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35 Horizontal Concentration in the Cable Television Industry: An Experimental Analysis

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Executive Summary

The Federal Communications Commission ("FCC") recently initiated a rulemaking proceeding to examine, among other things, the subscriber (horizontal ownership) limits that apply to cable operators.[1] This study employs economic theory and experimental economics to shed light on the effect of changes in horizontal concentration among cable operators on the flow of programming to consumers.[2] The study was designed to complement the information and analyses provided in the comments filed in the FCC's rulemaking proceeding.

Experimental economics involves the study of the interactions among market participants in a controlled laboratory setting. Conducting an economic experiment requires a set of agents (e.g., buyers, sellers), an environment in which they must make individual decisions (e.g., complete a trade), and a method of assessing the results of the decisions made by these economic agents. The experimental study began with the creation of a "market" that parallels the market in which buyers (i.e., Multichannel Video Programming Distributors ("MVPDs") and sellers (i.e., programming networks) negotiate affiliate fees.[3] To this end, buyers were assigned valuations for the programming networks and a set of costs. Valuations reflected the additional subscriber and local advertising revenue buyers would earn from carrying the programming networks. Sellers were assigned a set of costs and a schedule that shows the revenue they would receive if they conducted a trade with a particular buyer. This financial payment

[1] *Implementation of Section 11 of the Cable Television of the Cable Television Consumer Protection and Competition Act of 1992, Implementation of Cable Act Reform Provisions of the Telecommunications Act of 1996, The Commission's Cable Horizontal and Vertical Ownership Limits and Attribution Rules, Review of the Commission's Regulations Governing Attribution of Broadcast and Cable/MDS Interests, Review of the Commission's Regulations and Policies Affecting Investment in the Broadcast Industry, Reexamination of the Commission's Cross-Interest Policy*, CS Docket Nos. 98-82, 96-85, MM Docket Nos. 92-264, 94-150, 92-51, 87-154, Further Notice of Proposed Rulemaking, 16 FCC Rcd 17312 (2001) ("*Further Notice*").

[2] Congress directed the Commission to take into account, "among other public interest objectives," seven public interest factors. 47 U.S.C. §§ 533(2)(A)-(G). One of the factors specifically directs the Commission to "ensure that no cable operator or group of cable operators can unfairly impede, either because of the size of any individual operator or because of joint actions by a group of operators of sufficient size, the flow of programming from the video programmer to the consumer." 47 U.S.C. § 533(2)(A). In testing the effects of concentration in the cable television industry, this study has addressed and focused upon Factor A.

[3] The term "affiliate fee" refers to the payment made by an MVPD (e.g., cable operator or a direct broadcast satellite service provider ("DBS")) to a programming network in exchange for the right to carry the programming assembled by the network. For purposes of this study the term "programming network" is synonymous with the term "cable network."

represented the revenue the programming network would earn from selling national advertising time if a given MVPD carried it.[4]

In the naturally occurring market, buyers and sellers conduct trades through a sequential, multi-lateral bargaining process. Using a set of networked computers and computer software, buyers and sellers were given the opportunity to employ this process to negotiate mutually acceptable affiliate fees. Negotiations consisted of buyers submitting one or more bids to buy to sellers, and sellers submitting one or more offers to sell to buyers. A buyer's bid represented the maximum amount the buyer would pay a seller for the right to carry a programming network. A seller's offer represented the minimum amount for which the seller would grant the buyer the right to carry its programming network. The bids to buy and offers to sell were only disclosed to the parties to which they were directed. Participants were permitted to negotiate simultaneously with multiple parties and were permitted to conduct a trade at any time within a given trading period.

As in the actual marketplace, buyers and sellers earned revenue and generated profits based upon the decisions they made. Buyers earned revenue by negotiating affiliate fees that were less than their assigned willingness to pay for the programming networks. Sellers earned revenue by inducing buyers to pay them for the right to carry their network.[5] Sellers' affiliate revenue was augmented by a payment that represented the national advertising revenue they earn from completing trades with buyers. Buyers and sellers earned profits if the total revenue they earned from their trades exceeded their costs.

Experiments were conducted in a variety of horizontal concentration environments. In one environment the market consisted of two major cable operators (i.e., market shares of 44% and 39%) and one DBS operator. In another environment the market consisted of a single "large" cable operator (i.e., market share 51%) and several substantially smaller buyers. In yet another environment, the market consisted of two "moderately-sized" cable operators (i.e., market shares of 27% and 24%) and several

[4] In the naturally occurring market, in addition to affiliate fees, cable operators and programming networks negotiate over the number of "avails" which are assigned to the cable operator. In the current analysis parties only negotiate affiliate fees.

smaller buyers. These market environments were selected in order to test whether the relative and absolute size of a buyer, as measured by the number of MVPD customers served, has an impact on the affiliate fees negotiated by buyers and sellers. The largest buyer in each of these market environments served between 27% and 51% of the MVPD market.

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 included far fewer programming networks and MVPDs than there are in the actual market.[6] The experimental market also did not take into account the possibility that some large cable operators have attributable interests in programming networks. In addition, the experimental market did not include advertisers as experimental subjects, nor did it take into account that a programming network's bargaining power in an upcoming affiliate agreement negotiation may be enhanced if it is currently carried by an MVPD. These and other abstractions from features of the actual marketplace, and the relevance of some of these abstractions to the study's results, are discussed in more detail in Section 5.0, below. The absence of some of these characteristics may have affected the results of the study.

The major results of the experimental study are as follows.[7] 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." Economic efficiency measures the extent to which society makes the best use of its scarce resources.[8] In the current context, a

[5] One possible outcome of the negotiation process involves a seller paying a buyer for the right to acquire access to the buyer's attracted MVPD subscribers.

[6] The experimental market included four programming networks and, depending on the experiment, either three or five MVPDs.

[7] The results that immediately follow assume that a large buyer does not have the ability to impose a "Most Favored Nations" provision on sellers. An "MFN" guarantees that a large cable operator pays an affiliate fee, expressed on a per subscriber basis, that is no higher than the affiliate fee paid by a smaller cable operator. Results that apply to an environment where an MFN provision is imposed upon sellers by large buyers are discussed later in the Executive Summary.

[8] Trades buyers and sellers differed in the amount of surplus they generated. In the presence of limited channel capacity, societies' resources are best used when only those trades that generate the most surplus

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. By sending the wrong price signals regarding the value society places on particular types of programming offered by programming networks, a reduction in market efficiency could affect both the type and quality of television programming received by viewers. The reduction in market efficiency also indicates that there could be a decline in the benefit society receives from the resources used in creating advertisements.

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. A buyer's bargaining power was measured as the percentage of total surplus (i.e., gains from trade) captured by a buyer when completing a trade with a seller. 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.[9] The increase in affiliate fees paid by the DBS operator could result in an increase in the subscription fee paid by DBS customers.

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. The results indicate that the more popular programming networks were much more likely to earn a profit in each of the horizontal concentration environments.

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are consummated. There is nothing in the bargaining process involving cable programmers and MVPDs that ensures that only those trades that generate the most surplus are consummated.

[9] The analysis assumed that the MVPD market is served by a single DBS service provider whose market share is approximately equal to the sum of the shares possessed by Echostar and DirectTV. This assumption was made for analytical purposes and does not indicate or suggest that the FCC has made a decision regarding whether to permit a merger between these two entities.

These results are consistent with the result that shows that a seller's bargaining power is directly related to its popularity.

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. In these experiments buyers were allowed to trade with every seller. The results of these experiments differed markedly from experiments where buyers had 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. Thus, it appears that the bargaining process between MVPDs and programming networks fundamentally changes when the number of programming networks exceeds the MVPD's channel capacity. The resulting increase in the MVPD's bargaining power is due to the desire of programming networks to be carried by as many MVPDs as possible and their willingness to compete for the right to be carried by a given MVPD.[10]

Additional 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. Under an MFN, a common feature of today's market negotiations involving a large buyer, the programming network guarantees that the large buyer will not pay an affiliate fee that is higher than the affiliate fee (expressed on a per subscriber basis) paid by any smaller buyer. The results of these experiments differed in many respects from experiments where large buyers did not impose an MFN provision on programming networks.[11] For example, the experimental results indicate that the existence of an MFN provision increased the bargaining power possessed by the MFN-endowed buyers.[12] Furthermore, when negotiating with a popular programming network, the largest cable operator is able to negotiate lower affiliate fees (per subscriber) than small buyers (i.e., cable operators and DBS providers). A programming network's ability

[10] An increase in cable operators' bargaining power translates into a reduction in their affiliate fees.
[11] Under the MFN treatment, the rules of the experiment required that sellers provide the largest buyer the lowest affiliate fee (per subscriber).
[12] See buyer bargaining power data shown in Figures 3 – 5. The MFN-endowed buyers in the Low/High, High/High, High/Low concentration environments are Buyer #4, Buyer #3, and Buyers #1 and #2., respectively.

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.

In addition to the effect that a buyer's size may have on the negotiated affiliate fee, the degree of concentration among cable operators appears to affect the affiliate fees negotiated by buyers and sellers. For example, buyers appear to be 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.

The popularity of the programming network was also found to influence its ability to earn a profit in the different market concentrations examined in this study. According to the experimental data, the least popular programming networks incur losses in every market concentration examined. Among the market concentrations examined, the least popular programming networks incur the greatest losses in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers. The least popular programming networks incur the same level of losses in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS operator as in a market that includes two moderately-sized cable operators (i.e., market shares of 27% and 24%) and several smaller buyers.

A moderately popular programming network obtains the least amount of profits in a market that includes a single large cable operator (i.e., market share 51%) and several substantially smaller buyers. A moderately popular programming network obtains the same level of profits in a market that includes two major cable operators (i.e., market shares of 44% and 39%) and one DBS operator as in a market that includes two moderately-sized cable operators (i.e., market shares of 27% and 24%) and several smaller buyers. Very popular programming networks appear to be immune, over the range of horizontal concentrations considered in this study, to an increase in horizontal concentration. According to the experimental data, there is no substantial difference in

the profits earned by the most popular programming networks across the range of horizontal concentrations considered.

In parallel with our experimental analysis, we reviewed existing economic theories that might provide insights into the effect of horizontal concentration on the level of the affiliate fees negotiated by buyers and sellers. Particular attention was paid to several solution concepts found in cooperative game theory. Consistent with the experimental results, cooperative game solutions uniformly show higher payoffs to the buyers (i.e., lower affiliate fees paid to programming networks) when there is a channel capacity constraint versus when no such constraint exists. This and other results are discussed in Appendix A.

1. Introduction

This paper employs economic theory and experimental economics to shed light on the effect of changes in horizontal concentration among cable operators on the flow of programming to consumers. For purposes of the study, the flow of programming to viewers is impeded if a level of horizontal concentration adversely affects the profits earned by programming networks.[13] To this end, the study examines the relationship between different levels of horizontal concentration and the level of the affiliate fees buyers (i.e., cable operators and a DBS service provider) pay programming networks.[14] The paper also evaluates the effect of changes in horizontal concentration on economic efficiency. In the current context, economic efficiency measures the extent to which the gains of trade enjoyed by buyers and sellers are maximized. By sending the wrong price signals regarding the value society places on particular types of programming offered by programming networks, a reduction in market efficiency could, by reducing the rents obtained by programming networks, affect both the type and quality of programming received by television viewers.

[13] It is natural to emphasize existing programming networks since there is an existing flow of programming to viewers. In addition, there are publicly available cost and other data for existing programming networks.
[14] The cable network also generates revenue through the sale of national advertising. Using publicly available data, the analysis will make some assumptions regarding the size of such revenue. These assumptions will remain constant throughout the analysis in order to isolate the affect of horizontal concentration on the flow of programming to viewers.

The study incorporates numerous market features that may be relevant in considering the effects of horizontal concentration on the flow of programming to viewers.[15] First, affiliate agreements are negotiated in a sequential, multi-lateral bargaining environment where programming networks offer to license their assembled programming packages to a collection of MVPDs.[16] MVPDs, in turn, bid for the right to carry these packages of programs. Each side incurs costs that must be covered by earned revenues. Because the outcome of the bargaining process is not known in advance, all parties face financial uncertainty. One important research question involves examining whether the level of horizontal concentration among cable operators affects the ability of programming networks to complete a series of affiliate agreements that, taken together, enable them to recover their costs?

Second, MVPDs have the ability to choose both the type and number of cable networks to carry.[17] Does their ability to exercise such discretion affect the level of the affiliate fees MVPDs pay to programming networks?[18]

Third, programming networks vary in popularity, programming costs, and the amount of national advertising revenue they earn, and thus may be affected to different degrees by given levels of horizontal concentration among cable operators. Which programming networks will likely be affected most by increased levels of cable concentration?

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[15] An "affiliate agreement" specifies the terms and conditions under which cable operators have the authority to carry a cable network. The term "carriage agreement" is sometimes used to describe such an agreement.

[16] The term "sequential" refers to the fact that trades are not all completed at the same time. The term "multi-lateral" means that buyers and sellers typically conduct trades with multiple counterparties.

[17] *See* 47 U.S.C. § 544(b)(prohibiting local authorities from "establish[ing] requirements for video programming and other information services."); *see also Turner Broadcasting System, Inc. v. Federal Communications Commission*, 512 U.S. 622, 636 (1994) (subjecting cable operators' "must carry" requirements to intermediate scrutiny, in recognition of their First Amendment rights generally and editorial discretion in selecting programming particularly); *Time Warner Entertainment Co. v. FCC*, 240 F.3d 1126, 1129 (D.C. Cir. 2001) (remanding cable operators' horizontal and vertical ownership limits under the intermediate scrutiny standard, in recognition of the restraint such limits place on their ability to "reach the number of viewers to whom they can speak" and to "exercise their editorial control over a portion of the content they transmit," respectively.)

[18] For an analysis of some of the economic effects of cable operators' selection of programming networks, *see* Stanley Besen and Leland Johnson, "An Economic Analysis of Mandatory Leased Channel Access for Cable Television, Rand Corporation Report R-2989-MF (1982).

Fourth, programming networks negotiate affiliate agreements with both cable operators and DBS service providers. Does an increase in horizontal concentration among cable operators affect the affiliate fees paid by DBS service providers?

Fifth, some affiliate agreements may contain provisions that may affect the affiliate fees paid by MVPDs. For instance, an affiliate agreement between a large cable operator and a programming network may include an MFN clause. Do MFN provisions affect the level of the affiliate fees programming networks obtain from MVPDs?

This paper addresses these important questions in considering the implications of horizontal concentration in the MVPD industry. The paper is organized as follows: Section 2 discusses, in greater detail, the methodology of experimental economics and how the study was designed to examine the possible effects of horizontal concentration in the cable television industry. Section 3 presents the experimental design employed, including the set of market parameters used in the experimental design. Section 4 presents the results of the economic experiments. Appendix A analyzes the issue of horizontal concentration using principles from cooperative game theory. These principles are used to generate a set of predictions regarding the outcome of bargaining between buyers and sellers.

2. Methodology - Experimental Economics

Policymakers are sometimes asked to answer "what if" questions. For example, they may be asked to determine the effect of employing "circuit breakers" in equity markets or to determine the effect of a requirement that a carrier must file a rate change with a regulator before the rate change can become effective.[19] In many cases, the full consequences of a policy or rule may be unknown. As experimental economics involves the study of the economic interactions among market participants in a controlled laboratory setting, it offers policymakers a method by which to analyze potential effects of proposed regulations.

