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.

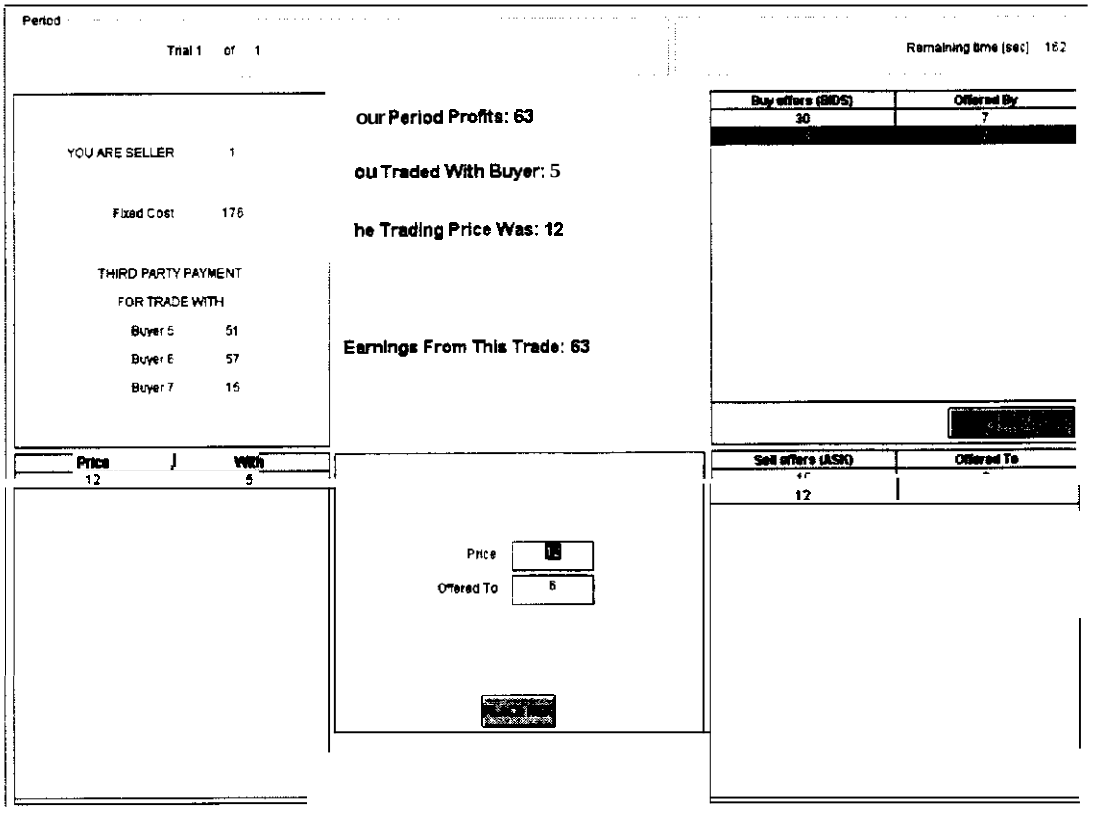

Figure 1: A Typical Seller Screen

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 comer 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.

