Buyer Size and Bargaining Power:
An Experimental Analysis[1]

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Abstract

The Federal Communications Commission (FCC) initiated a proceeding in 2002 to examine whether and to what extent cable operators should be limited in the number of subscribers they can serve. This paper reports on the performance of experimental (laboratory) markets designed to be similar in structure and practice to the market where cable operators negotiate affiliate fees with various programming networks. Funded by the FCC, these experiments examined whether different levels of market concentration among cable operators will lead to substantially different outcomes along a variety of performance measures. One important performance measure is whether programming networks are negatively affected by different levels of cable concentration.

1. Introduction

Following its acquisition of AT&T's cable television service division, Comcast Corporation has become the largest provider of cable television service in the U.S., serving approximately **30** percent of the multi-channel video distribution market.[5] According to industry analysts, Comcast's greater market size should enhance its bargaining power when negotiating "affiliate fees" (i.e., exhibition rights) with programming networks (e.g., MTV, ESPN, Discovery Channel).[6] However, the Cable Television Consumer Protection and Competition Act of 1992[7] ("Consumer Protection Act") directs the Federal Communications Commission ("FCC") to limit the number of subscribers a cable operator may serve in order to ensure that one or more cable operators, acting unilaterally or jointly, do not unfairly impede the flow of programming to consumers.[8]

In 2001, The United States Court of Appeals in *Time Warner Entertainment Co. v. FCC* remanded the FCC's horizontal ownership limit which prohibited a single cable operator from serving more than 30 percent of the United States multi-channel video distribution market.[9] The Court found that the Commission's evidentiary basis for imposing the limit failed to meet the required standard. In response, the FCC initiated a rulemaking proceeding in which it solicited comments on whether, and to what extent, cable operators should be limited in the number of subscribers they can serve.[10] An

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[5] For purposes of the Federal Communications Commission, the multi-channel video distribution market includes cable operators, multi-channel multi-point distribution service providers, direct broadcast satellite providers, and television receive-only program distribution service providers. 47 U.S.C § 522(13). **(Get a cite for the size of Comcast).**

[6] See, for instance, "Shifting the Balance of Power of Programming," Cable/Satellite/Entertainment Industry, Morgan Stanley Equity Research, North America, April 7, 2003, pg. 2.

[7] Section 613(f) of the Communications Act: 47 U.S.C. § 553(f).

[8] 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.

[9] 240 F.3d 1126 (D.C. Cir. 2001).

[10] *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*

important element of the public record was an experimental study designed to shed light on the effect that changes in horizontal concentration may have on the flow of programming to consumers. The use of experimental economics in this instance was quite natural since the policy issue involved the assessment of the economic effects on programming networks of horizontal concentration levels that had never been observed in the naturally occurring environment. Experimental economics can be used to avoid the possible high cost associated with having the naturally occurring market generate the requisite empirical data. Just as it is advisable for an airplane designer to first test a model of an airplane before putting it into service, it is advisable for regulatory bodies to, where possible, test a new policy proposal in the laboratory before instituting the policy in the naturally occurring world.

The application of experimental economics was made more natural by the absence of formal economic theory suggesting a possible relationship between concentration and the flow of programming to consumers. The market in which cable operators negotiate affiliate agreements includes multiple buyers and sellers. While theory provides clear economic predictions when either a single buyer (i.e., monopsony) or seller (i.e., monopoly) exists, its predictions are anything but clear when the market includes multiple buyers and sellers. Moreover, due to differences in the targeted demographics and program production expenses, broad groups of programming networks offer differentiated products. Such product differentiation may permit some programming networks to extract substantially higher affiliate fees from cable operators than other programming networks. Programming networks and cable operators negotiate affiliate fees through a series of bilateral negotiations where the terms of the affiliate agreements are typically protected under a non-disclosure agreement. The absence of such market information may, despite the differentiated nature of some of the products, have an affect on the negotiated affiliate fees. Negotiations take place in an environment where both buyers and sellers have previously incurred fixed costs that must be recovered before they earn a profit. Economic theory provides very little guidance on the affiliate fees that may result in such an economic environment. Finally, the cost that a

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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").

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programming network incurs from negotiating an affiliate agreement with an additional cable operator is extremely low relative to the upfront cost it has incurred from producing or acquiring the exhibition rights to its package of programs. Economic theory has not fully explored the strategic effects of this cost structure on the affiliate agreements entered into by cable operators and programming networks.

