of vertical integration efficiencies in the CRA Ownership Report can be similarly modified to account for a financial interest short of complete acquisition.

Summary. In summary, the acquisition of partial financial interests can benefit consumers by reducing or eliminating the "double-marginalization" that may occur at upstream and downstream levels. Similarly, these ownership interests can benefit consumers by more closely aligning the incentives of cable operators and their input suppliers. Judging by the extent to which cable operators and programmers have ownership interests in each other, and in the absence of any evidence that these interests have resulted in harm to consumers, the current attribution rules may sacrifice some of these benefits without any offsetting gains.

V. Conclusion

This report has reached the following conclusions about the FCC's current attribution rules. First, understanding the competitive effects of the attribution rules requires distinguishing among silent financial interests, interests that convey partial control, and interests that convey complete control of cable systems.

These distinctions have competitive significance. For example, the acquisition of a silent financial interest by a cable operator with programming interests in a cable operator with no rival program interests reduces the incentive to vertically foreclose. This is because the profits of the acquired system fall and some of that loss is borne by the investor.

Second, even large financial interests by one cable operator in another may not raise competitive concerns. This is especially so where the financial interest is silent, but it may also be the case where the interest conveys partial or complete control. For example, vertical foreclosure is not an issue in the acquisition of an interest conveying complete control by one system in another when neither have any programming interests.

Third, the effects on consumers of the accretion of bargaining power are ambiguous. In any event, the bargaining power of large MSOs has been reduced by the growth of other video distribution alternatives for programmers, most notably DBS.

Fourth, there is no evidence of systematic or economically meaningful discrimination against the rivals of program services in which cable operators have interests. Moreover, the growth of DBS has provided program services with more distribution outlets, weakening whatever ability and incentives cable operators may have had to successfully engage in foreclosure.

Finally, the benefits from a more permissive attribution rule may be substantial. The acquisition of financial interests by cable operators and programmers in each other may reduce the extent of double marginalization and better align the incentives of cable operators and their input suppliers.

In sum, determining how many homes passed of a cable operator should be attributed to an investor in that operator depends upon the type of financial interests acquired and the particular competitive circumstances of the acquisition. This suggests that a case-by-case approach would be the most appropriate for

determining the appropriate extent of attribution. However, such an approach would be administratively costly to both the Commission and investors, and as a result, could discourage beneficial cable investments. We conclude, therefore, that, in the absence of conceptual support or empirical evidence that the Commission's competitive concerns warrant stringent, broadbased attribution rules, the Commission should adopt less stringent attribution. In addition, the attribution rules for the cable industry should be more permissive than the attribution rules for the broadcast industry because cable operators do not compete with one another for the patronage of subscribers. If the acquisition of a financial interest were to raise significant competitive concerns in a particular case, the Commission itself or the antitrust agencies can conduct the necessary investigation.

Appendix A

THE TECHNICAL UNDERPINNINGS OF THE MHHI ANALYSIS

Appendix A

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A.1 Introduction

This appendix provides details on the theoretical underpinnings of the MHHIs and how they are calculated. It presents a model that allows one to calculate the change in concentration under arbitrary assumptions about the degree of influence owners have over the management of firms in which they have an interest. Section A.1 provides the notation used in the model. Section A.2 derives the MHHIs for the case of Cournot oligopoly and explains how they are calculated. Section A.3 explains the relationship between the MHHI and monopsony. Section A.4 gives an intuitive interpretation of how ownership and control affect concentration in the MHHI analysis.

A. 2 Notation

N firms ($j=1,\ldots,N$)

M owners ($i=1,\ldots,M$)

x_j = output of firm j;

$X=\sum_j x_j$ = industry output (summations are taken over all possible values of the index whenever the domain of the index is omitted)

$s_j = x_j/X$ = firm j's market share

$C_j(x_j)$ = cost of output level x_j

$P(X)$ = inverse demand for X

$\pi_j = P(X)x_j - C(x_j)$ = profits of firm j

β_{ij} = share of firm j owned by owner i

γ_{ij} = measure of owner i's degree of control over firm j

η = own price elasticity of demand (absolute value)

$\pi^i = \sum_j \beta_{ij} (x_j P(X) - C_j(x_j))$ = owner i's profit

$\Pi_j = \sum_i \gamma_{ij} \pi^i$ = profit maximized by the manager of firm j

A. 3 Analysis

We begin with the derivation of the MHHI as it applies to output markets. The analog for input markets is presented in subsection A.3.

