Vertical Control

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Overview

Readings

- If you haven't worked through double marginalization, read Chapter 4 of Tirole
- You should read the chapter from Whinston's antitrust lectures.
- Exclusionary Contracts: Conlon Mortimer (JPE 2021)
- Bargaining Models in Healthcare: Ho and Lee (AER 2019), Gowrisankaran, Nevo Town (AER 2015).
- Bargaining in TV: Crawford, Lee, Whinston, Yurukoglou (ECMA 2018), Crawford Yurukoglou (AER 2012)
- Do upstream or downstream firms set prices (Villas Boas (2007), Bonnet and Dubois (2010)).

Vertical Control

Manufacturers rarely supply final consumers directly (as we have modeled them so far). Instead, most industries are vertically separated.

We often refer to firms in these markets as upstream and downstream firms. In these settings, downstream firms are the customers of the upstream firms, and many of the standard issues still apply. For example:

1. choice of price is endogenous
2. price discrimination (both the upstream and downstream firms)
3. mergers
4. entry, etc.

Vertical Control

However, things can also get more complicated in vertically separated environments. In particular, downstream firms do not usually consume the good, but typically make further decisions regarding the product.

Examples of activities of downstream firms:

1. determination of final price
2. promotional effort
3. placement of product on store shelves
4. promotion and placement of competing products
5. technological inputs

Vertical Control

Why don't manufacturers simply engage in direct marketing to consumers?

Some reasons:

1. increasing returns to distribution due to shopping needs or travel costs for consumers
2. choice of variety
3. demand for service
4. integration of complementary products
5. different geographical markets, etc.

Vertical Control

Unlike the consumption activities of final consumers, the activities of the downstream firms may affect the profits of the upstream firm.

This is why upstream firms care about the activities of the downstream firms, and why we study vertical control/restraints between firms in these settings.

We focus on the incentives for vertical control when the market for the intermediate good is imperfectly competitive.

Vertical Control

A common benchmark for what firms can achieve through vertical control is the "vertically integrated profit." This is the maximum industry or aggregate (manufacturer plus retailer) profit.

If firms use vertical restraints efficiently, they should achieve the vertically integrated profit.

Vertical Control

There are several types of vertical restraints used by firms in vertically-separated markets:

1. *Exclusive Territories*: a dealer/ distributor/ retailer is assigned a (usually geographic) territory by the manufacturer/ upstream firm and given monopoly rights to sell in that area. [e.g Car Dealerships, Franchises, Beverage Distributors]

2. *Exclusive Dealing*: a dealer/ distributor/ retailer is not allowed to carry the brands of a competing upstream firm.[See Asker 2005 or Sass 2004,2005] on beer distribution.

3. *Full-line forcing*: a dealer is committed to sell all the varieties of the manufacturer's products rather than a limited selection. (i.e., the upstream firm ties all its products to sell to the downstream firm). See [Ho, Ho, Mortimer AER 2012] on video rentals.

Vertical Control

4. *Resale Price Maintenance*: a dealer commits to a retail price or a range of retail prices for the product. This can take the form of either minimum resale price maintenance or maximum resale price maintenance. Equivalently, firms can engage in quantity forcing or quantity rationing. [Apple (appears to have) minimum RPM for it's products]

5. *Contractual arrangements*: upstream and downstream firms write contracts to provide greater flexibility in the transfer of the product. Profit sharing and revenue sharing [Mortimer ReStud 2008] are the most common, which we'll see soon. Also, franchising arrangements.

Legal Issues

- There are many ambiguities in the legal treatment of vertical contracts.
- Until 1970s, RPM and E. Territories were per se illegal under Sherman Act.
- But many states passed fair trade laws that were interpreted to cover some of these cases.
- Furthermore, the Khan case in 1997 switched Maximum RPM to a “rule of reason” status, as did the Leegin Leather Products case in 2007 for Minimum RPM.

Legal Issues

Thus, although price fixing remains per se illegal, it's not always applied in vertical settings because it conflicts with free-trade notions between mfgs and their distributors.

Non-price issues have been generally accepted to be ok by the courts. Decisions turn on arguments about efficiency vs. anti-competitive effects.

- Exclusive territories
- Refusal to deal
- Foreclosure, etc.

Further Reading

Understanding the legal framework is important for working with vertical restraints:

- John Kwoka and Larry White (NYU Stern) have compiled an edited volume of summarized IO economist testimony and reports from various cases in *The Antitrust Revolution* across soon to be 7 volumes.
- Whinston has written some nice lectures on Antitrust, and Chapter 4 focuses specifically on vertical issues.
- There is not much on legal details, but Tirole's *Theory of Industrial Organization* covers many theoretical models on vertical contracting.