[19] See, R. King, V. Smith, A. Williams, and M. van Boening, " The Robustness of Bubbles and Crashes in Experimental Stock Markets," in *Nonlinear Dynamics and Evolutionary Economics*, (1993) edited by R. Day and P. Chen, Oxford University Press, pp. 183-200 and J. Hong and C. Plott, "Rate Filing Policies For Inland Water Transportation: An Experimental Approach," *Bell Journal of Economics*, vol. 13 (Spring 1982), pp. 1 – 19.

The experimental analysis began with the creation of an experimental market that parallels the market under investigation. In the current context, this market includes a set of human subjects that played the role of buyers and sellers. Sellers in our experimental market represented programming networks, and the buyers in our experimental market represented cable operators and a DBS provider. The trades that took place in this market were intended to represent the affiliate fees MVPDs agree to pay programming networks for the right to carry their programs.[20] The experimental analysis also required assigning sellers characteristics. Table 1 lists a set of characteristics that broadly define the four sellers (i.e., programming networks) included in the experiments.[21] The sellers' costs include monthly operating and programming expenses.

Programming Network	Monthly Costs (mil.)	CPM Prices ($) (30-second spot)	National Avails (Monthly)	Total Day Audience Ratings (%)
#1	1.5	1.00	11,004	.10
#2	1.7	1.00	11,004	.12
#3	10.4	2.34	9,092	.90
#4	39.1	6.99	11,782	1.50

Table 1: Seller Characteristics

Table 2 presents the average buyer's willingness to pay for the right to carry a given programming network.[22]

[20] The economic experiments allow sellers the opportunity to pay buyers for their carriage of their assembled programs.

[21] Data are derived, in part, from a sample of cable networks listed in Paul Kagan ("Economics of Basic Cable Networks 2002," Kagan World Media, September 2001). The sample of cable networks for programming network #4 consisted of A&E, CNN, Discovery Channel, Lifetime, MTV, and Nickelodeon. The sample of cable networks for programming network #3 consisted of the Cartoon Network, Court TV, and the Family Channel. The sample of cable networks for programming networks #1 and #2 consisted of the Great America Channel, BBC, Health Channel, Ovation, Outdoor Channel, and the Recovery Channel. In some instances, Paul Kagan did not provide estimates for certain data. In these instances an estimate of the missing data was generated.

[22] A buyer's willingness to pay for a given programming network is based upon an estimate of the additional subscriber and local advertising revenue it would obtain from carrying the programming network. An estimate of the local advertising revenue was based on estimates of the programming network's local audience ratings, CPM prices, and the number of local avails.

Programming Network	Willingness to Pay ($/Subscriber/Month)
#1	.090
#2	.094
#3	.393
#4	.647

Table 2: Average Buyer's Willingness to Pay

Buyers were also assigned a set of costs that they had to cover in order to stay in business. Table 3 presents the total monthly costs that were assigned to cable operators and the DBS operator. [23] The analysis assumed that a vast majority of the buyer's costs were already covered by an existing flow of revenue. Thus, the costs listed in Table 3 represent the costs the buyer must cover through its trades with the sellers included in the experiments. These costs include sales/administrative and interest expenses, but excluded programming expenses.[24]

Buyers	Monthly Costs (mil.)
Cable Operators	20.1
DBS Operator	3.4

Table 3: Buyer Monthly Expenses

In our experimental market, buyers and sellers were allowed to complete a series of trades with each other. Participants in the experimental market faced incentives similar to those that participants in the naturally occurring market face**.** We established such incentives for sellers by allowing them to retain the money they obtain from any trade. This money included the fee that buyers paid sellers for the right to carry their network and the revenue the seller would earn from selling national advertising time.

[23] These data are based upon information obtained from 10K reports for Adelphia, Classic, Comcast, Cox, Insight, and Mediacom and from Paul Kagan, "The State of DBS 2001."
[24] The analysis assumed that the revenue generated from the services provided by the cable operator already covered the buyer's existing programming expenses.

The level of advertising revenue varied across sellers in the experiments in order to mirror the variation in national advertising revenue earned by different programming networks in practice.[25] The amount of national advertising revenue earned by a seller varied directly with the number of subscribers served by the buyer. The larger the buyer, the greater the national advertising revenue earned by the seller.

We established incentives for buyers by guaranteeing them a sum of money for each trade they conducted. The guarantee can be viewed as a secondary market in which only buyers can participate.[26] The guaranteed money defines the maximum amount the buyer was willing to pay for the right to carry a particular network. Buyers earned money by acquiring the right to carry a programming network for a price that is less than the sum of money the buyers are guaranteed. The maximum amount the average buyer is willing to pay for each programming network is shown in Table 2.

In the naturally occurring market, MVPDs and programming networks conduct trades through a sequential, multi-lateral bargaining process. This market environment was simulated, in part, through the use of a data network, a collection of computer terminals, and computer software. In this experimental market, buyers and sellers were able to place bids to buy and offers to sell to each other, respectively.[27] A buyer's bid represented the maximum amount the buyer was willing to pay a seller for its set of programs. A seller's offer represented the minimum amount the seller was willing to receive in exchange for the buyer's right to carry its programs. Buyers and sellers "negotiated" with each other by sending each other bids to buy or offers to sell, respectively.[28] Buyers and sellers were free to select the entities with whom they negotiated, the manner in which they negotiated (e.g., does a buyer respond to a seller's ask by placing a bid?), and the order in which they negotiated with entities on the opposite side of the market.[29] Importantly, all revised bids and asks had to satisfy a "bid/ask" improvement rule. Under that rule, a revised bid placed by a buyer to a given

[25] The financial payment the seller received from conducting a trade with a specific cable operator was calculated using the data shown in Table 1.
[26] In this case, the buyer knew with certainty the value the secondary market places on the "carriage right."
[27] In the naturally occurring market, in addition to affiliate fees, cable operators and cable networks negotiate, among other things, over the number of avails which are assigned to the cable operator and the length of the affiliate agreement.
[28] One method of negotiation was simply not to respond to a party's bid or ask until such time as the bid and ask is acceptable.

seller had to be greater than the buyer's initial bid, while a revised ask submitted by a seller to a given buyer had to be less than the seller's initial ask.

Each experiment consisted of several "experimental sessions" in which a particular group of subjects participated. Each experimental session consisted of multiple "trading periods." A "trading period" is defined as a period of time in which buyers and sellers had the opportunity to negotiate and conduct a set of trades. A buyer earned a profit in each trading period if the revenue it earned in that trading period exceeded its assigned costs. A seller earned a profit in each trading period if the revenue it earned exceeds its assigned costs.[30] Finally, the experiments varied according to a systematic change in a set of "treatment variables." A "treatment variable" is a variable whose value is established by the experimenter and which is critically related to the economic and policy questions under investigation. One important treatment variable is the level of horizontal concentration among the MVPDs.[31] Table 4 shows the number of subscribers and the share of the MVPD market served by each buyer across the different horizontal concentration treatments.

Buyers	MVPD Subscribers (mil.)			Market Share (%)		
	Low/ High	High/ High	High/ Low	Low/ High	High/ High	High /Low
Cable Op. 1	20	11	32	24.4	13.4	39.0
Cable Op. 2	12	9	36	14.6	11.0	43.9
Cable Op. 3	14	42	*	17.1	51.2	*
Cable Op. 4	22	6	*	26.8	7.3	*
DBS Op.	14	14	14	17.1	17.1	17.1

Table 4: Horizontal Concentration Treatments

[29] Buyers are prevented from speaking to sellers, and vice versa. All communications are non-verbal.
[30] The prices at which trades occur are not disclosed to other participants
[31] Another important treatment variable included whether MVPDs are prevented, because of channel capacity constraints, from conducting trades with each programming network.

The term "Low/High" refers to a low level of horizontal concentration and a high number of buyers. The term "High/High" refers to a high level of horizontal concentration and a high number of buyers. And, finally, the term "High/Low" refers to a high level of horizontal concentration and a low number of buyers. One objective in selecting the different concentration levels was to obtain data on the outcome of the bargaining game among buyers and sellers across a variety of different environments. Another objective was to obtain bargaining outcome data involving a wide range of different "sized" buyers.

3. Experimental Design

The analysis of how a given level of horizontal concentration among cable operators may affect the flow of programming to viewers requires a carefully constructed "experimental design." An experimental design consists of a set of environments in which the experiments take place. The purpose of the experimental design is to create a set of data that shed light on the hypotheses under investigation. Such data are created in part through the specification of a set of "treatment variables." A treatment variable is a characteristic of the environment that is under the control of the experimenter.

3.1 Treatment Variables

A total of 25 experimental sessions were completed involving 200 human subjects.[32] The experimental design consisted of a number of treatment variables leading to what can best be described as a 3 x 3 experimental design. Table 5 depicts the experimental design and the number of sessions (i.e., independent observations) conducted under each treatment condition.

[32] Due to a software error, in one session involving the limited capacity treatment buyers were able to conduct more than three trades. The results of this session are not reported here.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	2	5*	2
High Concentration/High Numbers	2	4	2
High Concentration/Low Numbers		5*	2

Table 5: Horizontal Concentration Treatments
(One observation under each of these treatments used a parameter set slightly modified from the one reported here)[33]

The primary treatment variable was the level of horizontal concentration among buyers, where concentration is measured as a percentage of the total MVPD subscribers served by a particular buyer. Because the number of buyers may affect bargaining outcomes, the number of buyers also varied across some of the treatments. The following three treatment conditions were implemented:

- *Low Concentration/High Numbers* (Low/High). There were five (5) buyers and all served between 14.6% and 26.8% of the MVPD subscriber market.
- *High Concentration/High Numbers* (High/High). There were five (5) buyers. One buyer served 51.2% of the MVPD subscriber market. All other buyers served between 7.3% and 17.1% MVPD subscriber market.
- *High Concentration/Low Numbers* (High/Low). There were three (3) buyers. Buyers served 39%, 43.9%, and 17.1% of the MVPD subscriber market.

[33] Interested parties can observe the complete set of parameters by downloading a file labeled Parameters.xls from the following website addresses: http://www.fcc.gov/mb and http://www.fcc.gov/opp.

It is commonly believed that bargaining power increases with the size of the buyer. Based on this, the collective bargaining power of buyers should be the lowest in the Low/High treatment and the highest in the High/Low treatment. In addition, we should observe that large buyers possess greater bargaining power than small buyers. The treatments also permit an evaluation of the conjecture that the size distribution of buyers may affect the flow of programming to viewers. For example, the treatments allow an examination of whether an environment where a single firm that serves 51.2% of the MVPD market is more likely to impede the flow of programming than an environment where the two largest buyers have a MVPD market share of 39.0% and 43.9%, respectively.[34]

An additional treatment variable examined was the inclusion of a capacity constraint on the buyers. In some of the experimental sessions we did not restrict buyer purchases. Thus, they could trade with all four sellers.[35] In most other experimental sessions, buyers were allowed to conduct a trade with only three sellers. This treatment reflects the fact that most cable operators have diminishing marginal utility (i.e., profitability) from signing additional affiliate agreements with cable networks.[36] We denote the sessions without the capacity restriction as UNCAP and those with the restriction as CAP.

The final treatment variable was the inclusion of a "Most Favored Nation" ("MFN") clause in the CAP sessions. In practice, an MFN guarantees that a large cable operator pays an affiliate fee (per subscriber) that is no higher than the affiliate fee paid by a smaller buyer. In the MFN sessions any buyer with a market share greater than 26.8% was granted a "lowest price guarantee" for all trades she conducted.[37] If, at any time during the trading period, a seller, who had previously conducted a trade with a buyer with MFN status, subsequently traded with another buyer at a lower per subscriber price, then the buyer with the MFN status would be given the lower per subscriber

[34] This analysis involves comparing the results obtained in the High/High and High/Low environments.
[35] In this case the efficient outcome occurs when buyers trade with all sellers.
[36] See Appendix A for a discussion of this effect. One approach to generating this effect is to prevent buyers from completing trades will all sellers. An alternative approach involves providing buyers with a set of valuations for individual sellers as well as valuations for combinations of sellers. Our desire to simplify the analysis required the adoption of the former approach.
[37] An MFN may be "assigned" to buyers in a more complex manner in the actual market.

price.[38] We attach the term MFN to any experimental session that includes this requirement.

An MFN restriction may have a substantial effect on the affiliate fees cable networks receive from cable operators. Unfortunately, economic intuition provides very little guidance on what that effect may be. On the one hand, an MFN provision may provide cable networks the ability to credibly resist an attempt by a non-MFN endowed cable operator to obtain a lower affiliate fee.[39] If this effect predominates, an MFN may enhance a cable network's profitability. The extent to which it may enhance profitability would depend upon the number of MVPD subscribers that are served by an MVPD service provider that is not MFN-endowed. The greater this number, the greater the percentage of the MVPD marketplace over which a programming network can credibly resist a demand for a low affiliate fee. On the other hand, by reducing the range of affiliate fees over which the programming network is willing to trade, an MFN provision may reduce the number of affiliate agreements a cable network completes. The revenue the cable network foregoes due to the reduction in the number of affiliate agreements it completes may be greater than the revenue it obtains from inducing some buyers to pay a higher affiliate fee.

3.2 Experiment Institution

Between 7 and 9 subjects participated in each experimental session. The subjects were undergraduates and graduate students from Penn State University. All subjects were paid $7 for showing up on time for the session. Subjects were randomly assigned a role of either a buyer or a seller. Subjects read instructions prior to each session (See Appendix B). They then answered a set of questions designed to test their understanding of the instructions. Once all subjects had successfully answered these questions, a

[38] One difference between the MFN and No MFN treatments is that transaction prices in the No MFN treatment were expressed in experimental dollar units, while transaction prices in the MFN treatment were expressed on a experimental dollar per subscriber basis. The prices can be compared by dividing the non-MFN transaction prices by the number of subscribers served by the particular buyer.

[39] Recently, the YES Network denied Cablevision's demand for a lower affiliate fee based on the notion that a lower fee would trigger an MFN provision. All things being equal, the more successful this resistance, the greater the cable operator's incentive to grow. The cable operator's incentive to increase in size is only enhanced by the fact that a large cable operator may be able to impose an MFN provision on all the cable networks it carries.

practice trading period was conducted. A trading period is simply a period of time within which buyers and sellers have the opportunity to conduct a trade. Trades in each trading period were conducted using experimental dollars, which converted at the end of the each experimental session at the rate of .002 experimental dollars to one U.S. dollar. Unlike in the non-practice trading periods, participants could not earn/incur profits/losses during the practice period. Each experimental session was comprised of eight trading periods. The eight trading periods that comprise an experimental session employ the same subjects, parameters, and trading institution. With the exception of the subject's session earnings, all variables of interest are reset at the beginning of a new trading period. Because the participants incurred unavoidable costs in each trading period, we chose to give each participant "working capital" (i.e., an initial endowment of experimental dollars) to defray potential losses. Subjects were informed that they would be asked to leave the experimental session immediately if they incurred losses that exceeded their working capital.[40] Sellers 1 and 2 were endowed with 4,000 experimental dollars in working capital and the rest of the participants were given 2,000 experimental dollars. Sellers 1 and 2 were given more working capital since they were expected to have a more difficult time earning profits than other sellers. It is worth noting that Sellers 1 and 2 could make the maximum possible losses in every trading period and still not completely deplete their working capital. This allowed us to observe market negotiations and dynamics even in situations where participants might be incurring significant losses.

