

Does Top of the Market Pricing Facilitate Oligopsony Coordination?

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Background

The concentrated nature of the beef packing industry brings into concern the competitiveness of markets used to procure fed cattle. Research examining the relationship between concentration and market competitiveness can be seen as encompassing three bodies. Studies of the first type, pioneered in the 1950's by Joe Bain, are commonly referred to as "Structure-Conduct-Performance" (SCP) studies. These studies rely on theoretical models that suggest a relationship between the number of firms in an industry and industry prices and therefore profits. With these theoretical models as motivation, this empirical research examines the relationship between industry profits and industry concentration. While generally finding a positive relationship between concentration and profits, these studies are plagued by several shortcomings. They suffer because the underlying mechanism or conduct assumed to create increased profits is not explicitly modeled. Instead, the structure of an industry is seen to dictate the member firms' conduct resulting in increased prices and profits. Why and how firms behave is not modeled. With the advent of game theoretic models, it has been pointed out that outcomes deviating from the competitive outcome are far from certain in even the most concentrated markets. SCP studies also suffered from infrequently addressed technical econometric considerations, including simultaneous equation bias; i.e., industry concentration may be endogenous. In contrast to SCP studies, "new empirical industrial organization" (NEIO) models explicitly modeled the behavior of firms. In this research, structural equations derived from profit maximization conditions are estimated. The goal of this research was to estimate a parameter, bounded by 1 and 0, suggesting the degree price deviated from marginal cost. A value of zero indicated marginal cost pricing, while a value of 1 indicated monopoly pricing. Parameters between zero and one indicate the percent price is greater than marginal cost, and indicate the degree of an industry's competitiveness. While explicitly showing a theoretical model generating estimable structural equations, these studies are of limited usefulness in that they again fail to identify how prices deviate from marginal cost. Again, the mechanisms allowing firms to exercise market power are not considered. A third body of research, based in game theory, models players (firms) as rational decision-makers with optimal strategies based on their own payoffs and other players' payoffs and strategies. These models allow players to recognize their interdependency and change their behavior according to other player's available strategies and associated payoffs. These models are unique in that they allow researchers to examine industry practices or institutional features that "facilitate"

non-competitive outcomes. By identifying how non-competitive outcomes are generated, these models have proven useful to government regulators whose goal is to insure the competitiveness of markets. It is the goal of this paper to use this research as motivation to examine practices in the fed cattle market that may facilitate non-competitive market outcomes.

Theoretical Framework

A useful place to start the discussion is to examine the well-known prisoner's dilemma. This simple game has proven useful to examine the interaction and coordination of players in market situations. In this game, there are two players and two possible strategies. Each player can either compete or collude. Payoffs are dependent on the opposing player's strategy. Thus for each player, there are four possible outcomes. Either players can compete, both players can collude, or one player can compete while the other colludes. Of course, payoffs differ under each of the four possible strategy combinations. The game can be depicted in the following matrix, known as the normal form representation of the game.

		Player 2's Strategies	
		Compete	Collude
Player 1's Strategies	Compete	5,5	10,-2
	Collude	-2,10	8,8

Following convention, the first number in each cell represents player one's payoff, while the second number represents player two's payoffs. So for example if player one competes while player two colludes, player one receives a payoff of -2, while player two receives a payoff of 10.

This game has a single equilibrium when using Nash equilibrium as the solution concept. A Nash equilibrium can loosely be defined as the best strategy for each player in response to all other players' possible strategies. In this game, each player's best strategy and therefore the Nash equilibrium of the game is to compete. To see this, imagine that each player is currently playing collude. This is not a stable outcome because player one knows that cheating on the collusive agreement and instead playing compete nets her 10. By cooperating and colluding she would net only 8. The increased profits create an incentive for player one to cheat. Player two recognizes this and also sees that he has the same incentive to cheat. Thus, the optimal strategy is for each player to compete, which nets each player 5.

This game is designed to mimic the decisions firms have when establishing a cartel. By coordinating their activities each firm can increase their profits above those that can be had by competing vigorously. Firms recognize their interdependence and charge a higher price raising profits for each firm. However, each firm has an incentive to cheat on the cartel agreement. Each firm has an incentive to decrease price slightly in an attempt to gain market share. However, if this occurs the cartel breaks down and firms end up

charging the competitive price. This is the Nash equilibrium outcome described in the paragraph above.

