social norms); and cohesion within a sector (social ties). In our expanded model these variables are added to the classic deterrence variables.

Finally, we add knowledge of the relevant laws to our model. As with the risks and rewards of cartel behavior, business executives do not have perfect knowledge of which behavior is legal and which is illegal. We argue that knowledge of what constitutes an illegal cartel is an underlying driver of the deterrent factors and also the psychological factors. Therefore, we test if business executives know which types of cartel behavior are illegal.

In a large-scale questionnaire in the field, we find that the perceptions of penalty severity are negatively related to the openness to future cartel behavior.

Moreover, the psychological factors—and moral objections to cartel behavior (personal norms) in particular—are the most important drivers of openness to future cartel behavior. Additionally, our results show that knowledge of the law is important. We find that many respondents do indeed have insufficient knowledge of the illegality of cartels and that better knowledge relates to inhibition through moral objections and social norms. Moreover, more knowledge of the law is related to the perception of more severe penalties and a view of cartels as less profitable. This means that better knowledge is related to stronger deterrence of cartels. These findings have important policy implications for how competition authorities can most effectively prevent and deter cartels.

The remainder of our paper is structured as follows: In Sect. 2 we discuss related literature and construct our hypotheses. Section 3 presents the method of our research. Results are reported in Sect. 4, which we discuss in Sect. 5. Section 6 concludes.

## 2 Literature and Hypotheses

The predominant rational model in the scientific literature as well as in the practice of cartel enforcement by competition authorities is an application of the model of Stigler (1964) and Becker's rational choice theory of crime (1968) to a business context. This influential model makes the assumption that individuals are rational actors maximize their utility in a risk-neutral environment. In the context of crime this translates to weighing the potential benefits of a crime against the potential costs. As a result, a firm would choose to commit a particular crime only if they expect the net result to be gains instead of losses.

Several scholars have built upon the rational choice theory of crime. For example, Spagnolo (2000, 2004) assumes that firms engage in cartel behavior only as long as the expected gains exceed the expected costs. Not only should this value exceed zero—the individual rationality constraint—but the net profits of a cartel should also exceed the profits of competition in the long run: the incentive compatibility constraint (see amongst others Tirole, 1988, chapter 6; and Motta, 2004, chapter 4). If the value of future profits is large enough, and no firm will set a price other than the collusive price, firms might engage in a stable cartel (with grim trigger strategies; see Friedman, 1971).<sup>1</sup>

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<sup>1</sup> Friedman (1971) assumes that each firm uses the same discount factor. A few papers examine the effect of heterogeneous discount factors. In that case, the most impatient firm determines whether a cartel will be stable (Friedman, 1971). One factor to lessen a firm's impatience is to decrease the uncertainty as to whether firms think that other firms want to engage in a cartel. Harrington and Zhao (2012) show that this uncertainty can be lessened if a firm signals that it is willing to set a higher price; however, if the risk of losing business is too high a firm might prefer to wait for the other firm to initiate a cartel – which may result in no cartel initiated at all. Another way of decreasing uncertainty is to initiate explicit communication: Although it might be of little value if talking is cheap, it might increase cartel stability if talking is costly due to competition enforcement (Bos et al., 2015, show this theoretically, whereas Dijkstra et al., 2021, prove this experimentally).

The rational choice theory of crime has not only been applied to theoretical models. It is also used in empirical studies such as by Connor and Lande (2019), who used actual profits and allocated fines of cartelized firms to study whether it had paid off for those firms to engage in a cartel. Furthermore, several studies examined the rational choice theory of crime in the context of cartels in a lab setting: see Potters and Suetens (2013, Sect. 4) who provided an extensive overview of the experimental literature on collusion and policy.

Studies that are focused on business executives, outside of the lab, in the context of their own business practices and their actual perceptions appear to be missing in the current body of research. The only papers we know of are Van der Noll and Baarsma (2017) and Piquero (2012), who examined the response of executives in hypothetical business situations.<sup>2</sup> However, previous research does not take into account the natural context that shapes the behavior of individuals. By this we mean that decisions in day-to-day life are based on imperfect information: perceptions of deterrence and flawed knowledge of the rules and the social context. We propose that it is important to examine the relationship of business executives' perceptions of deterrence and their openness to form a cartel. In the next section we will explain why these perceptions of the possible risks and rewards are so relevant.

## 2.1 Perceptual Deterrence

The field of research on deterrence of cartels did not initially incorporate lessons from criminological research. There is a lack of what is called 'perceptual deterrence' in criminological literature. In research on the effectiveness of deterrence, criminologists realized early on that this effect is largely dependent on the effective transmission of information about penalty risk (Geerken & Gove, 1975; Zimring & Hawkins, 1973).

Perceptual deterrence poses that the effect of deterrence involves of two stages: In stage 1 potential offenders infer subjective penalty risks based on the available information: e.g., examples of penalties. This is an imperfect perception of the true penalty risks, because the objective risk of detection is unknown to them. In stage 2 the decision maker incorporates these risk perceptions in their cost–benefit analysis. It follows that to deter cartels effectively competition authorities need to influence the perceptions that business executives have of penalty risks (stage 1) so as to influence the decision-making process on whether to collude or not (stage 2).

The academic literature on cartels is almost entirely devoid of research on deterrence perceptions. The only examples that are known to the authors are a study by Piquero (2012) that surveyed a relatively small group of business-course attendees and a study by Paternoster and Simpson (1996) that consisted mainly of students. Instead of measuring perceptions, most experimental studies give participants (a range of) the probability of detection as well as the severity of the penalty. In reality,

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<sup>2</sup> Paternoster and Simpson (1996) also used price-fixing in a study with students and business executives on deterrence of white-collar crime, but combined this with research on other types of corporate crime and did not report specific findings for cartels.

individuals can never know the objective penalty; instead, they need to infer this from examples of other cartels that are either detected or go unnoticed. This means that individuals each have their own perception of the chance of detection and the consequent punishment. The current research addresses this issue by measuring business executives' perceptions of deterrence and their relationship with openness to future cartel behavior.

Consistent with the rational choice theory of crime our hypotheses of the perceptions of deterrence are as follows:

*H1a: Perceived profitability (for the business) of forming a cartel is positively related to business executives' openness to future cartel behavior.*

*H1b: The perceived severity of penalties is negatively related to openness to future cartel behavior.*

*H1c: The perceived risk of detection is negatively related to openness to future cartel behavior.*

## 2.2 Psychological Factors

It can be argued that, in a business setting, individuals may prominently be motivated by profits. It is true that evidence suggests that people sometimes behave more calculatedly and less pro-socially in a business setting (Belmi & Pfeffer, 2015). However, meta-analytic evidence shows that individual characteristics (e.g., Machiavellianism) as well as social factors (e.g., ethical climate in the organization) predict unethical behavior in an organizational setting (Kish-Gephart et al., 2010).

Below we argue that the moral and social context of an organization play an important role in the development of cartel behavior. In this section, we will discuss our expansion of psychological factors to the model of cartel behavior. The expansion consists of three factors: The first factor is personal norms, which consist of moral objections to cartel behavior. The second factor is social norms: the perceived prevalence of cartel behavior. The third factor is the social ties among businesses: specifically, the cohesion within the sector.

One way in which people deviate from the rational choice theory of crime is through moral inhibition. Research in the fields of criminology and social psychology support this view. Contemporary criminological studies have incorporated different types of moral and social inhibitions toward crime into the rational choice theory of crime. Several studies have shown that a large group of people is unlikely to commit a crime simply because they personally morally object to it. The consensus among criminologists is that most people will not even consider the costs and benefits and, thus, are not—or less strongly—influenced by potential punishment nor do they need to be in order to comply (Bachman et al., 1992; Gallupe & Baron, 2014; Paternoster & Simpson, 1996; Pogarsky, 2002). This conclusion is in line with findings from social psychological research. Various studies have shown that personal norms—an individual's moral inclinations or objections to particular behavior (Schwartz, 1977)—are important factors in explaining unethical behavior (Beck & Ajzen, 1991; Hofmann et al., 2008; Wenzel, 2004).

Moreover, we argue that the decision to form a cartel is not made in a vacuum: Individual behavior is shaped for a large part by the social context of an individual. For example, we learn by observing the behavior of others (Bandura, 1977)—partially because that teaches us how we *should* behave (Cialdini et al., 1990). Social identity theory has taught us that people often think of themselves not just as individuals but as members of a specific group. This group identity plays an important role in the way that we behave in an organizational or professional context (Ellemers & Haslam, 2012; Haslam & Ellemers, 2005). We argue that in addition to cost and benefits and their own morals, the perceptions of the behavior of other businesses influences the choice whether to collude or not.

Social psychology distinguishes social norms from personal norms. There are two types of social norms (see Cialdini et al., 1990): prescriptive (how others feel one should behave); and descriptive (how others behave themselves or the perception thereof). Social norms are important in shaping human behavior—including unethical behavior (Cialdini et al., 1990; Hofmann et al., 2008; Keizer et al., 2008; Wenzel, 2004). The more strongly that one thinks that others in their social circle agree with or show a certain type of behavior, the more likely they are to behave accordingly. In this study, we focus on the descriptive social norm, as in this case it also functions as an opportunity to collude. Since forming a cartel is a collaborative act, the perception that others might be involved in this behavior is potentially important: This means that others think that cartel behavior is acceptable as well as that there is an opportunity to collude.

Specifically for cartels, previous research has found evidence that both personal and social norms influence behavior in organizations (Kettle et al., 2016) and inhibit people from committing several types of corporate and white-collar crimes (Moore et al., 2012; Paternoster & Simpson, 1996). For cartels, Piquero (2012) found that personal moral convictions against cartels were negatively related to the likelihood that participants<sup>3</sup> would ever engage in price-fixing.