The trading institution can best be described as a decentralized bargaining market (DBM). In a DBM, buyers and sellers negotiate terms of trade in a pair-wise, private fashion. Participants could only submit a bid to buy or an offer to sell to one individual at a time.[41] Each participant was only aware of the bids to buy and offers to sell to which he or she was personally involved.[42] Each buyer (seller) could begin a negotiation with a particular party, decide not to conduct a trade at some point, negotiate with and complete

[40] Only in one instance did a participant face this situation. In that case, the seller (Seller 4) noted that he made an error and, since it was clear to all parties that he could easily make up the losses, the subject was allowed to continue.

[41] This did not prevent the participant from sending the same bid or ask to multiple entities.

[42] There are instances where participants obtained additional market information. In the CAP treatment, a buyer's standing bids would disappear from a seller's screen when the buyer completed three trades. Thus, a seller could potentially see when a buyer had completed three trades. Also, MFN-endowed buyers

a trade with another party, and then later resume negotiations with the initial party. Each buyer (seller) could trade with each seller (buyer) at most one time in a trading period. Figure 1 depicts the software interface sellers used to negotiate with buyers.

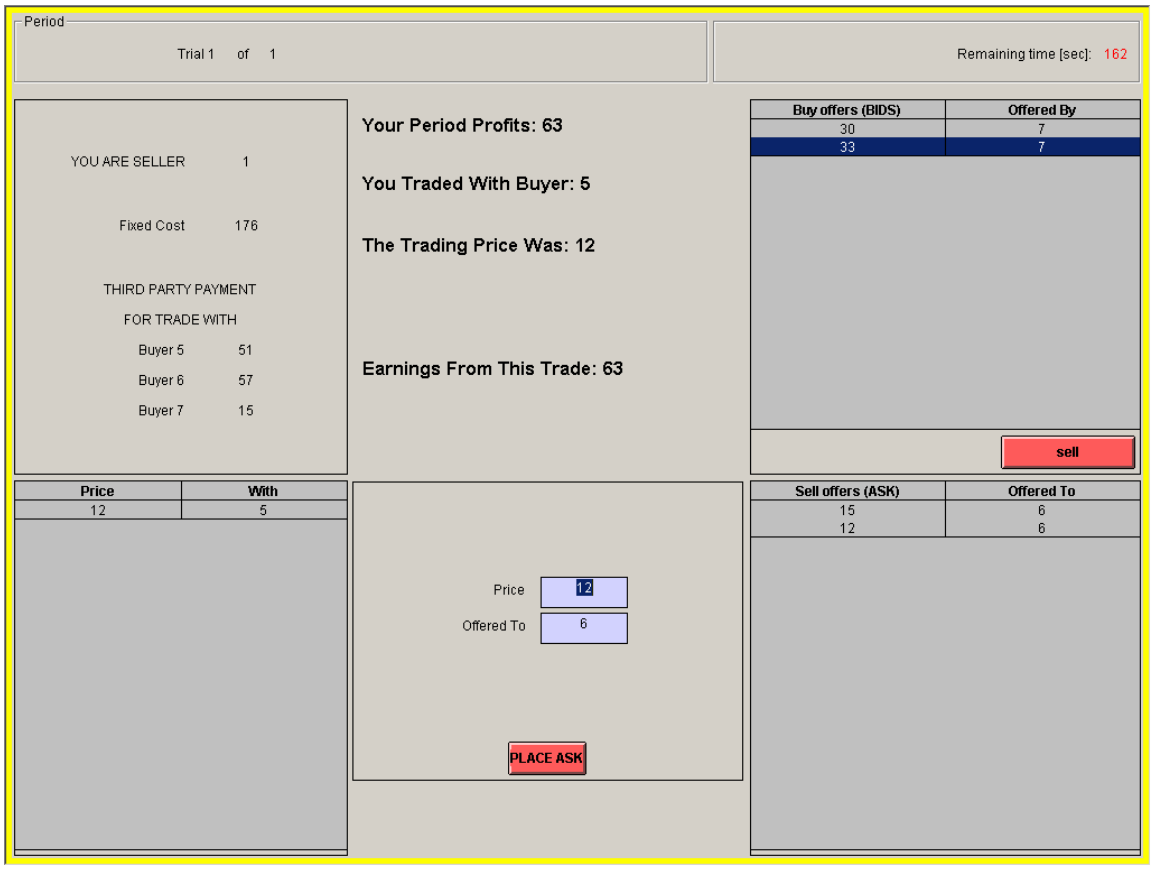

Figure 1: A Typical Seller Screen

The seller's screen is comprised of six areas. The upper left area shows the seller's assigned level of unavoidable costs as well as the level of the third party payments the seller would receive from conducting a trade with any particular buyer. The lower left corner shows the set of trades the seller has already conducted in the trading period. For example, the seller has already traded with Buyer 5 at a price of 12 in the current trading period. The upper center area shows the seller's most recent trade, its

obtained additional price information when sellers conducted trades with non-MFN-endowed buyers that triggered the MFN provision.

earnings from that trade, and total profit in the period.[43] The lower center area is where the seller creates an "ask" (an offer to sell) and where the seller can identify to whom the ask should be electronically submitted. The PLACE ASK button executes the entry. At that time, a variety of checks are run to make sure the ask is valid.[44] In this instance, the seller has placed an ask of 12 to Buyer 6. The upper right area shows the bids (offers to buy) that have been offered by various buyers to this seller. The left column indicates the amount of the bid and the right column is the identity of the bidder. As shown, Buyer 7 has recently raised its bid from 30 to 33. A seller can complete a trade with a buyer by accepting the buyer's bid.[45] A seller accepts a buyer's bid by moving a cursor in a manner that highlights the bid he wishes to accept. The sell button executes the trade.[46] The lower right area shows all asks this seller has offered during the trading period. The left column indicates the amount of the ask and the right column indicates the identity of the bidder to whom the ask was offered. As shown, the seller has recently lowered its ask that it submitted to Buyer 6 from 15 to 12.

Figure 2 depicts a screenshot of the software interface used by the buyer. It is similar to the seller's screen except that the lower center portion of the screen is where the buyer creates a "bid" to buy and where the buyer can identify to whom the bid should be electronically submitted. The upper right area lists all bids the buyer has placed in the trading period. As shown, the buyer has placed a bid of 100 to Seller 2 and a bid of 55 to Seller 3. The lower right area shows all the asks that have been sent to the buyer. A buyer can complete a trade with a seller by accepting the seller's ask.[47] A buyer accepts a seller's ask by moving a cursor in a manner that highlights the ask he wishes to accept. In this case, the buyer has yet to receive an ask from a seller. The buy button executes the trade.

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[43] Depending on the experimental session, the "Your Period Profits" calculation was either net of the seller's costs or only reported the sum of earnings from all trades. In either case, the participants were informed of the substance of the calculation and were advised to also complete similar calculations by hand.

[44] The checks determine whether a trade satisfies the set of constraints that exist in the market. For example, a check is completed to determine if the seller has already traded with the buyer. A check is also completed to determine whether the submitted bid/ask satisfies the bid/ask improvement rule.

[45] A seller can also complete a trade with a buyer when the latter accepts the seller's submitted ask.

[46] The execution function lowers the likelihood that the subject completes a trade in error.

[47] A buyer can also complete a trade with a seller when the latter accepts the buyer's submitted bid.

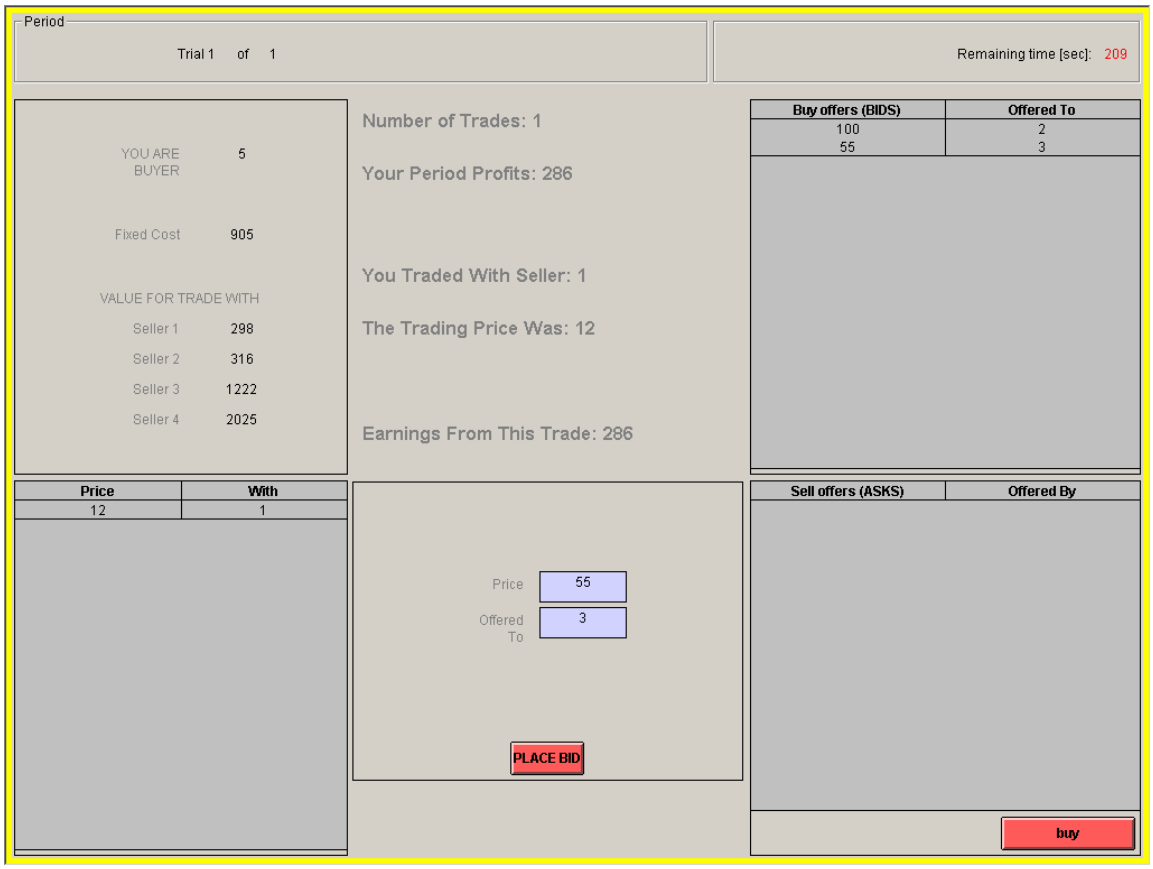

Figure 2: A Typical Buyer Screen

At the end of a trading period, participants were given time to calculate and record their profits. When they were ready to continue, participants would press a CONTINUE button at the bottom of the screen. The next trading period would begin once all subjects were ready. At the end of the eighth trading period, subjects were asked to calculate their total profits – the sum of their profits from the eight trading periods plus their working capital – and to multiply that amount by the conversion rate of .002.[48] Subjects were then paid their total earnings in private and in cash. They were then free to go.

[48] A conversion rate of .002 indicates that participants were paid $.002 for every experimental dollar they earned in the experiment. Some early sessions used a conversion rate of .003.

3.3 Performance Measures

This section discusses and formally defines several methods of evaluating market performance. Let $i=1,2,...,n$ be the set of buyers and $j=1,2,...,m$ be the set of sellers. Let TPP_i^j be the third party payment seller j receives from trading with buyer i. Let WTP_i^j be the willingness to pay of buyer i for a trade with seller j. Let P_{ij} be the price (assumed positive) that buyer i pays seller j. Let $x_{ij}=1$ if buyer i trades with seller j and 0 otherwise. Finally, let C_i and C_j represent the unavoidable costs of a buyer i and a seller j respectively.

> *Economic Efficiency*: Economic efficiency measures the extent to which society makes the best use of its scarce resources. In the current context, society obtains the largest benefit when buyers and sellers conduct a set of trades that maximize the sum of the gains from trade enjoyed by buyers and sellers. Efficiency is measured as the ratio of the sum of the gains enjoyed by trading participants divided by the maximum possible gains from trade.

The set of economic efficient allocations (under the CAP treatment) can be determined by solving the following maximization problem:

$$\begin{aligned} &\max \sum_{i=1}^{n}\sum_{j=1}^{m} x_{ij}\left(WTP_i^j + TPP_i^j\right) \\ &s.t. \\ &\sum_{j=1}^{m} x_{ij} \le 3 \\ &x_{ij} \in \{0,1\} \end{aligned} \qquad (5.1)$$

Let S^* be the total profits under an efficient allocation. That is, S^* represents the value of the objective function (5.1) at the maximum minus the sum of unavoidable costs. Note that due to the capacity constraints, this value can vary from treatment to

treatment. Also, more than one allocation can be economically efficient.[49] The efficient allocation under the UNCAP treatment is simply program (5.1) without the capacity constraint. It follows that x_{ij}=1 for all i and j. Table 6 lists the efficient surplus in the treatments examined.[50] Under the CAP treatments, the efficient allocation always requires that each buyer trades with Sellers 3 and 4 and either Seller 1 or 2.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	8217	8650	8650
High Concentration/High Numbers	6464	8644	8644
High Concentration/Low Numbers	*	8649	8649

Table 6: Efficient Total Surplus (S^*)

Under an efficient allocation, society is obtaining the most benefit from its scarce resources. In the presence of a capacity constraint, an efficient allocation means that trades have occurred between the set of buyers and sellers whose participation in a trade creates the greatest economic surplus. In the absence of a capacity constraint, an efficient allocation means that all feasible trades have occurred. In the presence or absence of a capacity constraint, an inefficient allocation means that society has left "money on the table." In most settings, a profit maximizing buyer (or seller) with market power will lead to an inefficient allocation. For example, a monopolist restricts output below the

[49] Under the parameters used here, the efficient allocation is unique for all treatments except the Low/High CAP treatment where Buyer 1 is indifferent between buying from Seller 1 or 2.

[50] The efficient surplus in the UNCAP treatments is lower due to small, inconsequential variations in the parameters used and the lack of a DBS buyer in the High/High UNCAP treatment. In addition, the first two of the Limited Capacity-No MFN experiments had slightly different parameter values than the remaining 12 experiments.

competitive level in order to maximize profits. Likewise, the Cournot equilibrium (see Appendix A) predicts some efficiency losses for any number of firms. Therefore, if one observes efficiency declines in treatments with higher concentration (or other features), then one could argue that the treatment is contributing to an overall loss in economic surplus. In order to construct a measure that is comparable across treatments, we compare the surplus of the observed allocation with S^* from above. Let x' be the binary variable reflecting observed trades in a particular trading period, and let S represent the total profits (i.e., gross surplus minus costs) resulting from these trades.

$$S = \sum_{i=1}^{n}\sum_{j=1}^{m} x_{ij}^{'}\left(WTP_i^j + TPP_i^j\right) - \sum_{j=1}^{m} C_j - \sum_{i=1}^{n} C_i \qquad (5.2)$$

Our efficiency measure is then simply $E = S / S^*$.

