Brand Portfolio as a Source of Bargaining Leverage: An Empirical Analysis*

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Abstract

In bilateral oligopolies, firms act strategically on both side of the market exerting their bargaining power vis-à-vis trading partners, which lead to complex vertical relationships in many industries. In this article, we investigate these vertical interactions by devoting special attention to practices in which upstream firms use their entire brand portfolio to affect bargaining threats, seeking to enhance their clout. For this purpose, we offer a structural bargaining model that includes different scenarios of business practices within the supply chain. Using purchase data on the French soft drink market, we are able to infer the nature of the manufacturer-retailer interaction, estimate the bargaining power of firms, and analyze the sharing of industry profits.

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1 Introduction

Over the course of these last decades, the food retail distribution sector has known a significant consolidation, leading to the rise of large food retailers owning important share of domestic retail sales (European Commission, 2008, 2009). In addition to this consolidation, the use of "buying alliances" – also called "joint purchasing agreements" – between retailers has become more and more frequent over the past years.[1] For instance, the French food retail sector is one of the highest concentrated market in the European Union where the four largest retail groups in 2015 are ITM Entreprises/Groupe Casino (25.9%), Carrefour/Cora (25.1%), Auchan/Système U (21.6%), Leclerc (19.9%).[2] Furthermore, the market share of discounters as well as the share of private labels introduced by food retailers have increased in almost all Member States, strengthening the bargaining power of retailers vis-à-vis producers (see Meza and Sudhir, 2010, for empirical evidence).[3][4] Consequently, those changes in the retailing sectors have affected the balance of power between manufacturers and retailers in agro-food industries. However, in bilateral oligopolies retailers may face strong manufacturers owning must-have brands, seeking to extract profits through vertical non-price restraints (e.g. tying/bundling), and are potentially able to challenge this buyer countervailing power.[5]

The goal of this article is to design a flexible empirical model of bargaining with *fixed-threats*[6] in which we assume different schemes of vertical agreements and investigate

[1]More recently, these agreements raised concern in France (see Autorité de la concurrence, 2015).

[2]Source: Autorité de la concurrence (2015).

[3]Private labels exceed 30% of market share in several Member States (e.g. UK, Germany, France) (see European Commission, 2011, p.78).

[4]It is important to be clear on what we mean by *bargaining power*. The bargaining power corresponds to the ability of a player to affect negotiation's terms. The bargaining power has two components: (i) an endogenous component that corresponds to the agreement and disagreement payoffs of a player (also called bargaining position); (ii) an exogenous component represented by the Nash bargaining weight that reflects some imprecisely defined differences in players' bargaining power other than those already captured by the endogenous component (Binmore et al., 1986). It is thus completely independent from the players' bargaining positions.

[5]For instance, tie-in sales may be seen as a threat to retailers who face the risk not to offer must-stock brands of a leading upstream firm if negotiations break down.

[6]In contrast to the *variable-threats* case, a bargaining situation with *fixed-threats* corresponds to a game in which players take they disagreement payoffs as given. In other words, disagreement payoffs are not affected

the one that best fits the data. By allowing each manufacturer to negotiate over wholesale prices of all his brands at once with each retailer,[7] we are able to infer the nature of the manufacturer-retailer interaction, and thereby analyze the sharing of industry's profits and its key factors.

For these purposes, we focus on the French soft drink market, which is a relevant industry to investigate the balance of power between manufacturers and retailers given the existence of large food companies operating in different segment of this sector.[8] A case law on 22 June 2005 in which the European Commission adopted a decision preventing The Coca-Cola Company from entering in business practices raising competition concerns (European Commission, 2005) provides us some insights regarding the vertical interactions between channel members. These practices, identified in a preliminary assessment in 2003, were mainly focused on exclusivity and exclusivity related practices, growth and target rebates, and tie-in sales.[9] Following this decision, the European Commission analyzed the competition concerns of some commercial practices within the food supply chains in its communication on "Food prices in Europe" (European Commission, 2008). It has been stated that a number of practices such as tying and bundling were deemed to merit special attention by competition authorities.

Our article is related to a number of empirical studies on vertical relationships. A first strand of empirical papers has been devoted to the analysis of vertical relationships in a setting of take-it-or-leave-it offers. Sudhir (2001) was first to consider both competitive interaction between manufacturers and retailer's interaction with manufacturers in an

by the players but are determined by the bargaining situation itself (Harsanyi and Selten, 1972).

[7]This kind of practices as the flavor of pure bundling strategies which refers to the selling strategy where a firm sells goods only in package form (Adams and Yellen, 1976). We thank Bruno Jullien for a helpful conversation on this issue.

[8]In its recent study, the European Commission has pointed out that the French soft drinks market belongs to the most concentrated industries in the agro-food sector (see European Commission, 2014, p. 306). Additionally, "the top 50 global brands include 7 food products, mainly beverages." (European Commission, 2007).