The manager of firm j is assumed to maximize a weighted sum of the profits of firm j's owners. The idea is that in markets with cross-ownership, the owners generally have conflicting interests regarding the firm's behavior. The assumption here is that owner i's influence over manager j is measured by its "control weight" γ_{ij}. Thus, the manager of firm j solves

$$\max_{x_j} \Pi_j = \max_{x_j} \sum_i \gamma_{ij} \pi^i = \max_{x_j} \sum_i \gamma_{ij} \sum_k \beta_{ik} \pi_k = \max_{x_j} \sum_i \gamma_{ij} \sum_k \beta_{ik} [P(X) x_k - C_k(x_k)].$$

The first-order condition for an interior solution is

$$\sum_i \gamma_{ij} \left\{ \sum_k \beta_{ik} P' x_k + \beta_{ij} \; [P - C_j'(x_j)] \right\} = 0 .$$

Multiplying through by X/X and 1/P, this condition can be rewritten as

$$\sum_i \gamma_{ij} \sum_k \beta_{ik} \left(\frac{P' X}{P} \right) \frac{x_k}{X} + \sum_i \gamma_{ij} \beta_{ij} \; \frac{P - C_j'(x_j)}{P} = 0,$$

and after rearranging sums, the condition becomes

$$L_j = \frac{P - C_j'(x_j)}{P} = \frac{1}{\eta} \sum_k \frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_l \gamma_{ij} \beta_{ij}} s_k .$$

Multiplying both sides by s_j and summing over all j yields

(1) $$\sum_j s_j \; \frac{P - C_j'(x_j)}{P} = \sum_j s_j L_j = \frac{1}{\eta} \left\{ \sum_k \; \sum_j \left(\frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_i \gamma_{ij} \beta_{ij}} \right) s_k s_j \right\}$$

In the standard Cournot model, the bracketed term in (1) would be the Herfindahl-Hirschman index of concentration, HHI= $\sum_j s_j^2$. Thus, the HHI can be thought of as a measure of concentration constructed to be proportional to the share-weighted sum of the margins of all firms under Cournot competition. Using the same rule to construct a concentration index for the case of partial cross-ownership, the modified-HHI (MHHI) is the bracketed term in (1):

$$MHHI = \sum_k \sum_j \left(\frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_i \gamma_{ij} \beta_{ij}} \right) s_k s_j . \tag{2}$$

By separating out the terms for which k=j, expression (2) can be written as

$$MHHI = HHI + \sum_j \sum_{k \neq j} \left(\frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_i \gamma_{ij} \beta_{ij}} \right) s_k s_j . \tag{3}$$

To carry out the calculations using actual data on market shares and ownership and control parameters, it helps to write expression (2) in matrix form. This gives

$$MHHI = \mathbf{s}' \Phi \mathbf{s}$$

where $\Phi = \begin{bmatrix} \phi_{11} & \cdots & \phi_{1N} \\ \vdots & \ddots & \vdots \\ \phi_{N1} & \cdots & \phi_{NN} \end{bmatrix}$, $\phi_{kj} = \frac{\sum_i \gamma_{ij} \beta_{ik}}{\sum_i \gamma_{ij} \beta_{ij}}$, and $\mathbf{s} = (s_1, s_2, \cdots, s_N)'$.

A.4. The MHHI for Input Markets

The derivation of the MHHI in the previous subsection was based on the assumption that firms compete as Cournot oligopolists in a market for output. Under that assumption, the MHHI is a measure of market power among competing oligopolists. In this subsection we show that the MHHI can also be

interpreted as a measure of market power among oligopsonists that purchase inputs in a competitive input market.