Bargaining Power: In the current context, a buyer's bargaining power measures the percentage of the total surplus available from a given trade that accrues to a buyer. One objective of the experiments is to determine if larger buyers possess greater bargaining power than smaller buyers. More generally, we wish to determine whether the collective bargaining power of buyers is greater in more highly concentrated markets than in less highly concentrated markets. The study employs the following measure of Buyer Bargaining Power ("BBP") for each completed trade.

$$BBP_i^j = \frac{WTP_i^j - P_{ij}}{WTP_i^j + TPP_i^j} \qquad (5.3)$$

This measure normalizes the surplus enjoyed by the buyer by the total surplus available from the trade. A buyer may conduct several trades in a given trading period. Under this condition, the buyer's bargaining power over all trades made in a given trading period is defined by:

$$BBP_i = \frac{\sum_j \left(WTP_i^j - P_{ij} \right)}{\sum_j \left(WTP_i^j + TPP_i^j \right)} \qquad (5.4)$$

where each summation is taken over all sellers *j* which a given buyer trades with in a given trading period.[51]

BBP does not, by itself, provide a complete picture of the price setting capabilities of buyers. For example, BBP does not take into account the number or "quality" of trades conducted by a buyer.[52] For example, a buyer whose BBP value is .70 and who trades with only a single small seller should be differentiated from a buyer whose BBP value is also.70 but who trades with two large sellers. The following measure takes into account both the number and the quality of trades conducted by the buyer.

Buyer Surplus: Defined as the amount of surplus earned by a buyer *i* divided by the maximum gross surplus, GS_i^* that buyer *i* could obtain under an efficient set of trades.

$$BS_i = \frac{\sum_{j=1}^{m} x_{ij}^{'} \left(WTP_i^j - P_{ij} \right)}{GS_i^*} \qquad (5.5)$$

Similarly, the *Buyers' Surplus* for all buyers in a given trading period can be defined as:

$$BS = \frac{\sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij}^{'} \left(WTP_i^j - P_{ij} \right)}{GS^*} \qquad (5.6)$$

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[51] Simple algebra shows that this measure can also be expressed as a weighted average of terms BBP_i^j with weights given by the total surplus possible in a given trade divided by the total surplus over all trades in the period.

[52] The word "quality" refers to the size of the economic surplus generated from a trade. The surplus generated from a trade involving a given cable operator and a popular programming network is greater than the surplus generated from a trade involving the same cable operator and a less popular programming network.

where $GS^* = S^* + \sum_{j=1}^{m} C_j$. A simple algebraic argument shows that *BS* can be expressed as a weighted sum of individual buyer's surpluses, as $BS = \sum_{i=1}^{n} \frac{S_i^*}{S^*} BS_i$.

Calculating equation (5.5) for each buyer and then taking the average across all buyers provides a measure of the average buyer's surplus in a given treatment.

Seller Profits/Losses: Sellers have been assigned non-avoidable costs that must be recovered in order for them to earn a profit in any trading period. The assignment of costs introduces the possibility that sellers may incur losses during the experiments. The study measures both the profits and losses earned/incurred by all sellers. Because seller profit/losses are sensitive to the parameter values employed in the experiments, particular attention is given to changes in these values across treatments.[53]

4.0 Experiment Results

The results of the economic experiments for each of the different treatments (e.g., Low Concentration/High Number; CAP No MFN) are organized according to the selected performance metrics (i.e., economic efficiency, buyer bargaining power, seller profits/losses). In the limited capacity, No MFN environment a non-parametric test was used to examine whether observed differences in treatment outcomes were non-random. This same procedure was not performed in the limited capacity, MFN environment because of the absence of a sufficient number of observations (i.e., sessions). The study employed regression analysis to the data generated in the limited capacity, MFN environment. In this case, an individual trade between a buyer and a seller is the unit of observation.[54] Finally, because participants may require a few trading periods to become fully accustomed to the experimental environment, it is customary to ignore several

[53] The study uses the term "net surplus" to describe the financial position of a participant following the completion of a trading period. A participant earns a profit when its net surplus is positive and incurs a loss when its net surplus is negative.

initial trading periods when conducting statistical tests on experimental data. All statistical tests conducted in this section are based upon data for trading periods 5 – 8.

4.1 Economic Efficiency

Table 7 reports the average efficiency levels for all treatments, where the average is calculated across trading periods 5 – 8 and all experimental sessions.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	94.9%	93.0%	84.5%
High Concentration/High Numbers	80.5%	83.6%	83.0%
High Concentration/Low Numbers		89.0%	89.2%

Table 7: Average Economic Efficiency (Trading Periods 5 - 8)

Result 1: For the CAP No MFN treatment, average economic efficiency is lowest under the High/High treatment. The difference between the efficiency value observed in the High/High and Low/High treatments is statistically significant at standard levels of acceptance. The difference in efficiency levels observed in the High/Low and Low/High treatments is not statistically significant at standard levels of acceptance. Under the channel capacity constraint (CAP) and No MFN treatment, a Wilcoxon-Mann-Whitney test finds that there is a statistically significant difference in the efficiency levels observed in the High/High treatments compared with the Low/High

[54] As discussed in Section 4.5, some of the regression models displayed a property that weakens the reliability of the statistical tests.

treatments (p-value = .0952). This result suggests that, under the examined treatments, an increase in concentration led to a reduction in economic efficiency. However, a Wilcoxon-Mann-Whitney test finds that there is no statistically significant difference in the efficiency levels observed in the Low/High and High/Low treatments (p = 0.2103), nor is there a statistically significant difference in the efficiency levels observed in the High/High and High/Low treatments (p = 0.1429).

Result 2: A more efficient allocation is likely to occur in the UNCAP sessions. The average efficiencies under the UNCAP treatments are somewhat higher than those obtained in the CAP treatments. This effect can be observed by comparing the number of times the UNCAP and the Cap No MFN treatments generated an efficient allocation (100%). Under the UNCAP treatment, 12 out of 32 (38%) trading period results are economically efficient. The number of trading periods that generated an efficient allocation under the CAP No MFN treatments is 15 out of 112 (13%), while there were no instances of an efficient outcome in any of the 48 trading periods conducted under the CAP MFN treatments.

Result 3: The MFN sessions generate similar efficiency levels to the No MFN sessions in the more concentrated treatments, and lower efficiency levels in the low concentrated treatment. The absence of sufficient data made it impossible to perform the standard statistical test to determine if the observed difference was statistically significant.

4.2 Buyer's Bargaining Power

An important policy issue is whether a buyer's bargaining power increases with an increase in the buyer's size, where size is measured by the share of the MVPD market served. A trade between a cable operator and a cable network creates an economic surplus. This surplus is composed of the amount of money the cable operator is willing to pay to carry the cable network and the amount of money the cable network earns from selling national advertising time. The affiliate fee agreed to by the two parties determines the share of the economic surplus that is assigned to each party. An affiliate fee that is

equal to the cable operator's willingness to pay effectively assigns the entire economic surplus to the seller. An affiliate fee in which the cable network pays the cable operator an amount that is equal to the cable network's national advertising revenue effectively assigns all of the economic surplus to the cable operator. For a given trade, the buyer's bargaining power is defined as the share of the economic surplus assigned to the buyer. Buyers will conduct multiple trades. A buyer's average bargaining power over the conducted trades is equal to the arithmetic average of the buyer's bargaining power over those trades. The experimental sessions typically had different subjects playing the role of a given buyer. The average buyer bargaining power is simply the average of these "averages." Figures 3 - 5 show the average buyer's bargaining power for the last four trading periods for each concentration treatment.

Figure 3: Buyer Average Bargaining Power (Periods 5-8)
Low/High Concentration Treatment

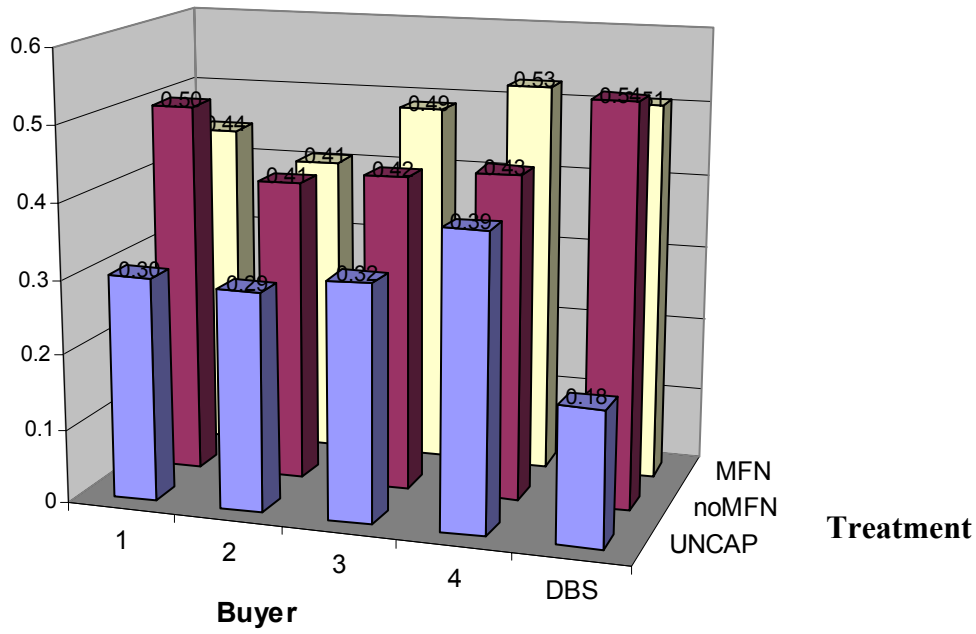


Figure 4: Buyer Average Bargaining Power (Periods 5-8) High/High Concentration Treatment

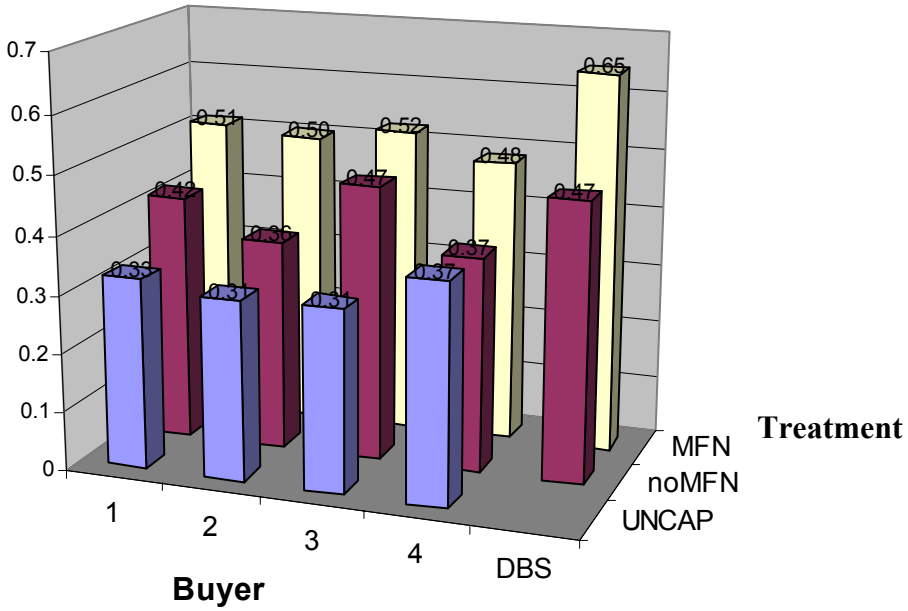
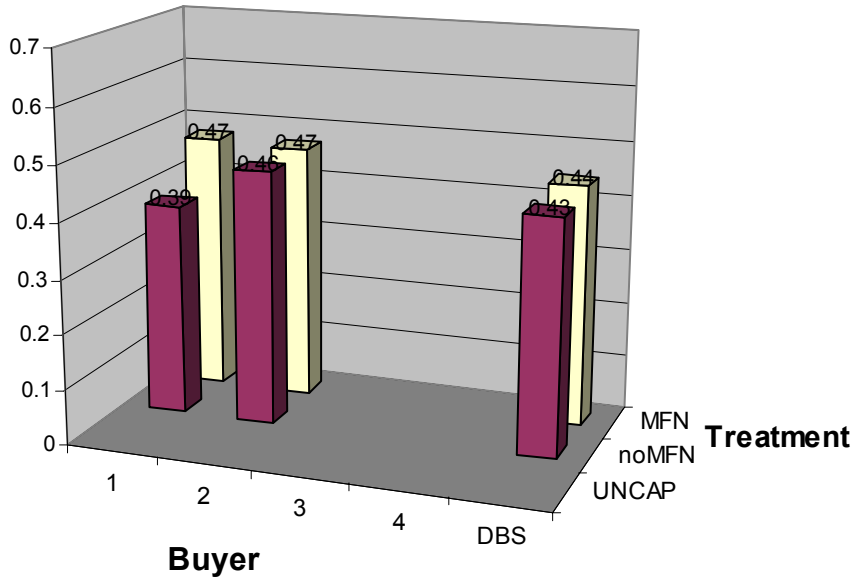


Figure 5: Buyer Average Bargaining Power (Periods 5-8) High/Low Concentration Treatment



Result 4: The buyer's average bargaining power is substantially higher in the CAP No MFN treatment than in the UNCAP No MFN treatment. With only one exception, the average buyer's bargaining power was greater in the CAP No MFN treatment than in the UNCAP No MFN treatment.[55] This result indicates that the cable operator's bargaining power and, thus, its ability to negotiate favorable affiliate fees with cable networks, is substantially enhanced when the number of cable networks is greater than the cable operator's channel capacity.[56]

Result 5: The buyer's average bargaining power is generally highest in the CAP MFN treatment. In all but two cases, the average buyer's bargaining power is greatest under the CAP MFN treatment. This difference is most pronounced in the high concentration, high numbers treatment. The relative bargaining power of the negotiating parties determines the level of the affiliate fee. An MFN clearly alters the relative bargaining power between the MFN endowed buyer and a seller. It may also affect the bargaining power of the non-MFN endowed buyers. For example, in the Low/High concentration treatment, the second and third largest buyers had lower bargaining power under the MFN. However, in the High/High concentration treatment, the DBS operator had increased bargaining power under the MFN.

Table 8 lists the average buyer's bargaining power aggregated across different buyers for the final four trading periods (i.e., Periods 5-8) for each concentration level in each of the treatments.[57]

[55] That one instance occurred with Buyer #4 in the High/High concentration treatment. In this case, there was no difference in Buyer #4's bargaining power.
[56] See "Who is Watching This Stuff," Wall Street Journal, Section B, April 24, 2002 for a brief discussion of the effect of channel rationing on the business models of cable networks.
[57] Table 12 contains a single value for each concentration treatment. This was accomplished by performing an additional average calculation involving the different buyers in each concentration treatment.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	29.6 %	46.0 %	47.4 %
High Concentration/High Numbers	29.1 %	41.9 %	53.5 %
High Concentration/Low Numbers	*	42.6 %	46.1 %

Table 8: Average Buyer's Bargaining Power (Trading Periods 5 - 8)

Result 6: The average buyer's bargaining power in the CAP No MFN treatments is not related to the level of horizontal concentration. In the experimental sessions performed under the CAP No MFN treatment, there is no significant difference in the average buyer's bargaining power across concentration treatments. A Wilcoxon-Mann-Whitney test finds that there is no statistically significant difference in the average buyer's bargaining power in the Low/High versus High/High treatments (p-value = 0.3651), nor is there a statistically significant difference in the average buyer's bargaining power in the High/High and High/Low treatments (p-value =.5476). Finally, the same test finds that there is no statistically significant difference in the average buyer's bargaining power in the High/Low and Low/High treatments (p-value = 0.3452).

