

2002-

14

FEDERAL COMMUNICATIONS COMMISSION

MEDIA BUREAU STAFF RESEARCH PAPER

---

# Most-Favored Customers In the Cable Industry

By Nodir Adilov and Peter J. Alexander

---

September 2002

# Most-Favored-Customers in the Cable Industry

Nodir Adilov and Peter J. Alexander

September 25, 2002

## ABSTRACT

In this paper, we explore the implications of most-favored-customer clauses in the cable industry. We show that the introduction of a most-favored-customer clause for large buyers will increase their profitability, and that the seller's profits may decrease. We examine the experimental cable bargaining results of Bykowsky, Kwasnica, and Sharkey (2002), and compare these results to our model. We find that the results of the Bykowsky-Kwasnica-Sharkey experiments regarding the effect of a most-favored-customer agreement are consistent with our findings.

## I Introduction

In this paper, we explore the use of 'most-favored-customer' clauses (hereafter, MFC) in the cable industry.<sup>1</sup> We examine the impact of MFC clauses on bargaining outcomes between buyers and sellers, and show that these outcomes depend on the market share of the larger buyers and the relative valuation of the seller's programming to different buyers.

The paper is organized as follows. We begin with the general case with many buyers and sellers, and show that in the absence of capacity constraints and MFC arrangements the competitive outcome obtains. We then introduce channel capacity constraints, and demonstrate that the competitive outcome still obtains. Next, we explore the case of large firms and MFC clauses. We show that the introduction of MFC clauses can disadvantage sellers and small buyers. We find that as the market share of the large buyer increases, smaller buyers are more likely to be disadvantaged.

---

\*Adilov: Department of Economics, Cornell University, email: na47@cornell.edu; Alexander: Federal Communications Commission, email: palexand@fcc.gov. We thank David Sappington and William Sharkey for their many thoughtful and useful comments. Any errors are our own. The views expressed in this paper are those of the authors, and do not necessarily represent the views of the Federal Communications Commission, any of its Commissioners, or other staff.

<sup>1</sup>The MFC represents a formal or quasi-formal arrangement by which the larger buyer pays no more than the highest amount of any smaller buyer.

Specifically, we find that if there are differences in the relative valuation of programming among buyers such that the larger buyer has a greater per-customer valuation, smaller buyers may be precluded from access to the programming because of its relative expense. In the penultimate section, we extend our model to accommodate the methodology utilized in the experimental studies conducted by Bykowsky, Kwasnica, and Sharkey (2002).<sup>2</sup> Our prediction that an MFC arrangement yields market power is supported by their data.<sup>3</sup> Finally, we make some concluding remarks.

## II The General Case of Multiple Buyers and Sellers

Assume that risk neutral content providers (also known as cable networks) have positive fixed (sunk) costs of producing and zero marginal costs of distributing their product. These content providers will be referred to as sellers (of programming). There are  $I$  sellers. The sellers earn revenue by selling their product to cable owners. The cable owners will be referred to as buyers.

For simplicity, we begin by assuming that sellers make a ‘take it or leave it’ offer to each prospective buyer and denote by  $T_{1,i}, T_{2,i}, \dots, T_{M,i}$  the total payments to seller  $i$  from buyers  $1, 2, \dots, M$  respectively, if the product is sold. There are  $M$  buyers, each of whom has  $N_1, N_2, \dots, N_M$  subscribers, where  $\sum_{m=1}^M N_m = N$ .

We assume that buyer  $m$  has positive fixed costs  $F_m$  and zero program provision costs (an assumption we relax later in the paper). We note that given  $I$  sellers with  $I$  products, every buyer has  $2^I$  possible programming choices. We denote a programming choice of buying only seller  $i$ ’s program by  $E_1^i$ , where subscript 1 denotes the program package consisting of only one program and the superscript  $i$  denotes seller  $i$ . The programming package consisting of 2 products, e.g., products from seller  $k$  and seller  $l$ , is given by  $E_2^{k,l} \equiv E_1^k + E_1^l \equiv E_1^k \cup E_1^l$ .

