Optimal dynamic antitrust fines

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Dynamic Antitrust Fines

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Abstract

Standard antitrust optimal fines rely on a microeconomic static model. [9] describes optimal antitrust dynamic sanctions and its application for EU and US methodology. For the EU fine, and based on this methodology, we find an equilibrium point for a high level of offence (2 times normal profits) and a high detection probability (0.6).

1 Introduction

An economic explanation of deterrent fines was first studied by G. Becker [2]. Although there is an extensive literature on the topic, the vast mayority is based on a short term static model , see [1, 3, 7, 6]. Examples of optimal fine determination on a dynamic framework are [9, 8, 4, 5]. We follow [9] who studied optimal dynamic fines and its application for the EU and US case. The dynamic model provides a better framework for studying optimal fines, as parameters such as detection probabilities are better explained in a dynamic environment.

2 Optimal Fine : Static model

In the below graph for a static model [9] we see that a company searches for positive illicit gains (PS) above normal profits using anticompetitive conduct. The competition agency wants illicit gains to be 0 accepting only profits above c that are due to competitive conduct.

Competition authorities can detect infringements and sanction companies imposing fines $s(t)$, during the infringement duration t. I study the interactions between companies and antitrust agency during T.

Companies maximize total profit and decide to collude, fixing prices above competitive prices. The level of gravity of the infringement is represented as the amount of overcharge $q(t)$.

Competition agency objective is to maximize consumer welfare by preventing

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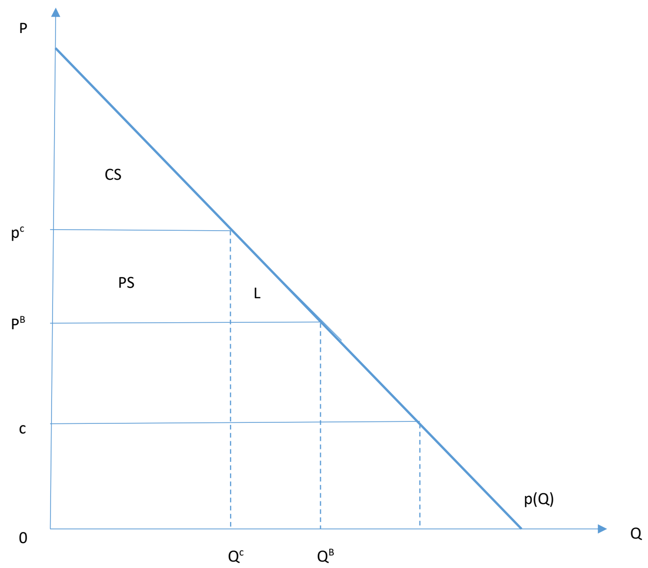


Figure 1: Producer and Consumer surplus in partial equilibrium

and dismantling cartels at the lowest budgetary cost. Its activities are summarized in the detection probability parameter $p(t)$. I consider the companies profit for colluding above imperfect competitive profit $\phi(t) > 0$. Profits in competition are above 0 and equal to a parameter m, $\phi^c = m$.

3 Optimal Fine: Dynamic model

As in [9], I assume that the company is player 1 and the competition agency is player 2. The detection of cartels are governed by a recursive process that depends on gravity of infringement (collusion degree which is the control variable of the company) $q(t)$, and the detection capacity of the agency is $p(t)$ so that : $\dot{F(t)} = p(t)q(t)[1 - F(t)]$.
In this case $\phi(t)$ is the probability conditional to being discovered in a time t if never being discovered previously.