Vertical Control

The typical outline of vertical control is as follows:

1. Double Marginalization/Successive Monopoly Problem.
2. Externalities between downstream and upstream firms (Maximum Resale Price Maintenance, Quantity Forcing, Contractual Arrangements, or Full-line Forcing)
3. Downstream Moral Hazard, or Externalities from Intrabrand competition (Exclusive Territories, Minimum RPM, or Quantity Rationing)
4. Interbrand competition (Exclusive Dealing or possibly Full-line Forcing)

Basic Framework

Double Marginalization

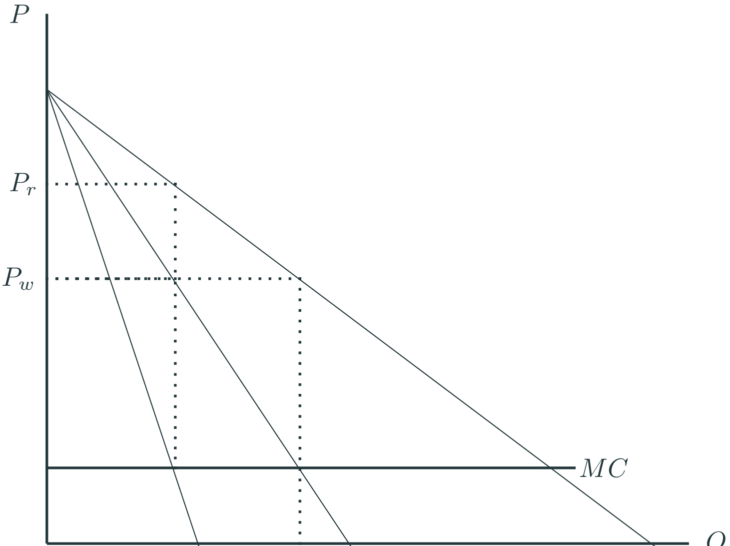
- U sells product to D who sells product to final consumers.
- Homogeneous product with final demand given by $D(p_d)$.
- U charges p_w to D.
- D chooses how much to buy from U

$$\begin{aligned} \max_{p_d} \pi_d &\equiv \max_{p_d} (p_d - p_w) D(p_d) \\ \text{FOC:} \quad & (p_d - p_w) D'(p_d) + D(p_d) = 0 \end{aligned}$$

- The solution is denoted by $p_d^*(p_w)$
- The upstream firm (U) now solves:

$$\max_{p_w} \pi_w \equiv \max_{p_w} (p_w - c) D(p_d^*(p_w))$$

- We have that $p_w > c$ and $p_d > p_w$ which we call double marginalization.


P
P_r
P_w
MC
Q

Double Marginalization

- Double Marginalization arises from the externality as p_w raises his price this raises the effective marginal cost to U and the monopoly price she charges is too large.
- Think about a vertically integrated firm.

$$\begin{aligned} \max_{p_m} \pi_d \quad &\equiv \quad \max_{p_m} (p_m - c) D(p_m) \\ \text{FOC:} \quad & \quad (p_m - c) D'(p_m) + D(p_m) = 0 \end{aligned}$$

- Since $p_w > c$ then we have that $\pi_D + \pi_U < \pi_{VI}$ and $p_D^*(p_w) > p^*(c)$

Double Marginalization

Most solutions involve contracting around the externality:

- Consider a two-part tariff where $p_w = c$ but that $\widetilde{\pi_D} = \pi_D - T$ and $\widetilde{\pi_U} = \pi_U + T$. We call T the franchise fee. This is sometimes known as the sell out contract because the wholesaler sets $p_w = c$.
- Now we have that $\widetilde{\pi_D} = \pi_{VI} - T$ and $\widetilde{\pi_U} = 0 + T$.
- There are other (sometimes legal, sometimes not solutions): RPM to set $p_d^* = p^m$.
- Quantity Forcing. Upstream firm makes a TILO offer of monopoly quantity to D.
- We can also allow revenue or profit sharing where U "owns" a fraction λ of the upstream firm.
  - These contracts are common in franchises. (ie: Subway corporate keeps 20% of your revenue).

Challenges for Empirical Work

- Good empirical work on these topics is generally limited by the availability of data
- It is not too difficult to gather data on retail (P, Q).
- Wholesale prices are harder to observe.
- Most nonlinear contracts between upstream and downstream firms are closely guarded trade secrets.
- If you can get your hands on contracts, you can write papers!