The process of averaging bargaining power across buyers may hide effects that can only be observed with less aggregated data. Thus, we examined some possible relationships employing less aggregated data. Table 9 lists, for the CAP No MFN treatment, the share of the MVPD market served by the largest cable operator in the

different concentration treatments and the bargaining power displayed by that cable operator.[58]

Treatment	Largest Buyer MVPD Market Share	Bargaining Power
Low Concentration/High Numbers	26.8 %	43.4 %
High Concentration/High Numbers	51.0 %	47.0 %
High Concentration/Low Numbers	43.9 %	46.3 %

Table 9: Largest Buyer Market Share and Bargaining Power CAP No-MFN Treatment (Periods 5 –8)

Result 7: There is no statistically significant difference in the bargaining power of the largest buyer in each of the three concentration treatments. A Wilcoxon-Mann-Whitney test found no statistically significant difference in the bargaining power possessed by a cable operator that controls 51% of the MVPD market and a cable operator that controls 26.8% of the MVPD market (p-value = .4524).

Table 10 reports the average bargaining power (Periods 5 – 8) for the DBS buyer in the CAP No MFN treatment.

[58] Because buyer bargaining power measure is normalized by the size of the trade, it is possible to compare average bargaining power across buyers in different treatments with different levels of concentration.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	18.0 %	53.6 %	50.1 %
High Concentration/High Numbers	*	47.4 %	64.6 %
High Concentration/Low Numbers	*	42.9 %	44.2 %

Table 10: DBS Operator's (Buyer 5) Bargaining Power (Trading Periods 5 - 8)

Result 8: In the CAP no MFN treatment, the DBS operator's bargaining power is higher in the Low/High concentration sessions than in the High/Low concentration treatments. This difference in DBS bargaining power is statistically significant. As shown in Table 10, the DBS operators' bargaining power is highest under the Low/High concentration treatment. A Wilcoxon-Mann-Whitney test shows that the DBS operator's bargaining power in the Low/High concentration treatments is higher, in a statistically significant manner, than in the High/Low concentration treatments (p-value = .0754). This result suggests that higher concentration levels would negatively impact the DBS operator's bargaining position. The reduction in bargaining power would cause the DBS operator to pay higher affiliate fees to cable networks. Insufficient data prevents an assessment about whether this effect holds under the CAP MFN treatment.

4.3 Buyer Surplus

Table 11 reports the average buyer's surplus as a percentage of the maximum possible surplus under the economically efficient allocation. The averages were calculated using data from trading periods 5 – 8.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	30.3%	44.0%	43.3%
High Concentration/High Numbers	28.6%	40.2%	47.5%
High Concentration/Low Numbers	*	40.0%	43.4%

Table 11: Average Buyer's Surplus
(Percentage of Maximum Possible Surplus)
(Trading Periods 5 - 8)

Result 9: There is no statistically significant difference in the average buyer's surplus across concentration levels in the Cap No MFN treatments. According to a Wilcoxon-Mann Whitney test, there is no statistically significant difference in buyer surplus across concentration treatments in the Cap No MFN treatment. The calculated p values for the pair-wise comparisons are .3452 (Low/High v. High/Low), .3651 (Low/High v. High/High), and .5476 (High/High v. High/Low).

Result 10: In both of the high concentration environments, average buyer surplus is higher under the CAP MFN treatment than in either of the other treatments. A large cable operator's ability to impose an MFN provision on sellers and the presence of a capacity constraint substantially enhances average buyer surplus. A statistical test designed to examine the statistical significance of the observed difference was not performed because of the limited number of observations. The effect of limited channel capacity and an MFN also appears when considering the average buyer's bargaining power.

The share of the MVPD market served by the DBS operator (i.e., Buyer 5) remained constant across all treatments. This consistency permits an examination of

whether the DBS operator is negatively affected by changes in horizontal concentration among cable operators. Table 12 reports the surplus earned by the DBS operator as a percentage of maximum surplus under the economically efficient allocation.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	17.5%	50.6%	41.4%
High Concentration/High Numbers	*	46.5%	37.4%
High Concentration/Low Numbers	*	40.5%	42.2%

Table 12: DBS Operator's Surplus
(Percentage of Maximum Possible Surplus)
(Trading Periods 5 - 8)

Result 11: In the CAP No MFN environment, the DBS operator's buyer surplus is highest in the Low/High concentration treatment. The difference in DBS operator's buyer surplus between the Low/High and High/Low concentration treatments is statistically significant. A Wilcoxon-Mann Whitney test reveals a statistically significant difference in DBS operator buyer surplus between the Low/High and High/Low concentration treatments (p-value = .0952). This result in consistent with Result #8 that showed a reduction in the DBS operator's bargaining power from a movement from a Low/High to a High/Low concentration environment.

4.4 Seller Profits and Losses

Table 13 reports the percentage of sellers that incurred a loss in a given traded period pooled across trading periods 5 – 8. Table 13 also shows the size of the average loss, expressed in experimental dollars.

Treatment Variables			
Environments	Unlimited Capacity	Limited Capacity	
		No MFN	MFN
Low Concentration/High Numbers	3.1% -425	38.8% -88.5	53.1% -166.6
High Concentration/High Numbers	0.00%	35.9% -127.6	53.1% -108.2
High Concentration/Low Numbers	*	32.5% -121.2	37.5% -76.0

Table 13: Percentage of Sellers with Trading Period Losses and Average Loss (Trading Periods 5 - 8)

Result 12: The probability that a seller will incur a loss in a trading period is not related to the level of horizontal concentration. [59] Sellers often lost money in a given trading period under the CAP No MFN treatment, regardless of the level of horizontal concentration. We conducted a Chi-square test to examine whether the proportion of sellers that incur a loss across concentration treatments are the same. Because this test generated a Chi-square statistic of .6825, which is less than the critical value consistent with standard levels of significance, we accept the null hypothesis that the proportions are the same.

Result 13: Seller losses are rare in the No CAP treatments. In the Low/High and High/High treatments the proportion of losses under the No CAP treatment is significantly lower than under the CAP treatments. Chi-square test statistic values of 14.2 and 15.1 exceed the critical values associated with standard levels of significance. This result is consistent with a previous result indicating that the average buyer's

[59] The statistical test does not examine whether the concentration treatment affect differs among sellers.

bargaining power is higher in the CAP environment than in the UNCAP environment. The result strongly suggests that the cable operator's bargaining power and, thus, its ability to negotiate favorable affiliate fees with programming networks, is substantially enhanced when the number of programming networks is greater than the cable operator's channel capacity.

Result 14: Seller losses are not more common under the CAP MFN treatment than under the CAP No MFN treatment. A Chi-square test comparing the proportion of sellers that incur losses in the CAP No MFN and CAP MFN treatments under each concentration treatment yielded test statistic values of 1.93 (Low/High), 2.59 (High/High), 0.255 (High/Low). None of these test statistics exceed the critical values associated with standard levels of significance.[60]

The above tests do not differentiate among sellers. However, this lack of differentiation may hide effects that can only be observed when such differentiation is present. Tables 14 and 15 report, for the CAP No MFN and the CAP MFN treatments, the proportion of trading periods in which a particular seller incurred a loss.

	Seller #1	Seller #2	Seller #3	Seller #4
Low Concentration/High Numbers	75.0% -81.4	75.0% -88.7	5.0% -191.0	0%
High Concentration/High Numbers	62.5% -96.6	68.8% -82.6	12.5% -529.5	0%
High Concentration/Low Numbers	60.0% -109.3	45.0% -55.8	15.0% -313.3	10.0% -198.5

Table 14: Percentage of Trading Periods in Which a Seller Incurs a Loss and Average Loss (CAP No MFN Treatments)

[60] Any buyer whose market share was greater than 26.8 % was granted MFN status in the experiments. The High/Low treatment was the only treatment in which two firms were granted MFN status.

	Seller #1	Seller #2	Seller #3	Seller #4
Low Concentration/High Numbers	100.0% -62.3	100.0% -97.9	0%	12.5% -1511.0
High Concentration/High Numbers	87.5% -110.3	100.0% -106.5	25.0% -107.5	0.0%
High Concentration/Low Numbers	62.5% -70.0	87.5% -80.3	0.0%	0.0%

Table 15: Percentage of Trading Periods in Which a Seller Incurs a Loss and Average Loss (CAP MFN Treatments)

Result 15: Small, less popular programming networks are the most likely programming networks to lose money. Sellers #1 and #2, the smallest programming networks, are the most likely to lose money.

Result 16: In the CAP No MFN environment, the size of the average loss incurred by Sellers #1 and #2 in a given experimental session is unrelated to the level of horizontal concentration. A Wilcoxon-Mann-Whitney test finds that there is no statistically significant difference in the size of the loss incurred by Sellers #1 and #2, conditional on them incurring a loss, in the Low/High versus High/High treatments (p-value = 0.5467), nor is there a statistically significant difference in the average loss incurred by Sellers #1 and #2 in the High/High and High/Low treatments (p-value =.5476). Finally, the same test finds that there is no statistically significant difference in the average loss incurred by Sellers #1 and #2 in the High/Low and Low/High treatments (p-value = 0.4206).

Result 17: Sellers #1 and #2 are more likely to lose money in the CAP MFN environment than in the CAP No-MFN environment under all concentration treatments. In the CAP No MFN treatments, Sellers #1 and #2 lose money in more than

half the trading periods. The frequency of losses for Sellers #1 and #2 are slightly higher in the CAP MFN treatments.

Using a trading period as the primary unit of analysis, the above presented the frequency with which a given seller incurred a loss and the level of that loss across the different concentration treatments. Using the experimental session (i.e., trading periods 5 – 8) as the unit of analysis, Table 16 below presents the average loss/profit incurred/earned by each trader across the different concentration treatments.[61]

	Seller #1	Seller #2	Seller #3	Seller #4	Buyer #1	Buyer #2	Buyer #3	Buyer #4	Buyer #5
Low/ High	-51	-60	477	3001	1256	555	776	1210	847
High/ High	-39	-34	649	2612	551	368	2135	215	774
High/ Low	-38	1	544	3162	1292	2101			611

Table 16: Average Profit or Loss for All Sellers and Buyers (CAP No MFN Treatments)

4.5 Regression Analysis – CAP MFN Treatment Data

A series of linear regression models were estimated to explore the determinants of the variations in the affiliate fees, expressed on a price per subscriber basis, and seller net surplus observed in the experiments under the CAP MFN treatment.[62] With one exception, all of the explanatory variables were indicator or "dummy" variables. For example, a dummy variable was created for each buyer. The dummy variable 7% takes on the value of one when a buyer that serves 7% of the MFPD market trades with a seller, zero otherwise. Likewise, the dummy variable 44% takes on the value of one when a buyer that serves 44% of the MFPD market trades with a seller, zero otherwise. A

[61] Note that while the profit or loss of each seller and for buyer #5 can be directly compared across concentration treatments, the profits earned by buyers 1-4 are not directly comparable, since these buyers differ in size as concentration varies.

[62] This analysis was motivated, in part, by the study's ability to provide only qualitative statements regarding hypotheses involving the experimental data generated under the CAP MFN treatment.

dummy variable was also created for each seller. For example, the dummy variable Seller #1 takes on the value of one when Seller #1 trades with a buyer, zero otherwise. The "period" variable identifies the trading period (e.g., 5-8) at which the trade takes place.

Table 17 presents the results of two regressions that explore the determinants of the variations in the affiliate fees, expressed on a price per subscriber basis, observed in the experiments. The regression uses an estimator that corrected the bias in the standard errors of the estimated coefficients resulting from heteroscedasticity. A Shapiro-Wilkes test rejects the null hypothesis that the regression error term is normally distributed. This outcome weakens the reliability of the statistical tests.[63]

[63] The rejection of the normality assumption weakens the reliability of all the t-tests. The extent to which the weakness is worrisome depends upon the calculated t-value. For example, the results of t-tests based upon calculated t-values that are close to +/- 1.96 are subject to more reliability concerns than t-tests results that are based upon higher +/- t-values.

Observations = 300 F(13, 286) = 22.48 Prob > F = 0.0000		R^2 = .4520 Root MSE = .0578		Observations = 300 F(6, 229) = 51.12 Prob > F = 0.0000	R^2 = .4160 Root MSE = .0590	
Price/ Subscriber	Coefficient (t-value)	(95% Confidence. Interval)		Coefficient (t-value)	(95% Confidence. Interval)	
High/Low	-			.0032 (0.34)	-.0156	.0221
High/High	-			-.0360 (-4.59)	-.0514	-.0205
7%	.0236 (2.27)	.0031	.0440	-	-	-
11%	.0196 (1.53)	-.0056	.0450	-	-	-
13%	.0252 (1.63)	-.0052	.0557	-	-	-
15%	.0868 (5.98)	.0582	.1153	-	-	-
17% (DBS)	.0525 (3.86)	.0257	.0793	-	-	-
17% (Cable)	.0521 (3.98)	.0264	.0779	-	-	-
24%	.0650 (2.89)	.0207	.1094	-	-	-
27%	.0080 (.61)	-.0177	.0337	-	-	-
39%	.0489 (4.45)	.0272	.0705	-	-	-
44%	.0496 (4.18)	.0262	.0729	-	-	-
Seller #1	-.1055 (-12.63)	-.1219	-.0890	-.1057 (-13.04)	-.1217	-.0897
Seller #2	-.1079 (-12.16)	-.1253	-.0904	-.0989 (-11.90)	-.1153	-.0826
Seller #3	-.0194 (-1.87)	-.0399	-.0010	-.0179 (-1.66)	-.0393	.0033
Period	-.0028 (-.87)	-.0091	.0035	-.0028 (-.85)	-.0093	.0036
Constant	.0868 (3.67)	.0402	.1334	.1393 (5.79)	.0920	.1867

Table 17: Price Per Subscriber Regression
(CAP MFN Treatment)

The constant term captures the effect of the dummy variables that are not explicitly included in the model. In this case, the constant term captures the effects that a buyer that serves 51% of the MVPD market and the most popular seller (i.e., Seller #4) has on the affiliate fees negotiated by such participants. The estimated coefficients for buyer size each represent the direction and magnitude by which the affiliate fees

negotiated by that buyer differs from the affiliate fees negotiated by the buyer that serves 51% of the MVPD market when both buyers negotiate with the most popular seller. The t-statistics associated with each estimated coefficient examines whether this difference is statistically significant. For example, the statistical significance and sign of the coefficient on the dummy variable "7%" indicates that the most popular seller (i.e., Seller #4) receives a higher affiliate fee (per subscriber) when conducting a trade with a buyer that serves 7% of the market than when conducting a trade with a buyer that serves 51% of the market.[64] Similarly, the statistical significance of the coefficient on the dummy variable "44%" indicates that the most popular seller receives a higher affiliate fee (per subscriber) when conducting a trade with a buyer that serves 44% of the market than when conducting a trade with a buyer that serves 51% of the market.[65]

The regression also shows some other interesting results. For example, the statistical significance of the coefficient on the dummy variable "Seller #2" indicates that the largest buyer, which serves 51% of the MVPD market, pays a lower affiliate fee (per subscriber) when trading with Seller #2 than when trading with Seller #4. In addition, the statistical significance of the coefficient on the dummy variable "Seller #3" indicates that such a buyer pays a lower affiliate fee (per subscriber) when trading with Seller #3 than when trading with Seller #4.[66] These and the preceding results indicate that, to some degree, the favorableness of an affiliate deal depends, in part, on the size of the participant.[67] Specifically, it indicates that, to some extent, large buyers negotiate lower affiliate fees than small buyers when negotiating with a large seller.[68] In addition, more popular programming networks appear to obtain higher affiliate fees than less popular

[64] The coefficient on the dummy variable "7%" identifies the "premium" that a buyer that serves 7% of the MVPD market pays above the affiliate fee paid by a buyer that serves 51% of the same market when conducting a trade with the largest seller.