There is a state variable $F(t)$ (probability distribution function of time until detection), and two controls $q(t)$ (firms degree of collusion) and $p(t)$ (agencys capacity enforcement). Competition agency maximizes the following objective function:

$$\begin{array}{c} max \int_0^T e^{-rt}[CS(q(t)) \mid +C(p(t))[1 - F(t)] + s(q(t), p(t))F(t)]dt \\ -e^{-rt}C_1(T)[1 - F(T)]. \end{array} \tag{1}$$

$C(p(t))$ is the cost function for the antitrust authority to carry on downraids (salaries, number of downraids, etc.). We use a quadratic costs of law enforcement due to price increase of the firm:$C(p) = Np^2$. The term $W(q(t))$ is the welfare loss due to the firms price increase. $W(q(t))$ increases when q increases. $s(t)\dot{F(t)}$ reflects the expected fine which is detected in t. The fine $s(t)$ represents the fine at t. The higher the degree of collusion is $q(t)$, the higher the detection probability and the higher the expected fine would be. $C_1(T)$ is the terminal loss of the authority if the colluding firm was not yet caught by time T.
A firm maximizes the following objective function:

$$\begin{array}{c} max \int_0^T e^{-rt}[PS(q(t))[1 - F(t)] + PS^{comp}F(t) - s(q(t), p(t))F(t)]dt \\ +e^{-rt}C_2(T)[1 - F(T)]. \end{array} \tag{2}$$

The term $PS(q(t)$ is the illicit profit of the firm, and $-s(q(t), p(t))F(t)$ is the punishment received by the infringing company in t, the fine multiplied by the detection probability: $s(q(t), p(t))$ that depends of both control variables.
$PS^{comp}F(t)$ reflects the profit of the firm after cartel discovery, once the cartel is expected to be dismantled, so that PS^{comp} is above 0. $C_2(T)$ is the final profit of the firm if the infringing firm is not detected by the time T.

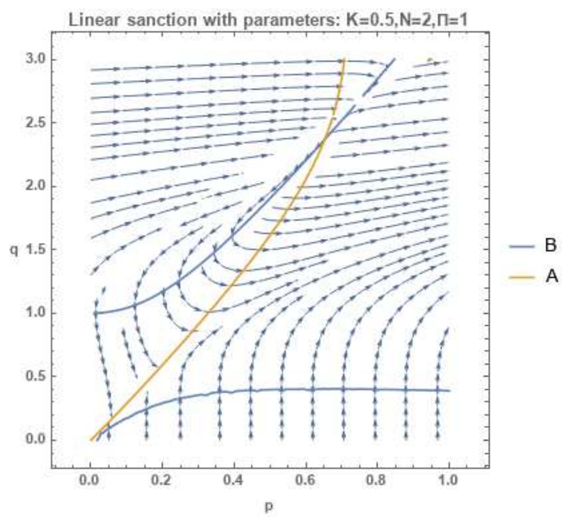
Using a linear fine that increases with gravity of infringement q:

$$s(q) = K\Pi^m q. \tag{3}$$

where K is a positive constant, which is the steepness of the penalty scheme and Pi^m are illicit profits. If we use the linear penalty together with parameter values of $\Pi^m = 1, N = 2, K = 0.5$ we obtain the following equations for the control variables:

$$\begin{aligned} dq &= \frac{1}{2}q^2\frac{q^2 - q^3 - 4p^2 + 8qp^2 + 2p^3q}{2p^2q + 0.5q^2 - 0.5q^3 + 4p} \\ dp &= \frac{1}{2}q^2p\frac{0.25q^2p^2 + 8p^2 + 4p^3 - q^2}{2p^2q + 0.5q^2 - 0.5q^3 + 4p} \end{aligned} \tag{4}$$

We obtain the following phase graph were OA is the line where dp=0 and OB where dq=0. There is no saddle point in the [0,1] limits of p and q but there is an equilibrium for higher levels of mark-ups and deterrence policies. In fact, the intersection of both lines shows an equilibrium point at $p = 0.652573, q = 2.36912$, which is out of the bounds for the q control variable.



4 Conclusion

In this note I describe a numerical solution to a dynamic optimal fines. I also show that phase diagrams can be an easy way to describe complex dynamic game solutions. In this case the equilibrium reached is not possible because the control variable of the firm q is out of normal bounds which is between 0 and 1. Besides it could be interesting to research on new possible numerical solutions and alternative equations for antitrust authority and firms.

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