

The Cost of an Inefficient Vertical Contract

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Big picture

- What vertical contracts are observed in practice?
- How do they distort incentives?
- What is their impact on efficiency?

Big picture

- Empirical challenge: contracts are confidential
- Researchers rarely gain access to upstream data
 - Some exceptions: pay TV (Crawford and Yurukoglu 2013, Crawford et al. 2018), food distribution (Marshall 2020), alcoholic beverages distribution (Miravete, Seim, Thurk 2018 and others), vending machines (Conlon and Mortimer 2021)
- Some work uses variation in vertical structure
 - Indirect test for linear prices: e.g., Luco and Marshall (2020), Bajo-Buenestado and Borrella-Mas (2022)
 - Experimental variation in vertical rebates: Conlon and Mortimer (2021)
- Other work attempts to learn about vertical contracts without variation in vertical structure
 - E.g., Villas-Boas (2007), Bonnet and Dubois (2010), Hristakeva (2021)
 - Leans heavily on model specification

What we do

- Leverage knowledge of a vertical contract in a given industry
 - An inefficient contract: a revenue sharing agreement
- Exploit variation in vertical structure to estimate the details of the contract
- Use an equilibrium model to quantify the cost of the inefficient vertical contract.

Context

- Between 1977 and 2011, General Mills produced Yoplait in the US under a licensing agreement with Sodiaal.
 - Sodiaal supplied an intangible input: Yoplait image and brand rights
 - Production and marketing were GM's responsibility
 - The agreement was for an unknown (to us) percentage of Yoplait-GM's gross revenues.
- May 2011: GM reached an agreement with Sodiaal to purchase the Yoplait brand.
- July 2011: The transaction was completed.



Source: “Grab a spoon. It's time to make sense of the yogurt aisle.” *The Washington Post*, September 16, 2019. Accessed on September 19, 2023.

Why are revenue sharing agreements (RSA) inefficient?

- Consider a monopolist single-product downstream firm.
- It keeps a fraction $\mu \in [0, 1]$ of its revenue due to a RSA.
- The firm solves

$$\max_p \mu \cdot p \cdot q(p) - c \cdot q(p)$$

- Or, equivalently,

$$\max_p p \cdot q(p) - \frac{c}{\mu} q(p)$$

- The RSA is as though the firm produces with a scaled-up marginal cost
- Relative to when $\mu = 1$, the firm chooses a higher price, distorting quantity produced and profits.

Data

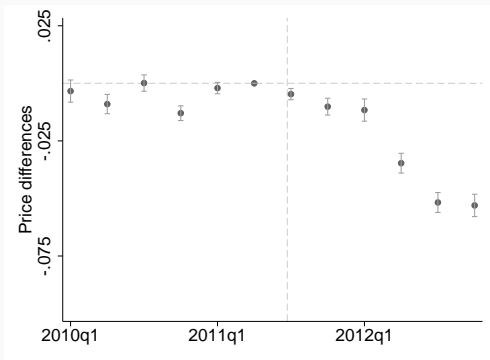
Data: IRI Marketing Data Set

- Weekly scanner data for the years 2010 to 2012 across 50 MSAs
- An observation is a store–week–product combination, where a product is a brand–size combination
- We focus on the top three firms: Groupe Danone, Chobani, and General Mills
 - 22 brands, 30 products
 - Example of product: 0.375 lbs package of Yoplait Original
- Top three firms: 75.6% of category revenue during sample period.

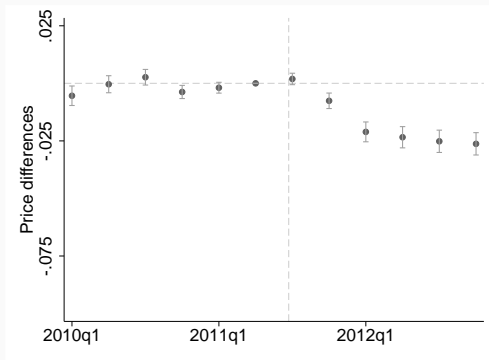
Descriptive evidence

The Impact of Revenue Sharing on Prices

- Yoplait prices drop by 1.8% on average after July 2011.



