**LENIENCY AND DAMAGE LIABILITY IN BRAZIL: THE EFFECTS ON COLLUSIVE BEHAVIOR[[1]](#footnote-1)**

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**Abstract:** Leniency policies are important tools for the fight against cartels. A recent debate about these policies is the interplay between public and private competition law enforcement, since damage claims may reduce the attractiveness of leniency application due the fear of being sued. The lack of a well-established set of rules regarding damage claims may be harming the Brazilian Leniency Program. The objective of this paper is to analyze and suggest the best policy for leniency applicants related to the damage liability in Brazil. We develop a theoretical model based on the Brazilian framework and conclude: the optimal policy is providing immunity to the leniency recipient, as well as increase the public enforcement of damage claims; the immunity is even more effective when there is risk of betrayal; the immunity is the best policy in the case of *ex-post* leniency; the immunity is the optimal policy when there is no bankruptcy, otherwise the applicant liability should be the minimum necessary to avoid the bankruptcy and to guarantee the refund.

***Keywords***: collusion, damage claim, leniency, infinitely repeated game, damage liability

**Resumo:** As políticas de leniência são ferramentas importantes no combate aos carteis. Uma discussão recente sobre o tema é a interação entre a ação pública e privada, uma vez que as ações privadas de reparação de danos podem reduzir a atratividade do acordo de leniência devido ao medo de ser processado. A ausência de regras claras relacionadas à responsabilidade pelos danos do cartel pode estar prejudicando a efetividade do Programa de Leniência brasileiro. O objetivo do trabalho é avaliar e sugerir a melhor política sobre responsabilidade pelos danos ao assinante do acordo de leniência no Brasil. Um modelo teórico com base no cenário brasileiro é desenvolvido, alcançando as seguintes conclusões: a política ótima é fornecer imunidade ao assinante do acordo, assim como elevar a ação pública que enseja na maior quantidade de ações privadas; a imunidade é ainda mais efetiva quando há risco de traição; a imunidade é a política ótima no caso do cartel já ter sido descoberto; a imunidade é a política ótima quando não há risco de falência, caso contrário a responsabilidade pelos danos do assinante deveria ser a minima necessária para evitar a falência e garantir a reparação.

***Palavras-chave*:** Cartel,ações privadas de reparação de danos, leniência, jogos repetidos infinitamente, responsabilidade pelos danos

**JEL code:** L13, L41, L44

1. **Introduction**

Collusive agreements represent a major concern of antitrust authorities. In essence, the cartel objective is to decrease the competition in a market, then sellers (or buyers less often) can obtain higher profits compared to a competitive environment. It is viewed as an illegal activity[[4]](#footnote-4) since they reduce the efficiency and often results in increased prices, which is wrongful to the consumers. As informed by OECD (2002), collusive agreements are universally recognized as the most harmful of all types of anticompetitive conducts.

In the 90s, a new tool for fighting cartels was released by antitrust authorities in developed countries, which Spagnolo (2008) denoted as “*the leniency revolution*”. According to the author, leniency policies reduce sanctions against colluding firms that report information on their cartel to the antitrust authority and cooperate with it along the prosecution phase to help convict their former partners. Thus, buyer’s complaints, audits and dawn raids have been replaced by well-designed leniency policies and self-reporting mechanisms. As informed by Harrington (2008), a well-designed leniency program was first adopted by the United States (USA) in 1993, although some antitrust policies related to amnesty can be observed since 1978. In 1996 the European Commission introduced its own leniency program in the European Union (EU) with some differences in comparison to the USA[[5]](#footnote-5). Recently, a great number of countries have adopted leniency programs, generally based on USA and EU policies.

In Brazil, the Brazilian System of Competition Policy, led by the Administrative Council for Economic Defense (CADE), began a public fight against cartels in the mid-2000s, releasing booklets aimed to explain people about their adverse effects and how to denunciate collusions, improving mechanisms to prosecute cartels and highlighting the importance of the Brazilian Leniency Program adopted in 2000. Martinez (2015) informs that the Brazilian Leniency Program was inspired by the USA antitrust policies. A winner-takes-all approach is observed, therefore only the first one to confess can be granted. Companies and individuals can apply for leniency, meaning that a corporation can avoid government fines while individuals escape fines and prison sentences.

A recent debate about leniency policies is the interplay between public and private competition law enforcement. As noted by Spagnolo and Marvão (2016), damage claims may reduce the attractiveness of leniency application for cartel participants if their cooperation with the antitrust authority increases the chance that the victims will bring a successful lawsuit. This conflict requires an intense debate about how antitrust authorities should act regarding damage liability, disclosure of information for victims and the enforcement for encourage lawsuits.

