programming networks when negotiating with a large buyer. These results indicate that buyers and sellers both have the incentive to become larger.

Table 17 also contains a regression that explores whether there is a statistically significant difference in the license fees (per subscriber) paid by buyers across concentration treatments.[69] The model includes a set of dummy variables for two of the analyzed concentration treatments and for three of the sellers. For example, the dummy variable "HigWLow" takes on the value of one when a trade occurs in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS operator, zero otherwise. Similarly, the dummy variable "High/High" takes on the value of one when a trade occurs in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers, zero otherwise. In this model, the constant term captures the effect of the Low/High concentration treatment. In this treatment. the market is served by two "moderately-sized" cable operators (i.e., market shares of 27% and **24%)** and several smaller buyers. The constant term also captures the effect on the affiliate fee when a buyer trades with the most popular seller (i.e., Seller #4).

The coefficient on the "HigWLow" dummy variable measures the difference in the effect of this concentration treatment on the affiliate fee (per subscriber) paid by buyers when completing a trade with the most popular seller, compared with the affiliate fee (per subscriber) paid by buyers when trading with the same seller in the Low/High concentration treatment. Similarly, the coefficient on the "High/High" dummy variable measures the difference in the effect of this concentration treatment on the affiliate fee (per subscriber) paid by buyers when completing a trade with the most popular seller, compared with the affiliate fee (per subscriber) paid by buyers when trading with the same seller in the Low/High concentration treatment.

The absence of a statistically significant coefficient on the "High/Low" dummy variable indicates that buyers pay, on average, the same affiliate fee (per subscriber) when operating in a market that includes two major cable operators (i.e., market shares of **44%** and 39%) and one DBS operator as when operating in a market that is served by two

[69] **A model specification that included both the market concentration and buyer size dummy variables generated "multicollinearity" problem.**

"moderately-sized" cable operators (i.e., market shares of **27%** and **24%)** and several smaller buyers. The statistical significance and sign of the coefficient on the dummy variable "High/High" indicates that buyers pay, on average, a lower affiliate fee (per subscriber) when operating in market that includes a single large cable operator (i.e., market share **51%)** and several substantially smaller buyers than when operating in a market that is served by two "moderately-sized" cable operators (i.e., market shares of 27% and **24%)** and several smaller buyers.

Tables **18-21** present regression results that explore the determinants .of the variations in the net surplus eamed by the different sellers. Net surplus measures the profits or losses eamediincurred by a seller during trading periods **5-8** within a given experimental session. These regressions were run to determine whether sellers varied in their ability to operate profitably in the various concentration treatments."

Observations 24		R^2 .2631	
F(3, 20) 2.38		Root MSE	
Prob > F 0.1000		50.43	
Seller #1 Net Surplus	Coefficient (t-value)	(95% Confidence. Interval)	
Low/High	**-21.31 (1.09)**	**-19.97**	**25.22**
High/High	**-55.87 (-2.22)**	**-108.47**	**-3.27**
Period	**-13.15 (-1.49)**	**-32.95**	**5.45**
Constant	**49.5** (.79)	**-80.77**	**179.77**

Table **18:** Seller **#1** Net Surplus Regression
(CAP MFN Treatment)

[70] In the regressions that employ Seller #3 Net Surplus and Seller #4 Net Surplus as dependent variables, a Shapiro-Wilkes test rejects the null hypothesis that the respective regression error terms are normally distributed.

Observations = 24		R^2 = .3054	
F(3, 20) = 1.90		Root MSE	
Prob > F = 0.1622		19.382	
Seller #2 Net Surplus	Coefficient (t-value)	(95% Confidence. Interval)	
Low/High	-28.125 (-1.63)	-64.14	7.89
High/High	-36.15 (-2.13)	-12.16	-.7315
Period	3.41 (.54)	-9.73	16.56
Constant	-91.95 (-2.15)	-181.16	*-2.15*

Table 19: Seller #2 Net Surplus Regression (CAP MFN Treatment)

The statistical significance of and sign on the coefficient on the dummy variable "High/High" in Tables 18 and 19 indicate that Sellers #1 and #2 incur losses operating in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers. The statistical insignificance of the coefficient on the dummy variable "Low/High" indicates that there is no significant difference in the net surplus earned by Sellers #1 and #2 when operating in a market that includes two "moderately-sized" cable operators (i.e., market shares of 27% and **24%)** and several smaller buyers than in a market that includes two major cable operators **(i.e.,** market shares of 44% and 39%) and one DBS service provider."

Table 20 reports regression results on the net surplus of the "moderately" popular seller (i.e., Seller #3).

[71] The model shown in Table 18 predicts that Seller #1 would incur a loss, given the size and sign of the coefficient on the Period vanable, following each trading period. The Period variable took on the values ***of 5*** through 8 in the regression model.

Observations = 24		R² = .2497	
$F_{(3, 20)}$ = 2.22		Root MSE =	
Prob > F = 0.1174		425.22	
Seller #3 Net Surplus	Coefficient (t-value)	(95% Confidence Interval)	
Low/High	-13.62 (-.06)	-457	429
High/High	**-481.25** *(-2.26)*	**-924**	-37
Period	**-9.21** **(-.12)**	-171	**152**
Constant	**811.40** **(1.54)**	*-286*	**1909**

Table **20:** Seller **#3** Net Surplus Regression
(CAP MFN Treatment)

The statistical insignificance of the coefficient on the dummy variable "Low/High" indicates that Seller #3 earns the same net surplus operating in a market that includes a two "moderately-sized" cable operators (i.e., market shares of 27% and 24%) and several smaller buyers than as in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS service provider. The statistical significance of the coefficient on the dummy variable "High/High" indicates that Seller #3 earns higher net surplus operating in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS service provider than in a market that includes a single large cable operator (i.e., market share **51%)** and several substantially smaller buyers. **In** contrast to Seller #1 and #2, Seller #3 would consistently earn profits, regardless of the market concentration environment. However, Seller #3 earns the lowest profits operating in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers.

