Economics Letters 124 (2014) 33–36

Contents lists available at ScienceDirect

Economics Letters

journal homepage: www.elsevier.com/locate/ecolet

Penalties and the deterrence of unlawful collusion☆

Joseph E. Harrington Jr.

Department of Business Economics & Public Policy, The Wharton School, University of Pennsylvania, 3620 Locust Walk, Philadelphia, PA 19102, United States

HIGHLIGHTS

- Stability of collusion is examined when the penalty is increasing in cartel duration.
- A lower bound is derived for the minimum penalty for deterring collusion.
- Lower bound is significantly lower than previous analyses.

ARTICLE INFO

Article history:
Received 20 November 2013
Received in revised form
26 March 2014
Accepted 11 April 2014
Available online 21 April 2014

JEL classification:
L1
L4

Keywords:
Collusion
Antitrust
Crime

ABSTRACT

This paper investigates the size of penalties required to deter cartel formation. Allowing the penalty to be increasing in duration within the infinitely repeated game framework, penalties do not need to be as severe as previous research would suggest.

1. Introduction

How large must penalties be in order to deter firms from forming a cartel and colluding? One approach is based on making collusion unprofitable. If the incremental profit from colluding is V and the probability of detection is α then the fine F required to deter collusion is $V - \alpha F < 0$ or $F > V/\alpha$. On the basis of this approach, Connor and Lande (2012) conclude that, in practice, penalties are far short of what is required to deter collusion. However, as pointed out by Buccirossi and Spagnolo (2007), it is not necessary to make collusion unprofitable in order to deter cartel formation; it is sufficient to make collusion unstable. That is, the penalty just has to be high enough so that there does not exist an equilibrium in which firms are able to sustain supracompetitive prices.[1] This approach is taken in Allain et al. (2011) who, quite contrary to Connor and Lande (2012), do not conclude there is under-deterrence and instead raise concerns that the fines being levied by the European Commission could be in the region of over-deterrence (though, for a different view, see Combe and Monnier, 2011).

A critical feature of penalties that has not been properly taken account of is the relationship between cartel duration and penalties. While the penalty formula can vary considerably across jurisdictions, an almost universal feature is that the penalty is increasing in cartel duration. The analyses mentioned above either assume the penalty is fixed and focus on the minimum penalty required to make collusion unstable or allow the penalty to depend on cartel duration but focus on the minimum penalty required to make collusion unprofitable (rather than make it unstable). The objective of this paper is to integrate the two approaches by allowing the penalty to depend on duration within the context of an infinite

☆ This paper would not have occurred but for discussions with Marcel Boyer and Doug Ginsberg, and the author would like to thank both of them. The central idea of this paper was first presented at *Deterring EU Competition Law Infringements: Are We Using the Right Sanctions?* (Brussels), December 2012. This research has been conducted with the financial support of the National Science Foundation (SES-1148129). I appreciate the research assistance of Yanhao Wei.

E-mail address: harrij@wharton.upenn.edu.

[1] In other words, the original approach focuses on the participation constraint, while the more recent approach focuses on the incentive constraint.

http://dx.doi.org/10.1016/j.econlet.2014.04.010
0165-1765/

horizon oligopoly setting, and to then characterize the minimum penalty required to make collusion unstable. We find that these two factors – dynamic penalties and dynamic conditions for cartel stability – are complementary and result in a significant reduction in the minimum penalty required to deter cartel formation.

2. Model

Consider an infinitely repeated oligopoly game for which the non-collusive (static Nash equilibrium) per period profit is π^n and the present value of the non-collusive profit stream is $W \equiv \pi^n/(1-\delta)$ where firms have a common discount factor $\delta \in (0, 1)$. The per period collusive profit is π^c $(> \pi^n)$ and our attention will focus on when firms seek to sustain collusion using the grim punishment; that is, deviation from the collusive outcome results in permanent reversion to the non-collusive outcome.[2] As long as firms collude, a firm will have a constant profit stream of π^c which has a present value of $\pi^c/(1-\delta)$. If a firm deviates from the collusive outcome, it earns profit π^{dev} $(> \pi^c)$ in that period and, as a consequence of the grim punishment, π^n thereafter. Thus, in the absence of a competition authority, collusion is sustainable (that is, the grim trigger strategy is a subgame perfect equilibrium) if and only if

$$\frac{\pi^c}{1-\delta} \geq \pi^{dev} + \frac{\delta \pi^n}{1-\delta}.$$

In each period that firms are colluding, there is an exogenous probability $\alpha \in (0, 1)$ that the cartel is discovered, prosecuted, and convicted. In that event, firms are levied a penalty and are assumed not to collude thereafter. The penalty scheme has each firm assessed an amount $f > 0$ for each period that firms colluded. Thus, in principle, if the cartel colluded for T periods prior to conviction then they are liable for a penalty of fT. In practice, the penalty is generally less than that value because it is based on *documented* cartel duration rather than *true* cartel duration. If it is more difficult to uncover supportive evidence of collusion for years farther in the past then documented duration will be less than actual duration. A second reason for the actual penalty to fall short of fT is that, at least in the US, interest is not assessed which means once again, the effective penalty is smaller, the farther back in time it was incurred.[3]