[65] One might expect that the size of the coefficients associated with the different dummy variables should decrease monotonically. The absence of this relationship among the estimated coefficients suggests that the importance of a buyer's size may depend, in part, on the size of the other buyers.

[66] Given the size of the t-statistic associated with the Seller #3 dummy variable (-1.87) and the absence of a normally distributed error term, the statistical strength of this result may be less than the strength demanded under conventional levels of acceptance.

[67] The statement was qualified because we have not completed all of the relevant statistical tests.

[68] Many other hypotheses can be tested. For example, does a large buyer have an advantage over a small buyer when negotiating with a moderately popular programming network? See J. Johnston, Econometric Methods 179 (1972) for a general discussion of how to test different hypotheses in the presence of a dummy variable model.

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 "High/Low" 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 "High/Low" 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 earned by the different sellers. Net surplus measures the profits or losses earned/incurred 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.[70]

Observations = 24 F(3, 20) = 2.38 Prob > F = 0.1000		R^2 = .2631 Root MSE = 50.43	
Seller #1 Net Surplus	Coefficient (t-value)	(95% Confidence. Interval)	
Low/High	-27.37 (1.09)	-79.97	25.22
High/High	-55.87 (-2.22)	-108.47	-3.27
Period	-13.75 (-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 F(3, 20) = 1.90 Prob > F = 0.1622		R^2 = .3054 Root MSE = 19.382	
Seller #2 Net Surplus	Coefficient (t-value)	(95% Confidence. Interval)	
Low/High	-28.125 (-1.63)	-64.14	7.89
High/High	-36.75 (-2.13)	-72.76	-.7315
Period	3.41 (.54)	-9.73	16.56
Constant	-91.95 (-2.15)	-181.16	-2.75

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.[71]

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 variable, following each trading period. The Period variable took on the values of 5 through 8 in the regression model.

Observations = 24 F(3, 20) = 2.22 Prob > F = 0.1174		R^2 = .2497 Root MSE = 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 earned 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 carry a programming network may affect the quality of the programming offered by the programming network. Such an effect 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 carry 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 carry 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 Cournot-Nash equilibrium determines the market price, and therefore the excess of price over marginal cost.[76] In the Cournot-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,

[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 to 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.[78] 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 opportunity 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

[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 be 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.[81] The second solution concept is the "Shapley Value," which measures what each player could reasonably expect to receive as his/her 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.[82]

[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 Statistics, 81,* pp. 326-40.

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 his/her 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.[90] 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.[91] 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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[87] 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, subject 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 10. 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.

[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 outcomes 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 unchanged 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.[101]

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.[102] In addition, each franchise area typically contains a single cable operator and the cable operator's channel

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[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 unfavorable 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.[103] 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 favoring 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 favoring 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.[104] 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 sellers 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 Department 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 short 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.[107]

	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

[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.

the sellers.[110] This uncertainty may substantially affect the bargaining outcomes between buyers and sellers.[111] Finally, none of the cooperative solutions examined capture the effect of expectations of individual buyers or sellers on the gains that could be expected to be achieved from future trades in a given trading period.

A.7 Testing the Theoretical Predictions

In this section we review the experimental results in light of the predictions made using the cooperative game theory described above. In our basic treatment consisting of a capacity constraint on buyer purchases and unavoidable fixed costs, which corresponds to the experimental design in 15 of the experiments, we computed solution values for the Nash Bargaining Solution, the Shapley value and the Core. These values are shown in Tables A.2 through A.5. In Table 16 in the main body of the paper, we presented the average values of the 112 experimental data points that correspond to the basic treatment case (i.e., CAP, No MFN treatment).[112]

A comparison of Table 16 with Tables A.2 through A.5 reveals that the smallest sellers (#1 and #2) receive lower payoffs in the experiments than they do under either the Nash Bargaining Solution or the Shapley value predictions, but higher payoffs than any of the Core predictions. The largest seller (#4), on the other hand, does better in the experiments than is predicted by the Nash Bargaining Solution or Shapley value, though not as well as the best Core outcome. The buyers' payoffs seem to be broadly consistent with both the Nash Bargaining Solution and Shapley value outcomes, as well as with the average of the extreme Core outcomes.

In order to provide a more quantitative estimate of the predictive power of the cooperative game solutions, we computed an average distance measure between the

[110] MVPDs also enter the bargaining game with some costs.

[111] Because of this uncertainty, trading outcomes may be due, in part, to the expectations that buyers and sellers have regarding the prices at which future trades may take place and their willingness to assume risk. An important issue for the development of a more complete theory involves the proper method of introducing expectation formation and risk into the theory.

[112] As noted earlier, substantial care must be taken in interpreting these results. With the exception of Buyer #5 (i.e., the DBS operator), the market share accounted for by a given buyer changes across treatments. This problem does not exist with sellers, given that their size remains constant across concentration treatments.

theoretical solution and the set of experimental data points.[113] These distance statistics are reported in Table A.8 for the three solution concepts. This table reveals that the Nash Bargaining Solution offers the best "fit" to the data, with the Shapley value a close second. The average of the Core outcomes is less predictive overall than the more "cooperative" solutions, but the Core does capture the fact that small sellers suffer relative to large sellers in this market environment, albeit in a more extreme manner than the experiments revealed.

Treatment	Nash Bargaining Solution	Shapley Value	Average of Core Outcomes
High/Low	1842	1896	2122
High/High	1805	1919	2305
Low/High	2379	2510	2999

Table A.8: Average Distance of Cooperative Solutions from Experimental Data Points

A.8 Summary of the Theoretical Results

The examined solution concepts provide the following insights. In the presence of a trading constraint and where competition among sellers is strong (as in the case of the Core), sellers incur losses. In instances where competition is not as strong (as in the Nash Bargaining solution and Shapley value), sellers could conduct a set of trades that allows them to more than cover their costs. Importantly, all solution concepts predict that the welfare of sellers is not affected by the degree of concentration among buyers. In instances where competition among sellers is strong, as when capacity constraints are in effect, small sellers can expect to lose money uniformly whatever the level of concentration on the buy side of the market. Finally, we have shown that the amount of surplus a buyer and seller achieve in trade depends upon the degree to which the sellers' costs are avoidable.

[113] That is, we computed the Euclidean distance between each theoretical solution and each of the data points representing net surplus achieved in a trading period. We then summed these values and divided by the number of observations.

It is worth noting that from a computational point of view it would be possible to impose a capacity constraint on the number of trades that each seller is permitted to make in any trading period. Following this logic would reveal that such a constraint would work to the advantage of the sellers in exactly the same way as the trading constraint on buyer trades works to the advantage of buyers. However, in the bargaining framework between cable operators and cable programming networks, a constraint on seller transactions is not plausible for a number of reasons. In contrast to the natural constraint on channel capacity that cable operators face, for any given cable delivery technology, there is no corresponding constraint on the number of cable operators a given cable network can sell to. For sellers, the marginal cost of selling to an additional buyer is essentially zero.

Even if channel capacity can be viewed as unlimited based on available delivery technologies (e.g., through digital technologies and fiber delivery systems), cable networks ultimately compete for cable subscribers' viewing time. Hence, cable networks are inherently substitute products from a cable operator's point of view. At some point the carriage of an additional cable network will reduce the advertising revenue earned by cable networks and cable operators. This reduction in revenue will, at some point, exceed the additional subscriber revenue earned by cable operators from carrying an additional cable network. These economic effects occur even if the cable operator has unlimited channel capacity. The relevant constraint is the cable subscribers' viewing time.

Finally, any given cable operator can make a strategic decision to limit the number of cable networks that it chooses to carry, without obtaining the cooperation of other cable operators. In contrast, given the substitutability of cable networks, any attempt by the cable networks to limit the number of programs sold by each network for strategic reasons would require a coordinated action by all networks.

Appendix B: Subject Instructions

Experiment Instructions – Buyers (No Cap, No MFN)

I. Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants, except as permitted under the rules of the experiment. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. Resale values may differ across assets for a given buyer and may differ across buyers. Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. Sellers will be assigned a particular asset and a previously incurred "fixed cost" from creating that asset. Sellers will also be assigned a schedule of payments that a third party provides them in the event of a trade between a seller and a buyer.

Buyers have the opportunity to purchase an asset from different sellers, while sellers have the opportunity to sell their respective assets to multiple buyers.
From this point forward, you will be referred to by your bidder number, which is bidder number _____. You are a BUYER in this experiment. There are four sellers and five buyers in your market.

II. Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by purchasing assets at prices below their assigned resale value that exceed their fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices, when combined with a third party payment that exceed their fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Buyers

Each buyer has the opportunity to buy a single asset from each of the four sellers (labeled Seller 1, 2, 3, and 4). You will be assigned a resale value for each potential trade. Resale values may differ among buyers. You are strictly prohibited from revealing your resale values to anyone. While you can conduct a trade with any seller during a trading period, you may only complete ___ trades in a given period. If you buy an asset from a seller, your earnings from the trade are equal to the difference between your resale value for that asset and the price you paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

Suppose, for example, that you traded with Seller 1 and that your assigned resale value for this asset is 644 experimental dollars. If you pay 300 experimental dollars for a trade with Seller 1, then your earnings are:

TRADE EARNINGS = 644 – 300 = 344 experimental dollars

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

For example, suppose your fixed cost was 110. Suppose that during the same trading period you traded with Seller 2 and that your assigned resale value for this asset is 120 experimental dollars. If you pay 70 experimental dollars, then your total earnings in that trading period are:

SUM OF TRADE EARNINGS = 344 + 50 = 394 experimental dollars

TOTAL PROFITS = 394 – 110 = 284 experimental dollars

The following record sheet, which you should always use to calculate and record your earnings from each trade, displays your total earnings in this trading period.

Trading Period	Trade	Seller	Resale Value	- PRICE	= Earnings
	1	1	644	300	344
	2	2	120	70	50
	3				
	4				
	-Fixed Costs				-110
	TOTAL				284

You incur a loss on any particular trade if the price you paid for an asset exceeds your assigned resale value for that asset. You incur a loss in a trading period if the sum of your trade earnings does not exceed your fixed costs. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed that amount, you will be paid your $7 show up fee and will be asked to leave the experiment.

2. Information on Sellers

Each seller has the opportunity to sell a single asset to each of the five buyers (labeled Buyer 5, 6, 7, 8, and 9). Before the trading period, sellers will be assigned one of the assets and a fixed cost. The level of the assigned fixed costs may differ across assets. The asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore, sellers are free to sell to one or more buyers. However, sellers may only trade with each buyer only once in a trading period.

The sale of an asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to the seller in the form of a fixed payment the level of which is known only by the seller. This third party payment augments the revenue the seller obtains from selling the asset to a buyer.

Seller earnings from a trade are equal to the sale price, augmented by the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

While you do not know the exact size of the third party payment any seller receives, you can reasonably infer that sellers for whom you have a higher resale value are likely to have higher third party payments, and sellers from whom you have a lower resale value are likely to have lower third party payments.

III. Trading Process

(NOTE: A COMPUTER SCREEN SHOT IS PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 6 minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is

offered. A buyer can place a bid by typing a bid amount in the "Price" box located in the center of the screen and typing the number of the seller (1, 2, 3, or 4) to whom the bid is offered in the "Offered To" box located immediately below the Price box. A buyer submits the bid by pressing the "PLACE BID" button. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price ("ASK") into the computer and identifying to whom the ask is offered. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand corner of the screen. The bids placed by you are in the upper right hand corner along with the identity of whom they were offered to. The asks that have been offered to you by various sellers can be seen in the lower right hand corner along with the identity of the seller making the offer. As a buyer, you accept an ask by highlighting the ask you wish to accept with your mouse and then pressing the "buy" button. If neither an initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than its standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with them again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower left hand corner of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand corner shows all trades this period. It is important for you to pay attention to these screens as a seller may accept one of your bids causing a trade to be completed with you.

In order to make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following resale values and fixed costs:

Fixed Costs	25
Seller	Resale Value
1	30
2	40
3	50
4	70

1. Suppose you placed a bid to buy from Seller 2 at a price of 12. If that bid is accepted, what would be your earnings on the trade?

2. If that is your only trade, what would be your total profits?

3. Suppose that Seller 3 offered an ask of 44 to you. If you accepted the ask, what would be your earnings on the trade?

4. If Seller 3's third party payment was 120 for the trade, what would have been Seller 3's earnings on the trade?

5. How many times may you trade with each seller in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question.

Are there any questions?

Experiment Instructions – Sellers (No Cap, No MFN)

I. Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants, except as permitted under the rules of the experiment. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. Resale values may differ across assets for a given buyer and may differ across buyers. Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. Sellers will be assigned a particular asset and a previously incurred "fixed cost" from creating that asset. Sellers will also be assigned a schedule of payments that a third party provides them in the event of a trade between a seller and a buyer.

Buyers have the opportunity to purchase one or more assets from the sellers, while sellers have the opportunity to sell their respective assets to one or more buyers. From this point forward, you will be referred to by your bidder number, which is bidder number _____. You are a SELLER in this experiment. There are four sellers and five buyers in your market.

II. Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by purchasing assets at prices below their assigned resale value that exceed their fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices, when combined with a third party payment that exceed their fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Sellers

Each seller has the opportunity to sell a single asset to each of the four buyers (labeled Buyer 5, 6, 7, 8, and 9). Before the trading period, you will be assigned one of the assets and a fixed cost. The level of the assigned fixed costs may differ across assets. You are not permitted to reveal your assigned fixed cost to anyone. The asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore, you are free to sell your asset to one or more buyers. However, you may only trade with each buyer only once in a trading period.

The sale of your asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to you in the form of a fixed payment the level of which is known only by you. This third party payment augments the revenue you obtain from selling your asset to a buyer. The following is an example:

Buyer	Third Party Payment
5	30
6	40
7	50
8	70
9	22

If you sell your asset to a buyer, your earnings from the trade, which are yours to keep, is equal to the sale price augmented by the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

Suppose, for example, that you are assigned a fixed cost of 200 experimental dollars. Suppose, Buyer 5 agrees to pay you 220 experimental dollars for this asset, then your earnings on this trade are equal to:

TRADE EARNINGS = 220 + 30 = 250.

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

Suppose that during the same trading period you traded with Buyer 6 and that your assigned third party payment for this trade is 40 experimental dollars. If Buyer 6 agrees to pay you 70 experimental dollars, then your total profits in that trading period are:

SUM OF TRADE EARNINGS = 250 + 110 = 360 experimental dollars

TOTAL PROFITS = 360 – 200 = 160 experimental dollars

The record sheet shown below shows the transactions. Please use the enclosed record sheet to calculate and record your earnings during each trading period.

Trading Period	Trade	Buyer	PRICE	+ Third Party	= Earnings
1	-Fixed Costs				-200
	1	5	220	30	250
	2	6	70	40	110
	3				
	4				
	5				
	TOTAL				160

You will incur a loss in the trading period if you do not generate enough revenue to cover your fixed costs. Please note that you will incur a loss on a particular trade if you agree to pay a buyer a price that exceeds the payment you receive from a third party from making that trade. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed that amount, you will be paid your $7show up fee and be asked to leave the experiment.

III. Trading Process

(NOTE: A COMPUTER SCREEN SHOT IS PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 6 minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price ("ASK") into the computer and identifying to whom the ask is offered. A seller can place an ASK by typing an ask amount in the "Price" box located in the center of the screen and typing the number of the buyer (5, 6, 7, 8, or 9) to whom the ask is

offered in the "Offered To" box located immediately below the Price box. A seller submits the ask by pressing the "PLACE ASK" button. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount.