Observations = 24 F(3, 20) = .42 Prob > F = 0.7379		R^2 = .0598 Root MSE 1173.50	
Seller #4 Net Surplus	Coefficient (t-value)	(95% Confidence Interval)	
Low/High	**-319.00** **(-.54)**	**-1542**	**904**
High/High	**-624.37** **(-1.06)**	**-1848**	**599**
Period	**-80.05** **(-.37)**	**-526**	**366**
Constant	**3035.32** **(2.09)**	**4**	**6060**

Table **21:** Seller **#4 Net** Surplus Regression
(CAP MFN Treatment)

The statistical insignificance of the coefficient on the dummy variable "Low/High" indicates that Seller #4 earns as much profit operating in a market that includes two "moderately-sized" cable operators (i.e., market shares of **27%** and **24%)** and several smaller buyers as in a market that includes two major cable operators (i.e., market shares of **44%** and **39%)** and one DBS service provider. Similarly, the statistical insignificance of the coefficient on the dummy variable "High/High" indicates Seller #4 earns as much profit operating in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers as in a market that includes two major cable operators (i.e., market shares of **44%** and **39%)** and one **DBS** service provider. Thus, according to the regression model, Seller #4's financial payoff does not vary significantly over the range of horizontal concentrations considered in this analysis.

5.0 Concluding Comments

In this paper we have reported on the results of a series of experiments designed to shed light on the impact of horizontal concentration among cable operators in markets in which cable operators (and a DBS operator) purchase programming packages from a set of suppliers. Our principle conclusions are as follows.

First, when the number of programming networks exceeds the cable operator's channel capacity, higher levels of horizontal concentration (holding the number of buyers constant) led to a modest reduction in "economic efficiency." In the current context, a reduction in economic efficiency indicates that fewer or socially less desirable trades occurred in the more concentrated market structure than in the less concentrated market structure. Second, the experimental results indicate that in the experimental economics setting the bargaining power of a cable operator that serves 27% of the MVPD market does not differ substantially from the bargaining power of a cable operator that serves 51% of the MVPD market. From the perspective of a programming network, a cable operator that serves 27% of the MVPD market is as powerful as one that serves 51% of the market. Third, the experimental results indicate that there is a statistically significant decrease in the DBS operator's bargaining power when two cable operators serve 44% and 39% of the MVPD market, than when the largest cable operator serves ***27%*** of the MVPD market. **A** reduction in its bargaining power means that the DBS operator can expect to pay higher affiliate fees following the increase in horizontal concentration. Fourth, the results indicate that sellers representing the least popular programming networks had difficulty earning a profit (i.e., conducting a series of trades that allowed them to more than cover their costs) in each of the horizontal concentration environments considered.

Additional experiments were conducted to explore the effects of two institutional features of the market environment. One set of experiments relaxed the assumption that buyers have limited channel capacity. Where a channel capacity constraint did not exist all sellers were consistently able to conduct a set of trades that enabled them to earn a profit. Consistent with this outcome, sellers' bargaining power increased while buyers' bargaining power declined. Experiments were also conducted to explore the effect of a large cable operator's ability to successfully include a "Most Favored Nation" ("MFN") provision in an affiliate agreement. The existence of an MFN provision increases the bargaining power possessed by the MFN-endowed buyers.[72] In addition, when negotiating with a popular programming network, the largest cable operator is able to negotiate lower affiliate fees, expressed on a per subscriber basis, than small buyers (i.e., cable operators and an DBS provider). Buyers are able to negotiate substantially lower affiliate fees in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers than in a market that includes two moderately-sized cable operators (i.e., market shares of 27% and 24%) and several smaller buyers. Consistent with this result, the least popular programming networks incur the greatest losses in a market that includes a single large cable operator (i.e., MVPD market share 51%) and several substantially smaller buyers. Furthermore, a moderately popular programming network earns the least amount of profit, among the market structures examined, in a market that includes a single large cable operator (i.e., MVPD market share 51%) and several substantially smaller buyers. Finally, a programming network's ability to negotiate a high affiliate fee with a large buyer depends on the popularity of the programming network. The more popular the programming network, the higher the affiliate fee. These results indicate that both buyers and sellers have an incentive, based solely on the expected changes in negotiated affiliate fees, to grow larger.

An attempt was made to include in the experimental market those features of the actual market that have an important impact on the affiliate agreements negotiated between programming networks and MVPDs. However, the experimental market did not and could not display all the complex characteristics of the actual market. For example, the experimental market includes far few programming networks and MVPDs than there are in the actual market. In particular, the experimental market does not take into account that there are multiple DBS service providers. The experimental market also does not take into account that some large cable operators have attributable interests in programming networks (i.e., vertical integration). While the issue of vertical integration is a potentially significant institutional feature that subsequent analyses may be able to

[72] See footnote 12

consider, we chose not to account for it because of the already complex nature of the experimental design.