Our hypotheses concerning personal and social norms are as follows:

*H2a: Moral objections to cartel behavior (personal norms) are negatively related to openness to future cartel behavior.*

*H2b: The perceived prevalence of cartel behavior (social norms) is positively related to openness to future cartel behavior.*

The goal that drives the prohibition of cartels is the protection of competition. The rationale is that competition drives businesses to efficiency and innovation, which lead to consumer welfare. While competition is an important driver of human behavior, this economic ideal can clash with humanity's natural need to work together. People are inherently social creatures; they largely depend on groups for their physical and mental needs (Baumeister & Leary, 1995; Boyd & Richerson, 2009). When considered part of the same group, people are expected to work together. The stronger is this social bond, the more strongly one identifies with a particular group (Castano et al., 2002; Ellemers & Haslam, 2012).

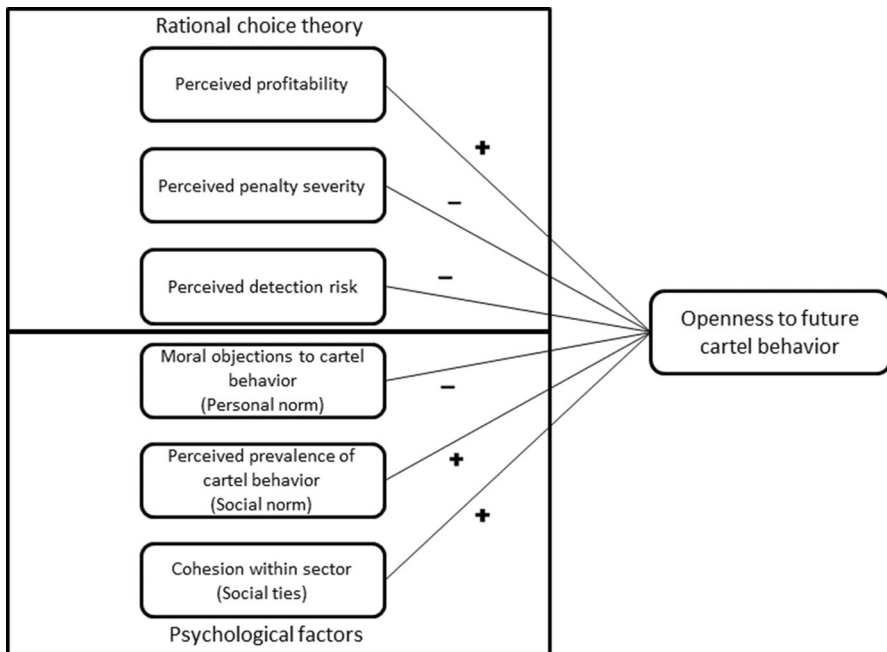
<sup>3</sup> The sample consisted of people who were following a higher education business course. 70% reported having management experience.

Competing businesses are businesses in the same sector, that do the same type of work in the same type of environment. They are likely at least to know each other—if not to meet several times a year. It is therefore probable that competing business executives feel part of the same social group, stimulating cooperation. Earlier research into compliance with competition law supports the idea that stronger ties among businesses in the same sector—such as social relationships—may lead to cartel behavior (Denkers & Jellema, 2016).

Therefore we hypothesize:

*H2c: The strength of the social ties among businesses within a sector is positively related to openness to future cartel behavior.*

The factors in our expanded model are summarized in Fig. 1.



**Fig. 1** This figure shows a diagram of our expanded model with all factors and their hypothesized effect on openness to future cartel behavior. The factors in the top of the figure are the rational choice theory factors: Perceived profitability, perceived penalty severity and perceived detection risk. Below are the psychological factors: Moral objections to cartel behavior (personal norm), perceived prevalence of cartel behavior (social norm) and cohesion with the sector (social ties)

### 2.3 Knowledge of the Law

Often the assumption is implicitly made that individuals have full knowledge of what they are legally allowed to do not allowed to do.<sup>4</sup> One might be particularly tempted to think this of professional organizations. However, there is good reason to suppose that this is often not the case for competition law. Research by the UK Competition and Markets Authority (CMA, 2018) shows that businesses in the UK often lack knowledge about competition law. For example, only 40% of UK businesses were aware that it is illegal to agree not to sell to each other's customers. Previous research into the Dutch ports shows a similar result: 54% of surveyed businesses were unaware that they are not allowed to discuss offers with competitors (Denkers & Jellema, 2016).

To explore the role that knowledge of competition law plays in cartel behavior we pose three research questions:

- i. How well do businesses know the legality of specific cartel behaviors?
- ii. How does knowledge of the law relate to the rational choice factors: perceived profitability; perceived severity of a penalty; and the perceived risk of detection?
- iii. How does knowledge of the law relate to norms: moral objections to and the perceived prevalence of cartel behavior?

Knowledge of the law is likely an important underlying driver of perceptions of both deterrence and norms. As for perceptions, an important assumption of deterrence is a basic awareness of the illegality of the relevant behavior (Becker, 1968). If an individual or a business executive does not possess the relevant legal knowledge, they will simply not be aware of the potential fine should they engage in cartel behavior. More specifically, limited knowledge of competition law could lead to business executives' underestimating both the risk of detection and the severity of penalties as a consequence of collusion.

Generally, laws are designed to change the incentives of the behaviors that they try to restrict. However, it has long been theorized that laws function also by changing the prevailing norms (Cooter, 1998; McAdams, 2000; Sunstein, 1996). Indeed, there is some empirical evidence of this "expressive function of the law": For example, Funk (2007) found that abolition of voting duties in Switzerland—a law that is functionally sanctionless—was followed by a lower average turnout. An experiment by Feldman and Perez (2009) showed that different legal settings have an effect on people's moral evaluations of pollutant behavior by businesses. If we apply this to competition law, it seems likely that an understanding of which behaviors constitute illegal cartels could lead to better social norms and a stronger moral objection to this behavior.

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<sup>4</sup> See, e.g., Motta and Polo (2003), Spagnolo (2004), Levenstein and Suslow (2006), Hinloopen and Soeteveit (2008), and Bos et al. (2018). Each of these papers discuss the – theoretical, empirical, or experimental – effect of changes in cartel laws or leniency programs, and (implicitly) assume that firms have full knowledge of the law and leniency framework before deciding whether to engage in cartel conduct.



## 3 Method

### 3.1 Participants

Our sample was drawn by research agency Panteia. This was done on a business level from the records of the Netherlands Chamber of Commerce. Since it is mandatory for every business in the Netherlands to register at the Chamber of Commerce, this organization has a complete register of the businesses that are active in the country. To ensure representation of the full width of the Dutch economy, the sample was stratified on two levels: First, our sample was divided into 26 clusters. Each cluster consisted of one or a combination of sectors. Second, business size was stratified on two levels: businesses that employed between two and 19 people; and businesses that employed 20 or more people.<sup>5</sup> This leads to a sample with 52 cells: 26 clusters  $\times$  2 sizes.

From the register of the Chamber of Commerce an initial sample of 18,000 businesses was drawn. From that sample attempts were made to contact 14,148 of the businesses. During the course of data collection, 1962 businesses were removed because they could not be reached: either the contact information was unusable; or these businesses simply ceased to exist. Of the 12,186 businesses that were contactable, 5859 (48%) did not wish to be interviewed and a single interview was prematurely cut short. In the end a total of 2125 interviews were completed: 17% participated. For a complete overview of the response, see Table 9 in the Appendix. In our final sample 51.2% of the businesses had between two and 19 employees; and 48.8% employed 20 or more employees. Each cluster had at least 80 completed interviews. For a complete overview of the interviews in the different cells (cluster and size), see Table 1.

At the start of every interview, the interviewer asked to speak to a representative of the business that held (final) responsibility for sales and commercial strategy. Of these representatives, 60.3% were either CEO or owner of the business; 7.2% were sales manager; 3.9% director of sales; and 28.4% had a different position (most of them varying kinds of managers). 24.1% of the sample was female.

To limit potential social desirability bias, we removed 105 participants from the final sample before conducting our analyses.<sup>6</sup> Of these participants 99 had been told, upon request, that the ACM was responsible for the questionnaire. Additionally, interviewers were not sure if six additional participants had been told about the involvement of the ACM.

### 3.2 Procedure

The interviewers employed by research agency Panteia telephoned the businesses within our sample based on the contact information that was listed in the Chamber of

<sup>5</sup> This split was chosen because the vast majority (approximately 91% if we leave out freelancers) of businesses in the Netherlands employ less than 20 people.

<sup>6</sup> To check for robustness we also ran our analyses with these participants included. We found that our results were qualitatively identical regardless of the in- or exclusion of these 105 participants.

**Table 1** Net response per cluster by firm size

Cluster	2–19 employees	20+ employees	Total
Agriculture	52	28	80
Food industry	31	50	81
Clothing industry	55	25	80
Wood- and building materials	41	45	86
Paper and printing	36	45	81
Chemical industry	34	46	80
Metal electronics industry	37	43	80
Furniture industry	52	28	80
Other industry	46	34	80
Mineral industry and utilities	39	43	82
Construction	35	46	81
Car dealerships	39	41	80
Wholesale	35	46	81
Retail	40	40	80
Land transportation	32	60	92
Other transportation	58	22	80
Distribution	36	44	80
Catering	40	40	80
Publishers and media	55	26	81
Telecom and ICT	43	39	82
Financial services	39	49	88
Real-estate	41	41	82
Business services	41	43	84
Rental of movable property	55	26	81
Other business services (incl. employment agencies)	39	44	83
Healthcare	37	43	80
<b>Total</b>	<b>1088</b>	<b>1037</b>	<b>2125</b>

Commerce register. Each business was called until they were successfully reached, with a maximum of seven attempts. In the event of contact, the interviewer read a standardized introduction text and specifically asked for a representative of the business who bore the responsibility for sales. The ACM was not named in the introduction, so as to reduce bias. However, if a respondent asked on whose behalf the call was being made, the interviewer would provide this information and record it in the data. This happened in 99 cases (4.7% of the interviews). After the introduction the interview either took place immediately (if a relevant representative was available at that time) or an appointment was made to conduct the interview at a later time. The interviews consisted of 41 questions in total. All questions were asked of all respondents, excluding some dependencies.