[9]For instance, The Coca-Cola Company recquired retailers to purchase his less popular products (tied goods) if they wanted to carry his must-have products such as Coca-Cola (tying goods).

empirical model. In his model, two manufacturers competing in an upstream market set their wholesale prices unilaterally and sell their products to consumers through an unique retailer. A first empirical study on the vertical relationships including retail competition was developed by Villas-Boas (2007). This study, focused on the U.S. yogurt market, points out that manufacturers make take-it-or-leave-it offers of two-part tariff contracts to retailers in order to avoid the double marginalization distortion and consequently increase industry profits. Bonnet and Dubois (2010) deepen the analysis of nonlinear contracts by putting forward that two-part tariff contracts with resale price maintenance are used in the French bottled water market. However, these empirical models explicitly assume that retailers are price-taker and have no active role in price determination. Bonnet and Dubois (2015) extend these models in a setting where retailers enjoy some endogenous buyer power. In their framework, each manufacturer makes simultaneously take-it-or-leave-it offers of two-part tariff contracts. All offers are assumed to be public and are made at the firm level.[10] Although this empirical model allows for two-part tariff contracts, it only endogenize the bargaining position of firms, fixing the bargaining weights of the retailers to zero.[11] Given that the bargaining power of firms is exogenously fixed, these structural models cannot be used as such to analyze the balance of power between manufacturers and retailers.

A more convenient way to model vertical interactions when the balance of power between trading parties is not easily determined is to refer to bargaining models wherein prices are negotiated (see Smith and Thanassoulis, 2012, for details). Our paper is in line with a recent literature on structural bargaining models with externalities. Draganska et al. (2010) propose an empirical model in which each pair of manufacturer-retailer negotiates separately wholesale prices of each product. This structural framework allows to estimate the Nash bargaining weights of manufacturers and retailers for each bilateral negotiation and analyze the sharing of industry profits. Crawford and Yurukoglu (2012) study the

[10] Each manufacturer makes take-it-or-leave-it proposal of his whole brand portfolio to retailers.

[11] When setting wholesale prices, manufacturers are constraint by the disagreement payoffs of the retailers. As a result, each retailer earns his disagreement payoffs and manufacturers obtain the remaining slice of the total pie.

welfare effects of a change in regulation requiring downstream firms to make individual offers for sale to consumers instead of bundling offers in the multichannel television industry. In their analysis, they estimate the Nash bargaining weights of firms in an empirical model of bargaining where wholesale prices of channels are jointly negotiated between each up- and downstream firms.
[TO BE COMPLETED]

In this paper, we extend the work of Draganska et al. (2010) and propose an empirical model of bargaining that allows each upstream firm to negotiate wholesale prices of their entire brand portfolio in a single negotiation with each retailer. Our approach differs from Crawford and Yurukoglu (2012) in that we are able to identify the Nash bargaining weights of firms without data on wholesale prices, which are rarely available in practice, and with unobserved marginal costs.[12] Because we would like to infer practices used between manufacturers and retailers in the vertical chain, we estimate the bargaining power and the market power of firms for different supply models. In particular, we test five scenarios:

Scenario	Negotiate all brands at once	Negotiate all brands separately
(1)	All manufacturers	∅
(2)	∅	All manufacturers
(3)	The Coca-Cola Company (TCCC)	All remaining manufacturers
(4)	TCCC and Orangina-Schweppes	All remaining manufacturers
(5)	TCCC and PepsiCo	All remaining manufacturers

From our demand model, we found that consumers substitute between categories of soft drink. Therefore, soft drink companies may not only have incentives to pool their brands

[12]The methodology developed by Crawford and Yurukoglu (2012) consists in estimate the wholesale prices of products, and then equalize the wholesale prices equilibrium given by the *asymmetric* Nash bargaining solution with the wholesale prices previously estimated by adjusting the Nash bargaining weights of firms. Fortunately in their setting the marginal cost of production is known to be nil, hence wholesale prices given by the *asymmetric* Nash bargaining solution only depend on the Nash bargaining weights of firms. However, in more general situations where the marginal cost is positive (as in our framework), wholesale prices that solve the Nash bargaining game are a function of two unknown terms: the Nash bargaining weights and the marginal cost of production. As a result, it would be impossible to know which term of the two would have to be adjusted to match the estimated wholesale prices. Our methodology do not suffer from this problem but we should point out that it strongly relies on other assumptions (e.g. nature of the downstream competition).

from a common category of beverages during the bargaining process, but also to use brands from other categories of beverages in order to reduce the number of alternative products available to retailers in case of disagreement. Based on the statistical test developed by Rivers and Vuong (2002), we find that The Coca-Cola Company and Orangina-Schweppes negotiate all their products at once with retailers. Moreover, our very preliminary results suggest that although the bargaining power of retailers is sensitive to their trading partners and varies across categories of products, it is in average stronger than manufacturer's bargaining power.

This article is organized as follows. In Section 2, we describe the data used to estimate our empirical model. Section 3 presents the demand model that captures the consumers behavior. In Section 4, we introduce the bargaining model devoted to the analysis of the balance of power between manufacturers and retailers in the French soft drink market. In Section 5, we provide our empirical results. Finally, research perspectives and extensions regarding the bargaining model are presented in Section 6.

2 Data on soft drink purchases

To estimate our demand model, we use a household-level scanner data of drink purchases in the French soft drink market collected by Kantar WorldPanel from April 2005 to September 2005.[13] This dataset is composed of $265,998$ purchases of soft drink products for home consumption and contains information on quantities purchased, selling prices, identities of retailers and manufacturers for each product purchased, the date of each purchase. As the dataset consists in home-scan purchases, we observe the price of the product that has been bought for a given purchase, but we do not have any information about the price of the

[13] We decided to conduct our analysis over this time period for two reasons. First, soft drink sales are sensitive to weather conditions, hence we select the most favorable time period for soft drink consumption in which we observe the largest number of purchases. Second, assuming that annual negotiations between firms which have affected observed retail prices in our dataset took place before the summer season, we decided to analyse the French soft drink market before the Commission's decision (European Commission, 2005) which bound The Coca-Cola Company's behavior regarding negotiations for the five subsequent years.

other competing products that the consumer decided not to buy. Hence, to infer the price of these other products we compute an average monthly price for each alternative and we assume that consumers faced the whole set of products at those average monthly prices when they made their purchases.[14]

The French soft drink market is composed of a large variety of products with different degrees of substitution. We can therefore find a wide range of carbonated soft drinks with different kind of flavour such as cola-flavoured or orange-flavoured. There are also non-carbonated soft drinks such as ice-tea, juices/nectars, and flavoured waters.

