BUYER CARTELS: A THEORETICAL AND POLICY FRAMEWORK

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By Sayantan Ghosal

This paper contains a theoretical analysis cartel formation by buyers in thin markets where with a small number of buyers and sellers. Limiting the impact of buyer cartels depends critically on whether such a cartel can create barriers to entry to exclude non-cartel members from the trading process. In addition, for a buyer's cartel to exist, cartel members need to be able to make side payments to each other which do not go through markets but are made directly each other. Allowing for bilateral cartels, the analysis shows that the formation of a cartel of sellers induces the formation of a cartel of sellers yielding a "balance" in market power on the two sides of the market.

I. INTRODUCTION

Typically, the analysis of collusion considers the formation of sellers' cartels. For example, in oligopolistic markets, the formation of cartels of producers is analyzed under the assumption that demand is atomistic, so that buyers react in a competitive fashion to the choices of sellers and cartel formation among sellers is studied in detail.

While such a model is well-suited to analyze collusion in markets for consumer goods, their conclusions cannot hardly be extended to other markets, such as markets for primary commodities, where a small number of buyers and sellers interact repeatedly. Moreover, the best-known examples of cartels are actually found on thin markets with a small number of traders on both sides. Examples include the commodity cartels grouping producer countries (OPEC, the Uranium, Coffee, Copper and Bauxite cartels) facing a very small number of buyers of primary commodities, the famous shipping conferences, legal cartels grouping all shipping companies operating on the same route, interact repeatedly with the same shippers.

In markets with a small number of strategic buyers and sellers, the study of collusion on one side of the market must take into account the reaction of traders on the other side. The formation of a cartel by traders on one side of the market may induce collusion on the other side. In fact, it is often argued that commodity cartels were formed in the 1970's as a response to the increasing concentration of buyers on the market (see the case studies by Sampson (1975)[2] on the oil market, by Holloway (1988)[3] on the aluminum market and by Taylor & Yokell (1979) on the uranium market).[4] In ocean liner shipping, the monopoly power of shipping companies has led to the emergence of cartels of buyers, the shippers' councils which negotiate directly with the shipping conferences (Sletmo & Williams 1980).[5]

In this short paper, the focus is on the formation of buyers' cartels on markets with a small number of strategic buyers and sellers.

The analysis reported here builds on Bloch & Ghosal (2000)[6] where a formal theoretical model to study bilateral collusion is developed. In that paper, a sequential model of interaction between an equal number of buyers and sellers of an indivisible good is studied. In the first stage, buyers decide to form a cartel and restrict the number of traders they put on the market. In the second stage, sellers form a cartel and restrict trade in the same way. In the third stage, once the number of buyers and sellers excluded from the market is determined, the remaining traders trade on the market. The model of trade for an indivisible commodity used is inspired by Rubinstein & Wolinsky (1990)'s model of repeated matching and bargaining among a small number of traders.[7] Buyers and sellers bargain over the surplus generated by the indivisible good, which is normalized to one. At each point in time, buyers and sellers are randomly matched and make decentralized offers. To guarantee the existence of a unique price at which trade occurs, it is assumed that trade only occurs when all offers are accepted in the same round.

The model of trade has the desirable feature that, as the discount factor converges to 1, the market outcome converges to the competitive outcome with the implication that all of the economic surplus is appropriated by traders on the short side of the market. On the other hand, when the discount factor converges to 0, the trading mechanism approaches a simple bargaining model with take-it-or-leave-it offers.

In this paper, in the next, section, the payoffs in the limiting case when the discount factor goes to one is used to examine the incentives of buyers to form cartels for a fixed number of sellers. As the price of the good traded depends on the numbers of buyers and sellers on the markets, traders have an incentive to restrict the quantities of the good they buy or sell on the market. However, given the indivisibility of the good traded, the only way to restrict offer or demand on the market is to exclude some agents from trade. Hence, the assumption is that cartels are formed in order to exclude some buyers from the market and to compensate them for withdrawal.

The next section contains analysis of a simple theoretical framework followed by a section containing a discussion of the implications of the analysis reported here as well as some policy implications.

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2 Sampson, A. (1975) *The Seven Sisters: The Great Oil Companies and the World they Made*. Viking Press, New York.