### 3.2.1 Test Interviews and Pilot Study

We took two steps to test the effectiveness and the validity of the questionnaire: First we did a small qualitative pre-test of three interviews where the researchers listened to the conversations with the respondents.<sup>7</sup> Second, a pilot of 42 interviews took place in the week of the 8th of October in 2018.<sup>8</sup> On both occasions the results were used to optimize the questions. We made a few changes in the wording of some of the questions and removed other questions to make sure that the interview length did not exceed 20 min.<sup>9</sup> The questions described below were the final versions.<sup>10</sup> After this, the actual fieldwork started. Data collection ran from the 17th of October to the 12th of December 2018.

### 3.3 Measures

A questionnaire was developed based on the one that was used by Denkers and Jel-lema (2016) in a study of compliance with competition law in the Dutch ports. Similar to previous research on deterrence and illegal behavior, the perceptions of the risks and rewards and the relevant norms were measured as specific functions of several distinct examples of cartel behavior (Cochran, 2015; Loughran et al., 2011; Wenzel, 2004). All measured variables consisted of two to four items.<sup>11</sup> The variables that were used in our analysis were calculated as averages of the underlying items.<sup>12</sup>

#### 3.3.1 Openness to Future Cartel Behavior

Openness to future cartel behavior was measured with four items. To limit socially desirable answers, we created distance between the respondent and their answer. We did this by asking the respondents questions from the perspective of their business instead of their personal perspective. Respondents were asked to respond to the following statements: I can imagine that this business, in the next few years, would... “discuss prices for customers with a competitor”; “make agreements on the level of prices for customers with a competitor”; “agree with a competitor on who can supply which customer”; “make secret agreements with a competitor to work together” (Cronbach’s alpha = 0.75). The possible responses ranged from 1 (completely

<sup>7</sup> To maintain the anonymity of the respondents and their businesses, the researchers started listening after the identifying and demographic questions.

<sup>8</sup> The data that were collected from these interviews were used only to optimize the questionnaire. These interviews were not used in the analyses.

<sup>9</sup> The research agency employs a formula to estimate the length of an interview based on the design of the questionnaire.

<sup>10</sup> The final questionnaire is included in the Appendix.

<sup>11</sup> To confirm that the items corresponded with the right variables, we performed a confirmatory factor analysis. The results are available upon request.

<sup>12</sup> To confirm the robustness of our results we also performed our primary analysis when the variables were calculated with factor scores. This had no qualitative effect on our results.

disagree) to 7 (completely agree). In the order of the questionnaire, we made sure that these questions were asked before the knowledge or deterrence questions. This was done to prevent an order effect that would emphasize the legal status of the described behaviors. An average score was calculated for participants who answered at least three of the four questions.<sup>13</sup>

### 3.3.2 Perceived Profitability

To measure the respondent's perceived profitability of cartel behavior we used two items: Does a business make more or less money when it... "agrees with competitors on who can supply which customer?"; "agrees with competitors on the prices they ask for their goods or services?" (Cronbach's  $\alpha=0.83$ ). The respondents could respond with answers ranging from 1 (much less) to 7 (much more). An average score was calculated for participants who answered both questions. If a participant answered only one question, this score was used for the variable.

### 3.3.3 Perceived Risk of Detection

The perceived risk of detection was measured with the use of two items: How big or small do you estimate the chance that an enforcement agency discovers that competitors... "agree on the level of their prices?"; "make agreements on who can supply which customer?" (Cronbach's  $\alpha=0.91$ ). The answer options ranged from 1 (very small) to 7 (very big). An average score was calculated for participants who answered both questions. If a participant answered only one question, this score was used for the variable.

### 3.3.4 Perceived Penalty Severity

The perceived severity of a possible fine or penalty was measured with the use of the following two items: How light or severe do you estimate the fine or penalty when an enforcement agency discovers that competitors... "agree on the level of their prices?"; "make agreements on who can supply which customer?" (Cronbach's  $\alpha=0.88$ ). Respondents could answer with responses that ranged from 1 (very light) to 7 (very severe). An average score was calculated for participants who answered both questions. If a participant answered only one question, this score was used for the variable.

### 3.3.5 Moral Objections to Cartel Behavior (Personal Norms)

Moral objections towards cartel behavior were measured with three items: "I think it's fine when competitors make agreements on who can supply which customer"; "I think it's fair when competitors set their prices in agreement with each other";

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<sup>13</sup> If respondents answered fewer questions, no score was calculated, and their answer was treated as missing. This is also the case for the other measures where we calculated an average score.

and “I think it’s okay when competitors work together in secret every now and then” (Cronbach’s  $\alpha=0.74$ ). Answers ranged from 1 (completely disagree) to 7 (completely agree). We reverse coded all of our items (meaning a 7 is now a 1, a 6 is a 2, etc.). Because of this, a higher score on this scale means stronger moral objections towards cartels. An average score was calculated for participants who answered at least two of the three questions.

### 3.3.6 Perceived Prevalence of Cartel Behavior (Social Norms)

The perceived prevalence of cartel behavior among peers was measured with three items: I think that businesses like this one... “make agreements with a competitor about the level of prices.”; “make agreements on the level of prices for customers with a competitor.”; and “make secret agreements with a competitor to work together.” (Cronbach’s  $\alpha=0.89$ ). Answers ranged from 1 (completely disagree) to 7 (completely agree). An average score was calculated for participants who answered at least two of the three questions.

### 3.3.7 Cohesion within Sector (Social Ties)

Cohesion within the sector was measured with three items: “Businesses in this sector help each other”; “Businesses within this sector have good relationships with each other”; and “I know the people working for other businesses in this sector” (Cronbach’s  $\alpha=0.69$ ). Answers ranged from 1 (completely disagree) to 7 (completely agree). An average score was calculated for participants who answered at least two of the three questions.

### 3.3.8 Knowledge of Competition Law

The knowledge that participating business executives had of competition law was measured with two items.<sup>14</sup> Both items described a type of behavior. Respondents were then asked to state if they thought that the described behavior was either legal or illegal, or that they did not know. We calculated a knowledge score based on the answers on the two questions. The two behaviors were “coordinate prices with competitors” and “making agreements with competitors not to pursue each other’s customers”. We constructed a knowledge scale based on the number of questions the participants answered correctly ranging from 0 to 2.

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<sup>14</sup> The questionnaire included six such items, but we were most interested in the two most serious offences. These items also described the same behavior as used in the deterrence items (price-fixing and market sharing).

**Table 2** Descriptive statistics of all measures

Question/Scale	M	SD	#items	N	Missing	Answer scale/options
Openness to future cartel behavior	1.67	1.01	4	2011	0.44%	1 completely disagree—7 completely agree
Perceived risk of detection	3.32	1.91	2	1855	8.17%	1 small chance—7 strong chance
Perceived penalty severity	4.87	1.94	2	1752	13.27%	1 very light penalty/fine—7 very severe penalty/fine
Perceived financial benefits	3.69	1.77	2	1765	12.62%	1 less money—7 more money
Moral objections to cartel behavior (Personal norms)	5.90	1.41	3	1984	1.78%	1 completely disagree—7 completely agree
Perceived prevalence of cartel behavior (Social norms)	2.09	1.44	3	1910	5.44%	1 completely disagree—7 completely agree
Cohesion within sector (Social ties)	4.16	1.39	3	1988	1.09%	1 completely disagree—7 completely agree
Knowledge of the law	1.19	0.76	2	2020	0%	Allowed, not allowed or don't know

## 4 Results

### 4.1 Descriptive Statistics

In this section we start by reporting the descriptive statistics of the different variables of interest (see Table 2).<sup>15</sup> Second, we summarize four different regression models we estimated to explain openness to future cartel behavior. Finally, through several regression models, we examine the way in which knowledge influences both deterrence and norms and how knowledge and norms interact in their effects on openness.

#### 4.1.1 Correlations

To investigate the relations between the different economic and psychological variables, we examined their correlations. As can be seen in Table 3 there are no strong correlations between the independent variables with the strongest relationship being between the personal and the social norms. We therefore conclude there is no risk of multicollinearity in our analyses.

#### 4.1.2 Openness to Future Cartel Behavior

On average, respondents report low openness to future cartel behavior (1.67). The distribution of the score on the openness scale was, however, highly positively skewed. The majority of business executives (69.45%) reported not being open to future cartel behavior at all. A minority of respondents<sup>16</sup> (12.52%) reported not ruling out cartel behavior in the future with a few even reporting being completely open to future cartel behavior (0.55%). In Table 4 we show the distribution.

#### 4.1.3 Deterrence Variables

The first thing to be noted about perceptions of possible gains and losses of cartel behavior is the relatively large percentage of respondents who are unsure of them. Almost one in eleven respondents (8.17%) was unable to answer<sup>17</sup> on their expectations of potential detection. Even more executives (13.27%) could not provide an estimate of the severity of a penalty upon detection. Finally, a similar number of respondents (12.62%) had no thoughts about the potential gains of cartel behavior.

The second point of interest is the finding that respondents, on average, do not seem to think cartels are financially very profitable (3.69), with almost half of the

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<sup>15</sup> As mentioned in the method section we removed 105 from the 2125 participants from the final sample before we conducted our analysis because they were (potentially) aware of ACM's involvement in this research. These participants are also not included in these descriptive statistics.

<sup>16</sup> Every respondent who scored 3 or higher on our openness scale.

<sup>17</sup> As was mentioned above, these scales are constructed based on two questions. Scores were calculated only for participants who answered at least one of the two. This means that the percentages of missing scores mentioned are respondents who could answer neither of the two questions.