This model would seem to rule out the possibility for cartel arrangements in even highly concentrated markets. After all, the optimal strategy is for firms to compete. However, extensions to this basic model have shown that strategies exist that support the collusive outcome. One such model suggests that if the game is seen as an infinitely repeated game, with players adopting a trigger strategy, a collusive equilibrium is possible. The trigger strategy dictates that if a player observed an opposing player cheating in the previous period, then that player reciprocates by cheating in all future periods. That is, if player one observes player two cheating, then player one also cheats in all subsequent periods. Given this setup, the optimal choice for all players is to collude. From Koontz et al (1993), the collusive equilibrium is supported as long as the following conditions are true:

- (1) $V_i(p') > V_i(p'')$ for all firms
- (2) $V_i(p') > \pi_i(p^*) + V_i(p'')$.

$V_i(s_t)$ represents the discounted expected profits for firm i , from following strategy s_t . Strategies, s_t , include colluding and paying a collusive price (p'), cheating and paying a competitive price when all others are colluding, p^* , and competing and paying the competitive price, p'' .

Equation (1) indicates that the discounted expected profits from colluding exceed the expected discounted profits from competing, for all firms. Equation (2) indicates the trigger strategy portion of the game. A player observed cheating and paying price p^* in any period triggers a response in all other players. All players respond to the cheater by following suit and paying the competitive price, p'' , in all subsequent periods. Equation (2) indicates that the expected discounted profits from colluding exceed the discounted expected profits from cheating in one period when added to the expected discounted profits from all firms subsequently competing. Note that in the event a player is observed cheating, the game reverts to the same equilibrium as the one shot Nash equilibrium in the prisoner's dilemma game.

In contrast to the one shot prisoner's dilemma, the trigger strategy game establishes that collusive outcomes are possible. Koontz et al. (1993) test for evidence that firms in the cattle industry followed the trigger strategy game. Their results suggest that in the past firms have exhibited collusive behavior.

While the theoretical model shows that collusive outcomes are feasible, practical considerations make that outcome less than certain. Not only must firms find mutually agreeable prices, but they must also achieve those prices and maintain them. An industry populated by similar firms may make agreeable prices easier to find, but changing market dynamics may make those prices difficult to attain and maintain. Recall one of the features of the trigger strategy game is the ability to detect cheating on cartel prices. In the face of changing supply and demand conditions, identifying whether a price change is

cheating on a cartel or is merely responding to changing market conditions may not be straightforward. Uncertainty about being detected as a cheater increases the likelihood of cheating, making the collusive outcome less stable. It is also important to note that the incentive to cheat arises from the desire to increase profits by cheating; the cartel price is different than the marginal value of the good under consideration. If this incentive is mitigated, the likelihood of cheating is also decreased. It is these two insights that give rise to a body of research that examines industry practices that can act to facilitate cooperative outcomes. In this research, practices that either increase the likelihood of being detected as a cheater, or that decrease the profit incentive to cheat are examined as practices that may increase the likelihood of a successful tacit cartel. In some cases this research is used to hypothesize how vertical arrangements or other industry practices can have consequences for horizontal coordination. In other words, vertical coordination may have horizontal consequences.

Practices that Facilitate Cartel Cooperation and Dampen Competition

As mentioned, practices that increase the certainty of being identified as a cheater, or that act to mitigate the profit incentive to cheat on a cartel arrangement, may be seen as practices that facilitate oligopsony coordination. These facilitating practices can have two types of effects. They can assist information exchange and/or manage incentives. Information exchange helps detect changes in rival behaviors, thus decreasing the lag between cheating and being detected as a cheater. The faster a cheater is identified, the shorter the period of time the cheater benefits from cheating. The shorter the period of benefit, the less incentive to cheat, and the more stable the collusive equilibrium. In contrast, incentive management directly mitigates the profit from cheating. Certain institutional features build in automatic penalties to cheating. Note that both directly or indirectly affect the incentive to cheat. The incentive to cheat is the basis for instability in cartels, and if this incentive to cheat is mitigated cartel arrangements become more stable, and thus more likely to occur and endure.

The Federal Trade Commission (FTC), and to a lesser extent the Department of Justice (DOJ) have used this theory to examine the anti-competitive effects of business practices in several industries. They examine the implications of several different practices, some of which may be analogous to practices occurring in the fed cattle market. Below, I briefly outline the theory behind several practices and attempt to draw parallels with practices in the fed cattle market.

The FTC is frequently concerned with supply contracts that contain “most-favored-nation” (MFN) clauses. In these contracts, a buyer and seller engage in either formal or informal agreements that guarantee a buyer the best price offered to any other buyer. These agreements can take two forms, either retroactive or contemporary. In a retroactive MFN, price guarantees take the form of rebates. Today’s transaction price is the worst case scenario for a buyer. If in the future, for the duration of the contract, a lower price is offered to any other buyer, then all buyers with MFNs must also receive the lower price. For the retroactive case, buyers will be paid a rebate equal to the price

difference times the number of units sold. For the contemporary case, all buyers with MFN's are guaranteed the best price offered to any other buyer.