The purpose of this paper is to describe and present results obtained from the economic experiments conducted for the FCC. The most significant results are the following. First, the experiments show that in the economic environment considered higher levels of horizontal concentration lead to a modest reduction in assignment efficiency. Second, while the bargaining power of the average buyer does not increase with increases in concentration, a particular cable operator's bargaining power increases, up to a threshold point, with size. Beyond this threshold point, at approximately a 12% share of the market, an increase in cable operator size does not lead to an increase in bargaining power. Third, consistent with the above result, the experiments show that programming networks are not harmed by increases in cable concentration. Fourth, the bargaining power of the simulated DBS operator tends to decrease as concentration increases. Section 2 presents a brief review of relevant economic theory. Sections 3 and 4 describe the experimental design and Section 5 summarizes the results.

2   Economic Theory

The central theme of the relevant theoretical literature, which addresses markets involving sequential bilateral trades, is the relationship between firm size and bargaining power. Assuming that there exists a positive relationship between firm size and bargaining power, it is plausible that a large firm may pay less for programming than a smaller firm, net of efficiency savings. If true, an increase in concentration may cause other program distributors to pay more for programming or, alternatively, program suppliers may acquire less expensively produced, lower quality programs, or may be unable to recover, in the long-run, their fixed costs of production. Each of these possibilities arguably falls within the FCC's mandate to consider the extent to which horizontal concentration among cable operators might restrict the flow of programming to final consumers.

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Chipty and Snyder (1999) examine a bargaining situation in which the gains from trade between program distributors and programming networks are split equally. In this case, by assumption very large program distributors have the same bargaining power as very small program distributors in negotiations with programming networks Chipty and Snyder (1999) demonstrate that as a buyer grows larger (e.g., through a merger) that buyer's bargaining position will worsen whenever the programming network's 'gross surplus function' is globally convex.[11] Based on this result, the authors demonstrate, through an econometric analysis of the advertising revenues earned by programming networks that a merger of two cable operators is likely to worsen, rather than enhance, the merged entity's bargaining position.

Raskovich (2001) follows the general bargaining framework established by Chipty and Snyder (1999), but introduces the idea of a 'pivotal' buyer. In the Raskovich model, a buyer becomes pivotal when it becomes sufficiently large that a seller cannot cover its programming development and other costs without conducting a trade with this buyer. In this context, Raskovich (2001) demonstrates that whenever a merger results in two non-pivotal buyers becoming pivotal, the bargaining surplus of the merged buyer is less than the sum of the surpluses that the two individual buyers would have received pre-merger.

Adilov and Alexander (2002) follow the framework established by Chipty and Snyder (1999) and Raskovich (2001), but introduce a different solution to the division of gains from trade between program distributors and programming networks. When firm size is positively related to bargaining power, Adilov and Alexander (2002) demonstrate that large buyers, including pivotal buyers, can enjoy greater gains from trade than smaller buyers.

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[11] A program network's net surplus function defines the relationship between a network's advertising revenues, minus the cost of producing its package of programs, and the number of viewers that have access to those programs. Due to the fixed nature of these production costs, the convexity of this function depends solely on the convexity of the network's advertising revenue function (i.e., gross surplus function). In this analysis, each buyer believes that the programming network will successfully trade with all other buyers, and so each considers itself to be the marginal buyer. By definition, when the programming network's gross surplus function is convex, the marginal buyer receives less total surplus from a trade than the infra-marginal buyers. Given the constant sum nature of the bargaining payoffs, this means that the marginal buyer contributes more to the programming network's surplus than the infra-marginal buyers (i.e., it has less bargaining power). Moreover, given the convexity of the function, the larger the size of the marginal buyer, the greater its contribution to the programming network's surplus. Hence, each buyer would prefer to bargain by itself rather than merge with other buyers before bargaining..

While interesting, these papers shed insufficient light on the economic issue at hand. For example, by specifying how the surplus from any trade will be shared between buyer and seller, each paper assumes a certain relationship between bargaining power and the size of the power. In addition, each assumes that the negotiations between a seller and multiple buyers take place simultaneously. However, program distributors and programming networks negotiate affiliate fees through a series of sequential, bilateral negotiations. Also, the negotiation environment for programming networks is complicated by the fact that they compete among themselves for the right to be carried by program distributors. Finally, the disagreement outcomes faced by programming networks are different than those implied in the above models since programming networks incur substantial fixed costs, a large portion of which are sunk, prior to negotiating affiliate fees. While existing economic theory provides little guidance on the relationship between affiliate fees and the size of the program distributors in this complex bargaining environment, the experimental results described later in this paper are important both in providing available evidence for current FCC policy making and in suggesting directions for future theory.