Table 3 Correlations between economic and psychological variables

	Openness	Detection	Penalty	Benefits	Personal norms	Social norms	Social ties
<i>Openness to future cartel behavior</i>	—						
Perceived risk of <i>detection</i>	0.04*	—					
Perceived <i>penalty</i> severity	-0.18***	0.27***	—				
Perceived financial <i>benefits</i>	0.13***	0.11***	0.10***	—			
Moral objections to cartel behavior ( <i>Personal norms</i> )	-0.49***	-0.03	0.22***	-0.12***	—		
Perceived prevalence of cartel behavior ( <i>Social norms</i> )	0.39***	0.01	-0.10***	0.18***	-0.44***	—	
Cohesion within sector ( <i>Social ties</i> )	0.18***	0.05**	-0.03	0.02	-0.13***	0.10***	—
<i>Knowledge</i> of the law	-0.29***	0.00	0.34***	-0.05*	0.40***	-0.21***	-0.12***

\* significant at 10%; \*\* at 5%; \*\*\* at 1%



**Table 4** Distribution of openness to future cartel behavior

Score (range)	N	Percentage
1—2	1016	69.45
2—3	264	18.05
3—4	110	7.52
4—5	50	3.42
5—6	15	1.03
6—7	8	0.55

respondents (45.04%) answering that they think cartels are actually detrimental to their profits. The perceived chance of detection is considered modest on average (3.32). More than a fifth of the respondents (22.56%) describe the chance of detection as very small. Regarding fines, on average, respondents consider the potential penalty to be quite severe (4.87). Almost a quarter of the business executives interviewed (21.94%) describe the severity of a potential penalty as very severe.

#### 4.1.4 Norms

Respondents' personal norms showed that most business executives morally object to cartel behavior. On average, respondents scored 5.90 on the scale measuring their objections to cartel behavior. This distribution is heavily positively skewed with almost half of the respondents (41.70%) stating that they very strongly disapprove of the different cartel behaviors. Still, a significant fraction of respondents (20.03%) do not object to cartel behavior.

The results with respect to executives' social norms were quite similar. They largely perceived cartel behavior by similar organizations to be quite infrequent: The average score was 2.09. The distribution of the social norm also was strongly positively skewed: Over half (52.84%) of the participants perceived no cartel behavior whatsoever among similar businesses.

Contrary to the questions on deterrence, nearly all respondents were able to answer the questions that formed both norm scales: 98.22% of respondents were able to give an estimate of their personal norms toward cartel behavior and 94.56% for social norms.<sup>18</sup>

#### 4.1.5 Social Ties

The strength of social ties between businesses was on average quite neutral: an average of 4.16. Most business executives reported having some sort of social connection with other organizations within their sector. Very few respondents indicated

<sup>18</sup> This means that a business answered at least two out of the three questions that formed the particular scale.

having very strong or very weak ties. These questions were answered by almost all respondents (98.91%).<sup>19</sup>

#### 4.1.6 Knowledge of the Law

Respondents' knowledge of competition law turned out to be limited, as can be seen in Table 5. This is in line with earlier findings from Denkers and Jellema (2016) and CMA (2018). Approximately 73% of business executives were aware that it is illegal to fix prices with competitors, while only 47% of business correctly answered that it is illegal to agree with competitors to respect each other's customer base. The percentage of respondents that answered both these questions correctly was 41%, while 19% answered both questions incorrectly. The average score of number of correct answers was 1.22 with a standard deviation of 0.74.

### 4.2 The Expanded Model of Openness to Future Cartel Behavior

To test our hypotheses, we estimate ordered logit models (Greene, 2012, pp. 824–827) with openness to future cartel behavior as the dependent variable.<sup>20</sup> Some questions offered respondents the option to answer that they did not know an answer. We treated these answers as missing. Consequently, we could not calculate a score on all variables for all respondents. To get a complete overview of the effects of all predictors we used only data of respondents for whom we could calculate all measures and for whom we had a complete set of background variables<sup>21</sup> (N = 1452). It is important to note here that a single “don't know” answer doesn't automatically mean deletion from our analyses; as was stated in 3.3 we could often still calculate the measures if only one answer was missing.

The ordered logit model estimates the values of a latent dependent variable, based on the observed value. If the value of the latent variable is below some cutoff point  $c_1$ , the respondent assigns the value of 1 to openness to future cartel behavior. If the value of the latent variable is above  $c_1$  but below another cutoff point  $c_2$ , the respondent assigns the following value of openness to future cartel behavior, etc.

First, we explore Becker's rational choice theory of crime: We hypothesize that the perceived risk of detection and the perceived severity of a penalty are negatively related to openness to future cartel behavior, while the perceived profitability of cartels is positively related to openness to future cartel behavior. To test our hypotheses we estimate the following model:

$$\text{Openness}_r = \beta_0 + \beta_1 * \text{Detection risk}_r + \beta_2 * \text{Penalty severity}_r + \beta_3 * \text{Profitability}_r + \beta_4 * \text{Knowledge score}_r + \beta_X * \text{Background variables}_r + \varepsilon_r.$$

<sup>19</sup> See footnote 18.

<sup>20</sup> Because of the dispersed nature of the outcome variable we also estimated the three models with the use of a negative binomial distribution. The results were qualitatively the same.

<sup>21</sup> We also did not include the participants who were aware that the ACM was involved in this research (for more information see footnote 15).

**Table 5** Response to questions on illegal cartel behavior

Question	Allowed (%)	Not allowed (%)	Don't know (%)	N
Price-fixing	18.81%	72.62%	8.56%	2020
Market sharing	39.85%	46.78%	13.37%	2020

Second, we explore the psychological variables: We hypothesize that acceptance and perceptions of the prevalence of cartel behavior and social ties with other organizations within the sector are positively related to openness to future cartel behavior. To test these hypotheses we estimate the second model:

$$\text{Openness}_r = \beta_0 + \beta_1 * \text{Personal norm}_r + \beta_2 * \text{Social norm}_r + \beta_3 * \text{Social ties}_r + \beta_4 * \text{Knowledge scorer} + \beta_X * \text{Background variables}_r + \varepsilon_r.$$

Furthermore, to test our proposed expanded model to explain cartel behavior we combine both the psychological and deterrence variables into a single model. This means that we estimate the following model:

$$\text{Openness}_r = \beta_0 + \beta_1 * \text{Detection risk}_r + \beta_2 * \text{Penalty severity}_r + \beta_3 * \text{Profitability}_r + \beta_4 * \text{Personal norm}_r + \beta_5 * \text{Social norm}_r + \beta_6 * \text{Social ties}_r + \beta_7 * \text{Knowledge score}_r + \beta_X * \text{Background variables}_r + \varepsilon_r.$$

The coefficients  $\beta_0$  to  $\beta_7$  and the vector of coefficients  $\beta_X$  are estimated, and the  $\varepsilon$  are logistically distributed errors. All independent variables are mean-centered and measured at the respondent level (indicated by subscript  $r$ ). Table 6 summarizes the regression results for all three models.

#### 4.2.1 Model 1: Rational Choice Theory

We find that the coefficients of both perceived penalty severity and the perceived profitability are in line with the rational choice theory. Business executives who perceive the possible penalty to be more severe are less open to future cartel behavior, while respondents who report perceiving collusion to be more profitable are more open to future cartel behavior. Surprisingly, the relationship between the perceived detection risk and openness to future cartel behavior is counterintuitive and not in line with deterrence theory. Business executives who perceive the risk of detection to be higher were more open to future cartel behavior than were respondents who perceive this risk to be lower. This effect is much smaller than both the effect of perceived profits and perceived severity of a penalty. Severity of a possible penalty is the most important deterrence-related explanation for openness to future cartel behavior. We also find a strong effect of the knowledge score on openness to future cartel behavior: More knowledge is related to a being less open to future cartel behavior.

**Table 6** Ordered logit model results of openness to future cartel behavior

	Model 1	Model 2	Model 3
Perceived profitability	0.1605*** (0.0302)		0.0815*** (0.0316)
Perceived penalty severity	-0.1374*** (0.0290)		-0.0997*** (0.0298)
Perceived risk of detection	0.0692** (0.0283)		0.0433 (0.0291)
Moral objections to cartel behavior (Personal norms)		-0.4972*** (0.0444)	-0.4796*** (0.0446)
Perceived prevalence of cartel behavior (Social norms)		0.2966*** (0.0400)	0.2808*** (0.0405)
Cohesion within sector (Social ties)		0.1728*** (0.0398)	0.1697*** (0.0399)
Knowledge score	-0.5849*** (0.0743)	-0.3233*** (0.0755)	-0.2539*** (0.0785)
N	1452	1452	1452
McFadden R <sup>2</sup>	0.0382	0.0817	0.0845

Standard errors in parentheses. \* significant at 10%; \*\* at 5%; \*\*\* at 1%

These models include background variables that are omitted in Table 6. The complete model can be found in Table 10 in the Appendix

### 4.2.2 Model 2: Psychological Model

All relationships in the psychological model are in line with our hypotheses: Business executives are more likely to report openness to collude in the future when they: (i) approve of cartel behavior; (ii) perceive similar businesses to show cartel behavior; or (iii) have stronger ties with businesses in their sector. The regression results show that the personal norm that a business executive holds with respect to cartel behavior has the strongest effect of the psychological factors, while social ties between businesses in the sector has the weakest of the three. The knowledge score effect is slightly weaker than in model 1, but points in the same direction.

### 4.2.3 Model 3: Expanded Model

The combined model yields qualitatively similar results to both individual models. We see that the psychological factors are more important in explaining openness to future cartel behavior than are the deterrence factors. When we look at the odds ratios we see that for every unit increase in the personal norms factor, the openness to future cartel behavior decreases with 38%. For social norms, a unit increase leads openness to increase with 32%; for the cohesion variable, this is 18%. This is a far greater influence than perceived severity (a 9% decrease) or perceived profitability (an 8% increase). The biggest difference with model 1 is that detection risk is not significant in this model. More knowledge of the law, again, relates to being less open to form a cartel in the future.

Additionally we note that we made a comparison between CEOs and the other respondents on the results above (both descriptive statistics and our models). This was done to be sure that there were no differences in outcomes based on the executive status of our respondent, as it is important that our respondents are actual decision-makers. We found no qualitative differences in results between the two groups of respondents.<sup>22</sup>

## 4.3 The Role of Knowledge of the Law

As can be seen in the above analyses, knowledge of the law is one of the stronger (inverse) predictors of openness to future cartel behavior. Initially we examined the direct relation between knowledge and openness to future cartel behavior. However, we also expect knowledge to relate to the psychological and economic variables. To test the role of knowledge in both the deterrence factors and norms, we estimated the following ordered logit model for each different factor: perceived detection risk; perceived penalty severity; moral objections to cartel behavior; and perceived prevalence of cartel behavior:

$$\text{Factor}_r = \beta_0 + \beta_1 * \text{Knowledge score}_r + \beta_X * \text{Background variables}_r + \epsilon_r$$

<sup>22</sup> Results are available upon request.

