Collusion in Industrial Economics: A Comment

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Abstract.   This note comments on Feuerstein's (2005) summary of the literature on collusion in infinitely repeated games. I specifically address firm asymmetries and settings in which punishments can be asymmetric. Changes in competition policy, such as exception from punishment for the first but only the first compliant, and the recent practice to study the effects of mergers after the fact, will provide interesting material for testing the theoretical predictions.

Feuerstein (2005) capably summarizes the literature on collusion in infinitely repeated games. She describes the factors that facilitate or inhibit collusion, which in this literature primarily means factors that affect the unilateral incentive to deviate from a collusive agreement. Firms will not have an incentive to deviate if the short run gains from deviating, say by undercutting agreed upon prices or producing more than one's allotted share, are outweighed by the punishment that would follow detection. Here punishments are typically modeled as symmetric, and they often entail the permanent collapse of the agreement and reversion to static equilibrium behavior, such as Cournot Nash quantities. There is less focus in the literature on describing which agreement is reached, as Feuerstein notes, in part because of the multiplicity of incentive compatible or self enforcing agreements (i.e., those in which no participant has a unilateral incentive to deviate). With discount rates close enough to zero, the folk theorem predicts that virtually any outcome will be self enforcing. If the agreement is the outcome of explicit negotiations, then one might restrict attention to the Pareto frontier of payoffs that are self enforcing, where no firm can receive higher payoffs without lowering the payoffs of at least one other firm. If, in addition, firms are symmetric, then it would be natural to consider the point where joint profits are maximized, subject to the self enforcing constraint.

If firms are not symmetric, however, the allotment of quantities under a cartel agreement, or the choice of prices or other strategic dimensions, is much less straightforward. The agreement will be the outcome of some bargaining process, which will be complicated by the requirements that the outcome be self enforcing and that it satisfy individual rationality or participation constraints. The latter stipulate that firms' profits under the agreement exceed what they would earn in the non-cooperative equilibrium. The participation constraint is trivially satisfied for symmetric firms. For example, in a repeated quantity setting game in which firms' products are homogeneous and their costs

identical, all firms will be willing to participate as long as the agreed upon industry output is less than the aggregate Cournot Nash level, and firms are assigned equal shares of industry output. But the participation constraint can be binding in asymmetric contexts. For example, suppose the product is homogenous, and that costs exhibit constant returns to scale but differ across firms. Then the joint profit maximizing solution, in which the most efficient firm produces its monopoly output, violates the participation constraint, absent side payments.

Reaching an agreement is more complicated if firms have private information concerning their payoffs. Firms may have better information than their co-conspirators about their own costs or their customers' demands, for example. Joint profit maximization would reflect any differences, but there is an additional constraint associated with eliciting private information. Because collusive prices exceed marginal costs, an inefficient firm has an incentive to report low costs and so be allocated a larger market share.

The cartel problem can be thought of as a group decision problem, subject to a variety of constraints. The tools available to the cartel vary according to the legal and institutional context. Legal cartels can freely communicate, and they may be able to write binding contracts, make side payments, or restrict entry. They maximize some function of the participants' profits, subject to participation constraints and the constraints associated with the revelation of private information, as well as the requirement that participants not have an incentive to defect. Self enforcement may not be an issue if the conspirators can rely on the courts or some regulatory body to punish defections. Even legal cartels with wide ranging powers do not necessarily form or endure, however, if they founder on the problems that result from asymmetries or private information.

Illegal cartels face many of the same constraints, but they often have fewer tools available. They typically cannot write contracts that will be enforced by the courts, and if so any agreement must be self enforcing. (International cartels, even if they are legal, may also not be able to write binding contracts, and so can face similar difficulties.) They cannot restrict entry, although an illegal conspiracy may be more likely to form in a setting in which entry has been restricted, say by trade barriers. Side payments require some agreement on a payment mechanism and the circumstances under which payments are made. The payment mechanism must satisfy an ex post budget balance condition, so that no payments are made to or from a third party. One example is a market share allocation in which payments are made between parties to compensate for deviations from allotted shares. E.g., if one firm obtained a 10% larger than allotted share, it would compensate the firms whose shares were lower than allotted. If the payments equal the output difference times an agreed upon cartel price, then there is no incentive to cheat, assuming that shares can be measured accurately.