3   Experimental Design: General Description

The study involved an experimental market that parallels in significant ways the market in which cable operators and programming networks negotiate affiliate fees. Human subjects assumed the role of buyers or sellers – buyers representing cable operators and a DBS operator (together referred to as multi-channel video program distributors or MVPDs) and sellers representing programming networks. Each seller was assigned economic characteristics, including a level of previously incurred fixed costs and was provided information regarding the revenue they would receive if they conducted a trade with a particular MVPD. The economic characteristics were intended to reflect the economic characteristics possessed by three different types of programming networks in the naturally occurring world. Each programming network "type" was defined according to the number of viewers it attracts, the price advertisers are willing to pay to acquire access to those viewers, the additional subscribers an MVPD would obtain

if it carried the programming network, and the level of the fixed costs incurred by each programming network.

In each of the experimental sessions, four sellers, representing different programming networks were represented. Programming Networks #1 and #2 represented programming networks that attract a relatively small number of viewers all of which are not highly valued by advertisers and have relatively low sunk costs. Programming Network #3 represented a more popular programming network the viewers of which are moderately attractive to advertisers and has moderate sunk costs. Programming Network #4 represented a highly popular programming network the viewers of which are highly desired by advertisers and which has high sunk costs. The data for each programming network type were obtained from a sample of programming networks in Kagan (2001). The sample of programming networks upon which the economic characteristics of Network #4 were based included A&E, CNN, Discovery Channel, Lifetime, MTV, and Nickelodeon. The sample of programming networks upon which the economic characteristics of Network #3 were based included the Cartoon Network, Court TV, and the Family Channel. The sample of programming networks upon which the economic characteristics of Networks #1 and #2 were based included the Great America Channel, BBC, Health Channel, Ovation, Outdoor Channel, and the Recovery Channel.

Table 1 lists the set of characteristics that broadly define the four sellers included in the experiments. The displayed values represent the mean values for each of these variables included in the respective samples. Monthly Costs measures the seller's monthly operating expenses plus the cost of producing video programming. The costs are assumed to be unavoidable at the time the negotiation takes place. Cost per month (CPM) Price measures the revenue per thousand viewers sellers of advertising time can expect from selling a single commercial spot (or "avail"). National Avails measures the total number of commercial spots the programming networks sells in a given month. Finally, Total Day Audience Ratings measures the average number of television viewers the programming network attracts during the entire day divided by the total number of available television viewers.

Programming Network	Monthly Cost (mil.)	CPM Prices ($) (30-second spot)	National Avails (Monthly)	Total Day Audience Ratings (%)	Average Willingness to Pay ($/Sub/Month)
#1	1.5	1.00	11,004	.10	.647
#2	1.7	1.00	11,004	.12	.393
#3	10.4	2.34	9,092	.90	.094
#4	39.1	6.99	11,782	1.50	.090

Table 1: Seller Characteristics and Buyer Willingness to Pay

The experimental design established incentives for sellers to trade by providing them an opportunity to earn money from the trades they conducted. This money included the affiliate fee buyers pay sellers for the right to carry their network and the revenue the seller would earn from selling to advertisers access to its attracted viewers (i.e., national advertising time). 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. The advertising revenue the seller received from conducting a trade with a specific MVPD was based on the data shown in Table 1. For a given seller, the level of advertising revenue varied directly with the size of the buyer – where size is measured according to the number of subscribers the buyer serves – the larger the MVPD, the greater the advertising revenue. However, sellers also had to earn enough revenue to cover their assigned costs in order to earn a positive profit. As in the naturally occurring market, the amount of money sellers made depended on the number of trades they conduct and the prices at which those trades were conducted.

Each buyer was assigned a set of economic characteristics, including the number of MVPD subscribers it serves. This particular assignment was accomplished by first dividing the MVPD subscriber marketplace into two sets representing cable subscribers and DBS subscribers. Cable subscribers were then grouped into six distinct service areas representing local franchise monopolies.[12] To provide a motivation to trade, buyers were given an opportunity to earn money from the trades they made. To this end, each buyer

was guaranteed a sum of money for each trade it conducted. The guarantee can be viewed as a secondary market in which buyers can sell the carriage they have acquired from programming networks.[13] The guaranteed money defines the maximum amount the buyer would be willing to pay for the right to carry a particular programming network. Buyers earned revenue 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 the right to carry each programming network is shown in Table 1.[14] The willingness to pay is based upon an estimate of the additional subscriber and local advertising revenue the MVPD would obtain from carrying the programming network. An estimate of the local advertising revenue was based on the programming network's local audience ratings, an estimate of the local advertising CPM price, and the number of local "avails," (i.e., the number of 30-second spots the MVPD can sell).