Villas Boas (ReStud 2007)

Retailer and Wholesaler FOC given by:

$$\mathbf{p^r} = \underbrace{\mathbf{p^w} + \mathbf{c^r}}_{\mathbf{mc^r}} - (\mathcal{H}_r \odot \Delta_r(\mathbf{p^r}))^{-1}\mathbf{s}(\mathbf{p^r})$$

$$\mathbf{p^w} = \mathbf{mc^w} + \left(\mathcal{H}_w \odot \left(\frac{\partial \mathbf{p^r}}{\partial \mathbf{p^w}} \cdot \Delta_r(\mathbf{p^r})\right)\right)^{-1} \mathbf{s}(\mathbf{p^r})$$

- Δ_r is matrix of (retail) demand derivatives $\frac{\partial\,\mathbf{s}}{\partial\,\mathbf{p}}$.
- $\mathcal{H}_r, \mathcal{H}_w$ ownership matrix $(j,k) = 1$ if both products sold by same retailer/wholesaler.
- $\frac{\partial\,\mathbf{p^r}}{\partial\,\mathbf{p^w}}$ is the pass-through matrix (NEW!)

Challenge: We want $\mathbf{p^r}(\mathbf{p^w})$ and $\mathbf{mc^w}$ but we only have implicit solution for retailer FOC.

How do we get pass-through?

The pass-through matrix $\frac{\partial \mathbf{p^r}}{\partial \mathbf{p^w}}$ can be obtained in one of two ways:

1. Numerically: perturbing the retailer's marginal costs for each possible choice of k and solving

$$\mathbf{p^r} = \mathbf{mc^r} + e_k - (\mathcal{H}_r \odot \Delta_r(\mathbf{p^r}))^{-1}\mathbf{s}(\mathbf{p^r})$$

   (Use Morrow Skerlos (2011) formulation and solve for every (j,k) pair).

2. Analytic: Use the retailer's FOC and apply the implicit function theorem.

$$f(\mathbf{p^r}, \mathbf{mc^r}) \equiv \mathbf{p^r} - \mathbf{mc^r} - (\mathcal{H}_r \odot \Delta(\mathbf{p^r}))^{-1}\mathbf{s}(\mathbf{p^r}) = 0 \qquad \text{(retailer FOC)}$$

   See Jaffe Weyl (AEJM 2013) or Miller Weinberg (2017 Appendix E) or Conlon Rao (2022). This is what PyBLP does.

Multivariate IFT: Easy Part

The multivariate IFT says that for some system of J nonlinear equations

$$f(\mathbf{p^r}, \mathbf{p^w}) \equiv [F_1(\mathbf{p^r}, \mathbf{p^w}), \ldots, F_J(\mathbf{p^r}, \mathbf{p^w})] = [0, \ldots, 0]$$

with J endogenous variables $\mathbf{p^r}$ and J exogenous parameters $\mathbf{p^w}$.

$$\frac{\partial \mathbf{p^r}}{\partial \mathbf{p^w}} = -\begin{pmatrix} \frac{\partial F_1}{\partial p_1^r} & \cdots & \frac{\partial F_1}{\partial p_J^r} \\ \cdots & \cdots & \cdots \\ \frac{\partial F_J}{\partial p_1^r} & \cdots & \frac{\partial F_J}{\partial p_J^r} \end{pmatrix}^{-1} \cdot \underbrace{\begin{pmatrix} \frac{\partial F_1}{\partial p_k^w} \\ \cdots \\ \frac{\partial F_J}{\partial p_k^w} \end{pmatrix}}_{=-\mathbb{I}_J} \tag{PTR}$$

Because the system of equations is additive in $\mathbf{mc^r} = \mathbf{c^r} + \mathbf{p^w}$ this simplifies dramatically.

Multivariate IFT: Hard Part

Use the substitution $\Omega(\mathbf{p^r}) \equiv \mathcal{H}_r \odot \Delta_r(\mathbf{p^r})$, and differentiate the wholesalers' system of FOC's with respect to p_l, to get the $J \times J$ matrix with columns l given by:

$$\frac{\partial f(\mathbf{p^r}, \mathbf{p^w})}{\partial p^r_l} \equiv e_l - \Omega^{-1}(\mathbf{p^r}) \left[\mathcal{H}_r \odot \frac{\partial \Delta(\mathbf{p^r})}{\partial p^r_l} \right] \Omega^{-1}(\mathbf{p^r})\, \mathbf{s}(\mathbf{p^r}) - \Omega^{-1}(\mathbf{p^r}) \frac{\partial \mathbf{s}(\mathbf{p^r})}{\partial p^r_l}. \tag{1}$$

The complicated piece is the demand Hessian: a $J \times J \times J$ tensor with elements (j, k, l), $\frac{\partial^2 s_j}{\partial p^r_k \partial p^r_l} = \frac{\partial^2 \mathbf{s}}{\partial \mathbf{p^r} \partial p^r_l} = \frac{\partial \Delta(\mathbf{p^r})}{\partial p^r_l}$.

This also shows a key relationship between pass through and demand curvature (2nd derivatives).