There is no consensus among countries yet. According to Cauffman (2011), in USA the Antitrust Criminal Penalty Enhancement and Reform Act of 2004 limits the civil liability of leniency applicants to single damages attributable to the applicant’s own sales, meanwhile the other cartelists are required to cover the additional damages. Without leniency, firms are liable for treble damages and are also jointly and severally liable for the entire cartel damage. On top of that, plaintiffs are able to request any relevant information they deem necessary from every wrongdoer, including the leniency applicant. In EU, Buccirossi, Marvão e Spagnolo (2015) highlight that a recent EU Directive states: “*an immunity recipient is jointly and severally liable to: a) its direct or indirect purchasers or providers; b) to other injured parties only where full compensation cannot be obtained from the other undertakings that were involved in the same infringement of competition law*.[[6]](#footnote-6) In addition, *“national courts cannot at any time order a party or a third party to disclose any of the following categories of evidence (a) leniency statement; and (b) settlement submissions”[[7]](#footnote-7).* Cauffman (2011) cites the Hungary case as an interesting one: an undertaking that has been granted immunity from fines may refuse to reimburse the damages as long as the claim can be collected from other undertakings being held liable for the same infringement, i. e., the cartel victims are only able to enforce their claims against the immunity recipient to the extent that it cannot obtain compensation from other cartelists.

As in other countries, the debate in Brazil is recent and not defined yet. According to Martinez (2015), cartel members in Brazil are jointly and severally liable for the illegal activity, with no exception to the leniency applicant. The Brazilian Constitution of 1988 states the disclosure of administrative processes as a rule, however other laws and the CADE internal regiment limit the access of some information, either to protect the investigation or due companies requests to protect market information. The lack of a well-established set of rules regarding damage claims may be harming the Brazilian Leniency Program effectiveness either by discouraging the wrongdoers for the leniency application in already formed cartels or by not being threatening enough to deter the cartel formation. The fight against collusive agreements is a priority of Brazilian antitrust enforcement, therefore it is important to understand the consequences of self-report policies to increase the effectiveness of the Brazilian Leniency Program, already considered one of the best tools for fighting cartels.

The main objective of this paper is to analyze the best policy for leniency applicants related to the damage liability and the consequences on the cartel behavior. Instead of considering a binary choice of collude or not depending on the incentives (as most papers in this literature), we allow for the possibility of an endogenous decision related to the collusive price. The idea is to develop a theoretical framework as close as possible from Brazilian situation regarding competition policies, antitrust authority acting and the market itself. Thereby, we can achieve some important conclusions for policy recommendations.

1. **Literature review**

This paper is related to two important subjects in competition policy. The first one is the interplay between the public and private enforcement of law. Despite being complementary, if not designed cautiously one may be harmful to the other and reduce the effectiveness of antitrust policies in general. Important contributions in this area from an economic and theoretical point of view include McAffee *et al.* (2008) and Bourjarde *et al.* (2009). More specific to our case, according to Cauffman (2011) two important actions may interfere in this interplay: the law can prevent disclosure of leniency applications; the law can decrease the risk or the amount of damages to be paid by leniency recipients. In practice, it represents no disclosure of information about the leniency agreement until the case is judged and partial liability/immunity of damages to the recipient.

The other important topic is the impact of leniency policies in collusive agreements from a theoretical perspective. Harrington (2008) differentiates two main effects: deterrence (preventing aspect) and desistance. Leniency programs can deter cartel formation either by making it unprofitable or making collusion unstable. On the other hand, leniency programs can cause collusion to desist by expanding the set of future states for which the cartel collapses. Since the seminal paper of Motta and Polo (2003) this is a vast literature that includes Brisset and Thomas (2004), Spagnolo (2005), Aubert *et al.* (2006) Harrington (2008), Lefouili and Roux (2012), Chen and Rey (2013), among others.

Finally, two papers are closer to this one. Buccirossi, Marvão and Spagnolo (2015) is related to the two topics above, i.e., they analyze theoretically the interplay between leniency policies and damage claims. They conclude that the private enforcement can improve the level of deterrence if the leniency applicant liability from damages is very low (immunity ideally), jointly with full disclosure of information to victims. In this sense, their proposal of immunity for the applicant is more effective than the current policy in US, EU and Hungary. The other paper is Houba, Motchenkova and Wen (2015). Inspired by Harrington (2005) and Harrington and Chen (2006), they analyze the impact of a leniency program on the collusive price, thus the decision of collude or not is not binary. Instead of that, there is a set of prices that sustains the cartel. They conclude that the *ex-ante* leniency is not effective in decreasing the maximal collusive price, while for *ex-post* leniency it is optimal to grant full immunity for the first one to report.

1. **The model**

The model is an infinitely repeated game, in which firms observe their expected values in each period to take their decisions. An industry consists of two symmetric firms competing *à la* Bertrand *ad infinitum* in a context of any degree of heterogeneity among products (except for completely homogeneous goods[[8]](#footnote-8))*.* We are interested in the Subgame Perfect Equilibrium (SPE hereafter), the profile of actions that induces Nash equilibrium in every subgame. However, it is well known that repeated games allow for the possibility of multiple SPE, including collusive and non-collusive ones. We analyze the most common and realistic one: the stationary SPE of collude and respect the collusive agreement in every period. Some papers like Motta and Polo (2003), Spagnolo (2005) and Houba, Motchenkova and Wen (2015) also consider the SPE in which firms “exploit” the leniency (since it reduces the costs of misbehavior) by colluding and reporting systematically. However, this is a very unrealistic situation and therefore not taken into account here.