We consider an industry in which N firms are monopolists in their own output markets. Let $P_j(x_j)$ be the inverse demand for product j in the final product market, and let w(X) ($X=\sum_j xj$) be the inverse supply of an input that is used in fixed proportions (specifically, 1 unit of the input yields 1 unit of output) by downstream firms to produce the final output. The absolute value of the elasticity of final demand for product j is $\eta_j=-1/[(\partial P_j/\partial x_j)(x_j/P_j)]$, and the elasticity of supply of the input is $\varepsilon^S=1/[(\partial w/\partial X)(X/w)]$. The profits of downstream firm j are then $\pi_j=P_j(x_j)x_j-w(X)x_j$.

Retaining the rest of the notation introduced in subsection A.1, the manager of firm j solves

$$\max_{x_j} \Pi_j = \max_{x_j} \sum_i \gamma_{ij}\pi^i = \max_{x_j} \sum_i \gamma_{ij} \sum_k \beta_{ik}\pi_k = \max_{x_j} \sum_i \gamma_{ij} \sum_k \beta_{ik}[P_k(x_k)x_k - w(X)x_k].$$

We will not work through the complete derivation of the MHHI for this case, as it is similar to the derivation for the output market case. Suffice it to say that after taking the first order condition to each manager's profit maximization problem and making the appropriate substitutions, the share-weighted sum of the margins can be written as

$$\sum_j \frac{P_j - w}{w} = \sum_j \frac{1}{\eta_j}\frac{P_j}{w}s_j + \frac{1}{\varepsilon^S}MHHI \tag{4}$$

where

$$MHHI = HHI + \sum_j \sum_{k \neq j} \left(\frac{\sum_i \gamma_{ij}\beta_{ik}}{\sum_i \gamma_{ij}\beta_{ij}} \right) s_k s_j .$$

The terms under the summation sign on the right-hand side of (4) represents the component of the average margin that arises from the pricing incentives of each firm in its own downstream market.[1] The second term, $(1/\varepsilon^S)$MHHI, represents the component of the margin that arises from incentives of the firms in purchasing their inputs. Condition (4) shows that these incentives, like the incentives governing quantity decisions in the Cournot output model, are proportional to the MHHI as it is defined in equation (3). In other words, the same expression for the MHHI holds for measuing the effects of oligopsony in input markets as holds for measuring the incentive effects of oligopoy in output markets.

A. 5 Interpretation of the MHHIs

The MHHI can be rewritten as:

$$MHHI = HHI + \sum_j \sum_{k \neq j} \left(\frac{HHIAF_{jk}}{HHIWF_j} \right) s_k s_j$$

where $HHIAF_{jk} = \sum_i \gamma_{ij} \beta_{ik}$ measures the "across-firms" concentration arising through owners that have ownership interests in firm k and control interests in firm j, and $HHIWF_j = \sum_i \gamma_{ij} \beta_{ij}$ measures the "within-firm" concentration of the joint ownership and control of firm k. All else equal, the greater is the across-firms concentration from joint ownership of firm k and control of firm j, the greater is the weight placed on the cross-product of the shares of firms j and k in the MHHI calculation. This makes perfect sense; additional joint ownership and

[1] To see this, note that a monopolist with a constant input price w would choose output so that $(P_j - w)/w = (1/\eta_j)(P_j/w)$. The summation on the right-hand side of (4) is simply the share-weighted average of these terms across all the output markets.

control causes managers to internalize more of the adverse effects on cross-owned firms of an expansion in their output. On the other hand, the greater is the within-firm concentration of the ownership and control of firm j, the smaller is the effect of an increase in concentration arising through the joint control of firm j and ownership of firm k. Intuitively, if the within-firm ownership and control of firm j is already highly concentrated, then *additional* control exercised over firm j by owners of firm k has little *additional* influence over firm j's management.

An example will help to clarify these intuitive arguments concerning the role of across-firms and within-firm concentration in determining the MHHI. Suppose that there are two firms, 1 and 2. Initially, firm 1 is wholly owned and controlled by owner A, and firm 2 is wholly owned and controlled by owner B. Suppose that owner A buys an α share of firm 2. If the investment is a silent financial interest, as is the case here, the across-firms concentration factors are given by

$$HHIAF_{12} = \gamma_{A1}\,\beta_{A2} + \gamma_{B1}\beta_{B2} = (1)(\alpha) + (0)(1) = \alpha,$$
$$HHIAF_{21} = \gamma_{A2}\,\beta_{A1} + \gamma_{B2}\beta_{B1} = (0)(1) + (1)(0) = 0,$$

and the within-firm concentration factors are

$$HHIWF_1 = \gamma_{A1}\beta_{A1} + \gamma_{B1}\beta_{B1} = (1)(1)+(0)(0)=1,$$
$$HHIWF_2 = \gamma_{A2}\beta_{A2} + \gamma_{B2}\beta_{B2} = (0)(\alpha) + (1)(1-\alpha) = (1-\alpha).$$