Panel A: Full sample



Panel B: No price promotions

Notes: Standard error clustered at the store level in parentheses. An observation is a store-week-product combination. All columns include product-store and store-week fixed effects.

Empirical Model

Empirical Model

We use an empirical model to:

1. Estimate the revenue sharing agreement
2. Compute the counterfactual equilibrium under an efficient vertical contract

Key features of the model:

- Demand follows BLP (1995), Nevo (2001)
 - Random coefficients on price and constant.
- Supply: We assume firms compete à la Bertrand-Nash
 - A market is a store-week.

Identification and estimation of demand system

- Instruments:
 - Cost shifters
 - Local differentiation IVs (Gandhi and Houde 2023)
- Estimation:
 - We estimate demand using pyBLP (Conlon and Gortmaker 2020).
 - 2-Step GMM, with approximated optimal instruments in the second step.
 - We include product, store, and week fixed effects.

Table 1: Estimated own- and cross-price elasticities for the most popular product of each firm

	Chobani	General Mills	Danone
Chobani	-3.56	0.13	0.04
General Mills	0.25	-2.73	0.03
Danone	0.32	0.14	-3.46

Notes: The table reports the median own- and cross-price elasticities for the top product of each firm. The sample used to compute these statistics consists of store-weeks in which the three products were available. Store-week combinations in which at least one of these products was not available are omitted. Overall, own-price elasticities range between -4.83 and -1.93 (considering the 1st and 99th percentiles of the distribution).

The cost of inefficient vertical contracts

Estimating the revenue sharing agreement

Under a revenue-sharing agreement, we can use our demand estimates to recover

$$\frac{c_{st}}{\mu_t} = \underbrace{\left[\mathbf{p}_{st} - \Omega(\mathbf{p}_{st})^{-1} \mathbf{s}_{st}(\mathbf{p}_{st}) \right]}_{\text{data} + \text{demand estimates}},$$

where

- $$\mu_{jt} = \begin{cases} \mu & \text{if Yoplait AND } t < \text{July 2011} \\ 1 & \text{otherwise.} \end{cases}$$
- $\Omega(p)$ is the matrix with the element-by-element product of the ownership matrix and the partial derivatives of demand with respect to prices (Nevo 2001).

\Rightarrow The challenge is to separate c_{st} from μ_t

Estimating the revenue sharing parameter I: marginal costs approach

- We can recover $\tilde{c}_{jst} \equiv c_{jst}/\mu_{jt}$
- Assume $c_{jst} = \exp\{\gamma_t + \gamma_j + \varepsilon_{jst}\}$
- Recall $\mu_{jt} = \mu$ if Yoplait and $t < \text{July 2011}$; $\mu_{jt} = 1$ otherwise.
- Taking logs and combining these equations:

$$\log \tilde{c}_{jst} = \gamma_t + \gamma_j - \log \mu \cdot 1\{\text{Yoplait, pre-July 2011}\} + \varepsilon_{jst}$$

- Key assumption:
 - No systematic change in costs except for a common trend

Estimating the revenue sharing parameter I: marginal costs approach

	(1)	(2)
	12-week window	24-week window
General Mills * Pre July 2011 ($-\log \mu$)	0.009 (0.003)	0.005 (0.003)
N	549,869	1,068,574
Implied Rev. Sharing Coef.	0.991 (0.003)	0.995 (0.003)

Notes: Standard errors clustered at the store level in parentheses. An observation is a product–store–week combination.