The firm’s profit is a function of the price set at the beginning of each period. A duopoly competition (no collusion) results in both firms setting the Bertrand-Nash price, hereafter , which generates the profit ( from now on). As in Houba, Motchenkova and Wen (2012) and Houba, Motchenkova and Wen (2015), without loss of generality we normalize , therefore the other profits are net values when compared to the default case of competition. The collusive profit for each firm is , such that is the price fixed by the cartel and is the monopoly price. Assuming continuous and strictly increasing in , firms will always choose the maximal as possible when colluding (given a set of prices that sustain the cartel and compensates all the risks, they will set the higher one), we call it as “collusive price”. Besides competing and colluding firms can also agree to collude and then deviate, i. e., agree to set the “collusive price” but instead of that set a lower price that maximize its profit given the “collusive price” of the other firm. The profit obtained by unilateral deviation is denoted by [[9]](#footnote-9) and is continuous and strictly increasing in . In the appendix, we provide an example of these profits and the respective assumptions. Lastly, we assume the same exogenous discount factor for both firms.

The AA acts in two ways: independent investigation and leniency mechanism. Concerning the independent investigation, both firms are detected and prosecuted with probability when they have done and respected the collusive agreement, such that due a given budget constraint. Once detected, each firm pays a fine in the same period, with . The Brazilian’s Law 12,529/2011 establishes the following criteria related to corporate fines: fine of 1% up to 20% of the company gross revenue in the last year preceding the establishment of the administrative procedure, concerning the business activity branch in which the offense occurred, which will never be lower than the advantage obtained when it is possible to calculate. Thus, considering the profit as a proxy for the revenue it is plausible to set the fine as a proportion of the total profit obtained in the beginning of each period[[10]](#footnote-10).

With respect to the leniency mechanism, the Brazilian Leniency Program guarantees immunity from fines to the first eligible firm that applies for leniency, just like in USA[[11]](#footnote-11). Therefore, after an unilateral deviation it is not possible for the betrayed firm to obtain benefits from another leniency agreement. The immunity (total amnesty) might be obtained only when the AA is unaware about the collusive activity (*ex-ante* leniency). When the AA knows about the cartel but does not have enough proof to start a prosecution a leniency applicant can obtain only partial amnesty (from one-third up to two-thirds of the fine as stated by the Brazilian’s Law 12,529/2011). This is known as *ex-post* leniency and will be considered later as a model extension.

Next, we define the private lawsuit enforcement, i.e., the capacity of agents to sue the cartel for damages. The plaintiffs are allowed to sue the cartel as a whole, then each firm is liable for the own damage when there is no leniency (different liabilities are proposed with leniency)[[12]](#footnote-12). We take an approach similar as Buccirossi, Marvão and Spagnolo (2015): when the cartel is detected and prosecuted by independent investigation each firm pays a total amount of damages of in the same period, in which is a parameter representing the AA enforcement for damage claims (mainly disclosure of evidence to plaintiffs, but also seminars, booklets, papers and other ways to promote the damage restitution), such that and is the maximal value given a budget constraint, while represents the court activity, i.e., it is the proportion of the maximum damage request ( set by the court when the firm is not a leniency applicant. Initially, when there is unilateral deviation and reporting the leniency applicant is liable for (different liability rules are proposed later), in which is the proportion of the maximum damage request ( set by the court when the firm is in fact the leniency applicant. Note that is an *ex-ante*policy and invariable with respect to being or not the recipient of leniency, while the terms and are responsible for distinguish the damage liability of the leniency applicant. We assume , such that when there is no AA policy of distinct liability, when there is a partial liability (the recipient receives a partial amnesty instead of immunity) and when there is immunity for the leniency applicant.

As in Buccirossi, Marvão and Spagnolo (2015), we assume it is optimal to apply for leniency (report) when deviating. One possible interpretation for this assumption is that the expected damage liability when reporting is always lower than the probability of getting caught and be required to pay the fine plus the collusive damage[[13]](#footnote-13). Other explanation is the following: is the probability of detection and prosecution when both collude and respect the collusive agreement, but a deviation may destabilize the market and generate more suspicion, increasing up to higher levels. In this framework, the probability of being caught may be very high, which induces the leniency application.

Lastly, firms are only liable for fines and damages regarding the actual period activity, therefore they are not guilty for past infringement.

* 1. **Optimal damage liability**

Each firm has two actions to take regarding the SPE we are analyzing: collude/respect the collusion (hereafter “collude”) and collude/deviate/report (“report” from now on). We consider the grim-trigger strategy, i.e., firms will keep colluding as long as no one “report”. If any “report” the cartel dissolves and firms compete *à la* Bertrand forever. The same happens when a cartel is detected and punished by the AA: it will never be formed again, resulting in competition from thereon. It seems appropriate because none cartel was discovered and punished twice in Brazil (as far as we know), even repeated offenders were members of different cartels[[14]](#footnote-14).

In each period, the timing of the game is the following:

1. Firms agree on the “collusive price” ;
2. Each one decides to follow the agreement or not and realizes the profits. In other words, they choose between “collude” and “report”.
3. When both “collude” the AA detects and prosecutes the cartel with probability . If yes, the AA sets the amount of fine and then the justice sets the amount damage for each firm (proportional to the collusive profit), the game ends for that period and firms compete from now on; if not, the game ends for that period and the same game is played next period. In case of unilateral “report”, the deviating firm receives the benefits of leniency (immunity from fines) and initially pays the amount of damage proportional to the profit from deviation (different liability rules are proposed later), the game ends for that period and firms compete forever[[15]](#footnote-15).