Buyers were also assigned a set of costs that they had to cover in order to stay in business. Together, cable operators were assigned over $20 million in monthly costs, while the DBS operator was assigned $3.4 in monthly costs.[15] The analysis assumed that a vast majority of the buyer's costs were already covered by an existing flow of revenue. Thus, the assigned costs represent the additional cost the buyer must cover through its trades with sellers. These costs included sales/administrative and interest expenses, the later of which is a fixed cost associated with the construction of the buyer's programming distribution system, but excluded programming expenses.[16]

In the naturally occurring market, MVPDs and programming networks conduct trades through a sequential, multi-lateral bargaining process that is not specifically

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[12] In 2001, the MVPD marketplace consisted of 82 million subscribers. Changes in market concentration were accomplished by changing the identity of the MVPD service provider in one or more service areas.

[13] In this case, the buyer knew with certainty the value the secondary market places on the carriage right.

[14] Just as in the naturally occurring environment, the analysis assumed that the households served by MVPDs vary in their socio-demographic characteristics. Such variation will have an affect on the price of local advertising time and the number of additional subscribers the MVPD can expect to serve in response to its decision to carry a particular programming network. Because of these two factors, subjects playing the roles of buyers varied in their willingness to pay for the right to carry a particular programming network.

[15] These data are based upon information obtained from 10K reports for Adelphia, Classic, Comcast, Cox, Insight, and Mediacom and from Kagan (2002).

[16] The analysis assumed that the revenue generated from the services provided by the cable operator already covered the buyer's existing programming expenses.

defined by particular rules. In this experimental market, buyers and sellers negotiated with each other by placing bids to buy and offers to sell to each other. Channel carrying capacity of each MVPD is assumed limited, and therefore each buyer was allowed to trade with a maximum of three different sellers in each trading period. No additional structure was imposed.[17] 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. As in the naturally occurring environment, buyers and sellers were free to select the entities with whom they negotiated, the manner in which they negotiated and the order in which they negotiated with entities on the opposite side of the market.[18]

The 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 exceeded its assigned costs. Consistent with industry practice, the prices at which traded occur were not disclosed to other participants.

Between seven and nine subjects participated in each experimental session. The subjects were undergraduate 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. They then answered a set of questions designed to test their understanding of the instructions. Once all subjects had successfully answered these questions, a practice trading period was conducted. Trades in each trading period were conducted using experimental dollars, which converted at the end of the each experimental session at the

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[17] In the naturally occurring market, in addition to affiliate fees, cable operators and programming networks negotiate, among other things, over the number of avails which are assigned to the cable operator and the length of the affiliate agreement.

[18] Buyers were prevented from speaking to sellers, and vice versa. All communications were non-verbal. Buyers could respond to a seller's ask by accepting it (and completing a trade) or by submitting a revised bid. Similarly, sellers could accept a buyer's bid or could submit a revised ask. All revised bids and asks had to satisfy an improvement rule -- a revised bid placed by a buyer to a given seller had to be greater than

rate of .002 experimental dollars to one U.S. dollar. 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.[19] 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 not completely deplete their working capital even if they did not trade (or traded at a zero price) in every trading period. This allowed us to observe market negotiations and dynamics even in situations where participants might be incurring significant losses.

3.1   Treatment Variables

A total of 14 experimental sessions were completed involving 200 human subjects. The 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 Number* (Low/High). There were five (5) buyers and all served between 14.6% and 26.8% of the MVPD subscriber market.

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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.

- *High Concentration/High Number* (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 Number* (High/Low). There were three (3) buyers. Buyers served 39%, 43.9%, and 17.1% of the MVPD subscriber market.

Table 2 shows the number of subscribers and the share of the MVPD market served by each buyer across the different horizontal concentration treatments. The concentration levels were chosen to obtain bargaining outcome data across a variety of concentration levels and across a wide variety of differ "sized" buyers.