According to our sample, the upstream market is oligopolistic. Four majors beverage companies, namely The Coca-Cola Company, PepsiCo, Orangina-Schweppes, and Unilever compete with private labels.[15] We selected the first 21 biggest national brands according to their market shares, and four private labels aggregated with respect to their category (cola-flavoured, juices/nectars, ice-tea, and other sodas). Private labels represent in average 41.61% of the total market shares over the six month period and national brands accounts for 32.97% of market share.[16] Therefore, because of the significant size of private labels, retailers are likely to play an important role in the allocation of margins within the distribution channel. In the downstream market, we consider five main retailers, an aggregate of remaining hypermarket and supermarket, and an aggregate of hard discounters.

We assume that a product is a combination of one brand and one retailer (also called brand–service combination), meaning that a brand sold by different retailers does not correspond to the same product. Therefore, we have 157 differentiated products competing in the market, plus an outside good that aggregates all the remaining products that a consumer might

[14]We assume that consumers face the same assortment of products in each retail store. As we consider the main brands in the choice set of consumers, it seems to be realistic to assume that all the stores sell all those products. Moreover, all the retailers are national chains and are present in all regions in France.

[15]In our framework, we assume that private labels are either produced by retailers themselves or by a competitive fringe. In both cases, retailers purchase their private labels at marginal cost.

[16]The market share of product j is defined as the sum of the purchased quantities of product j divided by the total quantities purchased.

purchase.[17] The combined share of products that enter in our analysis account for 74.58% of the total sales of soft drink. Table 1 gives an overview of the data used to estimate the demand model.

Table 1: Descriptive statistics of the brands

	Brands	**Manufacturer**	**# Outlets**	**Market shares**	**Price (€/liter)**
Cola	Brand 2 (PL)	M5	7	6.19% (0.37)	€0.29 (0.05)
	Brand 13	M2	7	2.00% (0.20)	€0.68 (0.07)
	Brand 22	M1	6	0.08% (0.02)	€0.96 (0.06)
	Brand 23	M1	7	17.20% (1.00)	€0.88 (0.03)
	Total			25.47% (1.16)	€0.71 (0.01)
Other Soda	Brand 4 (PL)	M5	7	9.09% (0.81)	€0.37 (0.06)
	Brand 5	M2	6	0.08% (0.04)	€0.76 (0.05)
	Brand 10	M4	7	1.71% (0.16)	€0.84 (0.07)
	Brand 11	M4	7	1.97% (0.17)	€0.97 (0.06)
	Brand 14	M4	7	2.03% (0.39)	€1.05 (0.04)
	Brand 15	M2	7	0.37% (0.10)	€0.71 (0.05)
	Brand 16	M1	6	0.31% (0.05)	€0.74 (0.05)
	Brand 17	M4	6	0.54% (0.07)	€1.09 (0.06)
	Brand 19	M4	2	0.02% (0.01)	€0.71 (0.01)
	Brand 20	M4	6	0.09% (0.02)	€0.96 (0.03)
	Brand 21	M4	6	0.05% (0.01)	€3.31 (0.12)
	Brand 24	M1	7	1.05% (0.13)	€0.91 (0.08)
	Total			17.31% (1.20)	€0.64 (0.01)
Juice/Nectar	Brand 1 (PL)	M5	7	23.67% (1.54)	€0.80 (0.09)
	Brand 8	M1	5	0.21% (0.04)	€1.70 (0.18)
	Brand 12	M4	6	0.57% (0.10)	€1.70 (0.10)
	Brand 18	M2	7	2.45% (0.19)	€2.08 (0.08)
	Brand 25	M1	6	0.18% (0.06)	€1.40 (0.10)
	Total			27.08% (1.71)	€0.94 (0.01)
Ice-Tea	Brand 3 (PL)	M5	7	2.66% (0.31)	€0.49 (0.08)
	Brand 6	M3	7	1.73% (0.33)	€1.03 (0.06)
	Brand 7	M3	6	0.09% (0.03)	€1.24 (0.11)
	Brand 9	M1	5	0.24% (0.07)	€0.89 (0.06)
	Total			4.72% (0.64)	€0.71 (0.02)
Outside Good			.	25.42%	.

Standard deviation in parenthesis refers to variation across retailers and periods. (PL) corresponds to *private label*. Prices in the rows *Total* have been weighted by market shares of brands and their standard deviation in parenthesis refers to variation across periods. The column *# Outlets* indicates the number of outlets where the brand is sold.