Pass-through and Curvature

A long literature relates the pass-through matrix to the curvature of demand (2nd derivatives)

- Bulow Pfleiderer (JPE 1983)
- Fabinger Weyl (JPE 2013)
- Recent work by Eugenio Miravete and Katja Seim.
- But estimating PTR directly from data can be tough – assumes smooth transmission of cost shocks (no menu prices, etc.). See Conlon Rao AEJP.

Empirical Work

- There is recent work empirical work on vertical restraints.
- Conlon and Mortimer (JPE 2021)
  - This paper asks how an upstream firm can use contracts to exclude an upstream rival from selling his products via a downstream retailer.
  - The focus is on fully categorizing the set of exclusionary rebate contracts that: (a) the dominant firm is willing to offer (b) the retailer is willing to sign (thus excluding the rival) and (c) the rival is unwilling to deviate to prevent exclusion.
  - The authors address the potential welfare implications of such contracts in a world with downstream moral hazard so that exclusion may be efficient (or not).

Empirical Work

- There also recent empirical work on vertical integration:
- Crawford, Lee, Whinston, Yurukoglou (ECMA 2018)
    - This paper asks how vertical integration changes the incentives for downstream firms to raise the price of upstream inputs to its downstream rivals.
    - The vertically integrated firm may raise rivals costs or it may fully foreclose its rival from acquiring the input.
    - Vertical integration may be good for efficiency reasons, but bad if foreclosure effects are large.
    - This approach builds on a literature using Nash Bargaining solutions to determine how to allocate surplus among upstream and downstream firms.

Crawford, Lee, Whinston, Yurukoglou (ECMA 2018)

- Household i in market m and period t subscribes to MVPD $f \in \mathcal{F}_{mt}$.
- Spends time w_{ifct} watching channel c or non TV activities $c = 0$ choice is the vector $\mathbf{w}_{ift}$.

$$\max_{\mathbf{w}_{ift}} v_{ift}(\mathbf{w}_{ift}) = \sum_{c \in \mathcal{B}_{fmt} \cup \{0\}} \frac{\gamma_{ict}}{1 - \nu_c} (w_{ift})^{1-\nu_c}$$

$$\text{s.t. : } w_{ifct} \geq 0 \quad \forall c \quad \text{and} \quad \sum_{c \in \mathcal{B}_{fmt} \cup \{0\}} w_{ifct} \leq T$$

- γ_{ict}: marginal value for first unit of watching TV channel
  - γ_{ict} with probability ρ_c^0 takes on $\gamma_{ict} \sim Exp(\rho_c^1)$ and zero otherwise.
- $\nu_c \in \{\nu^S, \nu^{NS}\}$: decay parameter (allow for different decay for sports and non-sports channels).
- Paper is about the value of Regional Sports Networks (RSNs). Probably high (γ, ν).
- Law and Order re-runs Probably low (γ, ν).

MVPD Demand

We can now calculate demand for MVPD service:

$$u_{ift} = \beta^v v^*_{ift} + \beta^x x_{ft} + \beta^{sat}_{if} + \alpha p_{ft} + \xi_{ft} + \epsilon_{ift}$$

- v^*_{jft} is viewership utility from bundle of channels on previous slide.
- p_{ft} is monthly (tax inclusive) price.
- x_{ft} firm-state and year dummies
- $\beta^{sat}_i \sim Exp(\rho^{sat}_f)$ for satellite providers.
- Demand is logit with random coefficients for (β, γ).
- Marketsize is # of TV households.

Supply/ Bargaining

1. MVPDs and content providers negotiate over a per subscriber fee τ_{fct} paid by distributor f to channel c: vector form τ_t.
2. Simultaneously: each distributor chooses prices and channel composition of its bundle in all markets where it operates.
3. $\{\mathbf{p}_{mt}, \mathcal{B}_{mt}, \tau_t, \mu\}$ are jointly optimal w.r.t one another.

MVPD Payoffs

$$\Pi^M_{ft}(\mathcal{B}_{mt}, p_{mt}, \tau_t, \mu) = D_{fmt} \times (p^{pre-tax}_{fmt} - mc_{fmt}) +$$
$$\mu \times \left(\sum_{g \in \mathcal{F}_{mt}} \sum_{c \in \mathcal{B}_{gmt}} O_{fct} \times D_{gmt} \times (\tau_{gmt} + a_{ct}) \right)$$

- D_{fmt} is consumer demand from previous slide
- τ is per subscriber fee and a_{ct} is advertising revenue (to MVPD).
- $O_{fct} \in [0, 1]$ measures the share of c that is owned by f at time t.
  - SNY (Mets) is owned 8% by Comcast and 27% by TWC.
- μ is internalization parameter. A fully rational firm $\mu = 1$ cares about profits of input providers that they own. $\mu = 0$ firm ignores the fact that as TWC pays SNY more they pocket 27% of proceeds.
- mc_{fmt} includes the sum of all τ's in the bundle plus MC of overall service.
- Maximize sum of profits over all markets m. In empirical model τ_{ft} does not depend on m.