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 2: Horizontal Concentration Treatments

The treatments permit two different examinations of whether a buyer's bargaining power increases with an increase in its market share. One test involves examining whether the average level of bargaining power displayed by buyers varies across concentration treatments. In two treatments (i.e., Low/High and High/High), the market share of the average buyer is the same (i.e., 20 percent), but the size distribution of the buyers differ. In the other treatment (i.e., High/Low), the market share of the average

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[19] 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.

buyer is 33 percent. Another test involves measuring the bargaining power displayed by each buyer in each trade and testing whether the amount of observed bargaining power is related to the size of the buyer. The inclusion of the DBS buyer also permits an examination of whether individual buyers whose market share size remains constant over time, while other buyers grow in size, will be negatively affected by an increase in concentration in the MVPD industry. Finally, the treatments permit an evaluation of the conjecture that increases in market concentration may negatively affect the flow of programming to viewers. For example, the treatments allow an examination of whether there exists a statistically significant difference in the profits of suppliers when operating in a market that includes a single large buyer serving 51.2% of the MVPD market versus a market where the largest firm serves either 43.9% or 26.8% of the market.[20]

3.2   Performance Measures

This section discusses and formally defines several methods of measuring market performance. Let $i=1,2,...,n$ be an index of the buyers and $j=1,2,...,m$ be an index of the sellers. Let TPP_j^i be the third party payment seller j receives from trading with buyer i, and WTP_i^j be the willingness to pay for buyer i for a trade with seller j. Let P_{ij} be the price (assumed positive) that buyer i pays seller j, and define the indicator variable x_{ij} such that $x_{ij}=1$ 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.

3.2.1 Economic Efficiency

Economic efficiency refers to the extent to which society makes the best use of its scarce resources. Under an efficient allocation, the benefit society receives from its scarce resources is maximized. In most settings, a profit maximizing buyer (or seller) with market power will lead to an inefficient allocation of resources. For example, a monopolist typically restricts output below the competitive level in order to maximize

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[20] This analysis involves comparing the results obtained in the High/High and High/Low environments.

profits. Similarly, a monopsonist restricts the quantity purchased below the competitive level in order to maximize profits.

Under an efficient allocation, buyers and sellers conduct a set of trades that maximize the sum of the gains of the trade enjoyed by buyers and sellers. It follows, therefore, that under an inefficient allocation there exists a different set of trades that generates greater benefits for society. If one observes a decline in economic efficiency in treatments with higher concentration (or other features), then one could argue that the higher concentration treatments are contributing to the market's overall inefficiency.

In the current context, economic 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 denominator – the set of economically efficient trades – can be determined by solving the following maximization problem in which the constraints incorporate the assumed channel capacity limitations.

$$\max \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij}(WTP_i^j + TPP_j^i)$$

$$s.t.$$

$$\sum_{j=1}^{m} x_{ij} \leq 3$$

$$x_{ij} \in \{0,1\}$$

(1)

Let $S*$ be the total profits under an efficient allocation. That is, $S*$ represents the value of the objective function (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.[21] The efficient surplus in the treatments examined is 8650 (Low/High), 8644 (High/High), and 8649 (High/Low). The efficient allocation always requires that each buyer trades with Sellers #3 and #4 and either Seller #1 or #2.

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

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[21] 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.

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.

$$S = \sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij}^{'} \left(WTP_i^j + TPP_i^j \right) - \sum_{j=1}^{m} C_j - \sum_{i=1}^{n} C_i \qquad (2)$$

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

3.2.2 Bargaining Power

A trade between an MVPD and a cable network creates an economic surplus. This surplus is composed of the maximum amount of money the MVPD 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 MVPD's willingness to pay effectively assigns the entire economic surplus to the seller. An affiliate fee in which the MVPD pays a negative price equal to the cable network's national advertising revenue (i.e. the cable network pays the MVPD that amount in order to be carried) effectively assigns the entire economic surplus to the MVPD. For a given trade, the buyer's bargaining power is defined as the share of the economic surplus assigned to the buyer. More formally, Buyer Bargaining Power ("BBP") for each completed trade is defined as:

$$BBP_i^j = \frac{WTP_i^j - P_{ij}}{WTP_i^j + TPP_j^i} \qquad (3)$$

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:

$$BBP_i = \frac{\sum_j \left(WTP_i^j - P_{ij} \right)}{\sum_j \left(WTP_i^j + TPP_i^j \right)} \qquad (4)$$

where each summation is taken over all sellers j which a given buyer trades with in a given trading period.[22] 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."