The experiments do not include subjects that play the role of advertisers or advertising agencies ("advertisers"). While they are not explicitly included in the experiments, the presence of advertisers is felt through a set of assumptions regarding the price at which advertising time is sold. For example, the analysis assumes that the price of national advertising time is independent of the size of the cable operator. It is possible that this assumption is not satisfied when a cable operator becomes very large. Because of cost effectiveness and superior ratings measurement considerations, national advertisers acquire cable advertising time directly from programming networks. However, their willingness to buy advertising time from cable operators may increase substantially as cable operators become larger. This increased willingness may lead to a reduction in the advertising revenue eamed by programming networks. Unless this reduction in revenue is offset by an increase in the affiliate fees paid to it by the cable operator, the cable network can expect to earn less revenue and, thus, be adversely affected by an increase in the size of the cable operator. By not including this potentially important effect, the economic experiments may understate the economic effect on programming networks of an increase in horizontal concentration among cable operators.

The experiments. did not take into account other institutional factors that may have bearing on the outcome of the bargaining game between programming networks and buyers. For example, the economic experiments may not fully capture the possibility that the bargaining outcomes in successive trading periods in the actual market may be correlated. Indeed, programming networks may have increased bargaining power in the future if a **MVPD** presently carries them. This increased bargaining power may be due to the dissatisfaction **MVPD** subscribers may experience from having a previously carried programming network dropped by the MVPD.[73]

The experiments impose the restriction that the value a particular buyer (e.g., cable operator) places on a particular programming network is independent of the carriage decisions made by another **MVPD** (e.g., **DBS). In** the actual market, a large

[73] **However, while the resulting sense of customer dissatisfaction may enhance a currently carried programming network's bargaining power,** it **may reduce the relative bargaining power** of **those programming networks that are currently not carried.**

buyer's decision not to cany a programming network may affect the quality of the programming offered by the programming network. Such an effecr would violate the restriction that a buyer's valuation for a programming network is independent of the carriage decisions made by other buyers. Similarly, the experiments impose the restriction that the value a particular MVPD places on a given programming network is independent of the types of programming networks the MVPD decides to carry. In the actual market, MVPDs have an incentive to cany a package of programming networks that maximizes their subscription and local advertising revenues. Under such packaging, the value MVPDs place on a given programming network depends, in part, on the types of programming networks they decide to carry. The experiments also impose the restriction that the subscription price charged by the MVPD is independent of the carriage decisions made by another MVPD and, in the instance where the MVPD decides to cany that programming network, the level of the affiliate fee paid by that MVPD. Such independence may not be observed in the actual market.

Finally, substantial effort was made to assign buyers' willingness to pay for programming networks that parallel the values they possess in the actual market. Similar care was given to the assignment of other important parameters, such as costs and, for sellers, the level of national advertising revenue they would earn from conducting a trade with a given buyer. While some may quibble with the values assigned to the subjects, the important issue is whether the assigned values affected the results of the analysis. It is worth noting that the results of the analysis are expressed almost entirely in terms of how a change in some feature of the market could affect the bargaining outcome as measured by a specific performance measure. Such an approach minimizes the importance of the assumptions used to construct the willingness to pay, national advertising revenue, and cost parameters that were assigned to subjects.

Appendix A: Economic Theory

In this appendix we review the relevant economic theories of bargaining processes. After initially concluding that traditional oligopoly and oligopsony approaches are not relevant to the bargaining situation between cable operators and programming networks, we focus on three solution concepts to bargaining games found in cooperative game theory. We then apply these solution concepts to the bargaining game in which cable networks and cable operators participate and provide a set of limited conclusions.[74]

A.1 Traditional Oligopsony/Oligopoly Theory

Traditional economic theory analyzes the role of horizontal concentration as an exercise in which "players" simultaneously and independently make decisions regarding either how much to sell or how much to buy. If concentration on the sell side of the market is of concern, the buy side is assumed to be passive, with a downward sloping demand curve expressing the marginal willingness to pay for any given total quantity offered for sale in the market.[75] If a set of identical sellers with constant marginal costs are assumed to behave strategically, then the symmetric Coumot-Nash equilibrium determines the market price, and therefore the excess of price over marginal cost.[76] In the Coumot-Nash equilibrium the market price declines and converges to marginal cost as the number of sellers increases. This result demonstrates an unambiguously adverse consequence of concentration on the sell side, measured in terms of both economic efficiency and the welfare of the buy side. If concentration on the buy side of the market is of concern, and sellers are assumed to behave passively (via an upward sloping supply schedule representing the average cost of supplying a given total market quantity), an oligopsony equilibrium exists, where the total quantity purchased is less than the efficient quantity, but approaches the latter as the number of buyers increases. In this case,

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[74] Cooperative game theory assumes that players have the ability to make binding commitments to behave in a certain way and that they attempt to coordinate with other players in order to maximize their respective payoffs given the strategies adopted by other players. Because of this attempt to coordinate with other players, the unit of analysis in cooperative game theory is typically a group or "coalition."

[75] Buyers behave "passively" when, as a group, they simply behave as "price takers.''

[76] The term "strategic" refers Io the decision each seller makes to restrict its output in an attempt to maximize its profits.

concentration on the buy side again has an unambiguously adverse consequence for both economic efficiency and welfare of the sell side.

While the models of oligopoly and oligopsony are familiar to all economists, neither of these approaches provides a suitable basis upon which to analyze the current market in which programming networks conduct trades with cable operators. Consider the oligopsony model. The current market involves a set of sellers offering for sale a set of differentiated products.[77] In contrast to the standard oligopsony model, the popularity of some cable networks may enable them to have a substantial say in the price at which they license their package of programs to cable operators." The traditional oligopoly model is equally inapplicable. The current market includes a set of buyers that have a large position in the market for the provision of multi-channel video service to the home in their respective franchise areas. The near exclusiveness of their franchises provides cable operators the opportunity to act in a non-passive, strategic manner, contrary to the assumption regarding buyers contained in standard oligopoly theory.[79] Thus, each side of the market has both the opporhmity and the incentive to behave strategically with respect to other members of its side of the market. For example, each cable operator has the incentive to minimize the affiliate fees it pays to programming networks, while attempting to increase the affiliate fees paid by other cable operators. Likewise, each cable network has the incentive to maximize its own national advertising revenue.