FOCs/Optimality

For Prices:

$$\Pi^{M}_{ft}(\mathcal{B}_{mt}, p_{mt}, \tau_t, \mu) = \frac{s_{fmt}}{1 + tax_{fmt}} \times (p^{pre-tax}_{fmt} - mc_{fmt}) \frac{\partial s_{fmt}}{\partial p_{fmt}} +$$
$$\mu \times \left(\sum_{g \in \mathcal{F}_{mt}} \sum_{c \in \mathcal{B}_{gmt}} O_{fct} \times \frac{\partial s_{gmt}}{\partial p_{fmt}} \times (\tau_{gmt} + a_{ct}) \right) = 0$$

For Carriage:

$$\mathcal{B}_{fmt} = \arg \max_{\mathcal{B}_f \subseteq A_{ft}} \Pi^{M}_{fmt}(\{\mathcal{B}_f, \mathcal{B}_{-f,mt}\}, p_{mt}, \tau_t, \mu)$$

- In each market you can carry a channel or not, choose among channels you have an agreement with τ:
  - If you carry you pay τ per subscriber but get a in ad revenue.
  - If you don't carry you might lose some subscribers.

Channel Payoffs / Bargaining

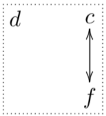
$$\Pi^C_{cmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t; \mu) = \sum_{g \in \mathcal{F}_{mt}: c \in \mathcal{B}_{gmt}} D_{gmt} \times \Big(\tau_{gct} + a_{ct}\Big) \dots \tag{7}$$
$$+ \mu \sum_{g \in \mathcal{F}_{mt}} D_{gmt} \times \Big(O^C_{gct} \times (p^{\text{pre-tax}}_{gmt} - mc_{gmt}) + \sum_{d \in \mathcal{B}_{gmt} \setminus c} O^{CC}_{cdt} \times (\tau_{gdt} + a_{gdt})\Big) .$$

However, if f and c are not integrated, c's profits in m are:

$$\Pi^C_{cmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \boldsymbol{\tau}_t; \mu, \lambda_R) = \sum_{g \in \mathcal{F}_{mt}: c \in \mathcal{B}_{gmt}} D_{gmt} \times \Big(\tau_{gct} + a_{ct}\Big) \dots \tag{8}$$
$$+ \mu \sum_{g \in \mathcal{F}_{mt}} D_{gmt} \times \Big(\lambda_R \times O^C_{gct} \times (p^{\text{pre-tax}}_{gmt} - mc_{gmt}) + \sum_{d \in \mathcal{B}_{gmt} \setminus c} O^{CC}_{cdt} \times (\tau_{gdt} + a_{gdt})\Big) .$$

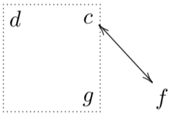
- Same as before μ is internalization of integrated profits
- New parameter λ_R is about raising rivals costs.
- Still get ad revenues but are different for channel and mvpd a_{ct}.

Channel Payoffs / Bargaining



$$\Pi^C_{cmt} = \pi_{cmt} + \mu \times (\pi_{fmt} + \pi_{dmt})$$

(a) Internal Bargaining.



$$\Pi^C_{cmt} = \pi_{cmt} + \mu \times ((\lambda_R \times \pi_{gmt}) + \pi_{dmt})$$

(b) Bargaining with Rival MVPD.

Figure 2: Examples of Π^C_{cmt} when c bargains with MVPD f.

Bargaining. We assume that, given channel c is carried on some of MVPD f's systems, the affiliate fee τ_{fct} between distributor f and channel c maximizes their respective bilateral Nash products *given the expected negotiated affiliate fees of all other pairs and the expected prices and bundles for all distributors.* In other words, affiliate fees $\boldsymbol{\tau}_t$ satisfy:

$$\tau_{fct}(\boldsymbol{\tau}_{-fc,t}, \mathcal{B}_t, \boldsymbol{p}_t) = \arg\max_{\tau_{fct}} \underbrace{\left[\sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc}\Pi^M_{fmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \{\tau_{fct}, \boldsymbol{\tau}_{-fc,t}\}; \mu)] \right]}_{GFT^M_{fct}(\tau_{fct}, \cdot)}^{\zeta_{fct}} \tag{9}$$