3.2.3 Buyer Surplus

BBP does not, by itself, provide a complete picture of the price setting capabilities of buyers since it does not take into account either the number or "quality" of trades conducted by a buyer. To be sure, 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. To take into account both the number and the quality of trades conducted by the buyer, we define a measure termed *Buyers' Surplus* (*BS*). *Buyers' Surplus* is simply 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. More formally:

$$BS_i = \frac{\sum_{j=1}^m x_{ij}^{'} \left(WTP_i^j - P_{ij} \right)}{GS_i^*} \qquad (5)$$

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

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[22] 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.

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$$BS = \frac{\sum_{i=1}^{n} \sum_{j=1}^{m} x_{ij}' \left(WTP_i^j - P_{ij} \right)'}{GS^*} \qquad (6)$$

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) for each buyer and then taking the average across all buyers provides a measure of the average level of buyer's surplus displayed in a given treatment.

3.2.4 Seller Profits/Losses

Sellers have been assigned non-avoidable sunk costs that must be recovered in order for them to earn a profit in any trading period. The assignment of such costs introduces the possibility that sellers may incur losses during the experiments. The study measures the profits (losses) earned (incurred) by each seller. 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.

4.0 Experiment Results

The results of the economic experiments are organized according to the selected performance metrics. Because participants may require a few trading periods to become fully accustomed to the experimental environment, we do not consider the 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. In most instances, a Wilcoxon-Mann-Whitney Rank-Sum test (WMW) is used to test for significant differences in the treatments. A powerful non-parametric alternative to the traditional t-test, the WMW makes no assumptions on the structure of the data other than that the data is ordinal in nature. We report the p-values associated with the WMW test statistic for each pair-wise test in parenthesis. In performing these tests, the average performance of

each experimental session for the final four periods is used as the unit of observation. While this technique lowers the number of observations, it reduces the potential statistical problem associated with treating the results of each trading period in a given session as though they are statistically independent. In some instances, the hypothesis in question requires the use of more disaggregated data. In these instances, we employ regression analysis and, in so doing, directly address the issue of treating the results of each trading period within a given session as though they are statistically independent. A summary of the performance measurements in each of the three treatments is reported in Table 3. The remainder of this section presents a more detailed statistical interpretation of these and other results.

Performance Measures	Treatments		
	Low/High	High/High	High/Low
Economic Efficiency	93.0%	83.6%	89.0%
Average Bargaining Power	46.0%	41.9%	42.6%
DBS Operator Bargaining Power	53.6%	47.4%	42.9%
Average Buyer Surplus	44.0%	40.2%	40.0%
DBS Operator Buyer Surplus	50.6%	46.5%	40.5%
Percentage of Seller's with Losses	38.8%	35.9%	32.5%
Average Losses for Sellers #1 and #2	88.5	127.6	121.2

**Table 3: Performance Measure Results
(Trading Periods 5 - 8)**

Result 1: Economic efficiency is lowest under the High/High treatment. We find that there is a statistically significant difference in the average efficiency level observed in the High/High treatment compared with the average efficiency level observed in the Low/High treatment (p-value = .0952). This result suggests that, under the examined treatments, an increase in concentration among buyers led to a reduction in economic

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efficiency. However, there is no statistically significant difference in the average efficiency levels observed in the Low/High and High/Low treatments (p = 0.2103), nor is there a statistically significant difference in the average efficiency levels observed in the High/High and High/Low treatments (p = 0.1429).

This result suggests that a market with a very large buyer may result in modest declines in economic efficiency. It is interesting to note that the lack of difference in economic efficiency for the High/Low treatment suggests that the lower efficiency is driven by the absolute size of the largest buyer rather than the number of active buyers in the market.

While Result 1 indicates that the surplus associated with trading in this market declines when there is a large buyer, the overall level of efficiency is quite high (between 83-93%) considering the complex, decentralized bargaining procedure used. However, market concentration might still affect the bargaining outcomes by changing the amount of the surplus captured by a particular side of the market.

Result 2: The average level of bargaining power is not related to the level of horizontal concentration. One objective of the experiments is to determine whether the level of bargaining power displayed by buyers in a given market concentration depends on the size of the buyer and the size distribution of buyers in the market. We find that there is no statistically significant difference in the <u>average</u> level of bargaining power displayed by buyers across the different concentration treatments: Low/High versus High/High treatments (p-value = 0.3651), High/High versus High/Low treatments (p-value =.5476), and High/Low versus Low/High treatments (p-value = 0.3452).