**Table 7** Regression results: effect of knowledge on different factors

	Perceived profitability	Perceived penalty severity	Perceived detection risk	Moral objections to cartel behavior (Personal norms)	Perceived prevalence of cartel behavior (Social norms)
Knowledge of the law	-0.1343** (0.0645)	0.7704*** (0.0678)	-0.1118* (0.0644)	1.0330*** (0.0709)	-0.5603*** (0.0674)
N	1452	1452	1452	1452	1452
McFadden R <sup>2</sup>	0.0054	0.0393	-0.0077	0.0517	0.0173

Standard errors in parentheses. \* significant at 10%; \*\* at 5%; \*\*\* at 1%

These models include background variables that are omitted in Table 7. The complete model can be found in Table 11 in the Appendix

The coefficients  $\beta_0$  and  $\beta_1$  and the vector of coefficients  $\beta_X$  are estimated [the knowledge score is measured at the respondent level (indicated by subscript  $r$ ); and the  $\varepsilon$  are logistically distributed errors.

The results of these regressions can be found in Table 7. The regression results indeed show a positive effect of knowledge of the law on perceived penalty severity, and moral objections to cartel behavior, and a negative effect the perceived profitability and the perceived prevalence of cartel behavior. Strangely, we also find a negative effect on perceived detection risk. However, this effect is only significant at the 10% level.

To explore further the role of knowledge in cartel behavior we also examined how knowledge of the law influences the effects of the deterrence and psychological factors on openness to future cartel behavior. First, we looked at all the possible interactions between knowledge score and the deterrence and psychological factors. We found two significant interactions and created a new model with only the two significant interactions. We estimated the following ordered logit model for all variables:

$$\begin{aligned} \text{Openness}_r = & \beta_0 + \beta_1 * \text{Detection risk}_r + \beta_2 * \text{Penalty severity}_r + \beta_3 * \text{Profitability}_r \\ & + \beta_4 * \text{Personal norm}_r + \beta_5 * \text{Social norm}_r + \beta_6 * \text{Social ties}_r \\ & + \beta_7 * \text{Knowledge score}_r + \beta_8 * \text{Knowledge score}_r * \text{Personal norm}_r \\ & + \beta_9 * \text{Knowledge score}_r * \text{Social norm}_r \\ & + \beta_X * \text{Background variables}_r + \varepsilon_r. \end{aligned}$$

The results of this analysis can be found in Table 8.

We explore both interaction effects, starting with personal norms. We find that a combination of good knowledge and strong moral objections against cartel behavior is related to being the least open to form a cartel in the future. Thus it appears that better knowledge of the law strengthens the inhibiting effect of moral objections on openness to future cartel behavior. In all cases the main effect of personal norms is maintained: The stronger is a participant's objection to cartel behavior, the lower is his/her openness to future cartel behavior.

When zooming in on the interaction between social norms and knowledge we find that knowledge tempers the relationship between social norms and openness to future cartel behavior. For participants who have more knowledge of the law, social norms are less strongly related to openness than for participants with less or no knowledge of the law. It appears that participants who know the rules are less likely to be influenced by social norms.

## 5 Discussion

It appears that psychological factors are a key element in understanding openness to future cartel behavior. Our results suggest that personal moral objections against cartel behavior may play a large role in inhibiting future cartel behavior.

In contrast, the perception that other businesses are involved in cartels (social norm) and stronger social ties between competitors might make business executives more open to future collusion.

Furthermore, we found that knowledge is an important factor. First, it relates negatively to openness to form a cartel in the future. Moreover, it seems to be a key element in both the psychological and economic variables. Participants with more knowledge have stronger personal norms against cartel behavior and have social norms that cartels are less prevalent. Additionally, they perceive a potential penalty to be more severe and perceive cartel behavior itself to be less profitable. More knowledge is thus related to both better norms and stronger deterrence. Combined, these findings suggest that competition authorities could potentially be more effective in preventing future cartels if they complement their focus on deterring cartels with additional strategies. These strategies should focus on increasing knowledge of competition law and promoting personal moral objections to cartel behavior.

Our results show a serious absence of knowledge of the legality of cartel behavior. For example, less than half of the participants knew that market sharing is illegal. This is important because knowledge of the law relates directly to openness to future cartel behavior. Participants who have a good knowledge of the law are much less likely to be open to future cartel behavior. Furthermore, our results also show that knowledge of the law is related to the norms that keep firms from considering future cartel behavior. Therefore, raising the level of legal knowledge from its current, relatively low level could be an important first step towards further improving personal and social norms with regard to cartels. Finally, we found that the more knowledge participants have, the more severe they perceived the potential fine.

While raising knowledge of the law is clearly very important as a general strategy, our findings also show that solely explaining the rules is not enough. Personal moral objections against cartel behavior seem to potentially be a necessary part of the puzzle to prevent businesses considering cartels. Participants who have both strong moral objections against cartels *and* good knowledge of the law, were the least open to form a cartel in the future. This further emphasizes the importance of strong norms against cartel behavior. We conclude that any intervention that is aimed at improving knowledge should also adequately explain that and especially *why* this cartel behavior is unwanted.

To reach these goals, we suggest that competition authorities supplement their traditional enforcement communication with information campaigns that aim to educate businesses about the relevant laws and the reasons why these laws exist. We think these campaigns should focus on the basics of competition law and explain the moral basis of these rules. Often the communication about cartels strongly focusses on disincentivizing collusion. However, based on our results we suggest that competition authorities add a moral component to their communication. Previous research has shown that the perceived damage of cartels is strongly related to how problematic one thinks this behavior is (Dijkstra & van Stekelenburg, 2021). So, we suggest that the competition authorities' message should not only explain which behavior is illegal and what the consequences are, but also, for example, show the consequences for consumers and the economic damage. In this way authorities can influence the societal norms against cartels.



**Table 8** Interaction between personal norms and knowledge score on openness to future cartel behavior

Perceived profitability	0.0834*** (0.0320)
Perceived penalty severity	-0.1120*** (0.0301)
Perceived risk of detection	0.0449 (0.0293)
Moral objections to cartel behavior (Personal norms)	-0.5587*** (0.0467)
Perceived prevalence of cartel behavior (Social norms)	0.2651*** (0.0412)
Cohesion within sector (Social ties)	0.1622*** (0.0403)
Knowledge of the law	-0.2814*** (0.0793)
Knowledge of the law x Moral objections to cartel behavior (Personal norms)	-0.3416*** (0.0554)
Knowledge of the law x Perceived prevalence of cartel behavior (Social norms)	-0.1421*** (0.0523)
N	1452
McFadden R <sup>2</sup>	0.0910

Standard errors in parentheses. \* significant at 10%; \*\* at 5%; \*\*\* at 1%

This model includes background variables that are omitted in Table 8. The complete model can be found in Table 12 in the Appendix

Based on our results we pose that informing businesses of the legal status of cartels and its moral objectionable nature show strong promise to help the fight against cartels in two ways: First, we know that both knowledge and personal norms against cartel behavior are directly related to less openness to future cartel behavior and that they might interact to strengthen each other. Second, we found that knowledge is positively related to the perception of higher fines and cartels being less profitable. In this way authorities can improve knowledge and norms among businesses while also increasing their deterrent effect.

One unexpected finding is the small positive relationship between perceived risk of detection and openness to future cartel behavior. This finding contradicts the rational choice theory of crime (Becker, 1968). It also does not fit with findings from criminological research that usually showed that detection risk is the strongest deterrent factor (Durlauf & Nagin, 2011; Lochner, 2007; Nagin, 2013). One possible explanation is the fact participants who have good knowledge of the law perceive a lower detection risk. We found that knowledge of the law is quite strongly related to a being less open to future cartel behavior. This could mean that participants who are likely to comply, because they know that cartel behavior is illegal, also have a slightly lower perception of the detection risk. Additionally, a large part of our sample was not open to collusion in the future and held strong views against such behavior. It is possible that detection risk only starts playing a role once businesses

are seriously considering forming a cartel. Taken together, this might explain the absence of the expected effect in our sample.

Our study has some limitations: First, it is possible that business executives with personal norms endorsing cartel behavior were less inclined to participate in our study: selection bias. In our sample, most businesses reported disapproval of cartel behavior. Previous research has shown that in many cases personal norms that object to cartel behavior are a strong inhibition to even considering cartel behavior (Bachman et al., 1992; Gallupe & Baron, 2014; Paternoster & Simpson, 1996; Pogarsky, 2002). This leaves a relatively small group that would actually weigh the risks and rewards of cartel behavior. However, we deem a selection bias unlikely because executives were not specifically told the topic of the questionnaire when they were invited and, moreover, only a single person broke off the interview prematurely.

A second limitation is the possibility of socially desirable answers. While we cannot rule out that some respondents lied about their openness to future cartel behavior, it is unlikely that a large part of the sample did so. Respondents were explicitly informed that their answers could never be traced back to them individually or their business. Moreover, we used openness to future cartel behavior as the outcome variable and, thus, respondents would not be confessing to any actual wrongdoing.

Finally, our study was correlational and focused on openness to future cartel behavior. Therefore, we cannot be sure of the causality of the relationships we found in our data and cannot relate our results to actual cartel behavior. It is true that we cannot be sure whether the factors in our model actually influence compliance. On the other hand, this research still provides competition authorities with new insights in the probable drivers of cartel behavior and their relative importance.

## 6 Conclusion

In this paper, we proposed expanding the rational choice theory of crime as applied to cartels with psychological factors and incorporating imperfect knowledge of businesses. We tested our expanded model by means of a survey of business executives in the Netherlands. We found that both the factors in the rational choice theory and the additional psychological factors are related to openness to future cartel behavior, with the latter improving the model considerably.