We can see from Table 1 that cola's products as well as juices/nectars dominate the market. Among categories of products, we can observe that market shares are not homogeneous across brands. Indeed, brand 23 represents approximately 68% of cola's market share, while private labels account for a large amount in the market share of other categories

[17] The outside good is composed of all remaining national brands of carbonated soft drinks, juices/nectars with very low market shares, plus flavoured waters.

of products (especially for juices and nectars products). Unsurprisingly, "juice/nectar" segment corresponds to the most expensive. Indeed, while cola and soda products consist of water-sugar mixture, juices and nectars rather contain costly inputs such as 100% pure juice or 100% juice blend. While some of them may be diluted with water, they remain costlier than other categories of products. We can note that brand 21 is the most expensive brand among our alternatives which can be explained by its content (pure carbonated apple juice) and its packaging design which mimics a famous French wine. In addition, we can observe that the price of private labels is strictly lower than the price of national brands regarding each category of products. Overall, in some extent, contrary to market shares, the price of national brands within each category of products appears not to be highly heterogeneous. This suggests that there is no clear correlation between market shares and prices.

Except for brand 19, all retailers were selling almost all brands that we consider in our analysis. Consequently, our assumption that consumers faced all brands in each retail store when they made their purchases does not appear too strong.

Table 2: Average market shares of the retailers

Market shares	
Retailer	**Market shares (%)**
Retailer 1	14.28% (0.62)
Retailer 2	7.91% (0.24)
Retailer 3	8.34% (0.14)
Retailer 4	7.64% (0.20)
Retailer 5	18.49% (0.69)
Retailer 6	11.80% (0.62)
Retailer 7	6.12% (0.19)

Standard deviation in parenthesis refers to variation across products and periods.

Table 2 depicts the market shares of retailers' products over the time period considered. We can observe that retailer 5 dominates the investigated market and faces two close competitors according to market shares, namely retailer 1 and retailer 6. Other retailers' market shares are quite homogeneous and account for a half of retailer 5's market shares.

Table 3: Average market shares of the national brands' producers

Market shares	
Manufacturers	**Market shares (%)**
Manufacturer 1	19.27% (0.94)
Manufacturer 2	4.90% (0.16)
Manufacturer 3	1.82% (0.35)
Manufacturer 4	6.98% (0.57)
Private labels	41.61%
Outside good	25.42%

Standard deviation in parenthesis refers to variation across retailers and periods.

The average market shares of manufacturers' products are shown in Table 3. We can observe that the French soft drink market is clearly dominated by manufacturer 1 whose market shares are approximately three times higher than his closest competitor. In addition, we can see from Table 1 that only manufacturer 1 is present on each category of products which reflects the large variety of his portfolio. On the opposite, manufacturer 3 has the smallest market shares and he is only present on the "ice-tea" segment.

3 The Demand Model

In order to deal with the dimensionality problem given the large number of products that enter into our analysis and considering heterogeneity in consumer preferences, we use a random coefficient logit model to estimate the consumer substitution patterns.

Utility We consider a choice set $\mathcal{J} = \{0, \ldots, J\}$ of differentiated products. We assume that consumer i can only choose one unit of one product belonging to the choice set $\mathcal{J}$ in each period. Following the discrete-choice literature (Berry et al., 1995; Nevo, 2001), we assume that the utility derived by consumer i from purchasing product j at period t is specified as follows

$$U_{ijt} = \delta_{b(j)} + \delta_{R(j)} - \alpha_{ij} p_{jt} + \delta_t + \Delta\xi_{jt} + e_{ijt}$$

where $\delta_{b(j)}$ and $\delta_{R(j)}$ are brand fixed effects that capture respectively the mean utility in the population generated by unobserved time invariant product characteristics and unobserved time invariant retailer characteristics, α_{ij} is the marginal disutility of the price according to the consumer i, δ_t are time dummies capturing monthly unobserved determinants of demand (e.g. weather or seasons variations), $\Delta\xi_{jt}$ corresponds to the mean utility generated by changes in unobserved products characteristics across time (e.g. changes in shelf display), e_{ijt} is an unobserved error term that represents the distribution of consumer preferences about the mean utility of product j (the unobserved consumer i's taste for product j).

Taking into consideration heterogeneous consumer price disutilities, we assume that α_{ij} is lognormally distributed and varies across consumers such that $\alpha_{ij} = \alpha_{nb(j)} + \alpha_{pl(j)} + \sigma\nu_i$, where $\alpha_{nb(j)}$ captures the mean consumer price disutility for buying a national brand, $\alpha_{pl(j)}$ captures the mean consumer price disutility for buying a private label, and ν_i the individual deviation from these mean disutilities.

Outside option In order to give the possibility to consumers not to purchase any products among the J alternatives, an outside good is introduced in the choice set $\mathcal{J}$. The utility from purchasing this outside good is given by $U_{i0t} = \delta_t + \Delta\xi_{0t} + e_{i0t}$.

Endogeneity problem When estimating a demand model, it is generally well-known that firms and consumers are able to observe some product characteristics that the researcher is unable to observe. Therefore, these unobserved product characteristics are included in the error term of the demand model. Because these unobserved product characteristics influence the way firms set prices, the error term and the price variable are correlated, introducing the so-called endogeneity problem (Berry, 1994).[18] In order to mitigate the endogeneity problem and therefore have consistent estimates, we use the two-stage residual inclusion method (2SRI).[19] The main idea behind this method is to generate a proxy variable that

[18]The coefficient associated to the price will not only capture price effect on demand but it will also capture effect of other factors that are correlated with the price.