$$\times \underbrace{\left[\sum_{m \in \mathcal{M}_{fct}} [\Delta_{fc}\Pi^C_{cmt}(\mathcal{B}_{mt}, \boldsymbol{p}_{mt}, \{\tau_{fct}, \boldsymbol{\tau}_{-fc,t}\}; \mu, \lambda_R)] \right]}_{GFT^C_{fct}(\tau_{fct}, \cdot)}^{1-\zeta_{fct}} \quad \forall f, c \in \mathcal{A}_{ft} \ ,$$

where $\mathcal{M}_{fct} \equiv \{m : c \in \mathcal{B}_{fmt}\}$ denotes the set of markets in which c is carried on f's bundle, $\zeta_{fct} \in [0, 1]$ represents a firm-channel-time specific Nash bargaining parameter, and:

$$[\Delta_{fc}\Pi^M_{fmt}(\mathcal{B}_{mt}, \cdot)] \equiv \left(\Pi^M_{fmt}(\mathcal{B}_{mt}, \cdot) - \Pi^M_{fmt}(\mathcal{B}_{mt} \setminus fc, \cdot) \right) \ ,$$

$$[\Delta_{fc}\Pi^C_{cmt}(\mathcal{B}_{mt}, \cdot)] \equiv \left(\Pi^C_{cmt}(\mathcal{B}_{mt}, \cdot) - \Pi^C_{cmt}(\mathcal{B}_{mt} \setminus fc, \cdot) \right) \ ,$$

Bargaining Example

Ignore any vertical integration and think about just the bargaining:

$$\sum_{m\in\mathcal{M}_{fct}} D_{fmt}\tau_{fct} = (1-\zeta_{fct}) \underbrace{\sum_{m\in\mathcal{M}_{fct}} \Big([\Delta_{fc}D_{fmt}](p^{\text{pre-tax}}_{fmt} - mc_{fmt\setminus fc})\Big)}_{GFT^{M}_{fct}(0,\cdot)} \tag{12}$$

$$-(\zeta_{fct}) \underbrace{\sum_{m\in\mathcal{M}_{fct}} \Big(D_{fmt}a_{ct} + \sum_{g\neq f:c\in\mathcal{B}_{gmt}} [\Delta_{fc}D_{gmt}]\big(\tau_{gct} + a_{ct}\big)\Big)}_{GFT^{C}_{fct}(0,\cdot)},$$

where $[\Delta_{fc}D_{gmt}] \equiv D_{gmt}(\mathcal{B}_{mt},\cdot) - D_{gmt}(\mathcal{B}_{mt}\setminus fc,\cdot)$ denotes the change in firm g's demand in market m and time t if channel c was removed from firm f's bundle, and $mc_{fmt\setminus fc} \equiv \sum_{d\in\mathcal{B}_{fmt}\setminus c} \tau_{fdt} + \kappa_{fmt}$.

- Combined gains from trade from both M and C
- Last term is "opportunity cost".
- Estimate two values for $\zeta \in \{\zeta^I, \zeta^E\}$.

Nash in Nash Mechanics

- Bargaining happens simultaneous with carriage and pricing
- What this means is that if τ_{fct} changes then there is no change in p_{fmt}.
  - Criticism is that this limits (but does not eliminate) mechanism for double marginalization (by restricting what happens off the equilibrium path).
  - Sometimes criticized as "schizophrenic": division negotiating τ doesn't talk to local managers deciding $p_{fmt}, \mathcal{B}_{fmt}$.
- This is common in the literature: Grennan on Medical Devices, Ho or Ho and Lee on Hospitals-Insurers, Gowrisankaran, Nevo and Town on Hospitals-Insurers.
- Collard-Wexler, Gowrisankaran and Lee (2017) attempt to micro-found the Nash-in-Nash solution.

Double Marginalization

Assume single channel c fully owned by downstream firm m:

- Given τ firm f sets the cable bundle price $p = \phi(mc_f + (1-\mu)\tau)$.

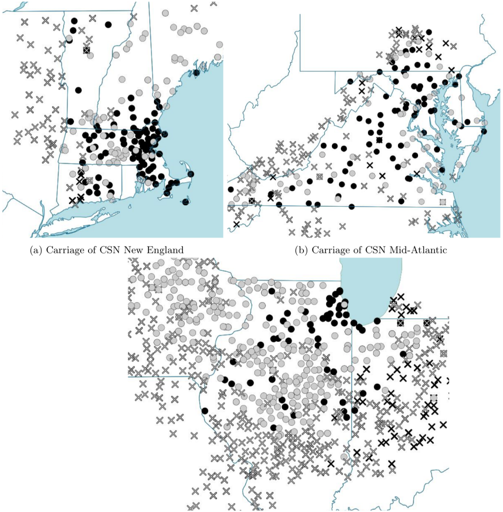
$$\begin{aligned} GFT_c^C(0,\cdot) &= 0 + \mu \times (p - mc_f)D(p) \\ GFT_f^M(0,\cdot) &= \mu \times (p - mc_f)D(p) + \mu \times 0 \end{aligned}$$

- The negotiated affiliate fee is then:

$$(1-\mu) \times D(p) = (1-\zeta)(p - mc_f)D(p) - \zeta\mu \times (p - mc_f)D(p)$$

- Holding p fixed an increase in μ lowers $91-\mu)\tau$ (effective affiliate fee).
- eq price satisfies $p = \phi(mc_f + [(1-\zeta) - \zeta\mu](p - mc_f))$.
- Increasing μ lowers p.