The program package that includes all programs from all sellers is denoted by  $E_I$  or  $E_I^{1,2,\dots,I}$ . The revenue that buyer  $m$  can derive from programming package  $\tilde{E}$  is denoted by  $V_m(\tilde{E})$ . Buyer  $m$ ’s objective is to maximize profits

$$\pi_m = V_m(\tilde{E}) - \sum_{i: E_1^i \in \tilde{E}} T_{m,i} \quad (1)$$

---

<sup>2</sup>Bykowsky, Mark, Anthony Kwasnica, and William Sharkey, ‘‘Horizontal Concentration in the Cable Television Industry: An Experimental Analysis,’’ Federal Communications Commission, Office of Plans and Policy, Working Paper Series, Number 35, June, 2002.

<sup>3</sup>Bykowsky, Kwasnica, and Sharkey use the term ‘most-favored-nation’ which follows the tradition in the experimental literature. We prefer to use the term ‘most-favored-customer’ for the sake of precision. Both terms as used refer to the same thing.

by choice of programming package  $\tilde{E}$ . We assume that the value of any combination of programs is positive, and that the ‘value correspondence’ satisfies decreasing marginal returns. More formally, we assume that for any buyer  $m$ , any two programming packages  $\hat{E}$  and  $\tilde{E}$ , and for any seller  $i$ ’s program such that  $E_1^i \not\subseteq \tilde{E} \cup \hat{E}$ , the following inequality holds:

$$V_m(\tilde{E} + E_1^i) - V_m(\tilde{E}) \geq V_m(\hat{E} + \tilde{E} + E_1^i) - V_m(\hat{E} + \tilde{E}) > 0 \quad (2)$$

i.e.,  $V_m$  is sub-modular.

**Claim 1:** With  $M$  buyers and  $I$  sellers, the unique Nash Equilibrium transfer price for each seller  $k$  to buyer  $m$  is:

$$T_{m,k} = V_m(E_I) - V_m(E_I - E_1^k) \quad (3)$$

and all buyers buy programs from all sellers.

**Proof of Claim 1:** First, we show that if there is a Nash Equilibrium, it is an equilibrium where all buyers buy from all sellers. Second, we show that in the equilibrium where all buyers buy from all sellers, (3) must hold. Finally, we prove by induction that the transfer price  $T_{m,i}$  is in fact a unique Nash Equilibrium transfer price.

By contradiction, assume that in some Nash Equilibrium, buyer  $m$  did not buy the program from seller  $i$ . Then, seller  $i$ ’s payoffs from buyer  $m$  are zero. Now, denote by  $E^*$  the value of the set of programs bought by buyer  $m$ . Since  $V(E^* + E_1^i) > V(E^*)$ , seller  $i$  is strictly better off (i.e., obtains positive payoffs) by charging any transfer price in the set  $T \in [0, V(E^* + E_1^i) - V(E^*)]$ , and buyer  $m$  finds it optimal to buy from seller  $i$ .

Next, assume that there is a Nash Equilibrium where all buyers buy from all sellers. Then, it must be the case that buyer  $m$  prefers buying from all sellers to buying from any set of  $(I - 1)$  sellers; i.e., the following condition holds for all  $m$  and  $k$ :

$$V_m(E_I) - \sum_{i=1}^I T_{m,k} \geq V_m(E_I - E_1^k) - \sum_{i=1}^I T_{m,i} - T_{m,k} \quad (4)$$

Assume (4) holds with a strict inequality for any seller  $l$ . Then, seller  $l$  can increase its payoffs by increasing the transfer price by an epsilon small amount, while condition (4) still holds for all  $k = 1, \dots, I$ . This is a contradiction. Therefore, (4) must hold with equality  $V_m(E_I) - \sum_{i=1}^I T_{m,i} = V_m(E_I - E_1^k) - \sum_{i=1}^I T_{m,i} - T_{m,k}$ , which simplifies to (3).