[19]This method has been first applied to the random coefficient logit model with consumer-level data by Villas-Boas and Winner (1999). Terza et al. (2008) show that this method, unlike the two-stage predictor substitution method (2SPS), gives consistent estimates in a non-linear econometric model. Petrin and Train (2010) show that the 2SRI method gives similar results than the BLP approach. Additionally, they put forward that the 2SRI method is a more general method and is even easier to implement than the BLP

captures the part of the error term $\Delta\xi_{jt} + e_{ijt}$ correlated with the price p_{jt}.
For this purpose, we regress the price on exogenous variables of the demand model (X_j)[20] and instrumentals variables (Z_{jt})[21] using OLS

$$p_{jt} = \vartheta X_j + \zeta Z_{jt} + \upsilon_{jt}$$

where υ_{jt} represents the error term containing all unobserved variables that explain p_{jt}.

Then, we add the residuals term of this regression $(\hat{\upsilon}_{jt})$, which captures the part of the error term $\Delta\xi_{jt} + e_{ijt}$ that is correlated with the price p_{jt}, into our model

$$\begin{aligned} & U_{ijt} = \delta_{b(j)} + \delta_{R(j)} - \alpha_{ij} p_{jt} + \delta_t + \varphi \hat{\upsilon}_{jt} + \epsilon_{ijt} \\ \Leftrightarrow \quad & U_{ijt} = V_{ijt} + \epsilon_{ijt} \end{aligned}$$

where $\epsilon_{ijt} = \Delta\xi_{jt} + e_{ijt} - \varphi\hat{\upsilon}_{jt}$ is now uncorrelated with prices.

Market share We assume that consumer i is an utility maximizer, and that ϵ_{ijt} is independently and identically distributed from the standard Gumbel distribution (also known as type I extreme value distribution). Therefore, the individual market share of product j at period t can be written as follows

$$s_{ijt} = \int_0^{+\infty} \left(\frac{e^{V_{ijt}}}{\sum_{k=0}^{J} e^{V_{ikt}}} \right) \times f\left(\nu_i\right) \, \mathrm{d}\nu_i$$

where $f(.)$ corresponds to the density function of the standard lognormal distribution, that is $\nu_i \sim Log - \mathcal{N}(0,1)$.

approach.

[20] These variables are brand fixed effect $\left(\delta_{b(j)}\right)$, retail fixed effect $\left(\delta_{R(j)}\right)$, and time specific fixed effect (δ_t).

[21] We exclusively use monthly cost shifters data collected by the French National Institute for Statistics and Economic Studies. Among these instrumentals variables we use the price of sugar, the price of water, the price of plastic, etc.

Elasticity The main advantage of the random coefficient logit is that it generates a flexible pattern of substitution between products by taking into account differences in consumer price disutilities.

The random coefficient logit model is not subject to the IIA assumption unlike the multinomial logit model or the nested logit model. Own price elasticities and cross price elasticities generated by the random coefficient logit model can be written as follows

$$\epsilon_{jkt} = \begin{cases} -\frac{p_{jt}}{s_{jt}} \int\limits_{0}^{+\infty} \alpha_{ij} s_{ijt} \left(1 - s_{ijt}\right) f\left(\nu_i\right) \ \mathrm{d}\nu_i \ \text{ if } \ j = k \\ \frac{p_{jt}}{s_{jt}} \int\limits_{0}^{+\infty} \alpha_{ij} s_{ijt} s_{ikt} f\left(\nu_i\right) \ \mathrm{d}\nu_i \ \text{ if } \ j \neq k \end{cases}$$

4 The Supply Model

Notation We consider the French soft drink vertical channel composed of F manufacturers that sell their brands to R retailers. For each manufacturer f, $\mathcal{G}_f$ represents the set of products he sells to retailers. For each retailer r, $\mathcal{G}_r$ corresponds to the set of products he resells to consumers. Hence,

$$\bigcup_{f=1}^{F} \mathcal{G}_f = \bigcup_{r=1}^{R} \mathcal{G}_r = \mathcal{J}$$

Denote the profit function of retailer r as follows

$$\pi^r = \sum_{j \in \mathcal{G}_r} \left(p_j - w_j - c_j\right) M s_j(p)$$

and the profit function of manufacturer f as follows

$$\pi^f = \sum_{j \in \mathcal{G}_f} \left(w_j - \mu_j\right) M s_j(p)$$

where p_j is the retail price of product j, w_j is the wholesale price of product j, μ_j corresponds to the constant marginal cost of production for product j, c_j represents the constant marginal cost of distributing product j, M is the total market share, and s_j represents the market share of product j.

Timing of the game In stage 1, each upstream firm publicly announces his bargaining strategy, that is whether to negotiate separately or jointly wholesale prices of his brands.[22] In stage 2, manufacturers and retailers bargain bilaterally[23] and simultaneously over wholesale price(s) of product(s).[24] We assume that negotiations' outcomes are secret[25] and that firms have *passive beliefs*.[26] Since negotiations are interdependent, we use the "Nash-in-Nash" bargaining solution (Horn and Wolinsky, 1988) to model their outcomes. This solution concept, based on the Nash's axiomatic theory of bilateral bargaining (Nash, 1950), corresponds to a Nash equilibrium between Nash bargains: each pair of players maximizes the bilateral gains from trade – modelled by the *asymmetric* Nash bargaining solution – given its conjectures on all other pairs' strategies.[27] We refer to Collard-Wexler et al. (2014)

[22]In other words, we assume that firms know their rivals' bargaining strategies within the supply chain. Applied to mature markets, this assumption seems sufficiently reasonable in our setting, all the more so as the Commission's investigation pertaining to The Coca-Cola Company's behavior was initiated by PepsiCo's complaints.