Now we define the expected values. The expected value of “collude” is:

(1)

In which the first part is the profit of colluding, the second part is the total amount of fines and damages when the cartel is detected and the third part is what happens in the future: firms compete forever or maintain the same expected value. After some manipulation and considering we have:

(2)

We assume , therefore  and there are always incentives for cartelization. Also, is strictly increasing in due the fact that is strictly increasing in . Next, we define the expected value of unilateral “report”:

(3)

The first part is the profit of unilateral deviation, the second part is the immunity from fines guaranteed by the Brazilian leniency program, the third part is the amount of damages to be paid and the last one is the competitive outcome forever. Again, we assume , therefore and strictly increasing in due strictly increasing in .

The ICC is given by . This condition states “collude” as a SPE and sets the maximal “collusive price” () [[16]](#footnote-16). Considering , the ICC be expressed as:

(4)

As in Houba, Motchenkova and Wen (2015), the term can be interpreted as the relative gains of “collude” in comparison to the gains of unilateral deviation. We assume that an increase in enhances the profit of unilateral deviation at a higher rate than the profit of “collude”, thus the fraction is strictly decreasing in (an example is provided in the appendix). The right-hand side of (4) is denoted by and the following proposition formalizes the first result:

***Proposition 1****: Assuming strictly decreasing in, either the price is or there exists a maximal “collusive price” satisfying .*

***Proof:*** Consider that is left-bounded by , while is exogenous. We have three possible cases:

1. If the price is and (total deterrence);
2. If there is an interior solution such that constraining the “collusive price” (partial deterrence);
3. If the “collusive price” is and (no deterrence).

The first case of the proof above represents a combination of a small , a big and high values of and . The third one is the opposite: firms are patient (high ), the independent investigation is small (low) and and are also small. We are more interested at the second one (intermediate cases), i.e., when the combination of parameters that compose provides an interior solution . This is the most realistic framework: firms have incentives to collude and set , but they are not able to act freely and the ICC binds the endogenous decision such that. The figure below illustrates this scenario:

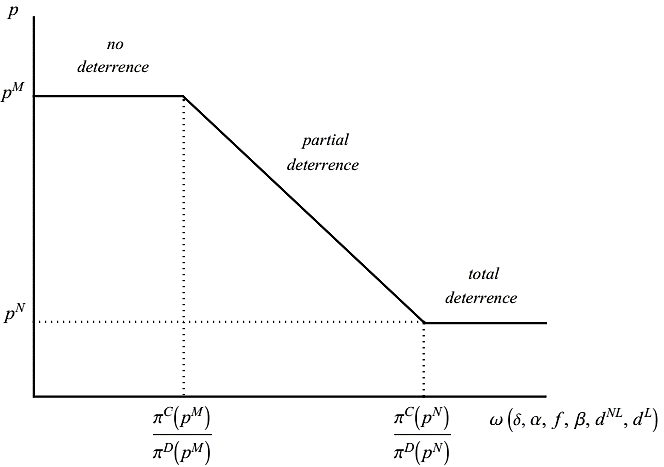


Figure 1. The three levels of deterrence

Now we analyze the AA activity. Assuming the cartel will form anyway when , the objective is to decrease the “collusive price” as much as possible. The closer is from the lower is the profit and the deadweight loss (and higher is the consumer surplus). From a simple comparative statics analysis, it is clear from (4) that an increase in strengthens the ICC (as shown in the appendix), thus it is optimal to elevate the AA independent investigation as much as possible. With respect to the AA enforcement for damage claims the situation is the following: is either decreasing or increasing in depending on the parameters (as shown in the appendix). This is because when the leniency applicant is liable for damages we have an adverse effect: while an increase in reduces at a rate (, it also decreases at a rate , thus the consequences might be more in the sense of discourage the report than reduce the gains of collusion. The following proposition states the optimal antitrust policy regarding the damage liability:

***Proposition 2****: From the AA perspective of decreasing the “collusive price” it is optimal to set . After that, the impact of in reducing the “collusive price” is higher.*

***Proof:*** The ICC is strengthened when . It shifts upward in (4) up to and decreases the “collusive price” to , such that . Any other policy that reduces the damage liability for the leniency applicant but does not provide immunity is sub-optimal since the “collusive price” obtained lies between and . At the same time, the comparative statics in the appendix shows that a decrease in turns the impact of on more positive/less negative. The maximal positive impact of on is obtained when . It occurs because with any other policy that reduces the damage liability for the leniency applicant, but does not provide immunity, the adverse effect of discouraging the report remains.

Lastly, the AA policies of setting and increasing maintains “collude” as a SPE for all . Consider exogenous and define the “collusive price” after the immunity by . Furthermore, denote the value of unilateral “report” after the immunity as . In the absent of the immunity the “collusive price” is set when , but since we have , thus this policy strengthens the ICC up to , “collude” remains a SPE and since the amount of damage is lower and the consumer surplus is higher than before[[17]](#footnote-17). The same occurs with an increase in after : it will reduce , which generates a new ICC equilibrium and a new “collusive price” strictly lower than before.