We have shown that for all sellers it is optimal to charge  $T_{m,k}$ . In order to ensure that this is in fact a Nash Equilibrium, we must check that for any buyer  $m$  the value of buying from all sellers is greater than or equal to the value of any programming package from the remaining  $2^I - 1$  possibilities. To begin, denote by  $T_{m,k}^n$  the transfer price defined in (3) when there are a total of  $I = n$  sellers. Clearly, when  $I = 1$ ,

$$T_{m,k}^1 = V_m(E_1^1) \quad (5)$$

is a Nash Equilibrium of the game, and all buyers buy from the seller.

Now, assume that  $T_{m,k}^n$  is a Nash Equilibrium outcome for some  $I = n \geq 1$ . Then, it suffices to show that  $T_{m,k}^{n+1}$  is also a Nash Equilibrium, which we do by showing that buyer  $m$ 's benefit from buying all available  $n + 1$  programs is positive. We note that  $V_m(E_{n+1}) - \sum_{i=1}^{n+1} T_{m,i}^{n+1}$  equals  $V_m(E_{n+1} - E_1^{n+1}) - \sum_{i=1}^n T_{m,i}^{n+1}$ . We then note that  $V_m(E_{n+1} - E_1^{n+1}) - \sum_{i=1}^n T_{m,i}^{n+1} \geq V_m(E_{n+1} - E_1^{n+1}) - \sum_{i=1}^n T_{m,i}^n \geq V_m(E_n) - \sum_{i=1}^n T_{m,i}^n \geq 0$  where the last inequality holds due to our assumption that  $T_{m,i}^{n+1} = T_{m,i}^n$ .

Any buyer  $m$ 's payoffs are positive when there are  $n + 1$  sellers charging  $T_{m,i}^{n+1}$ , and this buyer is better off buying  $n + 1$  programs than any program package consisting of  $n$  programs. But, we know from our induction assumption for  $I = n$ , that when there are  $n$  sellers, buying from all sellers is preferred to all other choices. Therefore, with  $n + 1$  sellers, buying from all  $n + 1$  sellers is preferred to any other programming package. Then, for  $I = n + 1$ , a Nash Equilibrium consists of sellers charging  $T_{m,i}^{n+1}$  and all buyers buying from all sellers. By construction this Nash Equilibrium is unique. Q.E.D.

One simple interpretation of Claim 1 is straightforward: when there are no capacity restraints, cable operators buy all network programs. However, in practice, cable operators do not buy from all sellers. We offer several explanations which we explore in the next two sections. First, we argue that there may exist capacity constraints on cable operators. Second, we explore the possible effects on program carriage in the presence of so-called 'most-favored-customer' clauses. In these cases, larger buyers are able to obtain prices that are at least as favorable as the prices secured by the smaller buyers, i.e., smaller buyers do not obtain asymmetric price discounts.

### III The General Case of Multiple Buyers and Sellers with Capacity Constraints

We introduce the idea of capacity constraints by noting that the total cost of any given cable operator  $m$ , excluding the payments to cable networks, is:

$$TC_m = F_m + \sum_{i=1}^k C_m(i) \quad (6)$$

where  $F_m$  are the fixed costs and  $C_m(i)$  is the marginal cost of introducing  $i$ 's program. We assume that  $0 \leq F_m$  and  $C_m(i) \leq C_m(i + 1)$  for all  $i$  and all  $m$ . These assumptions capture all possible cost structures with non-decreasing marginal costs.

We also assume that for any buyer  $m$ , any two programs  $E_1^i$  and  $E_1^k$ , and  $\hat{E}$  such that  $(E_1^i \cup E_1^k) \cap \hat{E} = \emptyset$  where  $V_m(E_1^i) \leq V_m(E_1^k)$ , the inequality

$V_m(E_1^i + \hat{E}) \leq V_m(E_1^k + \hat{E})$  holds. Simply put, we are assuming that if a buyer prefers one program to another, the buyer will always prefer this program to the other, regardless of the combination of other programs.