The total weight applied to the cross-product $s_1 s_2$ in the MHHI calculation is

$$\frac{HHIAF_{12}}{HHIWF_1} + \frac{HHIAF_{21}}{HHIWF_2} = \frac{\alpha}{1} + \frac{0}{1-\alpha} = \alpha\,.$$

Thus, the change in the MHHI when the owner of firm 1 (owner A) takes a silent financial interest in firm 2 is $\alpha s_1 s_2$. This adjustment factor reflects the idea that,

after the acquisition, the manager of firm 1 will take into account the effects of its output decision on the profits of firm 2 because the owner of firm 1 (owner A) will have a partial interest in firm 2.

Suppose that instead of being silent owner 1's financial interest in owner 2 allows it to exercise proportional control over the manager of firm 2. In this case:

$$HHIAF_{12} = \gamma_{A1}\,\beta_{A2} + \gamma_{B1}\beta_{B2} = (1)(\alpha) + (0)(1-\alpha) = \alpha$$

$$HHIAF_{21} = \gamma_{A2}\,\beta_{A1} + \gamma_{B2}\beta_{B1} = (\alpha)(1) + (1)(0) = \alpha$$

$$HHIWF_{1} = \gamma_{A1}\beta_{A1} + \gamma_{B1}\beta_{B1} = (1)(1)+(0)(0) = 1$$

$$HHIWF_{2} = \gamma_{A2}\beta_{A2} + \gamma_{B2}\beta_{B2} = \alpha^2 + (1-\alpha)(1-\alpha),$$

and

$$\frac{HHIAF_{12}}{HHIWF_1} + \frac{HHIAF_{21}}{HHIWF_2} = \frac{\alpha}{1} + \frac{\alpha}{\alpha^2 + (1-\alpha)^2} = 2\alpha\frac{1-\alpha(1-\alpha)}{1-2\alpha(1-\alpha)}.$$

Thus, the increase in the MHHI from a partial investment α that confers proportional control is

$$2\alpha\frac{1-\alpha(1-\alpha)}{1-2\alpha(1-\alpha)}s_1 s_2.$$

This the expression used to calculate the incentive effects of proportional control in the example in the main body of the report.

Appendix B

THE ABSENCE OF UNILATERAL INCENTIVES FOR TCI TO REFUSE CARRIAGE TO A RIVAL PROGRAM SERVICE

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THE ABSENCE OF UNILATERAL INCENTIVES FOR TCI TO REFUSE CARRIAGE TO A RIVAL PROGRAM SERVICE

B.1 Introduction

The purpose of this Appendix is to explain in greater detail the conclusion in the text that TCI need lose only a fraction of its subscribers to render a foreclosure strategy unprofitable. The examples are motivated by TCI's recent acquisition of a 33% ownership interest in Cablevision. We first consider how the acquisition of a financial interest in Cablevision affects TCI's incentives to foreclose a rival to Discovery, a popular basic service in which TCI has a 49% ownership interest.[1] We then consider how the acquisition of that financial interest affects TCI's incentives to foreclose AMC, a movie service in which Cablevision has a 75% interest.

In these examples, we assume that TCI has the ability to foreclose rivals. TCI is assumed to deny access by a service rival to its subscribers and any Cablevision subscribers it controls. The favored service is then assumed to have an increased ability to raise its price to subscribers and to advertisers. Each example is varied to account for the possible extent to which a financial interest in Cablevision results in control by TCI over Cablevision's subscribers.