A.2 Some Solutions Based on Cooperative Game Theory

The formal models of oligopoly and oligopsony are examples of very simple non-cooperative games, in which players are assumed to make strategic decisions by taking account of the strategies of other players in the game. An alternative game theoretic approach, known as cooperative game theory, takes a somewhat different approach to the

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[77] Programming networks are differentiated in that a cable operator does not value all programming networks equally.

[78] The popularity of some of programming networks may provide them substantial bargaining power over cable operators.

[79] Some claim that, because of changes in the MVPD marketplace, cable operators have little incentive to harm cable networks. This claim rests on the notion that DBS, despite serving approximately 17% of the MVPD universe, provides a method of distribution that is a close substitute to cable distribution. See Statement of Howard A. Shelanski ("Shelanski"), Attachment to Comments and Petition for Rulemaking of the National Cable and Telecommunications Association, filed January 4, 2002.

underlying strategic considerations. Rather than modeling in detail the individual decisions that could be made by individual players, the cooperative approach seeks to define the "value" that each coalition of players can achieve, and then draw conclusions regarding the distribution of the total value among the members of the coalition.[80] Cooperative game theory can therefore he used to frame and improve our economic understanding of market environments without the need to model in detail the strategies of individual players. Neither a cooperative game theoretic nor a non-cooperative game theoretic approach is able to incorporate many of the features that are likely to have an important effect on the outcome of the bargaining game that occurs between cable networks and cable operators.

Consequently, substantial care must be taken in interpreting the conclusions of this section. We examine three cooperative solution concepts that can be applied to the bargaining game that occur between cable operators and cable networks. The first solution concept is the "Nash Bargaining Solution," which is defined as the solution to the bargaining game between two players that maximizes the product of the gains enjoyed by both parties over the payoff earned by each when they do not trade." The second solution concept is the "Shapley Value," which measures what each player could reasonably expect to receive as hisher share of the reward in a more general cooperative game. **A** third solution concept is the "Core," which defines a range of bargaining outcomes for the buyers and the sellers that no coalition can improve upon."

[80] The bargaining process between MVPDs and programming networks is an example of a class of cooperative games known **as** "market games" that have been extensively studied in the literature. See, e.g. G. Owen **(1982).** ***Game*** *Theory,* Cambridge, MA: Academic Press; and M. Shubik (1982), ***Game Theory** in* ***the Social Sciences.*** Cambridge, MA: MIT Press for standard references. In a simple market game the value of a coalition is defined as the maximum possible surplus resulting from trades between buyers and sellers, after subtracting all relevant costs.

[81] **In** a paper closely related to this one, David Waterman argues that in a bargaining model in which upstream suppliers (e.g., network programmers) sell to a downstream retail sector (e.g., MVPDs), the retail sector may be able to exert monopsony power by forming coalitions. [D. Waterman (1996), "Local Monopsony and Free Riders," ***Information Economics and Policy, 8,*** pp. 337-55]. See also T. Chipty and C.M. Snyder (1999), "The Role **of** Firm Size in Bilateral Bargaining: A Study **of** the Cable Television Industry," ***Review of Economics and Starisrics. 81,*** pp. **32640.**

A.2.1 The "Nash Bargaining" Solution

The most straightforward bargaining problem can be represented as a "divide-the-surplus" game in which two parties bargain over the division of a known prize or surplus (e.g., gains from trade). If the parties reach an agreement about the division of surplus, they are entitled to keep their respective share. Based upon a set of "reasonable" and very general axioms (or assumptions), John Nash[83] was able to both generalize this simple situation and derive a solution concept that provides a precise solution to the bargaining game.[84] The Nash Bargaining solution attempts to identify a payoff for each player that is both "fair" and "efficient." In the present context, "fairness" is defined by a symmetry axiom, under which the parties agree to equally divide the surplus available from trade. "Efficiency" involves maximizing the sum of payoffs.

Under the Nash Bargaining solution, the outcome of the bargaining process is allowed to depend on the outside options available to each party, otherwise known as "disagreement outcomes."[85] For example, if two parties are bargaining over a dollar, and one party could secure 20 cents if negotiations fail, while the other party could secure 30 cents if negotiations fail, then only 50 cents (1 dollar minus 20 cents minus 30 cents) is at stake in the negotiations. Applying the equal division logic to this amount, the final bargaining outcome would be 45 cents and 55 cents. respectively, for the two parties.[86]

A.2.2 The "Shapley Value" Solution

The Shapley Value seeks to define what each player could reasonably expect to receive as hisher share of the reward when the coalition of all players (sometimes called

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[82] A competitive equilibrium, when it exists, is always contained in the Core, and under some circumstances the Core converges to the competitive equilibrium as the number of players becomes large.

[83] This is the same Nash responsible for the Nash equilibrium concept referred to previously, but the Nash Bargaining Solution is a solution in cooperative game theory, while the Nash equilibrium is a fundamental solution concept in non-cooperative game theory

[84] More specifically, Nash was able to restrict the set of possible bargaining outcomes by requiring that the equilibrium satisfy a set of axioms.

[85] In the current context, the notion of a disagreement outcome allows one to take into account the existence of the costs that have been incurred by cable networks and cable operators prior to entering into the market.