Perceived penalty severity and moral objections to cartel behavior (personal norms) are both negatively related to openness to future cartel behavior, whereas perceived detection risk, perceived prevalence of cartel behavior (social norms), and cohesion within the sector are positively related to openness to future cartel behavior. Furthermore, we found that the added psychological factors—personal norms, social norms, and social ties—greatly increase the explanatory power of the model. Specifically, personal norms and, to a lesser extent, social norms could potentially be strong factors in preventing future cartel behavior. Our results show the relationships between the psychological factors and openness to future cartel behavior are

four to five times larger compared to the deterrence factors: perceived penalties and perceived benefits.

Importantly, with respect to knowledge of the relevant laws, we found that many business executives are insufficiently aware of what constitutes (il)legal cartel behavior, with many businesses' being unable to answer correctly that price-fixing and market-sharing are illegal. Additionally, we found that knowledge of the law is strongly related to deterrence—specifically for perceived severity of a penalty—and personal and social norms.

The results of this study leave us with some interesting questions for future research: First, as mentioned, we found a lack of basic knowledge among businesses. Additionally, we found that knowledge of the law could potentially influence both norms and deterrent effect: perceptions of detection risk, cartel profitability, and severity of a penalty. In this way, knowledge might be key to harness these two separate ways to prevent cartels. Based on these results we concluded that competition authorities should step up their efforts to educate businesses about the relevant laws. Given the fact that competition authorities already spend resources on educating the public, this begs the question: How can competition authorities *effectively* improve knowledge of the law among businesses and where do their current efforts fall short?

We believe that subsequent research should investigate how competition authorities can communicate the relevant rules while at the same time increase their deterrent effect and improve the prevalent norms. Some questions that should be considered are: How can the basics of competition law be communicated effectively? How can authorities best reach their audience? and How can we make this information feel urgent and relevant to business executives? One specific way to explore these issues is by studying the effects of specific penalties on all three of these variables: knowledge, deterrence, and norms. In this way we can move towards an evidence-based way of teaching competition law. We propose that future research could look into these effects through field experiments: for example, by studying the effects of different versions of penalty communication.

Finally, while this study has focused on the actual perceptions of business executives in the context of their own business, we have not investigated the process of their decisions. It would be interesting to study the decision-making process of businesses that explicitly make a cost-benefit analysis of cartel behavior. In that way we can investigate how risk perceptions and norms affect actual business decisions. Future research could explore this topic through qualitative research: in the form of interviews with business executives.

Concluding: We have found that psychological factors and knowledge are potentially important additions to deterrence theory in understanding cartel behavior. These new determinants of cartel behavior are potentially powerful tools to improve compliance with competition law and should be taken into account to advance the fight against cartel behavior.

## Appendix

The distribution of response of the fieldwork by telephone can be found in Table 9.

Complete models (with background variables) can be found in Tables 10, 11, 12.

**Table 9** Distribution of response of the fieldwork and final sample

	Number of companies	Percentage
Gross sample	18,000	100%
Not used	3852	21%
Gross sample used	14,148	79%
Not usable (total)	1962	11%
Fax/information	355	
Incorrect/duplicate address	1484	
Company closed	123	
Usable (total)	12,186	68%
Fully interviewed	2,125	17%
Company has no employees	489	4%
Interview prematurely discontinued	1	-
Appointment / no call <sup>§</sup>	432	4%
Refusal	5859	48%
No answer / busy / answering machine	1692	14%
Not available by phone during data collection period	761	6%
More than 5 calling attempts	663	5%
Language difficulties	164	1%
Final sample	2125	
Used in analysis	2020	95%
Removed (told about involvement ACM)	99	0.46%
Removed (unknown if told about involvement ACM)	6	0.04%

<sup>§</sup> An appointment for an interview with these companies was made, but the interview did not occur

The main reasons for non-occurrence were that the quota cell was full, the contact person was not available, or the appointment fell outside the fieldwork period

**Table 10** Ordered logit model results of openness to future cartel behavior (with background variables)

	Model 1	Model 2	Model 3
Perceived profitability	0.1605*** (0.0302)		0.0815*** (0.0316)
Perceived penalty severity	-0.1374*** (0.0290)		-0.0997*** (0.0298)
Perceived risk of detection	0.0692** (0.0283)		0.0433 (0.0291)
Moral objections to cartel behavior (Personal norms)		-0.4972*** (0.0444)	-0.4796*** (0.0446)
Perceived prevalence of cartel behavior (Social norms)		0.2966*** (0.0400)	0.2808*** (0.0405)
Cohesion within sector (Social ties)		0.1728*** (0.0398)	0.1697*** (0.0399)
Knowledge score	-0.5849*** (0.0743)	-0.3233*** (0.0755)	-0.2539*** (0.0785)
Membership of trade association	0.2717** (0.1090)	0.2671** (0.1111)	0.2891*** (0.1116)
Growth market	0.1058 (0.1243)	-0.0382 (0.1267)	0.0090 (0.1276)
Market in decline	0.0262 (0.1544)	0.0335 (0.1579)	0.0690 (0.1584)
Customers: consumers	0.2605** (0.1122)	0.1194 (0.1144)	0.1115 (0.1150)
Customers: government	0.0555 (0.1110)	0.0590 (0.1132)	0.0600 (0.1137)
Customers: Businesses	-0.0979 (0.1619)	-0.1270 (0.1635)	-0.1470 (0.1642)
Competition law compliance training (yes)	-0.2958* (0.1550)	-0.2323 (0.1574)	-0.2204 (0.1588)

Table 10 (continued)

	Model 1	Model 2	Model 3
Business size: 10 to 20 workers	-0.2060 (0.1686)	-0.2262 (0.1703)	-0.2163 (0.1709)
Business size: 20 to 50 workers	-0.5420*** (0.1351)	-0.3736*** (0.1370)	-0.3842*** (0.1380)
Business size: 50 or more workers	-0.3732*** (0.1426)	-0.2531* (0.1436)	-0.2366 (0.1454)
Gender: female	0.1340 (0.1228)	-0.2057* (0.1237)	0.2034 (0.1242)
Barriers to entree	0.0589** (0.0300)	0.590* (0.0306)	0.586* (0.0308)
N	1452	1452	1452
Mc Fadden R <sup>2</sup>	0.0382	0.0817	0.0845

Standard errors in parentheses. \* significant at 10%; \*\* at 5%; \*\*\* at 1%

**Table 11** Regression results on effect of knowledge on different factors (with background variables)

	Perceived profitability	Perceived penalty severity	Perceived detection risk	Moral objections to cartel behavior (personal norms)	Perceived prevalence of cartel behavior (social norms)
Knowledge of the law	-0.1343** (0.0645)	0.7704*** (0.0678)	-0.1118* (0.0644)	1.0330*** (0.0709)	-0.5603*** (0.0674)
Membership of trade association	-0.0384 (0.0994)	0.2029** (0.1001)	0.0424 (0.0998)	-0.0030 (0.1056)	-0.1661 (0.1039)
Growth market	-0.3109*** (0.1152)	0.0859 (0.1150)	-0.0708 (0.1145)	-0.0085 (0.1208)	0.3321*** (0.1231)
Market in decline	-0.2022 (0.1441)	0.2059 (0.1453)	-0.1224 (0.1429)	0.1437 (0.1522)	0.1358 (0.1494)
Customers: consumers	0.1409 (0.1037)	-0.1648 (0.1035)	-0.0565 (0.1038)	-0.3687*** (0.1102)	0.1257 (0.1081)
Customers: government	-0.1182 (0.1030)	-0.0693 (0.1028)	-0.0546 (0.1032)	0.1702 (0.1089)	0.1608 (0.1063)
Customers: Businesses	0.4312*** (0.1503)	-0.0203 (0.1509)	0.1735 (0.1532)	0.0626 (0.1529)	0.1783 (0.1569)
Competition law compliance training (yes)	-0.1698 (0.1441)	0.6235*** (0.1452)	0.5049*** (0.1405)	0.6536*** (0.1607)	-0.1873 (0.1493)
Business size: 10 to 20 workers	0.1240 (0.1573)	0.0792 (0.1558)	0.1662 (0.1584)	-0.1054 (0.1640)	-0.1657 (0.1636)
Business size: 20 to 50 workers	0.3424*** (0.1239)	0.3353*** (0.1235)	0.3163** (0.1230)	0.2323* (0.1300)	-0.1498 (0.1281)
Business size: 50 or more workers	0.0505 (0.1310)	0.4914*** (0.1338)	0.4613*** (0.1304)	0.3605** (0.1403)	-0.1375 (0.1365)

Table 11 (continued)

	Perceived profitability	Perceived penalty severity	Perceived detection risk	Moral objections to cartel behavior (personal norms)	Perceived prevalence of cartel behavior (social norms)
Gender: female	0.2384** (0.1120)	-0.1931* (0.1150)	0.1458 (0.1157)	0.0647 (0.1190)	-0.1497 (0.1199)
Barriers to entree	0.0710** (0.0279)	0.0708** (0.0280)	0.0922*** (0.0278)	-0.0173 (0.0290)	0.0023 (0.0289)
N	1452	1452	1452	1452	1452
McFadden R <sup>2</sup>	0.0054	0.0393	-0.0077	0.0517	0.0173

Standard errors in parentheses. \* significant at 10%; \*\* at 5%; \*\*\* at 1%



**Table 12** Interaction between personal norms and knowledge score on openness to future cartel behavior (with background variables)

Perceived profitability	0.0834*** (0.0320)
Perceived penalty severity	-0.1120*** (0.0301)
Perceived risk of detection	0.0449 (0.0293)
Moral objections to cartel behavior (Personal norms)	-0.5587*** (0.0467)
Perceived prevalence of cartel behavior (Social norms)	0.2651*** (0.0412)
Cohesion within sector (Social ties)	0.1622*** (0.0403)
Knowledge of the law	-0.2814*** (0.0793)
Knowledge of the law x Moral objections to cartel behavior (Personal norms)	-0.3416*** (0.0554)
Knowledge of the law x Perceived prevalence of cartel behavior (Social norms)	-0.1421*** (0.0523)
Membership of trade association	0.2714** (0.1124)
Growth market	0.0053 (0.1285)
Market in decline	0.0833 (0.1587)
Customers: consumers	0.1207 (0.1159)
Customers: government	0.0691 (0.1148)
Customers: Businesses	-0.1355 (0.1652)
Competition law compliance training (yes)	-0.2106 (0.1609)
Business size: 10 to 20 workers	-0.2116 (0.1712)
Business size: 20 to 50 workers	-0.3815*** (0.1388)
Business size: 50 or more workers	-0.1713 (0.1474)
Gender: female	0.1868 (0.1248)
Barriers to entrée	0.0574* (0.0311)
N	1452
McFadden R <sup>2</sup>	0.0910

Standard errors in parentheses. \* significant at 10%; \*\* at 5%; \*\*\* at 1%

## Translated questionnaire

### Business demographics

This business supplies...