As a result of the growth of DBS and other alternative outlets for programmers, the assumption that a cable operator has the ability to foreclose a

[1] This analysis assumes that TCI and Liberty are a single economic entity. To the extent that each represent a separate collection of distinct economic interests, that would greatly complicate

rival service is becoming increasingly questionable. In addition, because Discovery and AMC likely compete with many other cable and non-cable services for the patronage of subscribers and advertisers, the advantaged service may not be able to raise license fees or advertising rates. Nonetheless, the analysis proceeds on the assumption that the foreclosure of rival services is possible and that prices can be raised.

Conceptually, each example is discussed in two stages. Module I reports the increased profits of the advantaged program service that accrue to TCI through its direct (in the case of Discovery) or indirect (in the case of AMC) financial interest in the service as well as the calculated effects of the advantaged service's price increase on the profits of the owned cable systems.

Module II refines the net profitability analysis of Module I by accounting for three additional components. First, it accounts for the cost savings experienced by TCI from not carrying the rival service, which increases the profitability of foreclosure. Second, it accounts for the lost profits borne by TCI from subscribers who terminate cable service as a result of TCI's decision not to carry the rival service. Third, the module accounts for the fact that this reduction in the number of subscribers reduces the profitability of the advantaged services, and therefore TCI's profits. These last two effects reduce the profitability of foreclosure.

Table 1 provides the basic data used in the calculations and the sources for those data. Tables 2A through 2C report the calculations for a TCI strategy to

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any effort to draw inferences about the profits earned by TCI from a refusal to carry a rival service.

foreclose a rival to Discovery. Tables 3A through 3C report the calculations for a TCI strategy to foreclose a rival to AMC. This analysis assumes that TCI accounts for 40% of all multichannel subscribers.

B.2 Discovery

To compare how the acquisition of a financial interest in Cablevision affects TCI's incentives to foreclose a rival to Discovery, Table 2A calculates TCI's incentives to deny access to a rival of Discovery prior to TCI's acquisition of Cablevision. The impact of TCI's partial acquisition of Cablevision on TCI's incentives to foreclose a rival of Discovery can then be evaluated against that benchmark. In all cases, the increased incentive depends upon the extent to which TCI can exercise control over the Cablevision systems. If TCI's interest in Cablevision is silent, TCI has no increased ability to foreclose.

Table 2A presents the benchmark case (prior to TCI's acquisition of an interest in Cablevision) and begins by assuming that if TCI were to deny a rival service of Discovery access to TCI's cable subscribers, Discovery could raise prices by 5% to all cable systems and advertisers. In this hypothetical example, TCI's failure to carry the rival service weakens that service and makes Discovery relatively more attractive to cable operators and advertisers. TCI cable systems then pay higher prices for Discovery and thereby incur an annual cost increase of $2.96 million (see Effect A in Module I). However, TCI also shares in the additional profits earned by Discovery through its 49% ownership interest, amounting to $9.25 million annually (see Effect B in Module I). Thus, based on this simple analysis, the higher profits earned by TCI from its interest in

Discovery exceed the higher programming fees that TCI cable systems must pay to Discovery by $6.29 million annually ($9.25 million - $2.96 million).[2]

However, there are additional sources of TCI gains and losses to be taken into account. If TCI drops the rival service without replacement, it avoids the cost of paying for the rival service. That avoided cost renders the foreclosure strategy more profitable. To calculate this effect, we assume that the rival service charges the same price and has the same penetration rate as Discovery. Thus, the TCI cable system cost savings are $59.15 million (see Effect A in Module II).

However, TCI will lose some cable subscribers and associated revenues due to its failure to carry the rival service. Here, we assume that TCI will lose 1% of the subscribers on its foreclosing systems.[3] Because the gross profit margin on cable subscribers is substantial, the cost of this reduction in the number of TCI subscribers is relatively large, $100.94 million (see Effect B in Module II).

While we have accounted for the negative impact of the loss of subscribers on the profits of TCI cable systems, we have not accounted for the impact of the loss of TCI subscribers on the profits of Discovery, and hence on TCI's share of these profits. TCI's share of Discovery revenues that will not be realized due to TCI subscriber cancellations is $0.78 million (see Effect C in Module II).