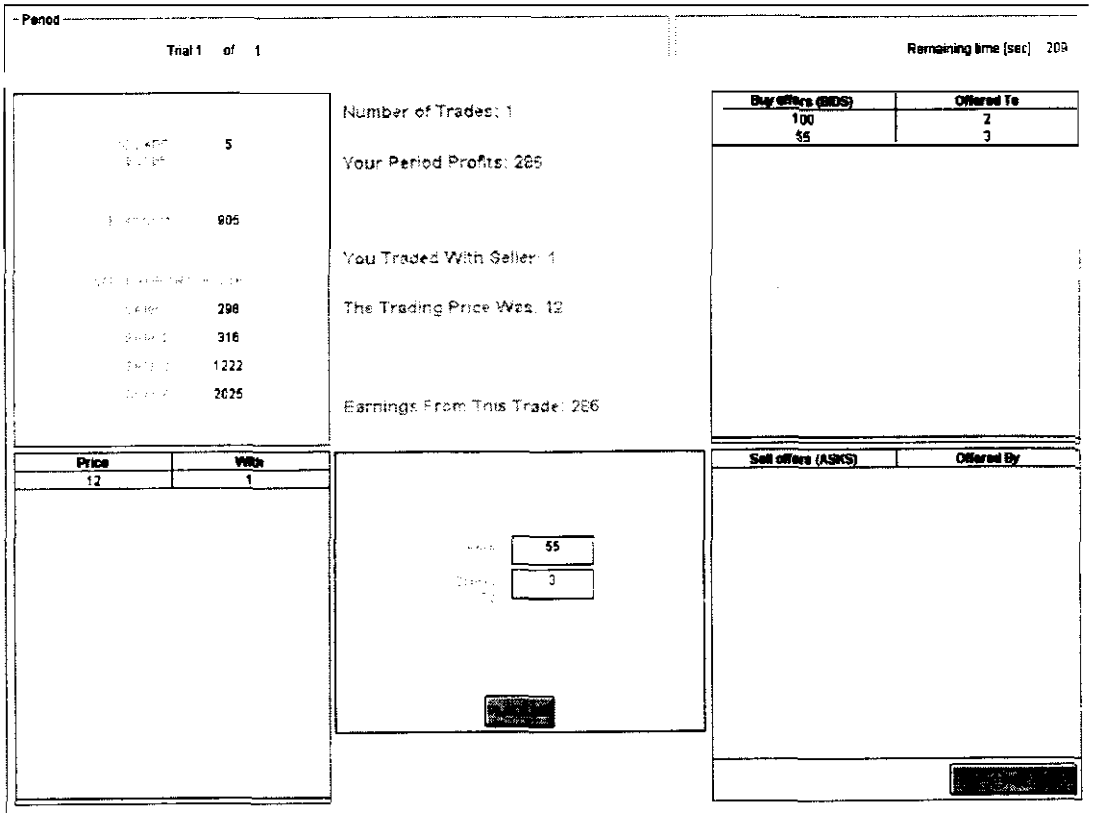

Figure 2: A Typical Buyer Screen

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:

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

$$s.t \qquad (5.1)$$

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

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

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.'" Under the *CAP* treatments, the efficient allocation always requires that each buyer trades with Sellers **3** and **4** and either Seller I 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 indiffcrcnt 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 Coumot 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 ("BBF"') for each completed trade

$$BBP,' = \frac{WTP,' - P_{ij}}{WTP_i^{'} + TPP_i^{'}} \qquad \mathbf{(5.3)}$$

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."

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 profitsilosses). 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 eams 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.

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 HighlLow and LowlHigh 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 HighiHigh treatments compared with the LowiHigh

[51] 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 HighiLow treatments ($p = 0.2103$), nor is there a statistically significant difference in the efficiency levels observed in the HighiHigh 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

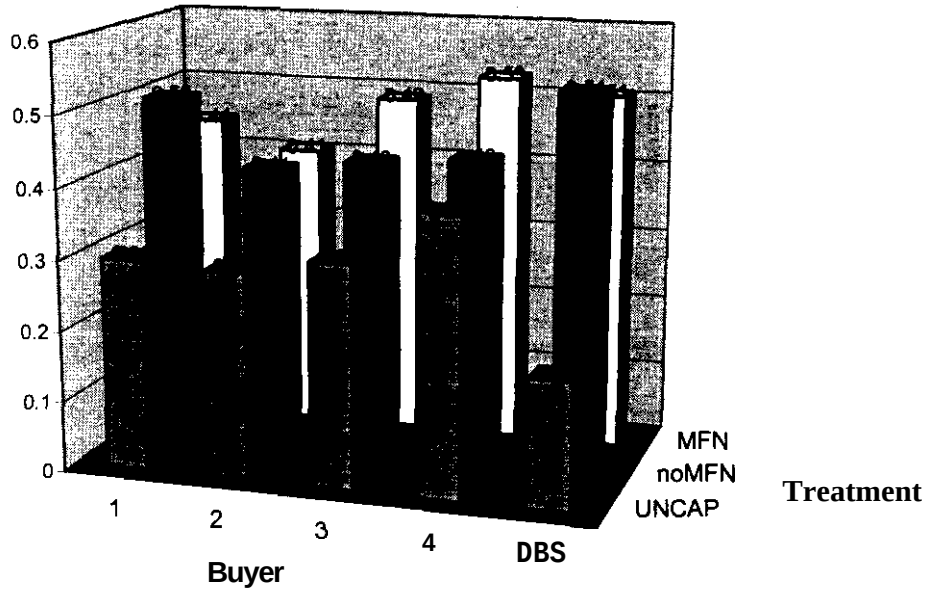


Figure 4: Buyer Average Bargaining Power (Periods 5-8)
High/High Concentration Treatment