Based on the preceding arguments, the effect of time on penalties will be modeled by assuming that penalties exponentially depreciate over time. Using the specification in Harrington (2004, 2005), if F_t denotes the penalty that a firm would have to pay if caught and convicted in period t, it is assumed to evolve as follows:

$$F_{t+1} = (1-\beta) F_t + f,$$

where $\beta \in (0, 1)$ is the depreciation rate. For future reference, if firms collude forever (without having been caught) then the steady-state value for the penalty, F^{ss}, is

$$F^{ss} = (1-\beta) F^{ss} + f \Rightarrow F^{ss} = f/\beta.$$

Assuming the cartel starts operating in period 1 and therefore $F_0 = 0$ then, on the equilibrium path, $F_t \in [0, f/\beta]$, $\forall t \geq 1$.

In comparing this structure with penalty schemes used in practice, the most recent European Commission Guidelines (2006) specify the base penalty to equal $SaT + Sb$ where $a \in (0, .3]$, $b \in [.15, .25]$, S is the value of the firm's sales in the last full business year of the firm's participation in the cartel, and T is the number of years of a firm's participation in the cartel. In comparing this formula with the specification here, $f = Sa$ but we have no fixed component to correspond to bS.

A second common formula is for the penalty attributed to a particular period to be proportional to some measure of either the gain to colluding firms or the harm to customers. In the US, the standard formula for customer damages is $d \equiv \left(P^c - P^{bf}\right) q^c$, where P^c and q^c are the collusive price and quantity, respectively, and P^{bf} is the but-for or counterfactual price; that is, the price that would have occurred but for collusion (which is typically taken to be the static Nash equilibrium price). If firms are found guilty by a court of law then they are obligated to pay triple the amount of calculated damages though, in practice, a very high fraction of cases are settled out of court and damages are probably more on the order of single rather than treble (Lande, 1993). In some jurisdictions, government fines follow a similar calculation. For the US Department of Justice, the Federal Sentencing Guidelines referred to in the Antitrust Division Manual (July 2013) state: "(T)he defendant may be fined not more than the greater of twice the gross gain or twice the gross loss". Thus, US fines can be as high as double damages, while government fines in Australia and Germany allow for up to treble damages. If we let $\gamma > 0$ denote the damage multiple then, in our formulation, $f = \gamma d$, and, in the US for example, $\gamma \in (0, 5]$.

In concluding this section, let me discuss two of the model's assumptions. First, there is no component to the penalty which is independent of duration. Such a fixed component is clearly present with the European Commission and is probably generally a feature of most jurisdictions.[4] A fixed component could be easily encompassed but would make the analysis a bit messier without substantively altering the paper's conclusions. Second, and more substantively, collusive profit is assumed fixed and, in particular, firms are not allowed to adjust the collusive outcome in response to the formula for penalties. The endogeneity of the collusive outcome to the penalty scheme is allowed for in Harrington (2004, 2005) but its inclusion here would significantly complicate the analysis. That extension is left for future research.

3. Deterrence of collusion: theory

Let us conjecture that, on the equilibrium path, collusion is sustainable in all periods (which, given that only F_t is changing over time, means for all values for F_t that occur on the equilibrium path). Letting $V(F)$ denote the collusive value given an accumulated penalty of F at the end of the previous period, it is defined recursively by:

$$V(F) = \pi^c + \alpha\left[\delta W - \left((1-\beta) F + f\right)\right] + (1-\alpha)\,\delta V\left((1-\beta) F + f\right). \quad (1)$$

It can be shown that[5]

$$V(F) = \frac{\pi^c + \alpha\delta W}{1-(1-\alpha)\,\delta} - \left(\frac{\alpha\,(1-\beta)\left[1-(1-\alpha)\,\delta\right] F + \alpha f}{\left[1-(1-\alpha)\,\delta\,(1-\beta)\right]\left[1-(1-\alpha)\,\delta\right]}\right). \quad (2)$$

[2] Focusing on a particular class of collusive equilibria limits the generality of the analysis and, in particular, leaves open whether there is another punishment that will be more effective. However, the paper's insight is less tied to the particular equilibrium and more to the dynamic nature of penalties.

[3] Blackstone and Bowman (1987) estimated that not assessing interest reduced the real value of penalties by 50% in the mid-1970s, based on the average length of a cartel (at that time) of 8.6 years.

[4] If a cartel was found to be largely ineffective – in which case damages are close to zero – I doubt that government fines would be close to zero. For example, the US system allows for fines to be set by either of two procedures; one based on damages and a second not tied to damages with an upper bound of $100 million. Even if penalties were indeed zero, there are still the attorney fees incurred by the defendants.

[5] The correctness of this expression can be easily verified by using it in the right-hand side of (1) for when the accumulated penalty is $(1-\beta) F + f$, and then showing that the derived expression is the expression in (2).