The sum of the effects in Module II shows a net loss to TCI of $42.57 million. Thus, the net gain of $6.29 million in Module I is more than offset

[2] Throughout this analysis, costs and benefits are measured on an annual basis.
[3] In his study,"Elasticity of Demand for Cable Service and the Effect of Broadcast Signals on Cable Prices" (mimeo, 1990), Robert Crandall estimates that the elasticity of subscribers with respect to the number of non-pay channels offered is about (0.7). Assuming that TCI systems

by Module II's net losses of $42.57 million. Thus, in the benchmark case, before TCI's acquisition of a partial interest in Cablevision, the strategy of foreclosing a rival service to the Discovery Channel would not be profitable.[4]

In this example, the losses experienced by TCI largely result from the profits lost on the assumed terminating subscribers. One way of "testing" that assumption is to determine the largest subscriber loss that TCI could sustain before the strategy becomes unprofitable. This is shown at the bottom of Table 2A where the "breakeven" number of lost subscribers is calculated. In the benchmark case, under the parameters assumed, if TCI were to lose more than 0.64% of its subscriber base, or 0.20 million subscribers, as a result of a foreclosure strategy, the foreclosure strategy would be unprofitable.

Table 2B considers the case in which TCI acquires a 33% interest in a cable system the size of Cablevision with no rival programming services. The effects on TCI's incentives depend upon whether the interest conveys partial or total control over the system. If TCI had no control over the acquired system's subscribers, then TCI would experience no increase in the ability to foreclose a Discovery rival and would experience a reduction in the incentive to foreclose. Table 2B assumes that TCI controls 33% of Cablevision's subscribers (i.e.,

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offer 50 non-pay channels (on average), Crandall's estimate suggests that TCI's failure to carry a rival program service could induce about 1.4% of its subscribers to terminate their cable service.

[4] There are other effects that are not accounted for in this example. For example, the reduction in the number of TCI subscribers reduces not only the profits of TCI's cable systems but also the profits of all the program services in which TCI has an ownership interest. Accounting for this effect would further reduce TCI's incentive to foreclose. As another example, an increase in the price of Discovery may permit other competing services in which TCI has an ownership interest to raise their prices, thereby increasing TCI's incentives to foreclose. The net effect of an induced price increase for other rival service is unlikely to be large. TCI cable systems will also experience an increase in the costs of those services in which TCI has only a partial ownership interest. In addition, non-affiliated program services may also be able to raise their prices and this will reduce the profits of TCI's cable systems.

control is proportional to its ownership interest) and can deny Discovery's rival access to those subscribers. As a result of the greater foreclosure to Discovery's rival, the example assumes that Discovery can raise its prices by 10% to cable systems and advertisers. This is twice the percentage price increase assumed in the benchmark case (prior to the acquisition of Cablevision), even though Discovery subscribers controlled by TCI have only increased by about 3%. This is meant to capture the concern that the acquisition of a financial interest in a cable operator might increase both the ability and the incentive to foreclose a rival service.

Since the hypothetical strategy of foreclosing a rival of Discovery now leads to a 10% increase in the price of Discovery, that strategy results in TCI (non-Cablevision) cable systems incurring a cost increase of $5.92 million (see Effect A1 in Module I of Table 2B). This is twice the amount of the corresponding cost increase in the benchmark case. Similarly, TCI's share of the additional profits that Discovery earns on all cable systems is $18.49 million (see Effect B in Module I), which is twice the amount of the corresponding figure reported in Table 2A. On the other hand, because TCI has a financial interest in Cablevision, it shares in the additional cost incurred by Cablevision's systems. TCI's share of the cost increase to Cablevision is $0.18 million (see Effect A2 in Module I).

Based on these calculations for Module I, the higher profits that TCI earns as an owner of Discovery exceed the higher programming fees that TCI incurs as an owner of cable systems by about $12.40 million ($18.49 million - $5.92 million

- $0.18 million). In other words, the calculations of Module I suggest that TCI's incentives to foreclose a rival of Discovery are about twice as large as what they were prior to TCI's acquisition of Cablevision.

Module II again considers the additional benefits and costs to the foreclosure strategy. The avoided TCI cost from not carrying the rival service (Effect A1 in Module II) is the same as in the benchmark case, i.e., $59.15 million. TCI's share of the avoided Cablevision cost is $0.59 million (see Effect A2 in Module II).