1. **Further extensions**
   1. **The risk of betrayal affecting the “collusive price”**

In this paper, we are considering the sustainability of the stationary SPE in which firms collude and respect the collusive agreement in every period (“collude”). Before, the ICC was set by comparing the expected value of “collude” to the expected value of unilateral “report”, which determines the “collusive price” and turns “collude” a SPE. Nevertheless, as pointed out by Spagnolo (2005) and Buccirossi, Marvão and Spagnolo (2015), the risk of betrayal is an important channel of deterrence, thus it is important to consider this effect in the analysis. It means that no firm is absolutely sure about the other’s decision. By consequence, the ICC is no longer obtained by comparing the value of “collude” to the value of unilateral “report”, since there is no certainty about unilateral “report” (the other one can also “report”). Instead of this, firms assign a probability for each possible action of the other and compare the expected pay-off when playing “collude” to the expected pay-off when playing “report”.

Following Spagnolo (2005) and Buccirossi, Marvão and Spagnolo (2015), to consider the fear of betrayal we apply an important concept developed by Harsanyi and Selten (1988): the equilibrium selection criterion of *risk dominance[[18]](#footnote-18).* As informed by Buccirossi, Marvão and Spagnolo (2015), the *risk dominance* points at the less risky equilibrium, i.e., when the consequences of the opponent not playing the equilibrium strategy are less negative. In our case, we are interested at the unique collusive SPE, when both “collude” (remember that both “report” is not a SPE, despite being a Nash equilibrium in an one-shot game). Thus, for our purposes, this concept is important because it changes the riskiness of collude, as shown from now on. The game that generates “collude” as a SPE is the following:

Table 1. The payoff matrix of the infinitely repeated game:

|  |  |  |
| --- | --- | --- |
|  | C | R |
| C |  |  |
| R |  |  |

In which and were already defined, while and is the expected value when the other “report” and when both “report”, respectively. We state the following:

(5)

(6)

In (5) the firm is cheated, obtains the lowest possible profit (other deviates) and pays the fine and damage with sure (we consider because the firm is not the leniency applicant). In (6) the term is the profit obtained when both deviate, and since only the first one to report is able for leniency we consider it a random event. When both “report” each one has a probability of ½ of being immune from fines (first brackets) and a probability of ½ of paying the whole fine (second brackets). We state strictly increasing in and strictly increasing up to a point and then strictly decreasing in (an example is provided in the appendix).

We follow the procedure developed by Harsanyi and Selten (1988)[[19]](#footnote-19). The matrix in Table 1 is transformed into an equivalent one that represents the net gains of each equilibrium. This matrix can be expressed by:

Table 2. The equivalent matrix of the infinitely repeated game:

|  |  |  |
| --- | --- | --- |
|  | C | R |
| C |  |  |
| R |  |  |

Note that an increase in reduces the gains of “collude”, making it less attractive. At the same time, a decrease in makes “report” more attractive for both. It is possible to measure this relative risk by the *riskiness index* (*,* defined by:

(7)

When we say that “report” is risk dominated by “collude”, while means the opposite and represents the equivalence. Comparing to the Proposition 1, if there is no deterrence, while if there is total deterrence. As we are interested at the “collude” SPE only the case when matters, i.e., an interior solution given by the equality in the new ICC is the interest here. After some manipulation, the new ICC can be expressed by:

(8)

Replacing (2), (3), (5) and (6) in (8), considering and after some manipulation we reach the new ICC that ensures “collude” a SPE and sets the “collusive price”:

(9)

We denote the right-hand side of (9) as . Maintaining the same assumptions of *Proposition 1,* this new ICC is more restrictive than (4) when:

(10)

This is true because (the example in the appendix gives support to that) and . Therefore, the “collusive price” obtained in (9) is strictly smaller than in (4), which would be expected because the risk of betrayal reduces the gains of collusion and restrict any collusive equilibrium. We denote this new “collusive price” as .

Now we focus on the immunity from damage claims. Note that it generates as defined previously, but it also changes and because the betrayed firm is liable for the entire cartel damage (his own and the other’s). We denote these new values as:

(11)

(12)

The ICC after the immunity is , which gives us the following:

(13)

Note that the immunity strengthens the ICC at a higher degree than without considering the risk of betrayal. The right-hand side of (4) was already denoted by , now consider that the immunity shifts upwards up to . At the same time, the immunity shifts in (9) up to (the right-hand side of (13)). We can state the following:

(14)

(15)

Since due to , the difference in (15) is strictly higher than in (14). It occurs because besides increasing up to by pulling out , the immunity also decreases up to by adding to the penalty. Denoting this new price as , we see that because , thus it is possible to conclude that the immunity from damage claims to the leniency applicant is even more effective in reducing the “collusive price” when the risk of betrayal is considered.

* 1. **Ex-post leniency**

Until now, we have been assuming that firms decide between “collude” and “report” before any investigation, i.e., the AA is unaware about the cartel activity and starts to investigate/prosecute only after their decision. It is possible to call this case as *ex-ante* leniency, but in many cases firms choose their actions when the AA is already investigating the cartel, which can possibly change the collusive SPE. This situation is denoted by Houba, Motchenkova and Wen (2015) as *ex-post* leniency*.*

As mentioned in the introduction, an important difference here is that when the AA knows about the cartel activity a leniency applicant can only obtain partial amnesty, from one-third up to two-thirds of the estimated fine (stated by the Brazilian’s Law 12,529/2011). We denote the amount of fine the applicant is liable as , such that , i.e., the applicant is never benefited with full immunity (, but he always receives partial amnesty (.