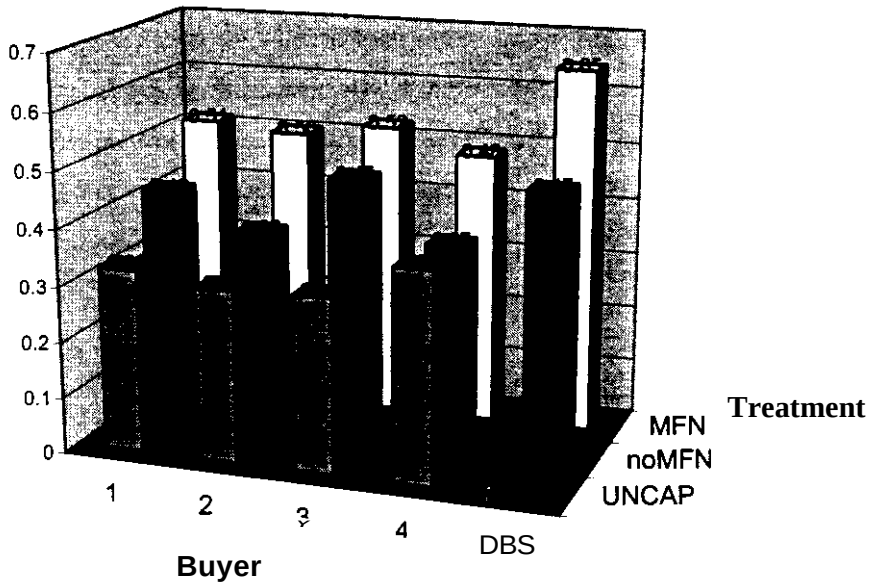
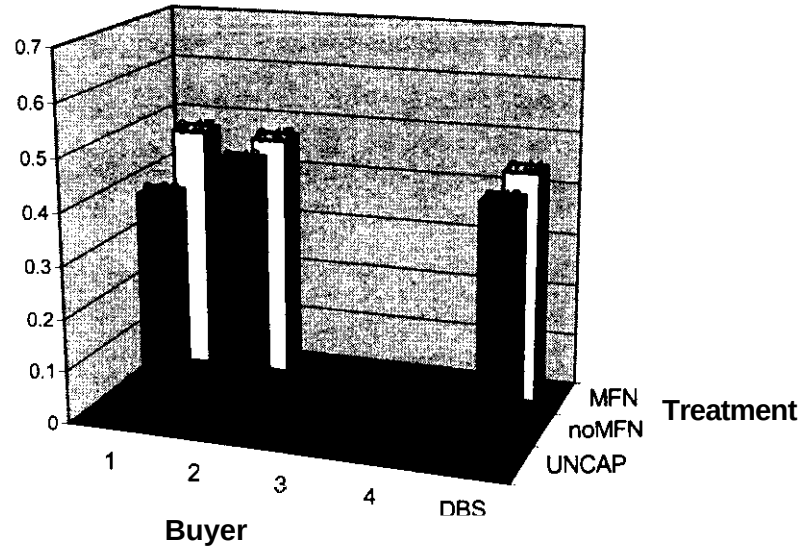


Figure 5: Buyer Average Bargaining Power (Periods 5-8)
HighlLow Concentration Treatment



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." 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 HighiHigh 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 HighiHigh 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 HigWHigh treatments (p-value = 0.3651), nor is there a statistically significant difference in the average buyer's bargaining power in the HigWHigh 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 LowiHigh 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 LowlHigh 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 (LowiHigh v. HigWLow), ,3651 (Low/High v. HigWHigh), and .5476 (High/High v. HigWLow).

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.

Environments	Treatment Variables		
	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 HighiLow 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%	38.8%	53.1%
	-425	-88.5	-166.6
High Concentration/High Numbers	0.00%	35.9%	53.1%
		-127.6	-108.2
High Concentration/Low Numbers	*	32.5%	37.5%
		-121.2	-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	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 HighiHigh treatments @-value = 0.5467), nor is there a statistically significant difference in the average loss incurred by Sellers #1 and #2 in the HighiHigh and HighiLow 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 incurredlearned 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 vanes.

[62] This analysis was motivated. in pan, 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 1-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 Price Subscriber	R² .4520 Root MSE .0578 Coefficient (t-value)	(95% Confidence Interval)		Observations 300 F(6, 229) 51.12 Prob > F 0.0000 Coefficient (t-value)	R² .4160 Root MSE .0590 (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

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[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.