Compared to the calculations in Table 2A, the subscriber losses to TCI will increase, because TCI's ownership interests in cable systems are higher than before the acquisition of Cablevision and because TCI is denying more subscribers access to the rival service. However, the losses experienced by TCI on its Cablevision subscribers are less than the losses it experiences on its own subscribers. This is because TCI bears only 33% of the losses experienced by Cablevision when Cablevision loses a subscriber but bears 100% of the loss when a TCI subscriber terminates service. In what is likely to be an unrealistic case, TCI is assumed to be able to force Cablevision to bear a substantial fraction of the costs of denying carriage to Discovery's rival without sharing any of the benefits of that denial with Cablevision.

The foregone TCI profits from lost subscriptions on TCI (non-Cablevision) systems are $100.91 million (see Effect B1 in Module II).[5] TCI's share of the

[5] The cable margin used in Table 2B is slightly lower than the cable margin used in Table 2A to reflect the higher cost of Discovery. Both cable margins are higher than in Table 1 because the cost of the rival service has been excluded from the margins in Tables 2A through Table 2C.

foregone Cablevision profits from lost subscriptions on Cablevision systems is $1.00 million (see Effect B2 in Module II). Finally, TCI's share of the foregone Discovery profits from lost subscriptions is $0.84 million (see Effect C in Module II).

The sum of the effects in Module II shows a net loss to TCI of $43.02 million. Combining the net gains of $12.40 million in Module I and the net losses of $43.02 million in Module II gives an overall loss to TCI of about $30.62 million from the hypothetical foreclosure scenario described in Table 2B.

Thus, in this case, after TCI's acquisition of a partial interest in Cablevision and assuming that TCI could exert some control over Cablevision's programming decisions, the strategy of foreclosing a rival service to Discovery would not be profitable. Indeed, TCI would have no incentive to foreclose the rival service even if TCI were to lose as few as 0.70%, or 0.22 million, of its controlled subscribers.

If TCI's partial financial interest in Cablevision provided it with complete control over Cablevision, the rival to Discovery could be weakened even further. Our calculations in Table 2C assume that as a result of denying Discovery's rival to all of Cablevision's subscribers, Discovery can raise its prices to cable operators (and to advertisers) by 20%, which is twice the percentage price increase that we assumed in the case with partial control (Table 2B).

The calculations in Modules I and II of Table 2C are identical to those in Table 2B, with the required modifications to account for a 20% price increase and to account for the unrealistic scenario in which the 33% interest in Cablevision

would allow TCI to completely control Cablevision's program carriage decisions. In Module I, the increase in TCI's profits from its interest in Discovery more than offsets the higher costs borne by it and its share of the higher Cablevision costs. On balance, the Module I components result in a $24.80 million gain to TCI.

Module II of Table 2C makes the necessary refinements to the calculations performed in Module I. TCI's avoided cost from not carrying the rival service (and its share of Cablevision's avoided cost) is more than offset by the profits lost due to terminating subscribers on both the TCI and Cablevision systems and the accompanying losses experienced by Discovery. The sum of the effects in Module II shows a net loss to TCI of $43.93 million. Combining the net gains of $24.80 million from Module I and the net losses of $43.93 million from Module II gives an overall loss to TCI of $19.13 million from the hypothetical foreclosure scenario described in Table 2C. Thus, in this case, after TCI's acquisition of a partial interest in Cablevision, even assuming that TCI could exert complete control over Cablevision's decisions, the strategy of foreclosing a rival service to the Discovery Channel would not be profitable.

It should be emphasized that in this example, while TCI dictates the non-carriage of the Discovery rival to Cablevision, TCI bears only 33% of Cablevision's subscriber losses through its financial interest. As with the partial control case, this seems highly unrealistic. Nonetheless, even with "free-riding" by TCI on Cablevision and a price increase by Discovery of 20%, the percentage loss of TCI's controlled subscriber base would have to be only about 0.82% (or 0.27 million subscribers) for TCI not to have any incentives to foreclose. While

the foreclosure incentive has clearly increased in this very unrealistic case, it still remains quite small.