- a. Products
- b. Services
- c. Both products and services

This business supplies... (multiple answers possible).

- a. Consumers
- b. The government
- c. Businesses

This company is member of a trade association.

- a. Yes
- b. No

### New economy

1. To what extent is the product or service that this business offers innovative? (1 Not at all innovative—7 Extremely innovative)
2. To what extent is data necessary for the existence of the product or service that this business offers? (1. Not at all – 7 Extremely necessary)
3. If there was no internet, to which extent could this business' product or service exist? (1. Not at all – 7. Definitely)

### Competition

How many other businesses does this business compete with for customers or work? (open question, number; if answer: none, open question asking for explanation).

To what extent to you agree or disagree with the next statements? (1 completely disagree – 7 completely agree).

1. In this sector, businesses are highly competitive with each other.
2. Businesses in this sector want to grow at each other's expense.
3. If you make a single mistake in this sector, you will lose customers to a competitor.

Comparability of products/services.

To what extent are the products or services in this sector similar? They are not at all similar – 7. They are (practically) the same).

**Cohesion within sector (social ties)**

To what extent do you agree or disagree with the next statements? (1 completely disagree – 7 completely agree).

1. Businesses in this sector help each other.
2. Businesses within this sector have good relationships with each other.
3. I know the people working for other businesses in this sector.

**Barriers to entry**

To what extent do existing businesses in this sector have an advantage over potential entrants?

(1 No advantage at all – 7 Extreme advantage).

**Market growth or decline**

Is this sector more of a growth market or a market in decline? (answers: the market is in decline, growing, or neither).

**Transparency competitors' prices**

To what extent can the prices of competitors in this sector be observed? (1 Impossible – 7 Very easily).

**Price following**

Does this business use competitors' prices to determine its own prices?

- a. Yes
- b. No

If yes: Does the business use pricing algorithms? (yes, no, don't know).

(Pricing algorithm description: a pricing algorithm is a formula that automatically calculates the price of a product or service based on data).

**Openness to future cartel behavior**

I can imagine that this business, in the next few years, would... (1 completely disagree – 7 completely agree).

1. discuss prices for customers with a competitor.
2. make agreements on the level of prices for customers with a competitor.
3. agree with a competitor on who can supply which customer.
4. make secret agreements with a competitor to work together.

**Past behavior**

In the past, has this business ever... (1 Definitely not – 7 Definitely yes).

1. made agreements on the level of prices for customers with a competitor.
2. agreed with a competitor on who can supply which customer.

3. made secret agreements with a competitor to work together.

### **Business climate**

(1 completely disagree – 7 completely agree).

*Egoistic:*

1. In this business, people mainly do the things that benefit them individually.
2. In this business, people protect their own interests before everything else.
3. People in this business are mainly interested in their personal benefit.

*Principled:*

4. Corporate social responsibility is the most important thing in this business.
5. In this business you are expected to always keep the public interest in mind.
6. People in this business have a strong sense of responsibility towards society.

### **Moral objections to cartel behavior (personal norms)**

(1 completely disagree – 7 completely agree).

1. I think it's fine when competitors make agreements on who can supply which customer.
2. I think it's fair when competitors set their prices in agreement with each other.
3. I think it's okay when competitors work together in secret every now and then.

### **Perceived prevalence of cartel behavior (social norms)**

I think that similar businesses to this business... (1 completely disagree – 7 completely agree).

1. make agreements with a competitor about the level of prices.
2. agree with a competitor who can supply which customer.
3. make secret agreements with a competitor to cooperate.

### **Opportunity**

(1 completely disagree – 7 completely agree).

1. Competitors in this sector would be willing to make agreements with each other on prices.
2. There are many occasions where I can make agreements with competitors about who will supply which customer.
3. If I wanted to, I could easily make secret agreements with competitors to cooperate.

### **Perceived obstacles to compliance**

(1 completely disagree – 7 completely agree).

1. In this industry you have to cooperate with competitors to make money.
2. Businesses in this sector have to divide up the market in advance, in order to be able to function.
3. Businesses in this sector have to agree on prices, otherwise they will go bankrupt.

### **Knowledge of competition law**

Do you think it is legal or not to... (You can also indicate if you don't know).

1. coordinate prices with competitors.
2. agree with competitors not to pursue each other's customers.
3. develop new products or services with a competitor if a company cannot do it alone.
4. discussing offers for customers with competitors.
5. to make agreements about discounts through a trade association.
6. copy a competitor's public prices.

### **Perceived profitability**

Does a business make more or less money if it... (1. Much less – 7. Much more).

1. agrees with competitors on who can supply which customer?
2. agrees with competitors on the prices they ask for their goods or services?

### **Perceived risk of detection**

How big or small do you estimate the chance that an enforcement agency discovers that competitors... (1. A Very small less chance – 7. A very big chance).

1. agree on the level of their prices?
2. make agreements on who can supply which customer?

### **Perceived penalty severity**

How light or severe do you estimate the fine or penalty when an enforcement agency discovers that competitors... (1. Very light penalty – 7. Very severe penalty).

1. agree on the level of their prices?
2. make agreements on who can supply which customer?

### **Perceived reputational damage**

How positively or negatively do you estimate the impact on a business' reputation if it becomes known that...

1. it has been involved in matching prices with competitors?
2. it has been involved in agreements with competitors about who supplies to which customer?

### **Compliance**

Does your business have a specific person, department or program that monitors compliance with laws and regulations?

- a. Yes
- b. No

Have you followed one or more compliance training courses while in your current position?

- a. Yes
- b. No

If yes → On which topic(s) did you receive training? (multiple answers possible) (read out).

- a. Safety
- b. Fraud
- c. Competition

### **Awareness of the ACM**

Which organization do you think oversees competition? (full names read, abbreviations not mentioned).

- a. Netherlands Authority for Consumers and Markets (ACM)
- b. Netherlands Authority for the Financial Markets (AFM)
- c. Netherlands Competition Authority (NMa)
- d. Authority for Competition Oversight (AC)

If ACM → Have you ever heard or read about the actions of this authority in the past? (If yes, ask for explanation) Do you think the following statements are true or false?

(True: 1, 3, 5, 7, 8 | False: 2, 4, 6).

If a business has broken competition law... (You can also answer that you don't know).

- 1. the business could be fined.
- 2. managers could receive a personal fine.
- 3. prison sentences could be imposed.
- 4. the business can avoid a fine by reporting its involvement to the authorities
- 5. buyers can file a damage claim.
- 6. a business can apply for leniency with the authority.

### **Social Media**

How often do you use... (never, monthly, weekly, daily).

- a. Twitter
- b. Facebook
- c. LinkedIn

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## References

- Bachman, R., Paternoster, R., & Ward, S. (1992). The rationality of sexual offending: Testing a deterrence/rational choice conception of sexual assault. *Law & Society Review*, 26(2), 343–372. <https://doi.org/10.2307/3053901>
- Bandura, A. (1977). *Social learning theory*. Prentice Hall.
- Baumeister, R. F., & Leary, M. R. (1995). The need to belong: Desire for interpersonal attachments as a fundamental human motivation. *Psychological Bulletin*, 117(3), 497–529. <https://doi.org/10.1037/0033-2909.117.3.497>
- Beck, L., & Ajzen, I. (1991). Predicting dishonest actions using the theory of planned behavior. *Journal of Research in Personality*, 25(3), 285–301. [https://doi.org/10.1016/0092-6566\(91\)90021-H](https://doi.org/10.1016/0092-6566(91)90021-H)
- Becker, G. S. (1968). Crime and punishment: An economic approach. *Journal of Political Economy*, 76(2), 169–217. <https://doi.org/10.1086/259394>
- Belmi, P., & Pfeffer, J. (2015). How “organization” can weaken the norm of reciprocity: The effects of attributions for favors and a calculative mindset. *Academy of Management Discoveries*, 1(1), 36–57. <https://doi.org/10.5465/amd.2014.0015>
- Boyd, R., & Richerson, P. J. (2009). Culture and the evolution of human cooperation. *Philosophical Transactions of the Royal Society b: Biological Sciences*, 364(1533), 3281–3288.
- Bos, I., Davies, S., Harrington, J. E., Jr., & Ormosi, P. L. (2018). Does enforcement deter cartels? A Tale of Two Tails. *International Journal of Industrial Organization*, 59, 372–405. <https://doi.org/10.1016/j.ijindorg.2018.04.005>
- Bos, I., Letterie, W., & Vermeulen, D. (2015). Antitrust as facilitating factor for collusion. *The BE Journal of Economic Analysis & Policy*, 15(2), 797–814. <https://doi.org/10.1515/bejeap-2014-0023>
- Buccirossi, P., Ciari, L., Duso, T., Spagnolo, G., & Vitale, C. (2014). Deterrence in competition law. In M. Peitz & Y. Spiegel (Eds.), *The analysis of competition policy and sectoral regulation* (pp. 423–454). Now Publishers.
- Castano, E., Yzerbyt, V., Paladino, M. P., & Sacchi, S. (2002). I belong therefore I exist: Ingroup identification, ingroup entitativity, and ingroup bias. *Personality and Social Psychology Bulletin*, 28(2), 135–143. <https://doi.org/10.1177/0146167202282001>
- Cialdini, R. B., Reno, R. R., & Kallgren, C. A. (1990). A focus theory of normative conduct: Recycling the concept of norms to reduce littering in public places. *Journal of Personality and Social Psychology*, 58(6), 1015–1026. <https://doi.org/10.1037/0022-3514.58.6.1015>