[23]We do not permit any bargaining that includes multiple manufacturers or multiple retailers at a time.

[24]We recognize that nonlinear contracts such as two-part tariffs are seen as more efficient from a theoretical perspective than linear tariffs in the sense that they allow to coordinate the distribution channel to avoid the double marginalization distortion and therefore maximize the industry profits. However, the use of linear contracts has been highlighted in some agro-food industries (Smith and Thanassoulis, 2012), in the video rental industry (Ho et al., 2012), and in the cable television industry (Crawford and Yurukoglu, 2012).

[25]This assumption means that firms are unable to observe the outcomes of contracts in which they was not a party to during the bargaining process.

[26]Implicitly referred in Horn and Wolinsky (1988), the concept of *passive beliefs* (McAfee and Schwartz, 1994) assumes that when a firm receives an offer different from what he expected (that is, an out-of-equilibrium offer), he does not revise his beliefs about the unobservable offers made to his rivals. Consequently firms still believe that their rivals receive an equilibrium offer in all circumstances. As underlined by Rey and Vergé (2004), while the term *beliefs* is usually related to the *type* of a rival firm, it refers in this literature to conjectures about rivals' negotiation outcomes.

[27]The "Nash-in-Nash" bargaining solution corresponds to the concept of *contract equilibrium* (Crémer and Riordan, 1987; O'Brien and Shaffer, 1992) in the particular case where wholesale prices are bargained. Indeed, the bargaining procedure can be illustrated by a setting where manufacturers and retailers send separate representatives to each bilateral negotiation. During these negotiations, firms' representatives – including those coming from the same firm – are unable to communicate with one another. Consequently, each pair of representatives chooses its best outcome – this outcome satisfies the *asymmetric* Nash bargaining solution – given its conjectures on outcomes determined by all other pairs, which thereby constitutes a Nash equilibrium. Note that, in this bargaining protocol, a firm involved in multiple bargains is unable to use information learned in one negotiation in another, which we refer to as *schizophrenia of the negotiator*.

for microfoundations of this semi-cooperative approach which has been extensively used in recent empirical models of bargaining (Crawford and Yurukoglu, 2012; Grennan, 2013; Crawford et al., 2014; Gowrisankaran et al., 2015).[28] In this game, we will limit our attention to the situation in which all bilateral negotiations are mutually beneficial. In stage 3, we assume that retail prices are determined by retailers competing à la Bertrand with *interim unobservability game* (Rey and Vergé, 2004).[29]

In this section, we use a timing assumption by considering a game-theoretic framework with *simultaneous-moves* in the sense that wholesale prices and retail prices are determined at the same time.[30]

In what follows, we first consider the stage 3 by computing retail margins coming from the downstream Bertrand competition. Then, based on an axiomatic approach, we solve the bargaining game (stage 2).

[28]Binmore et al. (1986) previously demonstrated in a two-player game that the outcome of the Rubinstein alternating offers coincides with the *asymmetric* Nash bargaining solution when the length of a bargaining period (offer/counter-offer) converges to 0, which suggests in a sense that there is no first-mover advantage in the bargaining procedure. Björnerstedt and Stennek (2007) extended this result and showed that in a setting with multiple buyers and sellers in which firms are schizophrenic the bargaining model à la Rubinstein generates the same outcome as the "Nash-in-Nash" bargaining solution. Collard-Wexler et al. (2014) extended these results to a setting where firms may enjoy asymmetry of information during the bilateral negotiations by relaxing the assumption of *schizophrenia of the negotiator*. Under certain assumptions, they show that there exists an unique passive-beliefs equilibrium that generates the "Nash-in-Nash" bargaining solution. These papers contribute to the literature on the Nash program initiated by Nash (1953) which intends to bridge the gap between the cooperative and non-cooperative approaches.

[29]Also called *unobservability game* (McAfee and Schwartz, 1994), this assumption implies that downstream firms neither observe which negotiations have succeed nor competitors' marginal costs when they set retail prices. Consequently, they have to form conjectures about the outcomes of negotiations which they were not a party to.

[30]We assume that the Bertrand competition between retailers and the Nash bargaining between manufacturers and retailers take place at the same time which consequently implies that all retail prices are conjectured by firms during the bargaining process as well as all wholesale prices which are conjectured by retailers when they compete in stage 2 (Dukes et al., 2006; Draganska et al., 2010; Crawford et al., 2014). This assumption imposes a kind of retailers' schizophrenia where retailers' representatives who set retail prices are different from those who negotiate over wholesale prices with manufacturers' representatives. Although the rationale for this assumption is to claim that retailers' response to a change in wholesale prices is not instantaneous, we plan to design an alternative game-theoretic framework with *sequential-moves*.

4.1 Stage 3: Downstream Bertrand competition

In stage 3, we consider the retailer's problem. In a Bertrand competition setting with multi-product firms, retailer r's maximization program given his beliefs regarding negotiated wholesale prices and retail prices set by his competitors can be written as follows

$$\max_{\{p_j\}_{j\in\mathcal{G}_r}} \sum_{j\in\mathcal{G}_r} \left(p_j - w_j^* - c_j\right) M s_j \left(p_{\mathcal{G}_r}, p^*_{\backslash\mathcal{G}_r}\right)$$

where w_j^* corresponds to the equilibrium wholesale price of product j, $p_{\mathcal{G}_r}$ represents the retail price vector set by retailer r, and $p^*_{\backslash\mathcal{G}_r}$ is the retail price vector conjectured by retailer r and set by his competitors.