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand side of the screen. The asks placed by you are in the lower right hand side along with the identity of who they were offered to. The bids that have been offered to you by various buyers can be seen in the upper right hand side along with the identity of buyer making the offer. As a seller, you accept a bid by highlighting the bid you wish to accept with your mouse and then pressing the "sell" button. If neither an initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than its standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with them again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower left hand side of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand side shows all trades this period. It is important for you to pay attention to these screens as a buyer may accept one of your asks causing a trade to be completed with you.

In order to make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following resale values and fixed costs:

Fixed Costs	225
Buyer	Third Party Payment
5	44
6	70
7	52
8	122
9	34

1. Suppose you placed an ask to sell to Buyer 6 at a price of 12. If that ask was accepted, what would be your earnings on the trade?

2. If that was your only trade, what would be your total profits?

3. Suppose that Buyer 5 offered a bid of 20 to you. If you accepted the bid, what would be your earnings on the trade?

4. How many times may you trade with each buyer in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question.

Are there any questions?

Experiment Instructions - Buyers (Cap, MFN)

I. Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. Resale values may differ across assets for a given buyer. Buyers vary in "size," which is measured by the number of customers it serves. The larger the buyer, the higher its assigned resale value for an asset. The following table ranks buyers from largest to smallest and provides the number of customers served.

Buyer	Customers (Size Rank)
6	36 (1)
5	32 (2)
7	14 (3)

In a given trading period a seller may conduct trades with multiple buyers. In each trading period the two largest buyers (i.e., Buyer 6 and Buyer 5) are guaranteed to receive the lowest price from the sellers with whom they trade. Specifically, if either

Buyer 6 or Buyer 5 agrees on a price that is higher than the price the seller agrees to conduct a trade with another buyer, each of these buyers get the lower price. In addition, Buyer 6 and Buyer 5 each receive the same price.

Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. These fixed costs may differ among buyers. At the beginning of the experiment sellers will be assigned a particular asset and a previously incurred "fixed cost" from creating that asset. These fixed costs may differ among sellers. Sellers will also be assigned a schedule of payments that a third party provides them in the event of a trade between a seller and a buyer. The larger the buyer, the higher the third party payment received by the seller. The level of the third party payment a given seller receives from a trade will vary across sellers. Buyers have the opportunity to purchase an asset from different sellers, while sellers have the opportunity to sell their respective assets to multiple buyers. Each buyer is limited to making three trades per trading period. You are a BUYER in this experiment. From this point forward, you will be referred to by your number, which is number _____. There are four sellers and three buyers in your market.

II. Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by: (1) purchasing assets at prices below their assigned resale value for those assets and (2) having the sum of these earnings exceed their assigned fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices that, when combined with a third party payment, exceed their fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Buyers

Each buyer has the opportunity to buy an asset from one or more sellers. The market includes four sellers (labeled Seller 1, 2, 3, and 4). You will be assigned a resale value for the asset sold by each seller. You are strictly prohibited from revealing your

resale values to anyone. While you can conduct a trade with any seller during a trading period, you may only complete 3 trades in a given period. You may trade with a particular seller only once in a trading period. If you buy an asset, your earnings from the trade are equal to the difference between your resale value for that asset and the price you paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

Suppose, for example, that you traded with Seller 1 and that your assigned resale value for the purchased asset is 244 experimental dollars. Suppose further that you serve 20 customers. If you pay 4.0 experimental dollars/customer or, a total of 80 experimental dollars (4.0 ∗ 20 customers) for Seller 1's asset, then your earnings are:

TRADE EARNINGS = 244 – 80 = 164 experimental dollars

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

For example, suppose your fixed cost was 110. Suppose that during the same trading period you traded with Seller 2 and that your assigned resale value for the purchased asset is 120 experimental dollars. If you pay a price of 2.0 experimental dollars per customer, or 40 total experimental dollars (= 2.0 ∗ 20), then your total earnings in that trading period are:

SUM OF EARNINGS = (244 - 80) + (120 – 40) = 244 experimental dollars

TOTAL PROFITS = 244 – 110 = 134 experimental dollars

The following record sheet, which you should always use to calculate and record your earnings from each trade, displays your total earnings in this trading period.

Trading Period	Trade	Seller	Resale Value	Price Per Customer	Customers	Total Price	Earnings = Resale Value – Total Price
1	1	1	244	4.0	x 20	80	164
	2	2	120	2.0		40	80
	3						
	- Fixed Costs						- 110
	TOTAL						134

You incur a loss on a trade if the price you paid for an asset exceeds your assigned resale value for that asset. You incur a loss in a trading period if the sum of your trade earnings is less than your fixed costs. If you are either Buyer 6 or Buyer 5 you may obtain additional earnings because the seller(s) with whom you have traded may have activated the provision that guarantees that you pay, expressed on a price/customer basis, no more than any smaller buyer. You will be informed at the end of each trading period whether you have obtained additional earnings because of the activation of this guarantee. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed that amount, you will be paid your $7 show up fee and you will be asked to leave the experiment.

2. Information on Sellers

Each seller has the opportunity to sell a single asset to each of the five buyers (labeled Buyer 5, 6, and 7). Each asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore,

sellers are free to sell to one or more buyers. However, sellers may trade with each buyer only once in a trading period.

The sale of an asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to the seller in the form of a fixed payment the exact level of which is known only by the seller. This third party payment augments the revenue the seller obtains from selling the asset to a buyer. The larger the buyer, the higher the third-party payment received by the seller.

Seller earnings from a trade are equal to the sale price, augmented by the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

III. Trading Process

(NOTE: A COMPUTER SCREEN SHOT IS PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 6 minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. A buyer can place a bid by typing a bid amount in the "Price" box located in the center of the screen and typing the number of the seller (1, 2, 3, or 4) to whom the bid is offered in the "Offered To" box located immediately below the Price box. A buyer submits the bid by pressing the "PLACE BID" button. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price ("ASK") into the computer and identifying to whom the ask is offered. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount.

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand corner of the screen. The bids placed by you are in the upper right hand corner along with the identity of the sellers to whom they are offered. The asks that have been offered to you by various sellers can be seen in the lower right hand corner along with the identity of seller making the offer. As a buyer, you accept an ask by highlighting the ask you wish to accept with your mouse and then pressing the "buy" button. If neither an initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than its standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and should record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with that seller again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower left hand corner of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand corner shows all trades this period. It is important for you to pay attention to these screens as a seller may accept one of your bids resulting in a trade with you.

In order to make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following resale values, customers served, and fixed costs:

Trading Period	Trade	Seller	Resale Value	Price Per Customer	Customers	Total Price	Earnings = Resale Value – Total Price
1	1	1	40		x 20		
	2	2	70				
	3	3	90				
	- Fixed Costs						- 25
	TOTAL						

1. Suppose you placed a bid to buy from Seller 2 at a price of 2.0 per customer. If that bid is accepted, what would be your earnings on the trade?

2. If that is your only trade, what would be your total profits?

3. Suppose that Seller 3 offered an ask of 3.0 per customer to you. If you accepted the ask, what would be your earnings on the trade?

4. If Seller 3's third party payment was 50 for the trade, what would have been Seller 3's earnings on the trade?

5. How many times may you trade with each seller in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question(s).

Are there any questions?

Experiment Instructions – Sellers (Cap, MFN)

I. Procedures and Market Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. The level of the resale value assigned to any buyer is related to the buyer's "size," which is measured by the number of customers it serves. The larger the buyer, the higher its assigned resale value for an asset. Resale values may differ across assets for a given buyer. The following table ranks buyers included in the experiments from largest to smallest and provides the number of customers served.

Buyer	Customers (Size Rank)
7	42 (1)
9	14 (2)
5	11 (3)
6	9 (4)
8	6 (5)

In a given trading period a seller may conduct trades with multiple buyers. In each trading period the largest buyer (i.e., Buyer 7) is guaranteed to receive the lowest price from the sellers with whom it trades. Specifically, if Buyer 7 agrees on a price that is higher than the price the seller agrees to conduct a trade with another buyer, Buyer 7 is guaranteed to receive the lower price.

Sellers will be assigned a particular asset and a schedule of payments that a third party provides to them in the event of a trade between a seller and a buyer. The larger the buyer, the higher the third-party payment. Buyers have the opportunity to purchase an asset from different sellers, but each buyer is limited to making three trades per trading period. Sellers have the opportunity to sell their respective assets to multiple buyers. Both buyers and sellers will be assigned a previously incurred "fixed cost" for participating in the market, which are different for each buyer and for each seller.

You are a SELLER in this experiment. From this point forward you will be referred to by your seller number, which is seller number _____. There are **four** sellers and **five** buyers in your market.

II. Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by: (1) purchasing assets at prices below their assigned resale value for those assets; and (2) having the sum of these earnings exceed their assigned fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices that, when combined with a third party payment, exceed their assigned fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Sellers

Each seller has the opportunity to sell a single asset to each of the five buyers (labeled Buyer 5, 6, 7, 8, and 9). Before the trading period, you will be assigned an asset and a fixed cost. You are not permitted to reveal your assigned fixed cost to anyone. The asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the

asset available for sale to another buyer. Therefore, you are free to sell your asset to one or more buyers. However, you may trade with each buyer only once in a trading period.

The sale of your asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to you in the form of a fixed payment, the exact level of which is known only by you. This third party payment augments the revenue you may obtain from selling your asset to a buyer. The following table shows an example of the third party payments you receive if you trade with a particular buyer. The larger the buyer, the higher the third party payment.

Buyer	Third Party Payment
7	70
9	50
5	40
6	30
8	22

If you sell your asset to a buyer, your earnings from the trade are equal to the sale price plus the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

Suppose, for example, that you are assigned a fixed cost of 200 experimental dollars. Suppose, Buyer 7, the largest buyer, agrees to pay you 10 experimental dollars per customer served (10/customer), or a total of 420 experimental dollars for your asset. Your earnings on this trade are equal to:

TRADE EARNINGS = 420 (10/customer $*$ 42 customers) + 70 = 490.

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

Suppose that during the same trading period you traded with Buyer 9 and that your assigned third party payment for this trade is 50 experimental dollars. If Buyer 9 agrees to pay you 12 experimental dollars/customer, or a total of 168 experimental dollars for your asset, your earnings from this trade are 218 experimental dollars:

TRADE EARNINGS = 168 (12/customer ∗ 14 customers) + 50 = 218.

Your current total profits in the trading period are:

SUM OF TRADE EARNINGS = 490 + 218 = 708 experimental dollars

TOTAL PROFITS = 708 – 200 = 508 experimental dollars

The record sheet shown below shows the transactions. Please use the enclosed record sheet to calculate and record your earnings during each trading period.

Trading Period	Trade	Buyer	Customers	Price Per Customer	Trade Price	+ Third Party	= Earnings
1	**1**	**7**	**42**	**10**	**420**	**70**	**490**
	2	**9**	**14**	**12**	**168**	**50**	**218**
	3	**5**	**11**			**40**	
	4	**6**	**9**			**30**	
	5	**8**	**6**			**22**	
						- Fixed Costs	**- 200**
	TOTAL						**508**

Suppose that during the same trading period you agree to sell your asset to Buyer 8 for 8.0 experimental dollars/customer, or a total of 48 experimental dollars. Your earnings on this trade are equal to 70 experimental dollars. However, the price of this

trade, expressed on an experimental dollar per customer basis, is lower than the price initially agreed to by Buyer 7, the largest buyer. According to the rules of the market, you must give this low per customer price to Buyer 7. The following record sheet records your revised total earnings.

Trading Period	Trade	Buyer	Customers	Price Per Customer	Trade Price	+ Third Party	= Earnings
1	**1**	**7**	**42**	**~~10~~ (8.0)**	**~~420~~ (336)**	**70**	**~~490~~ (406)**
	2	**9**	**14**	**12.0**	**168**	**50**	**218**
	3	**5**	**11**			**40**	
	4	**6**	**9**			**30**	
	5	**8**	**6**	**8.0**	**48**	**22**	**70**
						- Fixed Costs	**- 200**
	TOTAL						**~~508~~ (494)**

A comparison of the two record sheets shows that a trade with Buyer 8 at a price of 8.0 experimental dollars/customer results in a reduction in your earnings since you are required to provide Buyer 7, the largest buyer, the low per customer price you provided Buyer 8. In this example, the earnings you made from the trade with Buyer 8 was less than the earnings you lost from assigning Buyer 7 the per customer price you assigned to Buyer 8.

Finally, you incur a loss in a trading period if the sum of your trade earnings does not exceed your fixed costs. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed this assigned amount, you will be paid your $7 show up fee and will be asked to leave the experiment.

2. Information on Buyers

Each buyer has the opportunity to buy a single asset from each of the four sellers (labeled Seller 1, 2, 3, and 4). While buyers can conduct a trade with any given seller during a trading period, they are limited to **3** trades in a given period. That is, a buyer is unable to conduct a trade with all sellers in a given trading period. Buyer earnings from a trade are equal to the difference between their resale value for that asset and the price paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

While you do not know the exact size of the resale value any buyer receives, you can reasonably infer that the larger the size of the buyer, the higher the buyer's resale value.

III. Trading Process

(NOTE: A COMPUTER SCREEN SHOT IS PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 6 minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price ("ASK") into the computer and identifying to whom the ask is offered. A seller can place an ASK by typing an ask amount in the "Price" box located in the center of the screen and typing the number of the buyer (5, 6, 7, 8, or 9) to whom the ask is offered in the "Offered To" box located immediately below the Price box. A seller submits the ask by pressing the "PLACE ASK" button. Each ask can be sent to only ONE

buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount.

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand corner of the screen. Your submitted asks are in the lower right hand corner along with the identity of the buyers to whom they are offered. The bids that have been offered to you by various buyers can be seen in the upper right hand corner along with the identity of buyer making the offer. As a seller, you accept a bid by highlighting the bid you wish to accept with your mouse and then pressing the "sell" button. If neither an initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than it's standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and should record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with that seller again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower left hand corner of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand corner shows all trades this period. It is important for you to pay attention to these screens as a buyer may accept one of your asks resulting in a trade with you.

To make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following customer, third party payment, and fixed cost information.

Trading Period	Trade	Buyer	Customers	Price Per Customer	Trade Price	+ Third Party	= Earnings
1	1	7	30			10	
	2	9	20			9	
	3	5	10			5	
						- Fixed Costs	- 150
	TOTAL						

1. Suppose you submitted an ask of 6.0 per customer to Buyer 9. If that ask was accepted, what would your earnings be on the trade?

2. If that was your only trade, what would be your total profits?

3. Suppose Buyer 7 offered a bid of 3.0 per customer to you. If you accepted the bid, what would be your earnings on the trade?

4. If Buyer 7's resale value was 125, what would be Buyer 8's earnings on the trade?

5. Suppose Buyer 5 offered a bid of 2.0 per customer to you. If you accepted the bid, would you have to re-calculate your earnings on your trade with Buyers 7?

6. What would be your revised earnings from a trade with Buyer

7. How many times may you trade with each buyer in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question(s).

Are there any questions?