B.3 American Movie Classics

The previous example considered the possibility that TCI might use its control over Cablevision (if it had such control) to benefit TCI's own affiliated services. In the following discussion, we develop an illustrative example to consider whether TCI's partial interest in Cablevision provides it with incentives to deny access to its subscribers to benefit a program service affiliated with Cablevision, AMC. Of course, absent a financial interest in Cablevision, TCI has no incentive to take any actions that benefit Cablevision. The question is whether this incentive becomes economically meaningful when TCI acquires the interest.

An acquisition of a 33% interest in Cablevision could be viewed as equivalent to the acquisition of a 24.75% interest in AMC, because Cablevision has a 75% interest in AMC. If the financial interest is silent, TCI could benefit AMC if TCI's subscriber base alone is sufficient to weaken a rival to AMC. In this case, TCI could deny AMC's rival access to TCI's subscribers, thereby weakening the AMC rival. This is assumed to permit AMC to raise its price to cable operators by 5%.[6] TCI would then share in AMC's higher profits to the extent of its financial interest in Cablevision.

[6] As in the case of Discovery, whether AMC has the ability to raise price depends on the availability of substitutes for AMC. This example assumes that there is only one such good substitute.

In the case where TCI's interest in Cablevision is silent, the calculations in Module I of Table 3A show that TCI has no incentives to foreclose a rival of AMC. The reason is straightforward. Because TCI's interest in AMC is small relative to its interest in cable subscribers, an increase in the price of AMC is more costly to TCI's cable operations than it is beneficial to TCI through its indirect interest in AMC's programming revenues. Consequently, there is a net loss of $1.21 million reported in Module I of Table 3A.

The refinements in Module II generate an additional $34.88 million loss, primarily due to the profits lost as subscribers terminate service. Thus, if TCI were to lose 1% of its controlled subscribers, the total loss experienced by TCI would be about $36.09 million. Alternatively, any incentive that TCI might have to foreclose an AMC rival is eliminated if, as a result of its failure to carry the rival, TCI loses only 0.61% of its subscriber base. In short, TCI's acquisition of a silent financial interest in Cablevision is extremely unlikely to give TCI the incentive to foreclose a rival of AMC.

In the case of partial control, TCI is assumed to deny AMC's rival access to the 33% of Cablevision's subscribers controlled by TCI (see Table 3B). AMC is then assumed to be able to increase its service fees by 10%. As with the case of Discovery, TCI bears only 33% of the losses experienced by Cablevision for every subscriber that terminates its Cablevision service; other Cablevision shareholders bear the other 67% of the subscriber losses.

The Module I losses rise to about $2.41 million in Table 3B versus Table 3A while the Module II losses rise to about $35.21 million. Thus, the total losses from the foreclosure strategy increase to about $37.62 million.

Despite free-riding on the subscriber losses it is able to impose on Cablevision, TCI's incentive to foreclose falls with partial control. TCI need only lose 0.60% of its subscribers to completely offset the gains experienced by AMC from the higher prices. As in Table 3A, the most important reason why the threshold subscriber loss declines slightly is because of TCI's relatively low share of AMC's profits. When AMC increases its price, TCI experiences a cost increase on the 41% of subscribers that it controls (including the Cablevision subscribers it controls). However, it receives only about 25% of the additional profits earned by AMC as a result of the price increase. Thus, TCI tends to lose more through its cable interests than it gains through its programming interests.

Finally, in the very unrealistic case in which TCI's partial interest in Cablevision gives it complete control over Cablevision, denying AMC's rival access to all of Cablevision's subscribers is assumed to permit AMC to raise its price by 20% (see Table 3C). TCI's incentive to foreclose falls further. In Module I, TCI's losses from AMC's higher prices exceed its higher profits from its indirect interest in AMC by about $4.82 million. In Module II, largely as a result of the subscriber losses, TCI experiences an additional loss of about $35.88 million, for a total loss of about $40.70 million. Alternatively, if denying access to AMC's rival would cause TCI to lose 0.58% of its subscribers, TCI would have no incentive to foreclose.

B.4 Summary

To conclude, the examples analyzed in this Appendix strongly suggest that even substantial financial interests that convey some degree of control over the acquired cable system do not result in a significant incentive to foreclose. While there are surely counterexamples, the examples used here are based on existing cable circumstances. Indeed, these examples and any counterexamples serve only to illustrate why simple attribution rules are a highly imperfect substitute for case-by-case analysis.