[86] The Nash Bargaining Solution concept can also be employed where the bargaining game is not "symmetric." In such a situation, the disagreement payoffs are not the same across the two players and the set of possible payoffs to the players may be unequal (i.e., asymmetric). In such cases, the Nash Bargaining Solution considers a "weighted" or generalized bargaining solution, where each party's inherent bargaining power is determined by external factors.

the grand coalition) forms.[87] However, in contrast to the Nash Bargaining Solution, the Shapley Value takes account of all coalitions smaller than the grand coalition that could form.[88] As both a standard of fairness and a description of the way that bargains are decided, the Shapley Value assumes that players are entitled to their expected incremental contribution to the surplus.[89] In any given ordering of players, a player's incremental contribution to the game depends on the identities of players who are already present." Hence a player's expected incremental contribution is just the average incremental contribution which that player makes to the coalitions that it joins, over all possible orderings of players.

A.2.3 The "Core" Solution

The Core is based on the assumption that players can costlessly form coalitions and that members of each coalition can negotiate their share of the surplus available to members of that coalition. In negotiating its share, each member, or a set of members of the coalition, evaluates whether it could do better if it joined another coalition. The Core defines that set of payoffs such that no individual or group of individuals can improve their position by forming an alternative coalition." In the current context, the Core is the set of surpluses earned by cable networks and cable operators such that no individual cable network or cable operator can improve its welfare by joining and trading with members of another coalition.[92]

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s i The Shapley Value, like the Nash Bargaining Solution, has been defined by means of a set of plausible axioms or characteristics that an imposed equilibrium, such as an arbitrated outcome, ought to possess.

88 The Nash Bargaining Solution applies only to pair-wise bargains between players, and does not consider interactions among other coalitions.

89 If $v(S)$ represents the value of a coalition **S** then the incremental contribution of a player i to the coalition **S** is given by $v(S \cup i) - v(S)$

90 For example, if there are three players, then in the ordering 1,2,3, player 1's incremental contribution is the value that player 1 can achieve by itself; player 2's incremental contribution is the value achieved by 1 and 2 together minus the value achieved by player 1 in isolation; and player 3's incremental contribution is the value of 1,2, and 3 minus the value achieved by 1 and 2.

91 The Core is a widely used concept in the analysis of competitive equilibrium in the production of private goods. However. it also has relevance in trading situations involving small numbers of buyers and/or sellers. For example, in a simple bilateral bargaining model, the set of core allocations is that segment of the contract curve lying within the region in which both players are at least as well off as they would be if they did not trade.

92 The Core is defined with respect to a characteristic function representation of the trading situation in which the value of any coalition of buyers and sellers is equal to the maximum gains from trade. subiect to the capacity constraints that exist in the market.

Under the Core, every player or coalition of players is guaranteed a payoff that is at least as high as the payoff it would have received had it been a member of a smaller coalition. Moreover, in a market game involving trades between buyers and sellers, an increase in the number of traders of one **type** (e.g. **sellers)** tends to reduce the payoffs to traders of that type while increasing payoffs to traders of the opposite type.[93] In a market game, there are typically many allocations that are consistent with the Core.[94] Thus, in the current context, there are numerous allocations of surpluses among cable operators and cable networks that will satisfy the requirements of the Core.

A.3 Illustration of the Cooperative Solutions for a Symmetric Bargaining Game

As explained in Section 3.1, our experimental analysis focused largely on a specific "treatment variable" in which each MVPD is constrained in the number of programming networks that it can carry and in which the costs for both buyers and sellers are treated as unavoidable.[95] In order to gain additional insights on the relevant features of the market in which programming networks and cable operators negotiate affiliate agreements we examine carefully the cooperative game solutions defined in Section A.2 under all possible combinations of the treatment variables. We illustrate these solutions in an environment where there are four identical buyers and four identical sellers. The value of a trade between any buyer and any seller is assumed to be I0. Buyers do not have any costs and each seller has a cost of 20. The payoffs to a representative buyer and a representative seller in each of our four treatments are shown in Table A.1.

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[93] Intuitively, an increase in the number of sellers gives buyers more alternatives, but may also increase the competition among sellers to trade with a given buyer.
[94] However, it has been shown that the set of Core outcome5 shrinks as the number players increases, and in the limit as the number of traders goes to infinity, the Core converges to the competitive equilibrium. See, e.g., Owen (1982, p. 181-5).
[95] A limited number of experiments were done assuming no capacity constraint on buyer purchases. We did not attempt to experimentally test the case of avoidable costs.

Treatment	Payoff – (Sellers, Buyers) Nash Bargaining Solution	Shapley Value	Best Core Outcome for Buyers	Best Core Outcome for Sellers
Avoidable Cost, Capacity Constraint	(0, 0)[96]	(2.79, 12.21)	(0, 15)	(0, 15)
Avoidable Cost, No Capacity Constraint	(0, 20)	(6, 14)	(0, 20)	(20, 0)
Unavoidable Cost, Capacity Constraint	(-5, 15)	(-8, 18)	(-20, 30)	(-20, 30)
Unavoidable Cost, No Capacity Constraint	(0, 20)	(0, 20)	(-20, 40)	(20, 0)

Table A.1: Cooperative Solutions in a Symmetric Example

These computations reveal several of the most relevant features of each solution that are also present in the non-symmetric cases presented in the following sections. For example, the "competitive" aspect of the core outcomes is clearly revealed by comparing the core outcomes with and without the capacity constraint. In both the avoidable and unavoidable cost cases, the core solution permits sellers to earn the entire surplus of trade in situations without a capacity constraint on buyer purchases. However, with a capacity constraint, sellers can do no better than to earn the minimal payoff. In other words, to the extent that Core outcomes are predictive of actual bargaining behavior between cable operators and cable networks, MVPDs might legitimately prefer the capacity constrained environment. For example, if we take as a reasonable prediction based on the Core the midpoint of the outcome favoring buyers and the outcome favoring sellers, then each buyer in the symmetric game receives a payoff of 30 in the constrained case and a payoff of 20 in the unconstrained case. (Sellers receive comparable payoffs of –20 and 0

[96] The Nash Bargaining Solution in the case of avoidable costs is computed under the assumption that players *first* bargain over the gross surplus from trade. If a seller's share of the surplus from all efficient trades exceeds his costs, then the costs are assumed to be sunk and the specified trades occur. Otherwise, the sellers choose to not incur the costs (which would result in a negative net profit) and so no trades occur. A different approach to the Nash Bargaining Solution in the case of avoidable costs has been developed by

respectively.) Thus, even though the total surplus available for distribution is higher in the unconstrained trading environment, buyers may expect to receive higher rewards when a constraint is imposed since the sellers are forced to compete for scarce slots in the latter situation.