We are now able to show that under these conditions, if buyers cannot influence the bargaining outcomes between other buyers, there is unique Nash Equilibrium outcome. Furthermore, this outcome is efficient.

Since, by assumption, any given buyer cannot influence bargaining outcomes among other buyers, it suffices to show the result for only one buyer. We begin with any buyer  $m$ . Without loss of generality, we assume that for this buyer  $V_m(E_1^1) \geq V_m(E_1^2) \geq \dots \geq V_m(E_1^{I-1}) \geq V_m(E_1^I) > 0$ . If our assumptions hold, there is a unique Nash Equilibrium solution such that, if

$$C_m(I) \leq V_m(E_I) - V_m(E_I - E_1^I) \quad (7)$$

then,

$$T_{m,k} = V_m(E_I) - V_m(E_I - E_1^k) - C_m(I) \quad (8)$$

and the buyer buys from all sellers.

This is a direct extension of Claim 1. The condition on the cost function implies that there is a positive value to be obtained by including an additional program regardless of the current combination of programs. Therefore, all programs will be bought in the unique Nash Equilibrium. The transfer price charged by a seller will be such that the buyer is indifferent between buying and not buying this additional program. Also, if our assumptions hold, there is a second unique Nash Equilibrium solution such that if:

$$C_m(1) \geq V_m(E_1^1) \quad (9)$$

then buyer  $m$  does not buy from any seller regardless of the transfer price. The condition placed on the cost structure implies that the net benefit from buying any program is negative. Clearly, no programs will be bought in this equilibrium.

Finally, if our assumptions hold, there is a third unique Nash Equilibrium solution such that if:

$$C_m(I) > V_m(E_I) - V_m(E_I - E_1^I) \quad (10)$$

and

$$C_m(1) < V_m(E_1^1) \quad (11)$$

then there exists a  $k \in \{1, 2, \dots, I-1\}$  such that  $V_m(E_k^{1,2,\dots,k}) - V_m(E_k^{1,2,\dots,k} - E_1^k) \geq C_m(k)$  and  $C_m(k+1) > V_m(E_{k+1}^{1,2,\dots,k,k+1}) - V_m(E_{k+1}^{1,2,\dots,k,k+1} - E_1^{k+1})$ . The transfer price is given by:

$$T_{m,i} = V_m(E_k^{1,2,\dots,k}) - V_m(E_k^{1,2,\dots,k} - E_1^i) - \max\{C_m(k), V_m(E_k^{1,2,\dots,k} - E_1^i + E_1^{k+1}) - V_m(E_k^{1,2,\dots,k} - E_1^i)\} \quad (12)$$

for all  $1 \leq i \leq k$ , and  $T_{m,i} \geq 0$  for  $k+1 \leq i \leq I$ . In this case, buyer  $m$  buys from the first  $k$  sellers.

This condition states that the net value of buying just one program is positive, and the net value of buying the last program after buying all other  $I-1$  programs is negative. Clearly, there exists a  $k$  between 1 and  $I-1$  such that the net value of buying from first  $k$  sellers (ignoring transfer prices) is positive and the net value of buying from the  $(k+1)$ 's seller (ignoring transfer prices) is negative. Thus, the buyer will buy, at most,  $k$  programs. Since the value of seller  $i$ 's program is never less than the value of seller  $(i+1)$ 's program, it is straightforward to see that if seller  $i$  is served then seller  $i+1$  should also be served in any Nash Equilibrium. This implies that sellers  $k+1, \dots, I$  are not served in any Nash Equilibrium. Seller  $k$  must be served in any Nash Equilibrium, since it can always charge  $T_{m,k} = 0$  and the buyer buys from  $k$ , either by replacing some of its programs by program  $k$  or by keeping all other programs.