The first order conditions of retailer r's maximization problem for each $k \in \mathcal{G}_r$ are given by

$$s_k + \sum_{j\in\mathcal{G}_r} \left(p_j - w_j^* - c_j\right) \frac{\partial s_j}{\partial p_k} = 0$$

From these first order conditions, we can express in matrix form the margins of retailer r

$$\gamma_r \equiv p_r - w_r^* - c_r = -\left(I_r S_p I_r\right)^+ I_r s$$

where s represents the J-dimensional vector of market shares, I_r corresponds to the $J \times J$ ownership matrix of retailer r where the jth diagonal element is equal to 1 if retailer r sells product j and 0 otherwise (the off-diagonal elements being equal to 0). The mathematical symbol $+$ corresponds to the unique Moore-Penrose pseudoinverse operator,[31] and S_p is a $J \times J$ matrix consisting of the first derivatives of all market shares with respect to all retail prices.[32]

[31] $(I_r S_p I_r)$ is a rank deficient matrix.

[32] This matrix is written as follows $S_p = \begin{pmatrix} \frac{\partial s_1}{\partial p_1} & \cdots & \frac{\partial s_J}{\partial p_1} \\ \vdots & \ddots & \vdots \\ \frac{\partial s_1}{\partial p_J} & \cdots & \frac{\partial s_J}{\partial p_J} \end{pmatrix}$.

4.2 Stage 2: Bargaining between up- and downstream firms

In stage 2, we model the bilateral negotiations between leading producers of soft drinks and retailers. Because we do not observe directly the industry practices, we consider several plausible scenarios of manufacturer-retailer interaction. In particular, our analysis focuses on practices in which manufacturers decide on bargaining threats in order to affect trading terms. We therefore specify different scenarios where manufacturers negotiate – jointly or separately – over wholesale prices of products with retailers. In this section, we present the bargaining game for two scenarios of vertical interaction:[33] (i) all manufacturers negotiate all their brands at once; (ii) all manufacturers negotiate all their brands separately.

4.2.1 Scenario 1: All manufacturers negotiate all their brands at once

In the light of the Commission's decision in 2005 and due to the diverse portfolios of some large upstream firms, it appears that the soft drink industry is conducive to tie-in sales within the supply chain. Therefore, we propose to design a bargaining model that as the flavor of such practices by assuming that each pair of manufacturer-retailer bargains over wholesale prices of a set of products which encompasses all brands produced by the manufacturer. Consequently, there are $F \times R$ contracts that are negotiated under this scenario.

Agreement payoffs Let $\mathcal{B}_{fr}$ be the set of products negotiated between manufacturer f and retailer r, $w_{\mathcal{B}_{fr}}$ denote the wholesale price vector determined by manufacturer f and retailer r, and p^* is the equilibrium retail price vector of products. The agreement payoffs of manufacturer f (retailer r respectively) are written as follows

$$\pi^f_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) = \sum_{j \in \mathcal{B}_{fr}} \left(w_j - \mu_j\right) M s_j(p^*)$$

$$\pi^r_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) = \sum_{j \in \mathcal{B}_{fr}} \left(p^*_j - w_j - c_j\right) M s_j(p^*)$$

[33] Other scenarios being a mixture of these two scenarios.

Disagreement payoffs Let $w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}$ be the equilibrium wholesale price vector anticipated by manufacturer f's negotiator during the bilateral negotiation with retailer r. Denote $w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}$ the equilibrium wholesale price vector anticipated by retailer r's negotiator during the bilateral negotiation with manufacturer f. Hence, these two vectors encompass anticipated outcomes of all other bilateral negotiations involving manufacturer f and retailer r respectively. Given that manufacturer f and retailer r have *passive beliefs* and that wholesales prices and retail prices are determined simultaneously, their respective status quo payoffs are given by[34]

$$d^f_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}, p^*\right) = \sum_{\substack{k \in \mathcal{G}^f \\ k \notin \mathcal{B}_{fr}}} \left(w^*_k - \mu_k\right) M \Delta s_k^{-\mathcal{B}_{fr}}\left(p^*\right)$$

$$d^r_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}, p^*\right) = \sum_{\substack{k \in \mathcal{G}_r \\ k \notin \mathcal{B}_{fr}}} \left(p^*_k - w^*_k - c_k\right) M \Delta s_k^{-\mathcal{B}_{fr}}\left(p^*\right)$$

where $\Delta s_k^{-\mathcal{B}_{fr}}(p^*)$ represents the change in market share of product k when products belonging to the set $\mathcal{B}_{fr}$ are no longer offered. This change in market share can be written as follows

$$\Delta s_k^{-\mathcal{B}_{fr}}(p^*) = \int_0^{+\infty} \left(\frac{e^{V_{ikt}}}{1 + \sum\limits_{l \in \mathcal{J} \setminus \{\mathcal{B}_{fr}\}} e^{V_{ilt}}} \right) \times f\left(\nu_i\right) - \left(\frac{e^{V_{ikt}}}{1 + \sum\limits_{l \in \mathcal{J}} e^{V_{ilt}}} \right) \times f\left(\nu_i\right)\ \mathrm{d}\nu_i$$

Asymmetric Nash product Given $w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}$, $w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}$ and p^*, the *asymmetric* Nash product of the bilateral negotiation between manufacturer f and retailer r over $w_{\mathcal{B}_{fr}}$ is written as follows

$$\max_{\{w_j\}_{j \in \mathcal{B}_{fr}}} \left[\pi^r_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) - d^r_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}, p^*\right)\right]^{\lambda_{fr}} \times \left[\pi^f_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) - d^f_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}, p^*\right)\right]^{1-\lambda_{fr}}$$

[34] The *passive beliefs* assumption implies that manufacturer f and retailer r do not expect that wholesale prices of other products would change if the negotiations between them fail. Besides, as pointed out previously, the fact that stage 2 and 3 occur simultaneously implies that the outcome of the negotiations between manufacturer f and retailer r does not affect retail prices.

where λ_{fr} (resp. $1-\lambda_{fr}$) represents the averaged Nash bargaining weight of retailer r (resp. manufacturer f) when he bargains with manufacturer f (resp. retailer r).