Because Shapley values represent an average of incremental contributions to surplus over all possible coalitions, they mirror the above results but in a less extreme form. The Nash Bargaining Solution payoffs are similar to the Shapley value payoffs except that somewhat different trades are assumed in the computations.

Table 22 also demonstrates that treatments in which costs are viewed as avoidable guarantee that sellers receive non-negative payoffs under all circumstances, and in particular in the capacity constrained case. In contrast, with unavoidable costs and a capacity constraint, competition for scarce slots is so intense that sellers are never able to achieve a positive payoff under any of the three solution concepts.

In Sections A.5.1 and A.5.2 we further analyze the impact of varying our underlying treatment variables in the more interesting and realistic non-symmetric case which uses the same parameter values that are used in the experiments. All of the above conclusions continue to hold in the non-symmetric case, and some additional conclusions can be drawn based on the heterogeneity of both buyers and sellers.

A.4 Cooperative Solutions in the Non-Symmetric Bargaining Game

Tables A.2 through A.5 present the three cooperative game theoretic solutions to the bargaining game between the cable operators and cable networks in our basic treatment variable in which the cable operator carries only three out of four available cable networks and the costs are unavoidable. The solutions are based upon the parameter values assigned to the participants in the economic experiments and, importantly, the assumption that the participants behave in a manner consistent with the axioms or assumptions upon which each of the solutions is based.[97]

Alexander Raskovich [A. Raskovich **(2001)**, "Pivotal Buyers and Bargaining Position," **U.S.** Department of Justice, Economic Analysis Group Discussion Paper 00-9].

[97] The bargaining outcomes shown in Tables A.2-A.5 assume that both buyers and sellers enter the bargaining game with some previously incurred costs. Thus, buyers and sellers bargain over the **gross** surplus available from trade, and after all trades are conducted, the costs are subtracted. A discussion of the importance of previously incurred costs is contained in Section **3.5.2.**

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	80	40	998	1926	1389	836	996	1531	857
High/ High	154	-39	997	1927	775	614	2944	417	857
High/ Low	94	25	997	1927	2224	2527	-	-	857

Table A.2: Nash Bargaining Solution Outcomes (Capacity Constraint and Unavoidable Costs)

Under the Nash Bargaining solution, sellers (i.e., cable networks) vary substantially in the amount of surplus they obtain in the bargaining game. Regardless of the concentration environment, Seller #4 (the most popular cable network) obtains substantially more surplus than the other sellers. There is also substantial variation in the surplus earned by the buyers, since each cable operator is assumed to provide service to a different number of subscribers, and therefore generates different levels of advertising revenues. Interestingly, the amount of surplus earned by the sellers does not change with changes in the level of concentration on the buy side. In the Nash Bargaining Solution, the payoff to Buyer #5 (whose costs and values of trade are based on the **DBS** operator) remains unchauged with changes in market concentration.

Table A.3 presents the Shapley Value solutions to the bargaining game between the cable operators and cable networks where the cable operator carries only three out of four available cable networks. Again, the solutions are based upon the parameter values assigned to the participants in the economic experiments and, importantly, the solutions assume that players behave in a manner consistent with the axioms upon which the Shapley Value is based.

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/High	94	112	823	1752	1458	872	1039	1600	901
High/High	94	108	823	1753	814	643	3076	432	901
High/Low	88	108	826	1799	2345	2652			901

Table **A.3:** Shapley Value Solution Outcomes
(Capacity Constraint and Unavoidable Costs)

Because the Shapley Value (which is always a single-valued outcome) does not embody the competitive pressures between sellers in quite the same way as the Core, it shows higher returns to the small sellers and lower returns to the larger sellers than the returns enjoyed by each set of sellers at the Core boundaries. Similar to the results obtained from the other solution concepts, sellers vary substantially in the amount of surplus they obtain in the bargaining game. Regardless of the concentration environment, Seller #4 (the most popular cable network) obtains substantially more surplus than the other sellers. There is also substantial variation in the surplus earned by the buyers.