Therefore, if there is a Nash Equilibrium, then all  $k$  programs will be bought. If there is a Nash Equilibrium with  $k$  sellers served, then it should be the case that the buyer is indifferent between buying from any seller  $i$  as compared to not buying from that seller, and to replacing it with any other program from any of remaining  $I-k$  sellers' programs i.e., for  $1 \leq i \leq k$ , (7) holds. Just as in Claim 1,

$$T_{m,i} \geq 0 \quad (13)$$

and

$$V_m(E_k^{1,2,\dots,k}) - \sum_{i=1}^k C_m(i) - \sum_{i=1}^k T_{m,i} \geq 0 \quad (14)$$

and both buyers and sellers accept these transfer prices. Q.E.D.

Optimality implies that all programs that have a marginal value above marginal cost will be broadcast. The claim above shows that under our assumption of constrained capacity, the market outcome is efficient.

## IV Most-Favored-Customer Clauses

Assume there are two sellers and two types (sizes) of buyers. Buyer one is large, and is able to obtain MFC concessions from both sellers. Denote  $v_1(1)$  as buyer one's per customer valuation of seller one's product,  $v_1(1+2)$  as buyer one's valuation of having both sellers' products, and  $v_2(2)$  as buyer two's valuation of seller two's product.

We also assume that assumption one, given in equation (Section 1, Equation 2) still holds, i.e.,  $v_1(1) + v_1(2) > v_1(1+2)$  and  $v_2(1) + v_2(2) > v_2(1+2)$ . We know that the Nash Equilibrium prices under the non-MFC provisions are  $t_{11}^* = v_1(1+2) - v_1(2)$ ,  $t_{12}^* = v_1(1+2) - v_1(1)$ ,  $t_{21}^* = v_2(1+2) - v_2(2)$ , and  $t_{22}^* = v_2(1+2) - v_2(1)$ , where the  $t^*$  are

the equilibrium non-MFC transfer prices. Using these assumptions, we consider the following four cases.

First, we consider the case where  $t_{11}^* \leq t_{21}^*$  and  $t_{12}^* \leq t_{22}^*$ . In this case, both the MFC and non-MFC treatments give the same prices and outcomes since the MFC provisions do not restrict the sellers behavior in any fashion.

Second, we explore the case where  $t_{11}^* > t_{21}^*$  and  $t_{12}^* \leq t_{22}^*$ . In this case, the MFC clause only affects the first seller, and the seller has two options. Seller 1 could charge (A)  $t_{11} = t_{21} = t_{21}^*$  in which case both buyers buy from seller one. Seller one's revenue in this case is  $N \cdot t_{21}^* = (\sum_{m=1}^M N_m) \cdot t_{21}^*$  and seller two's best response to seller one's price is to charge  $t_{12} = t_{12}^*$  and  $t_{22} = t_{22}^*$ . Or, seller 1 could charge (B)  $t_{11} = t_{21} = t_{11}^*$  and sell only to buyer one. In this case, seller one's revenue is  $N_1 \cdot t_{11}^*$  and seller two's best response is to charge  $t_{12} = t_{12}^*$  and  $t_{22} = v_2(2)$  if  $v_2(1) - t_{11}^* < 0$  and  $t_{12} = t_{12}^*$  and  $t_{22} = v_2(2) - v_2(1) + t_{11}^*$  if  $v_2(1) - t_{11}^* \geq 0$ . Seller one prefers B to A if  $N \cdot t_{21}^* < N_1 \cdot t_{11}^*$  which we write equivalently as  $\frac{N_1}{N} \cdot (v_1(1+2) - v_1(2)) > v_2(1+2) - v_2(2)$  where  $\frac{N_1}{N}$  is firm one's market share.

Third, we have the case where  $t_{11}^* \leq t_{21}^*$  and  $t_{12}^* > t_{22}^*$ . We notice immediately that this case is symmetric to case two and therefore the results are the same.