3 Holloway, S.K. (1988) *The Aluminium Multinationals and the Bauxite Cartel*. Saint Martin's Press, New York.

4 Taylor, J.H. & Yokell, M.D. (1979) *Yellowcake: The International Uranium Cartel*. Pergamon Press, New York.

5 Sletmo, G.K., Williams, E.W. (1980), *Liner Conferences in the Container Age: U.S. Policy at Sea* Mac Millan, New York.

6 Bloch, F. & S. Ghosal (2000), "Buyers' and sellers' cartels on markets with indivisible goods," *Review of Economic Design* 5, pp.129–147.

7 Rubinstein, A. & Wolinsky, A. (1990), "Decentralized trading, strategic behavior and the Walrasian outcome," *Review of Economic Studies* 57: 63–78.

II. A THEORETICAL FRAMEWORK

We consider a market for an indivisible good with a finite set B of identical buyers and a finite set S of identical sellers and let b and s denote the number of buyers and sellers, the cardinality of the sets B and S respectively. Each buyer i in B wants to purchase one unit of the indivisible good traxded on the market, and each seller j in S owns one unit of the good. Without loss of generality, we normalize the gains from trade (the economic surplus) from each bilateral trade to 1.

We model the formation of the cartel as a simple, noncooperative game, where buyers simultaneously decide on their participation to the cartel. This participation game implies that a cartel is stable when (i) no trader has an incentive to join the cartel and (ii) no trader has an incentive to leave the cartel.

It has long been noted that traders have an incentive to collude on these competitive markets for indivisible commodities (see Shapley & Shubik (1969), fn. 10 p. 344).[8]

We consider two scenarios, one which a buyer's cartel once formed, can create barriers to entry and exclude non-cartel members from trading in the market and the another in which such a cartel cannot exclude non-cartel members from trading in the market.

In each scenario, the interaction between participants on the market is modelled as a three-stage process:

- Stage 1: a buyer's cartel is formed;
- Stage 2: members of the buyer's cartel choose the number of active traders they put on the market;
- Stage 3: buyers and sellers trade on the market.

Since the model is solved by backward induction, we start by describing the payoffs obtained in the final stage of the game and proceed backwards to the first stage.

As already noted, in this paper, the focus is on markets where all of the economic surplus is appropriated by traders on the short side of the market.

In both scenarios, the key result is that faced with a fixed number of sellers, there at most one stable cartel size on the buyer's side of the market.

Suppose there is small cost to cartel formation $\varepsilon > 0$. This cost could be the communication costs incurred by the cartel to coordinate its actions.

In the first scenario, if buyers and sellers are initially in equal number on the market, buyers form a cartel and exclude one trader from the market and capture all the economic surplus $1 - \varepsilon$. If there are more buyers than sellers to begin with, buyers form a cartel in order so that the number of buyers is exactly one less than the number of active sellers and again the buyers capture all the economic surplus $1 - \varepsilon$. If there are more sellers than buyer to begin with, there does not exist any stable cartel of buyers.

What is key here is that the buyer's cartel, once formed can create barriers to entry than can exclude non-cartel members from trading. In such a case, the cartel formation is entirely limited by how costly such barriers to entry are. If the cost is small, then essentially there will be few or no limits to formation of buyers' cartels resulting in a distribution of the economic surplus away from sellers to buyers and as well as the economic inefficiencies by limiting the opportunities to trade.

In the second scenario, where a buyer's cartel cannot prevent non-carted members from trading, the size of the cartel will be limited by the incentives to free ride. In this case, the unique cartel size is the one for which, upon departure of a member, the cartel collapses entirely i.e. every member of a buyers' cartel must be pivotal to the existence of the cartel.

8 Shapley, L.S. & Shubik, M. (1969), "Pure competition, coalitional power and fair division," *International Economic Review* 10: 337–362.

In order to gain some insight into this result, consider the case, where initially there is one less seller than the number of buyers. What will the buyers' response be? Clearly, by forming a cartel which excludes two sellers from the market they could capture a surplus of $1-\varepsilon$ per unit traded, whereas by excluding one trader they obtain a surplus of $\frac{1}{2}$.

Hence, at first glance, it seems that buyers should form a cartel which excludes two traders. However, we argue that this cartel cannot be stable, and that the only stable cartel is a cartel excludes exactly one buyer from the market. To see this, note that the minimal cartel size for which two buyers are excluded is four. Each cartel member then receives a payoff of $\frac{2-2\varepsilon}{4}=\frac{1}{2}-\frac{\varepsilon}{2}$. By leaving the cartel, a member would obtain a higher payoff of $\frac{1}{2}$. So the cartel is unstable.