The competitive implications for MFN contracts arise from two separate, but similar, theories. The first envisions a MFN clause as a practice that supports horizontal coordination in a trigger strategy game. That is, firms with these policies may be able to avoid a prisoner's dilemma. The second envisions MFN clauses as mechanisms that can dampen competition.

In the case of the retroactive MFN, the contract directly affects the payoffs from lowering price in the future. Referring back to the trigger strategy game above, the retroactive MFN directly affects the payoff ($\pi_i(p^*)$) from cheating on the collusive strategy. The profit from cheating gained by lowering price and gaining market share is decreased by the amount of profit lost from rebating the price decrease to previous buyers. In this way, the contract provision can aid to stabilize the collusive outcome.

Contemporary MFNs are very similar to best price policies (also called meet or release clauses). A seller offering contemporary MFN guarantees to match any lower price offered by the firm to any other buyer. A seller with a best price guarantee offers to match any lower price offered to buyers by any of the seller's competitors. In these arrangements, sellers guarantee buyers that if any other seller offers a lower price, then they will match that lower price. Both policies have the potential to allow firms to avoid the prisoner's dilemma.

When a seller commits to a contemporary MFN contract, she limits her ability to offer limited discounts. In the prisoner's dilemma game, the temptation to cheat is gained through the prospect of gaining customers through lower prices. However, with contemporary MFN clauses that temptation is lessened because the lower prices offered to the new customers would have to be offered to all customers guaranteed the price match. Therefore, the incentive to cheat is mitigated. The prospect of prices maintained near monopoly levels increases.

When a MFN contract is offered in conjunction with a best price policy, the prospect of oligopoly coordination increases further. A provider of a contemporary MFN contract commits to being less aggressive as mentioned in the paragraph above. Rival may see this as an advantage in the market place. Knowing that the provider of the MFN contract will not match price decreases, these decreases become more profitable, and thus more likely to occur. However, by committing to match any price decreases with a best price policy, the provider eliminates the rival's advantage.

This theory is articulated by Jonathan B. Baker, former Director of the FTC's Bureau of Economics, in a policy speech given in 1996. According to Baker, these arrangements have the potential to dampen competition (Baker, 1996). A firm that engages in a MFN agreement commits to being less aggressive. Once this is known, rivals may also become less aggressive. Once it is known that a firm cannot aggressively pursue additional customers, rivals are likely to react knowing that they also can be less aggressive. Under

these circumstances, it becomes likely that it becomes profitable to offer MFN clauses. Firms engage in a strategy to evoke a less aggressive strategy from a competitor.

Drawing Parallels to the Fed Cattle Industry

Some practices in the fed cattle market have the same potential to facilitate oligopsonistic coordination and dampen competition as do MFN clauses and best price policies. While the theory may apply to other marketing or procurement practices, I focus on one particular practice in this paper. Note that because I examine the procurement of inputs in a market where buyers possess the prospect for market power, in contrast to traditional treatments, the description of price increases and decreases is altered. Now because buyers are the decision-makers, cartel prices are lower than competitive prices. In the prisoner's dilemma game, excess profits are gained when low cartel prices are maintained. Cheating is accomplished by increasing prices in an attempt to steal customers from rivals. The model is equally applicable with only inconsequential changes in price movements.

Feedlots and packers often agree to market cattle using what is commonly referred to as top of the market pricing (TOMP). In this practice a feedlot and packer agree that a pen or pens of cattle will be sold to the packer at the top price in a market for that week. The cattle are committed before the market price is established and once the market top price is established the cattle trade at that price. This agreement is equivalent to a market-wide contemporary MFN clause with a best price policy. The packer is agreeing to pay the highest price that packer pays any feedlot. The packer has given that feedlot most favored customer status. The packer is also agreeing to match the highest price paid by any other packer in the region. This is the price match clause offered in best price policies. Because TOMP contains the same elements as a contemporary MFN clause with a best price policy attached, TOMP should raise the same anti-competitive concerns, as do these policies.

With TOMP, the packer is agreeing to match any competitor's price. This practice has the potential to facilitate coordination among packers and to dampen competition. Because the agreement is struck before the price is established, packers have an incentive to act strategically and keep the top price low. First, the packer engaging in the practice has now created a self-imposed penalty to increasing bids in the market. In terms of the trigger strategy game the profit incentive to cheat is mitigated. The packer with TOMP, while perhaps recognizing a profit incentive to increase bids in feedlots in which he does not have TOMP agreements in order to acquire more cattle, now must recognize the consequences from doing so. Because cattle trade in a very narrow range, with a majority trading at a single price, any packer increasing prices poses the real specter of setting the market top. Certainly, any packer offering TOMP has an incentive not to aggressively pursue cattle by increasing bids and pushing the market higher. The TOMP cattle already committed change the packers incentives and make it more likely that they chose not to act aggressively and instead tacitly cooperate with their competitors at a lower price. Furthermore, the packer is now insulated from the actions of rivals. There is no way rivals can acquire the TOMP cattle by out bidding the first packer. Given this,

rivals would certainly become less aggressive pursuing cattle committed under TOMP. Rivals would also recognize the packers with TOMP agreements in place would be less aggressive in the market, allowing them also to become less aggressive. This is the dampening competition effect described by Baker with discussing most favored nation clauses.