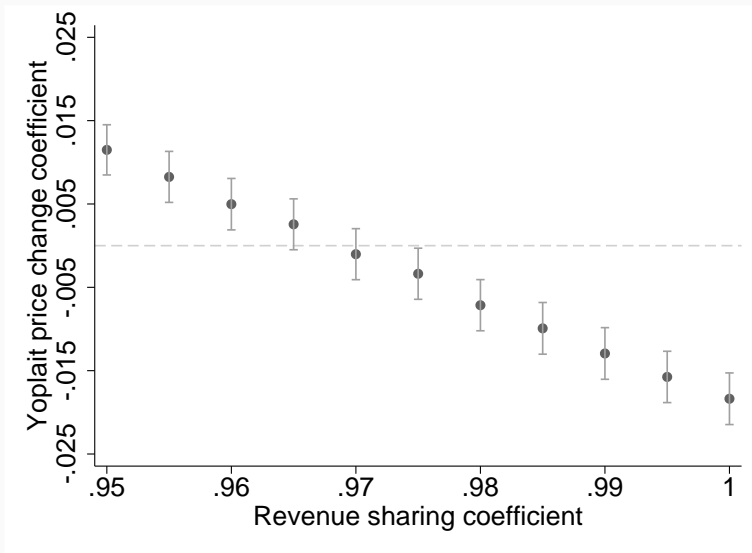
Estimating the revenue sharing parameter II: indirect inference approach

- In our descriptive section, we ran

$$\log p_{jst} = \beta \cdot 1\{\text{Yoplait AND post-July 2011}\} + \text{FEs} + \varepsilon_{jst} \quad (1)$$

- Recall $\tilde{c}_{jst} \equiv c_{jst}/\mu_{jt}$.
- We implement the following routine:
 1. Fix μ , compute $c_{jst} = \mu \cdot \tilde{c}_{jst}$.
 2. Use c_{jst} to solve for the price equilibrium assuming no revenue sharing.
 3. Use these counterfactual prices to run regression (1). Record β .
 4. Back to step 1 and repeat for another value of μ .
- Find the value of μ such that $\hat{\beta} = 0$.
- Key assumption: Elimination of the revenue sharing agreement was the only change affecting Yoplait through July 2011.

Estimating the revenue sharing parameter II: indirect inference approach



The Impact of an Efficient Vertical Contract on Market Outcomes

- Estimated $\hat{\mu} \in [0.97, 0.99]$.
- One efficient contract has a fixed transfer $F(\hat{\mu})$ that leaves Sodial indifferent between the revenue sharing contract $\hat{\mu}$ and $F(\hat{\mu})$.
- With the efficient contract, GM's profits are not distorted: $\mu = 1$.

The impact of efficient vertical contracts

Table 2: Changes in market outcomes (in log points) when switching to an efficient contract

	(1)	(2)	(3)	(4)	(5)	(6)
	Revenue sharing parameter: 0.97			Revenue sharing parameter: 0.99		
	Price	Market share	Profit	Price	Market share	Profit
Chobani	0.000	-0.006	-0.006	0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
General Mills	-0.019	0.044	0.041	-0.006	0.018	0.017
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Groupe Danone	0.000	-0.006	-0.007	0.000	-0.002	-0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Observations	2,384,559	2,384,559	2,384,559	2,384,559	2,384,559	2,384,559

Note: An observation is a product–store–week combination. We restrict attention to weeks prior to March 2011 (i.e., the time when the transaction was announced).

The impact of efficient vertical contracts

- GM's profits would increase by between \$245 y \$653, on average, by store–year, holding Sodial's profits constant.
- County Business Patterns: In 2011, there were 64,366 supermarkets/grocery stores in the U.S.
- Combining these figures: GM's profits would have increased by between 16 and 42 million (USD).
- In 2010, Yoplait sales in the US were about 1.5 billion.
 - Profit increase ranges between 1 and 2.9 percent of sales

Summary

- We leverage information about a vertical contract and variation in vertical structure to estimate the details of the contract
- We use an equilibrium model to quantify the impact of the inefficient vertical contract
- We show that an inefficient vertical contract can have a significant impact on efficiency and profits
- New evidence on vertical contracts that are used in practice

Thank you!