It is worth remarking what happens when one side of the market responds to collusion on the other side – when buyers form a cartel, they anticipate that sellers will respond by colluding themselves.

When buyers and sellers are originally in equal number on the market, it is easily checked that, using the earlier characterization of stable cartels on one side of the market, in a sequential game of bilateral cartel formation, there exists a unique stable cartel configuration, where both buyers and sellers form cartels, the cartels are of equal size, and both cartels exclude one trader from the market.

It thus appears that the formation of cartels on the two sides of the market leads to the same restriction in trade as in the case of unilateral collusion. Furthermore, the size of the cartels formed under bilateral collusion is smaller than the size of the cartel formed under unilateral collusion. The interpretation of these results is that there exist limits to bilateral collusion. The threat of collusion on one side of the market does not lead to a higher level of collusion among traders on the other side.

III. DISCUSSION AND POLICY IMPLICATIONS

The analysis shows that limiting the impact of buyer cartels depends critically on whether such a cartel can create barriers to entry to exclude non-cartel members from the trading process. In addition, for a buyer's cartel to exist, cartel members need to be able to make side payments to each other which do not go through markets but are made directly each other.

Allowing for bilateral cartels, the analysis shows that the formation of a cartel of sellers induces the formation of a cartel of sellers yielding a "balance" in market power on the two sides of the market. Clearly, the analysis too schematic to account for the emergence of cartels of producers of primary commodities. However, the analysis, however preliminary, gives credence to the view that these cartels were formed partly as a response to increasing concentration on the part of sellers. Furthermore, the analysis indicates that the cartels formed would only group a fraction of the active traders on the market, in accordance with the actual evidence at the time of the formation of OPEC, the Copper and Uranium cartels.

The roots of the analysis reported here can be traced back to the debate surrounding Galbraith's (1952) book on "countervailing power."[9] In this famous book, Galbraith (1952) argues that the concentration of market power on the side of buyers is the only check to the exercise of market power on the part of sellers. (see Scherer & Ross (1990), Ch. 14, for a survey of recent contributions to the theory of "countervailing power").[10] As was already noted by Stigler (1954)[11] in his discussion of the book, Galbraith's (1952) assertions are not easily supported by formal economic arguments. In fact, as shown here, existence of countervailing power may balance the market power of buyers and sellers, but does not help to reduce the inefficiencies linked to the existence of market power.

9 Galbraith, J.K. (1952) *American Capitalism: The Concept of Countervailing Power*. Houghton Mifflin, Boston.

10 Scherer, F. & Ross, D. (1990) *Industrial Market Structure and Economic Performance*, 3rd ed. Houghton Mifflin, Boston, MA.

11 Stigler, G.J. (1954) "The economist plays with blocs," *American Economic Review* 44: 7–14.

The analysis reported here relies strongly on the study of stable cartels on oligopolistic markets initiated by d'Aspremont et al. (1983),[12] Donsimoni (1985)[13] and Donsimoni et al. (1986).[14] The stability concept we use is due to d'Aspremont et al. (1983).[15] In spite of differences in the models of trade, our results bear some resemblance to the characterization of stable cartels in Donsimoni et al. (1986). As in their analysis, we find that free-riding greatly limits the size of stable cartels, thereby reducing collusion on the market.

It is worth remarking that in reality, a buyers' cartel can choose to enforce different collusive mechanisms. It could for example specify a common strategy to be played by its members at the trading stage or delegate one of the cartel members to trade on behalf of the other members. The analysis and detection of these forms of collusion are difficult areas of investigation both theoretically and empirically, a matter that competition policy-makers need to be aware in their work.

12 d'Aspremont, C., Jacquemin, A., Gabszewicz, J.J. & Weymark, J. (1983), "The stability of collusive price leadership," *Canadian Journal of Economics* 16: 17–25.

13 Donsimoni, M.P. (1985), "*Stable heterogeneous cartels*," *International Journal of Industrial Organization* 3: 451–467.

14 Donsimoni, M.P., Economides, N.S., & Polemarchakis, H.M. (1986), "Stable cartels," *International Economic Review* 27: 317–336.

15 d'Aspremont, C., Jacquemin, A., Gabszewicz, J.J. & Weymark, J. (1983), "The stability of collusive price leadership," *Canadian Journal of Economics* 16: 17–25.

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