The act of averaging bargaining power across different sized buyers may hide buyer size effects that can only be observed with less aggregated data. Thus, we also examined the bargaining power displayed by the largest buyer in each of the treatments. The share of the MVPD market served by the largest cable operator in the different concentration treatments and the bargaining power displayed by that MVPD is listed in Table 4.[23]

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[23] 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	Largest Buyer MVPD Market Share	Largest Buyer Bargaining Power	DBS Bargaining Power
Low Concentration/High Numbers	26.8 %	43.4 %	53.6 %
High Concentration/High Numbers	51.0 %	47.0 %	47.4 %
High Concentration/Low Numbers	43.9 %	46.3 %	42.9 %

**Table 4: Largest Buyer Market Share and Bargaining Power
and DBS Bargaining Power (Periods 5 –8)**

We 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% (p-value = .4524) or 43.9% (p-value = .xxxx) of the MVPD market . This suggests that higher concentration levels do not directly result in disproportionately higher surplus for the largest buyer. It is possible, however, that the competitive effects of a larger buyer might be borne out by smaller buyers losing bargaining power in the presence of a larger buyer. In all treatments, the DBS buyer holds the same small proportion of the market (14%). By looking at the bargaining power of the DBS buyer we are able to determine whether higher concentration limits adversely affect other buyers.

Result 3: The DBS operator's bargaining power is lower when there are few buyers and when concentration is high. As shown in Table 4, the DBS operators' bargaining power is highest under the Low/High concentration treatment. We find that the DBS operator's bargaining power in the High/Low treatment is significantly lower than in the Low/High concentration treatment (p-value = .0754). This result suggests that an increase in market concentration, coupled with a decrease in the number of MVPDs, would negatively impact the DBS operator's bargaining position.

Another objective of the experiments is to determine whether there are statistically significant differences in the bargaining power of other different sized buyers.

Result 4: A buyer's bargaining power is related to its size up to a point.

Observations = 706 F(14, 691) = 75.32 Prob > F = 0.0000		R^2 = .0.5636 Root MSE = .1403	
Buyer Bargaining Power	**Coefficient (t-value)**	**(95% Confidence. Interval)**	
7%	-.0940 (-3.90)	-.1414	-.0466
11%	-.0875 (-3.34)	-.1389	-.0361
13%	-.0408 (-1.51)	-.0940	.0122
15%	-.0318 (-1.17)	-.0851	.0214
17% (DBS)	.0141 (0.69)	-.0259	-.0541
17% (Cable)	-.0183 (-0.83)	-.0616	.0250
24%	.0435 (2.18)	.0042	.0827
27%	.0043 (0.18)	-.0430	.0518
39%	-.0615 (-2.44)	-.1112	-.0119
44%	.0032 (0.16)	-.0371	.0436
Seller #1	.3720 (24.69)	.3424	.4016
Seller #2	.3641 (23.02)	.3330	.3951
Seller #3	.1892 (14.52)	.1636	.2148
Period	.0128 (2.74)	.0036	.0220
Constant	.2912 (8.28)	.2221	.3603

**Table 5: Buyer Market Share and Bargaining Power
(Periods 5 –8)**

Table 5 shows the results of a statistical model that regresses the level of buyer bargaining power observed in each trade against the size of the buyer (where size is represented as a dummy variable), the popularity of the seller with whom the buyer has traded (also introduced as a dummy variable), and the trading period in which the trade occurred.[24] The model imposes the restriction that the differences in bargaining power across buyers (or across sellers) is independent of the popularity of the seller (buyer) with whom the buyer (seller) conducts a trade. As shown in Table 5, there is a statistically significant difference in the bargaining power between a buyer that serves 51 percent of the MVPD market, and buyers that serve either 7 percent, 11 percent, or 39 percent of the market.

While we do not systematically vary the size of the sellers, we can still examine whether larger sellers appear to have a preferential bargaining position relative to smaller sellers.

Result 5: A seller's bargaining power is directly related to its popularity. As shown in Table 5, the most popular programming network has substantially more bargaining power than either the least popular programming networks or the moderately popular programming network. For instance the least popular programming networks obtains, on average, 34 percent of the surplus available from a trade, while the most popular programming network obtains, on average, 71 percent of the surplus available from a trade.[25]

Like bargaining power, buyer's surplus is another measure of the gains from trade captured by different buyers under different treatment conditions. Not surprisingly, the results related to buyer's surplus are nearly identical. First, buyer's surplus is not affected by the level of horizontal concentration. There is no statistically significant difference in the average level of buyer surplus across concentration levels. The

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[24] Broadly speaking, the estimated model creates a set of mutually exclusive cells each of which contains a measure of the bargaining power (BBP) displayed by a particular-sized buyer when conducting a trade with a seller. The t-statistic associated with a coefficient for a particular-sized buyer tests the statistical significance of the difference between the bargaining power of subjects playing the role of that particular-sized buyer and the bargaining power of subjects playing the role of some referenced buyer.