Tables A.4 and A.5 identify the boundaries within which the set of Core payoffs reside.[98] Again, the solution values are based upon the parameter values assigned to the participants in the economic experiments and, importantly, the solution values assume that players behave in a manner consistent with the assumptions upon which the Core is based. The upper bound represents an outcome where sellers obtain all the economic

[98] A transaction price divides the surplus generated from any trade between a buyer and a seller into two pieces. One piece is the surplus enjoyed by a buyer and the other piece is the surplus enjoyed by a seller. A seller obtains the entire surplus generated from a trade when the agreed to price is equal to the buyer's willingness to pay. A buyer obtains the entire surplus when the seller agrees to a price that is equal to the incremental cost it incurs from producing an additional unit of the item. In the current context, a cable operator obtains the entire surplus when the seller agrees to pay the cable operator a negative license fee that is equal to the seller's national advertising revenue.

surplus, while the lower bound represents an equilibrium outcome where **buyers** obtain all the economic surplus.[99]

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-158	-145	2481	6206	-107	-41	-174	-201	789
High/ High	-156	- 151	2483	6210	562	198	-384	-85	-33
High/ Low	-160	-143	2496	6311	-214	489			-60

Table A.4: Core Solution Outcomes Favoring Sellers (Capacity Constraint and Unavoidable Costs)

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-176	-154	- 1357	-3225	3344	2009	2426	3731	2052
High/ High	-176	- 154	- 1357	-3225	1877	1466	7160	1001	2052
High/ Low	-176	-154	-1337	-3225	5391	6188			2052

Table A.5: Core Solution Outcomes Favoring Buyers (Capacity Constraint and Unavoidable Costs)

There are several results worth noting.[100] **As** expected, the Core approach generates a very large set of possible bargaining outcomes. Similar to the results

[99] To be more precise, the solution outcomes favoring sellers are determined by solving a linear program that maximizes the (unweighted) sum of sellers' payoffs subject to the Core constraints. Similarly, the solutions favoring buyers are determined by solving a similar linear program that maximizes the sum of buyers' payoffs. Since the Core is a multidimensional set, great care should be exercised in interpreting these values. That is, small changes in the weights assigned to each individual player (i.e. seller or buyer) in each of the linear programs might result in somewhat different payoff outcomes. In a game with this number of players, a complete enumeration of Core outcomes is neither technically feasible, given currently available software, nor pedagogically desirable.

obtained using the Nash Bargaining solution and the Shapley value, buyers vary substantially in the amount of surplus they obtain in the bargaining game. There is also substantial variation in the surplus earned by the buyers. The largest buyers obtain the most surplus.

Sellers #1 and #2 lose money in all Core outcomes. At the boundary point that favors buyers, all sellers lose money, while at the boundary point that favors sellers. some buyers lose money. Surprisingly, the extent *to* which sellers lose money is independent of the degree of horizontal concentration among buyers."'

A.5 Altering the Bargaining Game

The bargaining outcomes predicted by the different solution concepts were based on a set of assumptions. These assumptions enter into the bargaining problem in the form of restrictions that may affect the predicted bargaining outcome. In an effort to obtain a better understanding of the causes of the predicted outcomes, **we** have relaxed two constraints. In the first instance, we relax the constraint that buyers cannot conduct a trade with every seller. In the second instance, we relax the constraint that both sellers and buyers must recover some previously incurred costs.

A.5.1 No Capacity Constraints

Because cable franchise areas typically do not overlap, each franchise area can be viewed by the cable network as a separate geographic market.'" In addition, each franchise area typically contains a single cable operator and the cable operator's channel

[100] Substantial care must be taken in evaluating Tables 8 and 9. With the exception of Buyer #5 (i.e., the DBS operator), the market share accounted for by each buyer changes across treatments. This problem does not exist with sellers, given that their size remains constant across concentration treatments.

[101] In the Core outcomes favoring buyers, buyers capture the entire surplus from every possible trade, and so seller payoffs are the negative of their fixed costs. In the outcomes favoring sellers, competition between the two small sellers limits the surplus that either of these sellers can extract from any trade, resulting in negative profits. As noted in a previous footnote, the outcomes represented in Tables **A.4** and A.5 represent only two extreme points out of many possible core outcomes.

[102] Some commenters in the Further Notice have speculated on the effect of multiple geographic markets on the flow of programming to viewers. For example, one commenter notes that a cable network may be able to walk away from an unfavorablc deal in one market if it knows it can strike a favorable deal with cable operators in other markets (See Shelanski, pg. 7). The example, however, assumes that the cable network knows something about the quality of future trades. How does the cable network know that it can

capacity is less than **the** number of cable networks. Taken together, these conditions enable each cable operator to ration its channel capacity across a set of cable networks. To shed some light on the effect of this rationing on the welfare of buyers and sellers, it is instructive to compute a set of Core outcomes when there is no capacity constraint on the number of purchases made by each buyer.'" The results of this exercise are presented in the following tables.

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	713	726	3352	7077	-567	-338	-434	-669	-339
High/ High	712	717	3351	7078	-328	-239	1273	-167	-339
High/ Low	689	707	3299	6991	-905	1103			-339

Table A.6: Core Solution Outcomes Favoring Sellers
(No Capacity Constraints and Unavoidable Costs)

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-176	-154	-1357	-3225	3574	2129	2569	3961	2200
High/ High	-176	-154	-1357	-3225	2008	1563	7601	1052	2200
High/ Low	-176	-154	-1357	-3225	5731	6554			1966

Table A.7: Core Solution Outcomes Favoring Buyers
(No Capacity Constraints and Unavoidable Costs)

Just as in the symmetric market game presented in Section **A.3,** a comparison of Tables **A.4 – A.7** reveals that buyers may prefer the constrained trading environment to

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or cannot strike a favorable deal in other markets? What is it about different geographic markets that permits **a** given cable network to strike a favorable deal in one market, but not in another market?

the unconstrained environment. While total surplus available to divide is unambiguously larger in the unconstrained case (as can be verified by comparing buyer payoffs in Tables A.5 and A.7), a buyer's expected payoff (computed as an average of the Core outcomes favonng buyers and Core outcomes favoring sellers) is in almost every case larger in the constrained environment. **A** comparison of the seller's expected payoffs (again computed as an average of the Core outcomes favormg buyers and Core outcomes favoring sellers) reveals in an even more striking manner that sellers unambiguously suffer when the capacity constraint is imposed. Every seller in every treatment can expect a lower payoff when there is a capacity constraint. Moreover, the payoffs for the two smallest sellers change from positive to negative when the capacity constraint is imposed.