Identification



(a) Carriage of CSN New England

(b) Carriage of CSN Mid-Atlantic

(c) Carriage of CSN Chicago

Figure 4: Carriage by Comcast and non-integrated cable MVPDs of three Comcast-integrated RSNs across cable systems in 2007. Dots represent carriage by a system, X's represent no carriage.

Table 2: Estimates of Key Parameters

	Parameter	Description	Estimate	SE
Viewership	ν^{NS}	Viewership Decay, Non-sports	0.59	0.00
Parameters	ν^{S}	Viewership Decay, Sports	0.95	-
$\boldsymbol{\theta}_1$	γ^{b}	Fraction of Teams Blacked-out	-0.58	0.31
	γ^{d} (10^3mi)	Distance	-0.93	0.27
Bundle Choice	α	Bundle Price	-1.00	0.44
Parameters	β^{v}	Bundle Viewership Utility	0.14	0.07
$\boldsymbol{\theta}_2$	$\rho^{sat}_{DirecTV}(10^2)$	DirecTV Exponential Parameter	0.42	0.23
	$\rho^{sat}_{Dish}(10^2)$	Dish Exponential Parameter	0.49	0.27
Pricing, Bargaining,	σ^2_{ω}	Variance of Carriage Shocks	0.00	0.00
Carriage and	ζ^{E}	Bargaining, External	0.28	0.03
Foreclosure Parameters	ζ^{I}	Bargaining, Internal	0.37	0.06
$\boldsymbol{\theta}_3, \underline{\lambda}_R$	μ	Internalization	0.79	0.09
	$\mu \times \underline{\lambda}^{Phil}_R$	Internalization & Rival Foreclosure, Philadelphia	1.11	0.14
	$\mu \times \underline{\lambda}^{SD}_R$	Internalization & Rival Foreclosure, San Diego	0.94	0.11

Notes: Selected key parameters from the first and second step estimation of the full model, where parameter ν^S is estimated separately via a grid search (see Appendix C.3). Additional viewership parameters contained in $\boldsymbol{\theta}_1$ are reported in Appendix Table A.4; state-firm and year fixed effects in $\boldsymbol{\theta}_2$ are not reported. Asymptotic GMM standard errors are computed using numerical derivatives and 1500 bootstrap draws of markets and simulated households to estimate the variance-covariance matrix of the moments.

- Most markets have program access rules (PAR)s assume $\lambda_R = 0$.
- Estimate lower bound on λ_R because SAN and PHL have exclusion.

Results and Counterfactuals

- Advantages of VI
  - Lower negotiated price τ to cable company
  - Lower prices to consumers
  - More carriage by integrated firm
- Disadvantages
  - Higher prices to competitor (often satellite) τ
  - Higher prices to competitor's customers p
  - Foreclosure or failure fo reach agreement.
- Three scenarios
  - No VI ($\mu = 0$).
  - VI with PARs $\lambda_R = 0$
  - VI without PARs μ, λ_R both nonzero.