Fourth, we have the case where  $t_{11}^* > t_{21}^*$  and  $t_{12}^* > t_{22}^*$ . In this case, the MFC arrangements restrict both sellers, and each seller has three choices: (1) provide the product only to buyer one, (2) provide the product to only buyer two, or (3) provide the product to both buyers.

In the table that follows, we have listed each of the possible combinations for the sellers.

		<i>Seller One</i>		
		Buyer One	Buyer Two	Both Buyers
<i>Seller Two</i>	Buyer One	a	b	c
	Buyer Two	d	e	f
	Both Buyers	g	h	i

As we shall demonstrate, (b), (d), (e), (f), and (h) can never be part of a Nash Equilibrium, while (a), (i), (c), and (g), can be part of a Nash Equilibrium.

We note immediately that (e) cannot be a Nash Equilibrium. If both sellers serve only buyer two, then  $t_{21} = t_{21}^*$  and  $t_{22} = t_{22}^*$ , and then  $t_{11} = t_{21}^*$  and  $t_{12} = t_{22}^*$ . But at these transfer prices, buyer one finds it optimal to buy from both sellers. It is also clear that (f) and (h) cannot be Nash for the same reasons given for (e). Next, assume (b) is a Nash Equilibrium. Then,



buyer one buys only from seller one, and buyer two buys only from seller two. However, this is not incentive compatible for seller two. Seller two can always charge a positive price to buyer one (that buyer one accepts) and increase its profits. Given the symmetry of (d) and (b), (d) cannot be a Nash Equilibrium.

Next, we explore the conditions under which (a), (i), (c), and (g) are Nash Equilibria.

In the first case, (a) is a Nash Equilibrium if  $t_{11}^* \cdot \frac{N_1}{N_1+N_2} \geq V_2(1) > t_{21}^*$  and  $t_{12}^* \cdot \frac{N_1}{N_1+N_2} \geq V_2(2) > t_{22}^*$ . In this case, buyer one buys both products, and buyer two does not buy any product. Seller one's profits are  $t_{11}^*$ , and seller two's profits are  $t_{12}^*$ .

In the second case, (g) is a Nash Equilibrium if  $t_{11}^* \cdot \frac{N_1}{N_1+N_2} \leq t_{21}^*$  and  $t_{12}^* \cdot \frac{N_1}{N_1+N_2} > t_{22}^*$  or  $V_2(1) > t_{11}^* \cdot \frac{N_1}{N_1+N_2} > t_{21}^*$  and  $V_2(2) > t_{11}^* \cdot \frac{N_1}{N_1+N_2} > t_{22}^*$  and  $N_1 \cdot (t_{12}^* - t_{11}^*) \leq [V_2(2) - V_2(1)](N_1 + N_2)$ . In this case, seller one sells to buyer one only, while seller two sells to both buyers.

In the third case, (c) is a Nash Equilibrium if  $t_{11}^* \cdot \frac{N_1}{N_1+N_2} > t_{21}^*$  and  $t_{12}^* \cdot \frac{N_1}{N_1+N_2} \leq t_{22}^*$  or  $V_2(1) > t_{11}^* \cdot \frac{N_1}{N_1+N_2} > t_{21}^*$  and  $V_2(2) > t_{11}^* \cdot \frac{N_1}{N_1+N_2} > t_{22}^*$  and  $N_1 \cdot (t_{12}^* - t_{11}^*) \leq [V_2(2) - V_2(1)](N_1 + N_2)$ . In this case, seller one sells to both buyers, and seller two sells to buyer one only.

Finally, (i) is a Nash Equilibrium if  $t_{11}^* \cdot \frac{N_1}{N_1+N_2} \leq t_{21}^*$  and  $t_{12}^* \cdot \frac{N_1}{N_1+N_2} \leq t_{22}^*$ . In this case, both sellers sell to both buyers.