[25] The constant term (i.e., .291) measures the percentage of the surplus obtained by the largest buyer when conducting a trade with the most popular seller. The percentage of the surplus obtained by the largest seller

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). Second, the DBS operator's buyer surplus is highest in the Low/High concentration treatments. There is a statistically significant difference in DBS operator buyer surplus between the Low/High and High/Low concentration treatments (p-value = .0952). This result is consistent with Result 3 that showed a reduction in the DBS operator's bargaining power from a movement from a Low/High to a High/Low concentration environment.

We next turn to the profitability of sellers given changes in buyer concentration. A reduction in profitability will cause sellers to exit the market if, following the reduction, sellers earn negative quasi-rents. Such exit will, in the long run, lower the variety and flow of programming to consumers. The actual market in which sellers operate appears to be structured in a way that leads some sellers to likely earn small quasi rents.[26] Table 6 reports the proportion of trading periods in which a particular seller incurred a loss and the amount of the loss, on average.

	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 6: Percentage of Trading Periods in Which a Seller Incurs a Loss and Average Loss

Result 6: Small, less popular programming networks are the most likely programming networks to lose money. Using a trading period as the unit of analysis, Table 6 above shows the frequency with which a given seller incurred a loss across the

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is .709 (= 1.0 - .291). The percentage of the surplus obtained by Seller #1 when conducting a trade with the largest buyer is .336.

[26] See Wall Street Journal, "Digital World Churns as Cable Homes Ignore Many Channels," Section B-1, September 24, 2003.

different concentration treatments. Sellers #1 and #2, the least popular programming networks, are the most likely to lose money.

Result 7: 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. We find 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 8: The probability that any seller will incur a loss in a trading period is not related to the level of horizontal concentration. Sellers often lost money in a given trading period, 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. The Chi-square statistic was .6825, which is less than the critical value consistent with standard levels of significance.

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, higher levels of horizontal concentration (holding the number of buyers constant) led to a modest reduction in economic efficiency. Second, the results indicate that in the experimental setting the bargaining power of a cable operator that serves 27 percent of the MVPD market does not differ substantially from the bargaining power of a cable operator that serves 51 percent of the MVPD market. From the perspective of a programming network, a cable operator that serves 27 percent of the MVPD market is as

powerful as one that serves 51 percent of the market. However, based on regression analysis, the results indicate that there are statistically meaningful differences in the bargaining power of other different sized buyers. For example, there is a statistically meaningful difference in the bargaining power between a buyer that serves 51 percent of the MVPD market and buyers that serve 7 percent, 11 percent, or 39 percent 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. This result suggests that small MVPD, like the DBS operator, might be adversely affected by higher levels of concentration. Fourth, according to regression analysis, a cable operator's bargaining power depends importantly on the popularity of the programming network. The more popular the programming network, the lower the cable operator's bargaining power. Fifth, 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.

When compared to the economic theory models previously discussed, our results seem to support the notion that the effects of increased concentration are modest at best. While there is some decline in efficiency at high concentration levels and very small buyers do see their bargaining power decline, for the most part, buyer bargaining power, buyer surplus and seller profits are unrelated to the level of horizontal concentration. These results do not support the predictions made by the models of Chipty and Snyder (1999) and Raskovich (2001) both of which predict that buyer bargaining power should fall as buyer size increase.[27]

The economic experiments were designed to include many of the central features of the actual market in which MVPDs and programming networks negotiate affiliate fees. For example, the experiments took into account that programming networks offer

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[27] Our results, however, are consistent with the more general framework introduced by Adilov and Alexander (2002).

differentiated products, vary in the level of non-avoidable, sunk costs they incur, and use a sequential, bilateral bargaining process to negotiate affiliate fees. However, the experiments abstract from several features of the actual market. For example, they do not take into account that large some cable operators, notably the largest operators, are able to include a "Most Favored Nation" ("MFN") provision in an affiliate agreement. Under such a provision, programming networks guarantee that the affiliate fee paid by the large cable operator is no greater than the affiliate fee paid by any smaller MVPD. By creating an interdependency in the affiliate fees paid by some buyers, an MFN provision complicates a programming network's bargaining problem.

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