In the main model, we stated as the probability of independently investigation and prosecution by the AA. It is possible to think of it as two distinct activities: the AA may launch an investigation on the market and may detect the cartel with probability ; then, after the cartel detection the AA may successfully prosecute it with a probability . As both are probabilities (thereby restricted between zero and one) we have and . Before, we were considering and both launched at the same time, but now the timing of the game is the following:

1. Firms agree on the “collusive price” simultaneously;
2. The AA launches the investigation on the market and detects the cartel with probability ;
3. Each firm chooses between “collude” and “report” and realizes the profits.
4. When both “collude”:
5. If detected, the AA successfully prosecutes the cartel with probability , each firm pays the fines and damages, the game ends for that period and they compete from now on.
6. If detected but not successfully prosecuted no one is penalized, the game ends for that period and both play the same game in the next period.
7. If not detected, each one earns the collusive profit and both play the same game in the next period.

With respect to the unilateral “report”:

1. Like in Motta and Polo (2003), we assume it occurs only when the cartel is detected. In this case the applicant pays the reduced fine and the amount of damage (different liability rules are proposed later), the game ends for that period and firms compete forever.
2. If the cartel is not detected the deviating firm earns the profit of unilateral deviation, the game ends for that period and both compete from now on.

Now we define the values of “collude” and “report”[[20]](#footnote-20) under *ex-post leniency*, respectively (already considering ):

(16)

(17)

We assume and . The new “collusive price” is set by , therefore:

(18)

Denote the right-hand side of (18) as and the new “collusive price” as . While an increase in enhances , thus it is optimal to increase the capacity of prosecution as much as possible, the same problem of increasing without immunity in the main model occurs with now: an increase in reduces at a rate (, but it also decreases at a rate, thus besides the impact of reducing the gain of collusion it also discourages the report. The fact is that setting is the optimal policy in this framework as well: it shifts upward up to and removes the adverse effect of in regarding the damages. By consequence, the “collusive price” is decreased from to .

Finally, what about the relation between the “collusive prices” in *ex-ante* and *ex-post* frameworks? Due the Brazilian Leniency Program rules of *ex-post* leniency it is not possible to reach an overall conclusion. The fact of existing (the leniency applicant receives partial amnesty and not full immunity) means that the adverse effect of with respect to remains after . Since , , and , we have when , so when this inequality holds. In this situation, it is better for the AA to launch the investigation and try to detect the cartel before the decision of “collude” and “report”, otherwise it is better to wait and set togheter. This problem would vanish if the AA follows the Houba, Motchenkova and Wen (2015) suggestion: the most effective *ex-post* leniency policy in lowering the “collusive price” of silent cartels should grant full immunity to the applicant. Setting would result in and in all circumstances, and in this case the anticipated investigation would always worth it.

* 1. **Bankruptcy**

In the previous sections, we are assuming that when one firm applies for leniency (and receives immunity from damages) the other one can afford for the total amount of damages claimed. Depending on the previous fine set by the AA, plus the damage payment, perhaps the betrayed firm is unable to pay this entire amount and goes bankruptcy, resulting in a market concentration for the future periods.

We assume the bankruptcy only occurs when one firm chooses “report”, i.e., if the cartel is discovered by independent investigation they both can afford for the damages. Thereafter, the expected value of “collude” is the same as (1). Now we define the new expected value for the one who “report”. After the bankruptcy, the leniency applicant becomes a monopolist from now on for an unknown period, for simplicity we say forever. Thereby, the firm will be able to set indiscriminately and the expected value of “report” becomes:

(19)

In which is the monopolist profit at the monopoly price. Note that , thus the ICC is strengthened with the bankruptcy and, by consequence, the “collusive price” is lower than .

Apparently, the immunity for the recipient is even more effective in a bankruptcy scenario. However, there are two points we need to address. The first one is that if the AA commits to the immunity and to a high enforcement of damage claims, the betrayed firm may go bankruptcy and maybe some plaintiffs will not be able to receive the refund (once it cannot be charged from the recipient). We consider that the proven claim is a right of the plaintiff set by the civil justice, thus someone needs to pay for it, even more in jurisdictions where each firm is jointly and severally liable for the entire cartel damage (as Brazil). Secondly, it is hard to believe that the antitrust authority will be directly responsible for bankruptcy and market concentration[[21]](#footnote-21) (except for authorized mergers). Since and are *ex-ante* policies, if the betrayed firm informs and proves that will lead them to bankruptcy, the AA will be directly responsible for this. Thereby, we state a new expected value of “report”:

(20)

The term represents the AA policy regarding the damage liability to the leniency applicant with the risk of bankruptcy. From this perspective, the optimal should be zero in the case of no bankruptcy or the minimum necessary for no bankruptcy otherwise (and henceforward). In other words, to guarantee the refund for those who claimed, maybe it is necessary to charge a certain amount from the leniency applicant. It may weak the ICC up to a “collusive price” , but is necessary to guarantee the right of refund and the integrity of firms.