When the MFC affects both sellers, it is optimal for the sellers to always sell to buyer one. In this case, only buyer two's profits potentially decrease, while buyer one's profits are never decreasing. The higher the valuation of the program for the large buyer as compared to the smaller buyer, the more likely that the smaller buyers will not be able to buy the "MFC" program. This effect depends on two basic factors: (1) the large buyer's market share, and (2) the relative per-customer valuation of the programs to different buyers.

## V The Bykowsky-Kwasnica-Sharkey Results

Bykowsky, Kwasnica, and Sharkey (2002), report results of experimental studies that explore bargaining among buyers and sellers in the cable industry. These results give us an opportunity to evaluate the predictive power of our model. However, in order to evaluate the results of these experiments in the context of our MFC model, we must first extend the model given in Section 4 to accommodate multiple buyers and a sequential bargaining process. In the context of this extended model, we can then show that the Bykowsky-Kwasnica-Sharkey experimental results relating to MFC treatments are broadly consistent with our theory.

We start by modelling a bargaining process with one seller and multiple buyers, and then extend our MFC model to include multiple buyers

and sellers. We model this bargaining process as one in which the seller's choices are independent, which implies that a model with a single seller is reasonable. The assumption of independence among buyers is consistent with the experimental framework employed by Bykowsky, Kwasnica, and Sharkey (2002). Finally, we extend our model to accommodate informational asymmetries.

We begin by assuming that without a most-favored-customer provision, seller  $i$  is charging  $t_1^*, t_2^*, t_3^*, \dots, t_M^*$  per customer transfer prices to buyers  $1, 2, 3, \dots, M$  respectively. Assume that buyer one has the most customers, i.e.,  $N_1 > N_m$  for all  $m \geq 2$ . Now, assume that buyer one is able to obtain 'most-favored-customer' terms requiring the seller to charge a per customer price no more than the minimum of prices charged to other buyers, i.e.,  $t_1 \leq \min\{t_2, t_3, \dots, t_M\}$ . We note that if  $t_m^* \geq t_1^*$  for all  $m \geq 2$ , then the MFC provision will have no effect on a seller's decision.

For simplicity, assume that  $t^*$  takes four possible values  $0 = t_4^* < t_3^* < t^* < t_2^*$ . In fact, this analysis applies to any finite number of buyers. In the present case, there are some buyers with (non-MFC) transfer prices above  $t_1^*$ , there are some buyers with (non-MFC) transfer prices below  $t_1^*$ , and there are some buyers who do not buy from seller  $i$ , denoted by  $t_4^* = 0$ . We denote customers served by different transfer prices  $t_k^*$  by  $n_1 = N_1$ ;  $n_2 = \sum_{t_m^*=t_2^*} N_m$ ;  $n_3 = \sum_{t_m^*=t_3^*} N_m$ ; and  $n_4 = \sum_{t_m^*=t_4^*} N_m$  where  $\sum_{k=1}^4 n_k = N$ .

The MFC arrangements do not affect the buyers who are paying above buyer one's price. Given the MFC constraint, the seller has two options. First, the seller could charge  $t_1 = t_3 = t_1^*$  and  $t_2 = t_2^*$ . In this case, the seller serves only the first and second type of buyers, and the seller's revenue is  $r_1 = n_1 \cdot t_1^* + n_2 \cdot t_2^*$ . Or, the seller could charge  $t_1 = t_3 = t_3^*$  and  $t_2 = t_2^*$ . In this case, the seller serves all the buyers that it would serve without the MFC and the seller's revenue is  $r_2 = (n_1 + n_3) \cdot t_3^* + n_2 \cdot t_2^*$ . We note that only the first and second buyer types are served if  $r_1 > r_2 \Leftrightarrow \frac{n_1}{n_1+n_3} > \frac{t_3^*}{t_1^*}$ .

Notice the higher  $n_1$  (the market share of buyer one), the more likely it is that smaller buyers will not buy programming. Also, note that buyer one always buys the product and pays, at most, the price under the non-MFC provision. These results are consistent with our findings in Section 4.