Experiment Instructions – Buyers (Cap, No MFN)

I. Procedures and Asset Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants, except as permitted under the rules of the experiment. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. Resale values may differ across assets for a given buyer and may differ across buyers. Buyers will also be assigned a previously incurred "fixed cost" for participating in the market. These fixed costs may differ among buyers. At the beginning of the experiment sellers will be assigned a particular asset and a previously incurred "fixed cost" from creating that asset. These fixed costs may differ among sellers. Sellers will also be assigned a schedule of payments that a third party provides them in the event of a trade between a seller and a buyer.

Buyers have the opportunity to purchase an asset from different sellers, while sellers have the opportunity to sell their respective assets to multiple buyers.
From this point forward, you will be referred to by your bidder number, which is bidder number _____. You are a BUYER in this experiment. There are four sellers and five buyers in your market.

II. Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by: (1) purchasing assets at prices below their assigned resale value for those assets and (2) having the sum of these earnings exceed their assigned fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices that, when combined with a third party payment, exceed their fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Buyers

Each buyer has the opportunity to buy an asset from one or more sellers. The market includes four sellers (labeled Seller 1, 2, 3, and 4). You will be assigned a resale value for the asset sold by each seller. You are strictly prohibited from revealing your resale values to anyone. While you can conduct a trade with any seller during a trading period, you may only complete 3 trades in a given period. You may trade with a particular seller only once in a trading period. If you buy an asset, your earnings from the trade are equal to the difference between your resale value for that asset and the price you paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

Suppose, for example, that you traded with Seller 1 and that your assigned resale value for the purchased asset is 644 experimental dollars. If you pay 300 experimental dollars for a trade with Seller 1, then your earnings are:

TRADE EARNINGS = 644 – 300 = 344 experimental dollars

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

For example, suppose your fixed cost was 110. Suppose that during the same trading period you traded with Seller 2 and that your assigned resale value for the purchased asset is 120 experimental dollars. If you pay 70 experimental dollars, then your total earnings in that trading period are:

SUM OF TRADE EARNINGS = 344 + 50 = 394 experimental dollars

TOTAL PROFITS = 394 – 110 = 284 experimental dollars

The following record sheet, which you should always use to calculate and record your earnings from each trade, displays your total earnings in this trading period.

Trading Period	Trade	Seller	Resale Value	- PRICE	= Earnings
	1	1	644	300	344
	2	2	120	70	50
	3				
	4				
	-Fixed Costs				-110
	TOTAL				284

You incur a loss on any particular trade if the price you paid for an asset exceeds your assigned resale value for that asset. You incur a loss in a trading period if the sum of your trade earnings is less than your fixed costs. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed that amount, you will be paid your $7 show up fee and you will be asked to leave the experiment.

2. Information on Sellers

Each seller has the opportunity to sell a single asset to each of the five buyers (labeled Buyer 5, 6, 7, 8, and 9). Each asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the asset available for sale to another buyer. Therefore, sellers are free to sell to one or more buyers. However, sellers may trade with each buyer only once in a trading period.

The sale of an asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to the seller in the form of a fixed payment the level of which is known only by the seller. This third party payment augments the revenue the seller obtains from selling the asset to a buyer.

Seller earnings from a trade are equal to the sale price, augmented by the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

While you do not know the exact size of the third party payment any seller receives, you can reasonably infer that sellers for whom you have a higher resale value are likely to have higher third party payments, and sellers from whom you have a lower resale value are likely to have lower third party payments.

III. Trading Process

(NOTE: A COMPUTER SCREEN SHOT IS PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 5 minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. A buyer can place a bid by typing a bid amount in the "Price" box located in the center of the screen and typing the number of the seller (1, 2, 3, or 4) to whom the bid is

offered in the "Offered To" box located immediately below the Price box. A buyer submits the bid by pressing the "PLACE BID" button. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price ("ASK") into the computer and identifying to whom the ask is offered. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand corner of the screen. The bids placed by you are in the upper right hand corner along with the identity of the sellers to whom they are offered. The asks that have been offered to you by various sellers can be seen in the lower right hand corner along with the identity of seller making the offer. As a buyer, you accept an ask by highlighting the ask you wish to accept with your mouse and then pressing the "buy" button. If neither an initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than its standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and should record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with that seller again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower left hand corner of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand corner shows all trades this period. It is important for you to pay attention to these screens as a seller may accept one of your bids resulting in a trade with you.

In order to make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following resale values and fixed costs:

Fixed Costs	25
Seller	Resale Value
1	30
2	40
3	50
4	70

1. Suppose you placed a bid to buy from Seller 2 at a price of 12. If that bid is accepted, what would be your earnings on the trade?

2. If that is your only trade, what would be your total profits?

3. Suppose that Seller 3 offered an ask of 44 to you. If you accepted the ask, what would be your earnings on the trade?

4. If Seller 3's third party payment was 120 for the trade, what would have been Seller 3's earnings on the trade?

5. How many times may you trade with each seller in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question(s).

Are there any questions?

Experiment Instructions – Sellers (Cap, No MFN)

I. Procedures and Market Description

You are about to participate in an experiment in the economics of market decision making in which you will earn money based on the decisions you make. Your earnings are yours to keep and will be paid to you in cash at the end of the experiment. During the experiment all units of account will be in experimental dollars. Upon conclusion of the experiment, all experimental dollars earned will be converted into U.S. dollars at the conversion rate of _____ U.S. dollars per experimental dollar. Your earnings, plus a lump sum amount of $7, will be paid to you in private. You are not allowed to communicate with the other participants. If you have any questions, please raise your hand and I will answer them in private.

In this market experiment you will have the opportunity to buy and/or sell a set of fictitious assets. The assets are "fictitious" in that they only exist in the context of the experiment. You will be assigned, at the beginning of the experiment, a "bidder" number and a role as either a buyer or a seller. To simulate the financial benefits of acquiring an asset, buyers will be assigned a guaranteed "resale" value for each asset. The level of the resale value assigned to any buyer is related to the buyer's "size," which is measured by the number of customers it serves. The larger the buyer, the higher its assigned resale value for an asset. Resale values may differ across assets for a given buyer. The following table ranks buyers included in the experiments from largest to smallest and provides the number of customers served.

Buyer	Customers (Size Rank)
7	42 (1)
9	14 (2)
5	11 (3)
6	9 (4)
8	6 (5)

In a given trading period a seller may conduct trades with multiple buyers. In each trading period the largest buyer (i.e., Buyer 7) is guaranteed to receive the lowest price from the sellers with whom it trades. Specifically, if Buyer 7 agrees on a price that is higher than the price the seller agrees to conduct a trade with another buyer, Buyer 7 is guaranteed to receive the lower price.

Sellers will be assigned a particular asset and a schedule of payments that a third party provides to them in the event of a trade between a seller and a buyer. The larger the buyer, the higher the third-party payment. Buyers have the opportunity to purchase an asset from different sellers, but each buyer is limited to making three trades per trading period. Sellers have the opportunity to sell their respective assets to multiple buyers. Both buyers and sellers will be assigned a previously incurred "fixed cost" for participating in the market, which are different for each buyer and for each seller. You are a SELLER in this experiment. From this point forward you will be referred to by your seller number, which is seller number _____. There are four sellers and five buyers in your market.

II. Earnings

Participants have the opportunity to conduct trades during a series of independent trading periods. Buyers earn money by: (1) purchasing assets at prices below their assigned resale value for those assets; and (2) having the sum of these earnings exceed their assigned fixed cost. Sellers earn money by selling their assigned assets to one or more buyers at prices that, when combined with a third party payment, exceed their assigned fixed cost. The following section describes how you calculate your earnings.

1. Instructions for Sellers

Each seller has the opportunity to sell a single asset to each of the five buyers (labeled Buyer 5, 6, 7, 8, and 9). Before the trading period, you will be assigned an asset and a fixed cost. You are not permitted to reveal your assigned fixed cost to anyone. The asset is "non-depletable" in that its sale to one buyer does not diminish the amount of the

asset available for sale to another buyer. Therefore, you are free to sell your asset to one or more buyers. However, you may trade with each buyer only once in a trading period. The sale of your asset to any buyer conveys a financial benefit to a third party, a portion of which is transferred to you in the form of a fixed payment, the exact level of which is known only by you. This third party payment augments the revenue you may obtain from selling your asset to a buyer. The following table shows an example of the third party payments you receive if you trade with a particular buyer. The larger the buyer, the higher the third party payment.

Buyer	Third Party Payment
7	70
9	50
5	40
6	30
8	22

If you sell your asset to a buyer, your earnings from the trade are equal to the sale price plus the third-party payment. That is:

TRADE EARNINGS = SALE PRICE + THIRD PARTY PAYMENT

Suppose, for example, that you are assigned a fixed cost of 200 experimental dollars. Suppose, Buyer 7, the largest buyer, agrees to pay you 10 experimental dollars per customer served (10/customer), or a total of 420 experimental dollars for your asset. Your earnings on this trade are equal to:

TRADE EARNINGS = 420 (10/customer $*$ 42 customers) + 70 = 490.

Your total profits in any trading period are equal to the sum of your earnings from all trades minus your fixed cost.

TOTAL PROFITS = SUM OF TRADE EARNINGS – FIXED COST

Suppose that during the same trading period you traded with Buyer 9 and that your assigned third party payment for this trade is 50 experimental dollars. If Buyer 9 agrees to pay you 12 experimental dollars/customer, or a total of 168 experimental dollars for your asset, your earnings from this trade are 218 experimental dollars:

TRADE EARNINGS = 168 (12/customer ∗ 14 customers) + 50 = 218.

Your current total profits in the trading period are:

SUM OF TRADE EARNINGS = 490 + 218 = 708 experimental dollars

TOTAL PROFITS = 708 – 200 = 508 experimental dollars

The record sheet shown below shows the transactions. Please use the enclosed record sheet to calculate and record your earnings during each trading period.

Trading Period	Trade	Buyer	Customers	Price Per Customer	Trade Price	+ Third Party	= Earnings
1	1	7	42	10	420	70	490
	2	9	14	12	168	50	218
	3	5	11			40	
	4	6	9			30	
	5	8	6			22	
	- Fixed Costs						- 200
	TOTAL						508

Suppose that during the same trading period you agree to sell your asset to Buyer 8 for 8.0 experimental dollars/customer, or a total of 48 experimental dollars. Your earnings on this trade are equal to 70 experimental dollars. However, the price of this trade, expressed on an experimental dollar per customer basis, is lower than the price initially agreed to by Buyer 7, the largest buyer. According to the rules of the market, you must give this low per customer price to Buyer 7. The following record sheet records your revised total earnings.

Trading Period	Trade	Buyer	Customers	Price Per Customer	Trade Price	+ Third Party	= Earnings
1	1	7	42	10 (8.0)	420 (336)	70	490 (406)
	2	9	14	12.0	168	50	218
	3	5	11			40	
	4	6	9			30	
	5	8	6	8.0	48	22	70
	- Fixed Costs						- 200
	TOTAL						508 (494)

A comparison of the two record sheets shows that a trade with Buyer 8 at a price of 8.0 experimental dollars/customer results in a reduction in your earnings since you are required to provide Buyer 7, the largest buyer, the low per customer price you provided Buyer 8. In this example, the earnings you made from the trade with Buyer 8 was less than the earnings you lost from assigning Buyer 7 the per customer price you assigned to Buyer 8.

Finally, you incur a loss in a trading period if the sum of your trade earnings does not exceed your fixed costs. You begin the experiment with _____ experimental dollars in working capital. If your losses ever exceed this assigned amount, you will be paid your $7 show up fee and will be asked to leave the experiment.

2. Information on Buyers

Each buyer has the opportunity to buy a single asset from each of the four sellers (labeled Seller 1, 2, 3, and 4). While buyers can conduct a trade with any given seller during a trading period, they are limited to 3 trades in a given period. That is, a buyer is unable to conduct a trade with all sellers in a given trading period. Buyer earnings from a trade are equal to the difference between their resale value for that asset and the price paid for the asset. That is:

TRADE EARNINGS = RESALE VALUE – PURCHASE PRICE

While you do not know the exact size of the resale value any buyer receives, you can reasonably infer that the larger the size of the buyer, the higher the buyer's resale value.

III. Trading Process

(NOTE: A COMPUTER SCREEN SHOT IS PROVIDED FOR YOUR REFERENCE)

Trading occurs in a series of independent trading days or periods. Each period will last 6 minutes. Buyers and sellers have the opportunity to conduct a set of trades through a series of bilateral negotiations. A buyer may submit a bid to buy a particular seller's asset by entering a bid into the computer and identifying to whom the bid is offered. Each bid can be sent to only ONE seller, and only that seller will see the bid. A bid indicates that the buyer is willing to accept any price at or below that amount. Similarly, a seller may submit offers to sell its asset to a particular buyer by entering an asking price ("ASK") into the computer and identifying to whom the ask is offered. A seller can place an ASK by typing an ask amount in the "Price" box located in the center of the screen and typing the number of the buyer (5, 6, 7, 8, or 9) to whom the ask is offered in the "Offered To" box located immediately below the Price box. A seller

submits the ask by pressing the "PLACE ASK" button. Each ask can be sent to only ONE buyer, and only that buyer will see the bid. An ask indicates that the seller is willing to sell at any price at or above that amount.

A buyer can accept an initial ask, or a seller can accept an initial bid. The bids and asks can be seen on the right hand corner of the screen. Your submitted asks are in the lower right hand corner along with the identity of the buyers to whom they are offered. The bids that have been offered to you by various buyers can be seen in the upper right hand corner along with the identity of buyer making the offer. As a seller, you accept a bid by highlighting the bid you wish to accept with your mouse and then pressing the "sell" button. If neither an initial bid nor an ask is accepted, a buyer may increase its standing bid and/or a seller may decrease its standing offer. A buyer's revised bid must exceed its standing bid to that seller, while a seller's revised offer must be lower than its standing ask to that buyer. As long as the period is open, participants are allowed to submit as many bids and asks as they like. If either side accepts one of the bids or asks, the two participants complete a trade at the designated price and should record the trade on their record sheet. Once you have traded with a particular seller in a period, you may not trade with that seller again during this period.

Information on completed trades can be seen in the upper center portion of the screen and in the lower left hand corner of the screen. The upper center portion reports the most recent trade you have completed and the lower left hand corner shows all trades this period. It is important for you to pay attention to these screens as a buyer may accept one of your asks resulting in a trade with you.

To make sure you understand the instructions, please complete the following exercise. Once you are finished (or if you have a question), raise your hand and someone will come by to help you.

Consider the following customer, third party payment, and fixed cost information.

Trading Period	Trade	Buyer	Customers	Price Per Customer	Trade Price	+ Third Party	= Earnings
1	1	7	30			10	
	2	9	20			9	
	3	5	10			5	
	- Fixed Costs						- 150
	TOTAL						

1. Suppose you submitted an ask of 6.0 per customer to Buyer 9. If that ask was accepted, what would your earnings be on the trade?

2. If that was your only trade, what would be your total profits?

3. Suppose Buyer 7 offered a bid of 3.0 per customer to you. If you accepted the bid, what would be your earnings on the trade?

4. If Buyer 7's resale value was 125, what would be Buyer 8's earnings on the trade?

5. Suppose Buyer 5 offered a bid of 2.0 per customer to you. If you accepted the bid, would you have to re-calculate your earnings on your trade with Buyer 7?

6. What would be your revised earnings from a trade with Buyer 7?

7. How many times may you trade with each buyer in a period?

RAISE YOUR HAND WHEN FINISHED.

Period zero will be a practice period. You will receive no earnings for this practice period. If you have any questions, please raise your hand and I will come by to answer your question(s).

Are there any questions?

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Office of Plans and Policy
Federal Communications Commission

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