- Cochran, J. K. (2015). Morality, rationality and academic dishonesty: A partial test of situational action theory. *International Journal of Criminology and Sociology*, 4, 192–199. <https://doi.org/10.6000/1929-4409.2015.04.19>
- Competitions and Markets Authority (CMA). (2018). Competition law research 2018. Report by ICM on behalf of the CMA. [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/750149/icm\\_unlimited\\_cma\\_competition\\_law\\_research\\_2018.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/750149/icm_unlimited_cma_competition_law_research_2018.pdf)
- Connor, J. M., & Lande, R. H. (2019). Does crime pay? *Cartel Penalties and Profits, Antitrust*, 33(2), 29–36.
- Cooter, R. (1998). Expressive law and economics. *The Journal of Legal Studies*, 27(S2), 585–607. <https://doi.org/10.1086/468036>
- Denkers, A. J. M., & Jellema, F. E. (2016). Concurrentie over boord in de haven? Report commissioned by ACM. <https://www.acm.nl/nl/publicaties/publicatie/16730/Onderzoek-VU-Concurrentie-over-boord-in-de-haven>
- Dijkstra, P. T., Haan, M. A., & Schoonbeek, L. (2021). Leniency programs and the design of antitrust: Experimental evidence with free-form communication. *Review of Industrial Organization*, 59(1), 13–36. <https://doi.org/10.1007/s11151-020-09789-5>
- Dijkstra, P. T., & van Stekelenburg, L. (2021). Public attitude in the Netherlands towards cartels in comparison to other economic infringements. *Journal of Competition Law & Economics*, 17(3), 620–641. <https://doi.org/10.1093/joclec/nhaa036>
- Durlauf, S. N., & Nagin, D. S. (2011). Imprisonment and crime: Can both be reduced? *Criminology & Public Policy*, 10(1), 13–54. <https://doi.org/10.1111/j.1745-9133.2010.00680.x>
- Ellemers, N., & Haslam, S. A. (2012). Social identity theory. In P. A. M. Van Lange, A. W. Kruglanski, & E. T. Higgins (Eds.), *Handbook of theories of social psychology* (pp. 379–398). Sage Publications Ltd.
- Feldman, Y., & Perez, O. (2009). How law changes the environmental mind: An experimental study of the effect of legal norms on moral perceptions and civic enforcement. *Journal of Law and Society*, 36(4), 501–535.
- Friedman, J. W. (1971). A non-cooperative equilibrium for supergames. *Review of Economic Studies*, 38(1), 1–12.
- Funk, P. (2007). Is there an expressive function of law? An empirical analysis of voting laws with symbolic fines. *American Law and Economics Review*, 9(1), 135–159.
- Gallupe, O., & Baron, S. W. (2014). Morality, self-control, deterrence, and drug use: Street youths and situational action theory. *Crime & Delinquency*, 60(2), 284–305. <https://doi.org/10.1177/0011128709359661>
- Geerken, M. R., & Gove, W. R. (1975). Deterrence: Some theoretical considerations. *Law & Society Review*, 9(3), 497–513. <https://doi.org/10.2307/3053169>
- Greene, W.H. (2012). *Econometric Analysis*. Pearson Education.
- Harrington, J. E., Jr., & Zhao, W. (2012). Signaling and tacit collusion in an infinitely repeated Prisoners' Dilemma. *Mathematical Social Sciences*, 64(3), 277–289. <https://doi.org/10.1016/j.mathsocsci.2012.05.005>
- Haslam, S. A., & Ellemers, N. (2005). Social identity in industrial and organizational psychology: Concepts, controversies and contributions. *International Review of Industrial and Organizational Psychology*, 20(1), 39–118. <https://doi.org/10.1002/0470029307>
- Hinloopen, J., & Soetevent, A. R. (2008). Laboratory evidence on the effectiveness of corporate leniency programs. *The RAND Journal of Economics*, 39(2), 607–616. <https://doi.org/10.1111/j.0741-6261.2008.00030.x>
- Hofmann, E., Hoelzl, E., & Kirchler, E. (2008). Preconditions of voluntary tax compliance: Knowledge and evaluation of taxation, norms, fairness, and motivation to cooperate. *Zeitschrift Fur Psychologie*, 216(4), 209–217. <https://doi.org/10.1027/0044-3409.216.4.209>
- International Competition Network (ICN). (2005). Defining hard core cartel conduct; effective institutions; effective penalties, building blocks for effective anti-cartel regimes. ICN Working Group on Cartels. [https://www.internationalcompetitionnetwork.org/wp-content/uploads/2018/05/CWG\\_BuildingBlocks.pdf](https://www.internationalcompetitionnetwork.org/wp-content/uploads/2018/05/CWG_BuildingBlocks.pdf)
- International Competition Network. (ICN) (2022). ICN factsheet and key messages. <https://www.internationalcompetitionnetwork.org/wp-content/uploads/2022/08/Factsheet-2022.pdf>
- Keizer, K., Lindenberg, S., & Steg, L. (2008). The spreading of disorder. *Science*, 322(5908), 1681–1685. <https://doi.org/10.1126/science.1161405>



- Kettle, S., Hernandez, M., Ruda, S., & Sanders M. A. (2016). Behavioral Interventions in tax compliance: Evidence from Guatemala. In: *Policy research working paper*, pp. 7690. <https://doi.org/10.1596/1813-9450-7690>
- Kish-Gephart, J. J., Harrison, D. A., & Treviño, L. K. (2010). Bad apples, bad cases, and bad barrels: Meta-analytic evidence about sources of unethical decisions at work. *Journal of Applied Psychology*, 95(1), 1. <https://doi.org/10.1037/a0017103>
- Levenstein, M. C., & Suslow, V. Y. (2006). What determines cartel success? *Journal of Economic Literature*, 44(1), 43–95. <https://doi.org/10.1257/002205106776162681>
- Lochner, L. (2007). Individual perceptions of the criminal justice system. *American Economic Review*, 97(1), 444–460. <https://doi.org/10.1257/aer.97.1.444>
- Loughran, T. A., Paternoster, R., Piquero, A. R., & Pogarsky, G. (2011). On ambiguity in perceptions of risk: Implications for criminal decision making and deterrence. *Criminology*, 49(4), 1029–1061.
- McAdams, R. H. (2000). An attitudinal theory of expressive law. *Oregon Law Review*, 79, 339–390.
- Moore, C., Detert, J. R., Treviño, L. K., Baker, V. L., & Mayer, D. M. (2012). Why employees do bad things: Moral disengagement and unethical organizational behaviour. *Personnel Psychology*, 65(1), 1–48. <https://doi.org/10.1111/j.1744-6570.2011.01237.x>
- Motta, M., & Polo, M. (2003). Leniency programs and cartel prosecution. *International Journal of Industrial Organization*, 21(3), 347–379.
- Motta, M. (2004). *Competition policy—theory and practice*. Cambridge University Press.
- Nagin, D. S. (2013). Deterrence: A review of the evidence by a criminologist for economists. *Annual Review of Economics*, 5(1), 83–105. <https://doi.org/10.1146/annurev-economics-072412-131310>
- Paternoster, R., & Simpson, S. (1996). Sanction threats and appeals to morality: Testing a rational choice model of corporate crime. *Law & Society Review*, 30(3), 549–583. <https://doi.org/10.2307/3054128>
- Piquero, N. L. (2012). The only thing we have to fear is fear itself: Investigating the relationship between fear of falling and White-Collar crime. *Crime & Delinquency*, 58(3), 362–379. <https://doi.org/10.1177/0011128711405005>
- Pogarsky, G. (2002). Identifying “deterable” offenders: Implications for research on deterrence. *Justice Quarterly*, 19(3), 431–452. <https://doi.org/10.1080/07418820200095301>
- Potters, J., & Suetens, S. (2013). Oligopoly experiments in the current millennium. *Journal of Economic Surveys*, 27(3), 439–460. <https://doi.org/10.1111/joes.12025>
- Schwartz, S. H. (1977). Normative influences on altruism. *Advances in Experimental Social Psychology*, 10, 221–279. [https://doi.org/10.1016/S0065-2601\(08\)60358-5](https://doi.org/10.1016/S0065-2601(08)60358-5)
- Spagnolo, G. (2000). Self-defeating antitrust laws: How leniency programs solve Bertrand’s paradox and enforce collusion in auctions. In: *FEEM working paper*, pp.52
- Spagnolo, G. (2004). *Divide et impera: Optimal leniency programmes*. CEPR Discussion Paper.
- Stigler, G. J. (1964). A theory of oligopoly. *Journal of Political Economy*, 72(1), 44–61. <https://doi.org/10.1086/258853>
- Sunstein, C. R. (1996). On the expressive function of law. *University of Pennsylvania Law Review*, 144(5), 2021–2053. <https://doi.org/10.2307/3312647>
- Tirole, J. (1988). *The theory of industrial organization*. MIT Press.
- Van der Noll, R., & Baarsma, B. (2017). Compliance with cartel laws and the determinants of deterrence—an empirical investigation. *European Competition Journal*, 13(2–3), 336–355. <https://doi.org/10.1080/17441056.2017.1387450>
- Wenzel, M. (2004). The social side of sanctions: Personal and social norms as moderators of deterrence. *Law and Human Behavior*, 28, 547–567. <https://doi.org/10.1023/B:LAHU.0000046433.57588.71>
- Zimring, F. E., & Hawkins, G. J. (1973). Deterrence: The legal threat in crime control. *Stanford Law Review*, 25(4), 647. <https://doi.org/10.2307/1227719>