Counterfactuals

Table 4: Simulated Market Outcomes for Selected RSNs

		(i) No VI	(ii) VI PARs (vs. No VI)		(iii) VI No PARs (vs. No VI)	
		Level	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$	$\%\Delta_{lvl}$	$\%\Delta_{WTP}$
CABLE INTEGRATED RSNs						
CSN PHIL	Cable Mkt Share	0.64	0.8%		1.8%	
Comcast		[0.62,0.65]	[0.2%,2.4%]		[0.6%,4.0%]	
Pop 4.25M	Sat Mkt Share	0.18	-0.5%		-10.4%	
Footprint 90%		[0.17,0.19]	[-3.3%,-0.2%]		[-14.8%,-0.5%]	
WTP $4.99	Cable Carriage	0.95	1.6%		0.4%	
		[0.62,0.97]	[0.0%,53.8%]		[-6.2%,52.9%]	
	Cable Prices	54.31	-0.5%		0.9%	
		[53.28,55.42]	[-1.5%,0.9%]		[-1.4%,1.8%]	
Foreclose: 85%	Aff Fees to Sat	2.26	3.6%		-	
		[1.00,2.64]	[-9.4%,7.0%]		-	
	Cable + RSN Surplus	30.19	0.2%	0.9%	1.1%	6.5%
		[14.57,32.67]	[0.0%,2.4%]	[0.3%,13.7%]	[0.4%,3.3%]	[3.0%,20.5%]
	Satellite Surplus	4.29	-0.9%	-0.8%	-2.1%	-1.8%
		[1.26,4.70]	[-3.4%,-0.4%]	[-2.4%,-0.5%]	[-4.8%,-1.1%]	[-4.5%,-0.9%]
	Consumer Welfare	31.21	0.6%	3.9%	-2.9%	-18.1%
		[16.82,34.81]	[0.2%,2.0%]	[1.4%,12.7%]	[-3.3%,1.5%]	[-21.8%,9.9%]
	Total Welfare	65.69	0.3%	4.0%	-1.0%	-13.4%
		[31.14,71.73]	[0.1%,1.9%]	[2.0%,25.2%]	[-1.1%,1.1%]	[-15.6%,14.7%]
MSG	Cable Mkt Share	0.63	3.3%		3.3%	
Cablevision		[0.62,0.67]	[0.3%,4.8%]		[0.2%,4.7%]	
Pop 11.7M	Sat Mkt Share	0.18	-4.3%		-4.3%	
Footprint 42%		[0.17,0.18]	[-7.1%,-0.4%]		[-8.1%,-0.4%]	
Pred WTP $2.32	Cable Carriage	0.68	10.5%		10.5%	
		[0.67,0.87]	[-2.5%,18.5%]		[-3.1%,18.5%]	
	Cable Prices	59.40	-2.4%		-2.4%	
		[56.80,60.81]	[-3.5%,0.0%]		[-3.5%,0.2%]	
Foreclose: 1%	Aff Fees to Sat	1.22	-3.3%		22.4%	
		[0.42,1.28]	[-5.9%,10.4%]		[17.1%,53.4%]	
	Cable + RSN Surplus	30.64	0.3%	4.4%	0.5%	6.8%
		[14.61,34.12]	[-0.1%,0.6%]	[-1.6%,7.4%]	[0.0%,1.3%]	[0.4%,14.6%]
	Satellite Surplus	4.16	-4.2%	-7.5%	-5.5%	-9.9%
		[1.24,4.48]	[-7.2%,-0.5%]	[-12.1%,-0.9%]	[-8.5%,-1.2%]	[-14.3%,-2.4%]
	Consumer Welfare	33.80	3.1%	44.6%	3.0%	44.3%
		[18.38,38.14]	[0.3%,4.3%]	[4.4%,66.3%]	[-0.4%,4.3%]	[-6.3%,66.0%]
	Total Welfare	68.60	1.4%	41.4%	1.4%	41.2%
		[32.06,76.01]	[0.1%,1.9%]	[3.4%,60.9%]	[0.1%,1.9%]	[2.5%,60.7%]
NON-INTEGRATED RSN						
NESN	Cable Mkt Share	0.61	7.6%		9.4%	
*Comcast		[0.59,0.65]	[1.6%,11.2%]		[2.7%,12.5%]	
Pop 5.20M	Sat Mkt Share	0.13	-7.8%		-22.3%	
Footprint 85%		[0.12,0.14]	[-12.6%,-1.8%]		[-26.5%,-7.2%]	
WTP $6.91	Cable Carriage	0.92	6.2%		3.6%	
		[0.68,0.98]	[0.0%,33.1%]		[-0.5%,38.1%]	
	Cable Prices	56.73	-4.7%		-3.9%	
		[54.24,57.88]	[-6.6%,-0.5%]		[-6.0%,0.6%]	
Foreclose: 96%	Aff Fees to Sat	3.32	3.1%		-	
		[1.23,3.79]	[-12.6%,16.9%]		-	
	Cable + RSN Surplus	28.38	0.9%	3.6%	2.0%	8.2%
		[13.68,31.36]	[0.1%,2.4%]	[0.9%,10.6%]	[0.7%,4.0%]	[5.4%,16.7%]
	Satellite Surplus	2.96	-8.3%	-3.5%	-10.9%	-4.7%
		[0.84,3.24]	[-13.2%,-1.8%]	[-5.5%,-1.3%]	[-13.9%,-3.0%]	[-6.3%,-1.7%]
	Consumer Welfare	28.36	6.4%	26.5%	3.3%	13.5%
		[15.54,31.97]	[1.4%,10.0%]	[8.2%,40.8%]	[-1.7%,7.1%]	[-9.0%,29.2%]
	Total Welfare	59.70	3.1%	26.5%	2.0%	17.0%

Conclusions

- VI is good but PARs are important.