Conclusion

While the intuition of the theory above is sound, it is far from rigorous. It suggests that top of the market pricing has the potential to dampen competition and facilitate coordination among competitors. Whether or not it does is not established. The usefulness of economic theory is often measured by its ability to suggest testable hypothesis. However, in this case the hypotheses that arise from this theory would be difficult to empirically test. Presumably, any empirical examination would be dependent on data measuring the volume of cattle sold using top of the market pricing. These data would likely be difficult to acquire. Most packers record top of the market transactions as cash transactions. This makes it impossible to identify these transactions in packers' records. Conversations with packers also suggest they are unlikely to identify which transactions used top of the market pricing. In our questions about these types of transactions, one packer was evasive and questioned whether any transactions could be termed top of the market. Feedlots are equally unlikely to identify themselves as using this method. The benefit to feedlots from using this practice is to be able to report to their customers that they received the top market price for their cattle and that the cattle were sold in a timely manner. It is unlikely they would be willing to identify themselves as an idle price taker, rather than an aggressive market maker.

Lacking data, the likelihood that a theory is appropriately applied to a market can be judged by how well the characteristics of the market match the theory. For MFNs, the anti-competitive consequences are more likely to occur in markets with few firms, with a low likelihood of new entry, and with predictable demand and supply shifts. The fed cattle market is highly concentrated, with four firms purchasing over 80 percent of the fed cattle in the U.S. While not insurmountable, new entry would be difficult. Many studies show the industry is characterized by large economies of scale, suggesting a large plant is necessary to compete with established firms. The capital requirements to enter the industry at such a large scale are likely considerable. It may be the case that cartel arrangements result in prices just high enough to prevent new entry. That is, given the large capital requirements and the large risk associated with a large-scale investment, prices may persist below marginal revenue product, but high enough to prevent entry. Third, very short run price fluctuations seem to be fairly predictable. Packers have extensive knowledge of market ready supply through their salaried buyers that weekly visit every feedlot and view the cattle ready and nearly ready for market. In contrast, demand in the market seems to be fairly stable or predictable.

It is also important to investigate why feedlots enter into these agreements. It is likely these agreements result from feedlots' desire to sell cattle in a timely manner at the market price. A prospect that has grown increasingly difficult in times of oversupply and

as marketing options as measured by the number of available packers declines. Given this, TOMP creates the possibility that efficiencies are gained by increasing the frequency of timely marketing. Furthermore, customers receive the top market price for their cattle. Again, a consideration afforded customers when TOMP provisions are available. Of course, the highest price argument is questionable if, as theorized, the high market price is not the result of a competitive market.

The theory outlined above represents a rough sketch to examine practices that facilitate oligopsony coordination. Given the prospect for anti-competitive effects, it may be appropriate for this agency to pursue regulatory action. The reason to focus on this practice is three fold. First, the practice is similar to MFN clauses that other regulatory agencies have attempted to regulate and which academics have examined (Grether and Plott, 1984). These provide a useful framework to formulate and justify regulatory action. Second, the practice seems intuitively anti-competitive. It is difficult to formulate practical business reasons for packers to use this practice. The agency could conceivably contend the only reason the practice is utilized is to lower price. Finally, regulatory action would likely correct a market failure. Thus, regulatory action has the potential to improve the working of the overall market and increase societal welfare and not simply realign welfare among market participants.

Finally, this paper suggests how a particular vertical arrangement, TOMP, can have horizontal anti-competitive effects. However, this theory is also applicable to other vertical arrangements in use in the fed cattle market. Note especially, how it changes the theoretical backdrop for examining captive supplies. Until now, a negative correlation between prices and captive supplies was theorized to result from a reduction in bidding aggressiveness on behalf of packers. The theory above suggests why packers might bid less aggressively when captive supplies are high. Furthermore, it eliminates debates over the appropriate time span over which to define captive supplies and whether feedlots or packers control delivery. Delivery control and delivery timing matter in the theory above only in the respect that packers must know cattle are committed prior to price being determined. In short, this theory represents a dramatically new way to examine the theoretical consequences of captive supplies.

References

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