This point was considered in Buccirossi, Marvão and Spagnolo (2015). They assume that when the betrayed firm goes bankruptcy another one will replace immediately. The immunity from damage claims increases the “minimum discount factor” that sustains the cartel, by consequence a group of cartels that would form in the absent of this policy will not form anymore. In case of bankruptcy there is a trade-off: if the AA commits to the immunity some plaintiffs will not be refunded, and if the difference is charged from the leniency applicant the ICC is weakened. The authors affirm that the immunity is optimal even in this case, since a higher “minimum discount factor” prevents the cartel formation, thus the damage of potential cartels is avoided*.* If we consider the damage of potential cartels and of actual cartels at the same weight, it is better to avoid the total amount of damages preventing the cartel formation than leaving some plaintiffs without refund.

We state the opposite in this extension. Considering the plaintiff’s right of restitution and the market concentration, the optimal policy in Brazil should be: immunity for the leniency applicant and maximum enforcement of damages claim as a rule; the recipient will be liable only if the amount of damages cannot be required from the others due bankruptcy[[22]](#footnote-22). As informed by Cauffman (2011) and Buccirossi, Marvão and Spagnolo (2015), these policies recommendations are close to the Hungary approach, in which the leniency applicant is only required to pay damages if the plaintiff cannot obtain compensation from other cartelists.

1. **Conclusions**

The interplay between private and public antitrust enforcement is an important issue nowadays. Regarding the leniency policies there are two main points to discuss: the damage liability for the leniency applicant; the AA enforcement for damage claims. The situation in Brazil is not different and these topics are calling the attention of economist, lawyers, CADE employees and people from law and economics in general.

The main objective of this paper was to analyze the best policy for leniency applicants related to the damage liability in Brazil. We considered the cartel as a living organism, able to change the “collusive price” and to adapt itself according to distinct policies and situations. In the main model, we concluded that it is optimal to give immunity to the leniency applicant, as well as increase as much as possible the AA enforcement of damage claims. The three extensions confirmed the following: the immunity is even more effective when there is risk of betrayal; the immunity is the best policy in the case of *ex-post* leniency, but due the Brazilian Leniency Program rules we cannot conclude that the “collusive price” in an *ex-post* leniency framework is always lower than in *ex-ante* leniency scenario; the immunity is the optimal policy when there is no bankruptcy, otherwise the applicant liability should be the minimum necessary to avoid the bankruptcy and to guarantee the refund to plaintiffs.

Despite the model has been developed based on the Brazilian structure of antitrust law, the results may be helpful to other jurisdictions as well. The private enforcement of damage claims is a powerful channel of deterrence, but in a context of leniency it may discourage the applicant if there is a fear of being sued for damages. The leniency applicant needs to be protected from that, and maybe the partial liability as in US is not the best policy. Our approach is closer to the one adopted in Hungary.

In the model, we assumed that profits, fines and damages do not accumulate over time. It means that in each period there is a new independent value of these terms, so the firm is liable only for the damage done in the current period. It is possible to consider the cartel behavior in a dynamic context of accumulation. If the cartel lasts for ten years, firms will be liable for the damage done in this entire period, and possibly this fact modifies the cartel pricing over time. We leave this suggestion for future works.

1. **Appendix**
   1. **An example of and strictly increasing in**

Suppose one demand function for each firm: and , , with and . The parameter is the maximum demand, is the own-price effect and is the cross-price effect. The higher is higher is the similarity between products, thus indicates completely differentiated products and at the limit indicates homogeneous products. We assume the goods are substitutes, which implies positive, and also so that when colluding they will face a negative demand function. We also assume marginal costs equal to zero, therefore when colluding they are going to set the same price (there is no difference among market share, scale gains, etc.).

When both compete *a la* Bertrand the profit for each firm is and , which results in by Bertrand equilibrium. After that, denote the profit function after the collusive agreement[[23]](#footnote-23) by , . The first order condition states . Finally, the profit of each firm after the cartel is denoted by:

(21)

And the first and second derivatives:

(22)

(23)

Since the first order condition in (22) represents a maximum point in (21), therefore and by consequence is strictly increasing in .

Next, we assume the deviating firm takes the collusive price as given and then maximize its own profits. The price of deviation is a function of the “collusive price”, therefore we denote it as . The profit function when the firm deviates from the agreement is:

(24)

And the first order condition regarding states the reaction function . Replacing the reaction function in (24) and taking the first derivative, we have:

(25)

From (25) it is clear that , thus is strictly increasing in .

* 1. **An example of strictly increasing in and strictly increasing up to a point and then strictly decreasing in**

As a sequence of the previous example, the profit occurs when both set the deviating price simultaneously, consequently:

(26)

Replacing the reaction function in (26) and calculating the first derivative we have:

(27)

After some algebraic manipulation we see that as long as , which is the case for all (remember and ). Hence, is strictly increasing in .

The profit occurs when the firm sets the “collusive price” while the other cheats and set . It can be represented by:

(28)

After replacing in (26) and obtaining the first derivative we have:

(29)

Note that this expression is strictly negative when , however this value represents an inflection point ( of “inflection point”). When , we have and strictly increasing in , while when , we have and is strictly decreasing in.

* 1. **An example of strictly decreasing in :**

Replacing the reaction function in , we can express the ratio by the following:

(30)

Denote . Taking the first derivative and after some algebraic manipulation:

(31)

To guarantee decreasing in , we need . Note that the denominator is strictly increasing and strictly positive in , while the numerator is strictly decreasing in due to:

(32)

Consider also that , thus and . Therefore, starts with zero and is strictly negative when , thereby is strictly decreasing in .