Most important, illegal conspirators face legal risks when they communicate. The literature distinguishes between tacit and explicit collusion, where the distinction hinges on whether there is direct communication. The US antitrust laws stipulate that communication is per se illegal, whether or not the communication results in higher prices, with few exceptions. (Exceptions include agricultural marketing agreements, some international agreements, and some R&D joint ventures.) The problem with tacit

collusion, from the perspective of the participants, is that there is no mechanism to reach an agreement, nor any way to resolve disputes. The former problem might be dealt with via price leadership, or pre-announcements of price changes, but both can be imperfect collective decision mechanisms. Many conspiracies then choose to collude explicitly, and risk prosecution.

The cartel formation process therefore involves more than the issues studied in the repeated games literature. Dampening the short run incentives to cheat is only one facet of a cartel's problems. Other factors facilitate or inhibit collusion, for example through the participation and information revelation constraints. The factors that play a role in the self enforcement constraint identified in the repeated games literature can also affect the other constraints faced by a conspiracy.

Moreover, the punishments associated with reversion to some competitive equilibrium need not be symmetric. The symmetric reversionary punishments emphasized in the literature are most compelling when the firms cannot tell who, if anyone, has violated their agreement. If the cartel members can identify the firms that cheated, they may be able to single out the offenders. Under these circumstances, the punishment does not necessarily have to entail collective sacrifice. A legal cartel could require that members post bonds that would be forfeited in the event of cheating, thereby avoiding costly reversions to competition. Both legal and illegal cartels have used the market share settlement mechanism described above. Alternatively, it may be possible to tailor a reversionary episode to harm the offending parties more than the other firms. For example, after a deviation is detected, the offender could be asked to produce less, and surrender some of its market share to the other participants for some period, so that the victims could be better off than under the original agreement. (This punishment would itself have to be self enforcing, say by the threat of collapse of the agreement to competition should the intended victim not lower its output.)

Feuerstein also briefly surveys some of the empirical literature. Porter (2005) provides a recent survey of the related literature that is concerned with the detection of collusion. There the perspective is to assess the various constraints faced by a conspiracy, as described above. The manner in which the conspirators deal with these constraints may allow one to distinguish between collusive and competitive behavior. Detection of collusion is a concern of antitrust policy, and it is relevant for the victims when they can alter aspects of the economic environment. For example, the victim of a bid rigging conspiracy can change the auction rules.

Let me comment briefly on Feuerstein's discussion in Section 5 of the effects of fluctuations in demand. She follows some of the literature in asking whether price wars are more likely to occur in periods of low or high demand. The literature sometimes frames this question as pitting Green and Porter (GP) vs. Rotemberg and Saloner (RS). Note, however, that the two theories are not mutually incompatible, as Bagwell and Staiger have demonstrated. GP emphasize unobserved shocks to demand, and the inference problems a cartel faces when firms' strategic decisions are not observed by their rivals. Price wars are triggered by unexpectedly low prices (for quantity setting firms; or unusually asymmetric market shares in the case of price competition), not low demand *per se*. In the Joint Executive Committee railway cartel, price wars were not

triggered by the predictable drop in demand that followed the opening of the Great Lakes to navigation in the spring (at which point boats could provide rival service). In contrast, RS emphasize publicly observed demand shocks. In their model, the predicted price fluctuations are not price wars, but instead the fluctuations of the joint profit maximizing self enforcing price. If demand shocks are i.i.d., then this price is counter-cyclical. As noted by Feuerstein, the best self enforcing price can be pro-cyclical if instead demand shocks are positively correlated, or if demand follows a predictable seasonal cycle.

Feuerstein concludes with a nice discussion of the recent theoretical literature on leniency programs and their effect. Since the revision of the US policy in 1993, a number of high profile conspiracies have been uncovered, with record fines and civil penalties in both North America and Europe. Experts at the US Department of Justice attribute their recent successes in detection and prosecution to the changes in the leniency program. The revisions essentially guarantee that the first, and only the first, participant to report a conspiracy will be shielded from prosecution and fines (although not from third party civil actions), thereby inducing a "race to the courthouse." A few case studies have examined some of the recent cases, but there has not been a more systematic empirical investigation of the effect of the program.

The repeated games literature identifies a number of factors that affect the incidence and effects of collusion. This literature, together with the related research that considers other constraints on cartel formation, indicates when tacit or explicit collusion may occur. It can guide the analysis of when a merger is likely to lead to collective dominance. There has been a recent move by the US Federal Trade Commission and Department of Justice to study the effects of some mergers after the fact. It would be interesting to test whether the predictions of the theoretical literature are consistent with the data.

Acknowledgments

References

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