As noted above, the model we have constructed must be amended to accommodate the information asymmetries embedded in the sequential bargaining framework of Bykowsky, Kwasnica, and Sharkey (2002). Specifically, in the Bykowsky-Kwasnica-Sharkey model, the sellers do not know the buyers' valuation, and thus must form some expectation regarding the willingness-to-pay on the part of each individual buyer. Moreover, the seller must determine an optimal trading sequence. Amending our model to accommodate these conditions is a simple exercise in straightforward logic, as we demonstrate next.

Assume that we have two buyers and single seller where the seller does

not know the buyer's valuation of the seller's product. As we showed in Section 4 (equilibria a,c,g,i), it is always optimal for the seller to trade with the larger buyer, but not the smaller buyer. Thus, the seller will always want to trade with the biggest buyer first and hence the outcome of the game is the same as if the seller knew, with certainty, the outcome of negotiations with other buyers. Since trading with the smaller buyer first would lock the seller into equilibrium  $i$ , if we extend the analysis to the case with more than two buyers, we conclude that the seller would always want to trade with the biggest buyer first. The determination of a particular equilibrium will depend on the biggest buyer's market share, the relative valuation of programming by different buyers, and the uncertainty of the bargaining outcome with the remaining buyers.

Four of the results of the Bykowsky-Kwasnica-Sharkey (2002) experiments are germane to our model. First, Bykowsky, Kwasnica, and Sharkey find that with no channel capacity constraints and no MFC clauses, all of the sellers were able to conduct profitable trades, which is precisely the result our model predicts in Section 2. Second, Bykowsky, Kwasnica, and Sharkey find that with capacity constraints and no MFC clauses, a seller's bargaining power decreased, while a buyer's bargaining power increased relative to the case of no capacity constraints. This result is consistent with our model, as can be seen by comparing (3) in Section 2, with (3) and (7) in Section 3, and noting the extra negative terms in Section 3. Third, Bykowsky, Kwasnica, and Sharkey find that the existence of an MFC clause increases the profitability of MFC buyers, a result our (extended) Section 4 and 5 model predicts. Finally, note that in our model (where the sellers can make take-it-or-leave-it offers, by assumption), the presence of an MFC arrangement is the only source by which large firms exhibit greater market power. This is exactly paralleled by the results of the Bykowsky-Kwasnica-Sharkey study.

## VI Conclusion

In this paper, we explored the use of 'most-favored-customer' clauses in the cable industry. We examined the impact of MFC clauses on bargaining outcomes between buyers and sellers, and showed that these outcomes depended on the market share of the larger buyers and the relative per-customer valuation of the seller's programming to different buyers.

We showed that both with and without channel capacity constraints, in the absence of MFC clauses, the market outcome is efficient. However, the introduction of MFC clauses can disadvantage sellers and small buyers. We found that as the market share of the large buyer increases, smaller buyers are more likely to be disadvantaged. Specifically, we found that if there is a disparity in the relative valuation of programming among buyers, in the case where the large buyer has a greater per-customer valuation, smaller

buyers may be precluded from access to the programming because of its relative expense.

We extended our model to accommodate the methodology utilized in the experimental studies conducted by Bykowsky, Kwasnica, and Sharkey (2002) and demonstrated that our prediction that an MFC arrangement yields market power is supported by their data. Bykowsky, Kwasnica, and Sharkey find that with no channel capacity constraints and no MFC clauses, all of the sellers were able to conduct profitable trades, which is precisely the result our model predicts in Section 2. Consistent with the experimental results, our model predicts that under capacity constraints and no MFC clauses, a seller's bargaining power decreases, while a buyer's bargaining power increases relative to the case of no capacity constraints. Bykowsky, Kwasnica, and Sharkey's findings that the existence of an MFC clause increases the profitability of MFC buyers is a prediction of our (extended) Section 4 and 5 model. In our model, the presence of an MFC arrangement is the only source by which large firms exhibit greater market power. This is exactly paralleled by the results of the Bykowsky-Kwasnica-Sharkey study.