* 1. **Comparative statics on :**

(33)

Since all terms inside the parentheses are positive the derivative is positive.

(34)

We see that the derivative is zero when , is negative when and positive when .

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4. For our purposes, we consider a cartel/collusion/collusive agreement as a synonym for an explicit agreement, in which the coordination is evident. The definition of tacit collusion as an illegal activity is not a consensus among antitrust authorities. [↑](#footnote-ref-4)
5. See Spagnolo (2008) for a comparison between USA and EU leniency policies. [↑](#footnote-ref-5)
6. The full EU Directive is presented in European Commission (2014) and this quote represents the Article 11, paragraph 4. [↑](#footnote-ref-6)
7. Article 6, paragraph 6 of EU Directive. [↑](#footnote-ref-7)
8. The appendix contains a general example to support our model that works for any degree of differentiation, except for perfect homogeneity. Strictly speaking, as considered in Chen and Rey (2013) and Buccirossi, Marvão and Spagnolo (2015), in a context of homogeneity an unilateral deviation provides twice the collusive profit (the deviating firm will set a price marginally lower than the collusive one and sell for the entire market), thus the collusive price set does not matter (the ratio between the profit of collude and deviate is always half). This assumption works well for them, but since our analysis is focused on the cartel behavior on price we opted for a different approach. [↑](#footnote-ref-8)
9. Note that is the profit when the “collusive price” combined previously is , and not the price when deviating. [↑](#footnote-ref-9)
10. In Houba, Motchenkova and Wen (2015), both and are non-decreasing functions of. They assume that the higher the price charged by the cartel more distrusted is the AA about the crime. In the same way, the degree of the infringement is a criterion for the penalty statement, thus higher collusive prices induce higher fines. We consider these parameters as exogenous for three reasons: simplicity of the model, the focus is the damage liability and the results are not modified in either. [↑](#footnote-ref-10)
11. This approach is considered also in Motta and Polo (1999) and Chen and Harrington (2007), despite most papers allow amnesty for more than one applicant (which represents the European Union case). [↑](#footnote-ref-11)
12. In theory, it is possible to claim the whole damage from one firm, since each wrongdoer is jointly and severally liable for damages caused by their illegal antitrust activity, i.e., each cartel member may be held liable for the entire cartel-related damage, as highlighted by Martinez (2015). Nevertheless, Martinez (2015) gives an example of a damage claim against a leniency applicant of a cartel in Sao Paulo/Brazil where the judge required the government to amend the claim to also include the other cartel members. [↑](#footnote-ref-12)
13. Motta and Polo (2003) and Houba, Motchenkova and Wen (2015) consider the deviating firm immune to antitrust penalties, and in fact some papers like Spagnolo (2005) and Chen and Rey (2013) also argue that this is theoretically optimal in the sense of antitrust policy, since firms would be more encouraged to deviate when the cost of deviating is lower. However, the Brazilian’s Law 12,529/2011 states that an antitrust infringement is any violation of economic order, regardless of fault, which achieved or not the objective. Thus, the intention itself is enough to induce guiltiness. [↑](#footnote-ref-13)
14. Motta and Polo (2003) and Houba, Motchenkova and Wen (2015) consider the possibility of a new collusive agreements even after punishment, which is kind of unrealistic in our case. [↑](#footnote-ref-14)
15. Note that we are analyzing the cartel behavior regarding one specific stationary SPE: collude and respect the collusive agreement. The pay-off when both “report” plays no role here (it will be important later at the model extension “bankruptcy”). [↑](#footnote-ref-15)
16. This is the same as if we consider a firm’s maximization problem of in the form of: . [↑](#footnote-ref-16)
17. If this policy results in completely cartel deterrence. [↑](#footnote-ref-17)
18. Harsanyi and Selten (1988) argue that in games with multiple equilibria it is possible to use an equilibrium selection criterion to define which one is most likely. They propose two criteria: the pay-off dominance and the risk dominance. In the first one the idea is that an equilibrium that provides higher pay-offs for all players dominates the others, while in the second one the dominating equilibrium is the less risky for all players. Spagnolo (2005) and and Buccirossi, Marvão and Spagnolo (2015) provides support for these concepts with experimental examples. [↑](#footnote-ref-18)
19. Check Harsanyi and Selten (1988) and Buccirossi, Marvão and Spagnolo (2015) for further details. [↑](#footnote-ref-19)
20. As in the main model, we assume is always optimal to report when deviating, [↑](#footnote-ref-20)
21. The fines defined by the law have a preventive and punitive purpose. The Brazilian’s Law 12,529/2011 defines the economic situation of the offender as a criterium for the fine, precisely to not be responsible for bankruptcy and market concentration. [↑](#footnote-ref-21)
22. One would think that the AA could increase the enforcement of damage claims (high ), but in the case of bankruptcy they could reduce this enforcement to guarantee the immunity for the leniency applicant (maybe denying proofs and information). Nevertheless, we assume as an *ex-ante* and general policy, therefore it cannot change according to the circumstances. [↑](#footnote-ref-22)
23. Like if they were acting as one monopolist. [↑](#footnote-ref-23)