A.5.2 Avoidability and Unavoidability of Costs

The experiments are constructed to shed light on the following hypothetical – would existing cable networks have difficulty recovering their costs if they had to conduct a series of multi-lateral negotiations with cable operators? Implementing this hypothetical involves assigning costs to both buyers and sellers. These assigned costs are properly viewed as unavoidable for purposes of this analysis.'" To what extent, however, does the unavoidability of these costs affect the bargaining outcomes?[105]

Table **A.8** presents the Shapley Value solutions to the bargaining game between the cable operators and cable networks where the costs incurred by each are "avoidable."[106] **An** avoidable cost is one that need not be incurred in the short run if the seller determines that there are not sufficient revenues from trade to make it worthwhile

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[103] A comparison of the Shapley Value outcomes for the capacity constrained and unconstrained cases reveals a similar, though less extreme behavior compared to the Core.

[104] In the unavoidable cost framework, we assume that buyers and sellen bargain over the gross surplus available from trade, and after all pair-wise bargains are agreed upon, the costs are subtracted.

[105] This is an important question. In an interesting paper, Alex Raskovich of the Deparlrnent of Justice has shown that, in a market where a seller conducts bilateral trades with multiple buyers, a buyer's bargaining power may decline if the buyer becomes larger. Whether bargaining power declines depends on whether the buyer becomes "pivotal" in the sense that the payments contributed by other buyers falls short of the supplier's avoidable costs. To enjoy the benefits of a trade with the seller, the pivotal buyer must make up for this shortfall. In making up for the shon fall, the surplus enjoyed by the pivotal buyer is less than the surplus it could enjoy if the firm were broken up. Understandably, the results are based on several assumptions, one of which is that the seller's costs are avoidable. The current analysis sheds light on the importance of this assumption.

[106] **A** comparison of Core outcomes in the avoidable cost and unavoidable cost cases reveals similar results to the comparison of Shapley values

to bear it. Thus, avoidable costs are equivalent to an assumption that exit from the market is both possible and relatively costless. In the avoidable cost framework, no buyer’s or **seller’s** costs are incurred unless that trader makes a contribution to the net surplus of the coalition (after accounting for costs). **The** main difference between the two theoretical setups is that negative ex post profits **are** possible in the unavoidable cost case, but not in the avoidable fixed cost case.”’

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	119	126	945	2297	1319	784	984	1472	799
High/ High	122	126	989	2451	667	529	2835	356	724
High/ Low	124	133	1005	2507	1970	2324			816

Table A.8: Shapley Value Solution Outcomes
(Capacity Constraints and Avoidable Costs)

A comparison of Tables **A.3** and **A.8** reveals that **sellers** uniformly gain and buyers uniformly lose in the avoidable cost-capacity environment relative to the unavoidable cost environment. Furthermore, the weakest (i.e., smallest) **sellers** gain relatively **the** most in going from one environment to the other.[108] The intuition behind these results is straightforward. Total net surplus is somewhat larger in the avoidable cost case since not all **sellers** are required to actively produce in the grand coalition outcomes. Moreover, for a given **seller,** the incremental surplus achieved when joining a coalition must always be larger in the case of avoidable costs than in the case of unavoidable costs. This is true because the incremental surplus contributed to the coalition by the **seller** is either positive and identical in the two situations or **zero** in the

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[107] An important consequence of the unavoidable cost assumption is that all sellers should optimally remain active in the market at all times. In the case of avoidable costs, it may be optimal from both a social surplus and individual profit perspective for some sellers to exit the market in any given period.

[108] **As** previously noted, negative profits are possible in the unavoidable cost case, but not in the avoidable cost case.

avoidable cost case and negative in the unavoidable cost case. However, for buyers the situation is reversed. In the case of unavoidable costs, a given buyer's incremental contribution to total surplus is just equal to the buyer's gross gains from trade with all existing sellers in the coalition. In the case of avoidable costs, there are situations in which a given seller would not find it worthwhile to incur its costs before a buyer joins the coalition, but would be willing to incur those costs with the buyer present. In this case, the incremental surplus attributable to the buyer is responsible for covering a portion of the sellers fixed cost.[109]

These observations suggest that the manner in which buyers and sellers view their costs while attempting to conduct a set of trades may be critical in determining bargaining outcomes. From an economic point of view, the critical issue is whether, and to what extent, these costs **are** avoidable in the short run. The threat of exit from the market, and the resulting harm that potential buyers of the sellers' product may incur, can be a powerful tool to increase the bargaining power of sellers in any market.

A.6 Some Caveats in Interpreting the Cooperative Solutions

The axioms or assumptions upon which the three cooperative solutions are based make it possible to make specific predictions regarding bargaining outcomes. However, some of these assumptions may not hold in practice. For example, the Nash Bargaining solution assumes that only those trades that generate the most surplus are conducted. The Shapley value assumes that all coalitions are equally likely to form, as players evaluate their marginal contributions to the game. The Core assumes that coalition formation is costless, so that the surplus obtained by any sub-coalition of the grand coalition constrains the payoffs enjoyed by members of the grand coalition. More generally, the efficiency assumption may not hold given the multi-lateral nature of the bargaining process. The three cooperative solutions that we have examined assume that trades take place simultaneously. However, trades between buyers and sellers occur in a sequential manner in the naturally occurring environment. Given the presence of previously incurred costs, the sequential nature of these trades creates profitability uncertainty for

[109] This point is closely related to the observation made by Raskovich (2001) in his analysis of the role of "pivotal" buyers in a market in which sellers regard their fixed costs as avoidable.