Solving the bargaining game, we can find the vector of manufacturers' margins (see Appendix A for computational details)

$$\Gamma \equiv w - \mu = \sum_{f=1}^{F} \sum_{r=1}^{R} \left(I_f S_{\mathcal{B}} I_f\right)^{+} \left[\left(\frac{1-\lambda_{\mathcal{B}}}{\lambda_{\mathcal{B}}}\right) \circ \left(I_r S_{\mathcal{B}} I_r \gamma\right)\right] \tag{1}$$

where $\circ$ represents the Hadamard product operator (also known as the element-by-element multiplication). $\frac{1-\lambda_{\mathcal{B}}}{\lambda_{\mathcal{B}}}$ is a column vector of dimension J. This vector corresponds to the ratio of the Nash bargaining weights between channel members when all upstream firms negotiate all their brands at once with each retailer (scenario 1). γ corresponds to a J-dimensional vector of retail margins.[35] Finally, $S_{\mathcal{B}}$ is the $J \times J$ matrix of market shares and changes in market shares

$$S_{\mathcal{B}}(b,k) = \begin{cases} s_k(p^*) & \text{if } k \text{ belongs to the } b\text{th set of products} \\ -\Delta s_k^{-\mathcal{B}_{fr}}(p^*) & \text{otherwise} \end{cases}$$

Given that (1) contains an unknown vector of parameters ($\lambda_{\mathcal{B}}$), we need an additional equation to identify Γ. This second equation can be obtain from the relationship between the total channel margins and the sum of manufacturers' margins and retailers' margins

$$\Gamma + \gamma = p - (c + \mu) \tag{2}$$

Because the total marginal cost for each product is not observed, we need to make some additional assumption about the cost function. We specify the total marginal cost as a

[35]From stage 3, the vector of retail margins is given by $\gamma = \sum\limits_{r=1}^{R} \gamma_r$.

reduced-form function of cost shifters

$$c + \mu = w\theta + \eta \tag{3}$$

where w is a $J \times K$ matrix of cost shifters[36] and η is a J-dimensional vector of error terms.

Then, substituting (1) and (3) into (2), we obtain the final equation

$$p - \gamma = \sum_{f=1}^{F} \sum_{r=1}^{R} (I_f S_{\mathcal{B}} I_f)^{+} \left[\left(\frac{1 - \lambda_{\mathcal{B}}}{\lambda_{\mathcal{B}}} \right) \circ (I_r S_{\mathcal{B}} I_r \gamma) \right] + w\theta + \eta \tag{4}$$

From (4), we are able to estimate the vector of Nash bargaining weights ($\lambda_{\mathcal{B}}$) and θ by nonlinear least squares

$$\min_{\lambda_{\mathcal{B}}, \theta} \quad \eta^T \eta$$

and finally recover the vector of manufacturers' margins (Γ).

4.2.2 Scenario 2: All manufacturers negotiate all their brands separately

Analogously to Draganska et al. (2010), we also consider the Nash bargaining game in which each manufacturer negotiates separately each of his brands with retailers.

Asymmetric Nash product Let $w^*_{\mathcal{G}_f \setminus \{j\}}$ denote the equilibrium wholesale price vector anticipated by manufacturer f's negotiator during the bilateral negotiation over w_j with retailer r. Denote $w^*_{\mathcal{G}_r \setminus \{j\}}$ the equilibrium wholesale price vector anticipated by retailer r's negotiator during the bilateral negotiation over w_j with manufacturer f. As previously, these two vectors encompass anticipated outcomes of all other bilateral negotiations involving manufacturer f and retailer r respectively. Given $w^*_{\mathcal{G}_f \setminus \{j\}}$, $w^*_{\mathcal{G}_r \setminus \{j\}}$, and p^*, the *asymmetric* Nash product of the bilateral negotiation between manufacturer f and retailer r over w_j can

[36]We use K variables on input costs (e.g. price of sugar) collected by the French National Institute of Statistics and Economic Studies (INSEE).

be written as follows

$$\max_{w_j} \left[\pi_j^r(w_j, p^*) - d_j^r\left(w^*_{\mathcal{G}_r\setminus\{j\}}, p^*\right)\right]^{\lambda_{fr}} \times \left[\pi_j^f(w_j, p^*) - d_j^f\left(w^*_{\mathcal{G}_f\setminus\{j\}}, p^*\right)\right]^{1-\lambda_{fr}}$$

As previously, solving the bargaining game and using the link between total margins and marginal costs lead to the following final equation

$$p - \gamma = \sum_{f=1}^{F}\sum_{r=1}^{R}(I_f S_{-j} I_f)^+ \left[\left(\frac{1-\lambda_{\mathcal{C}}}{\lambda_{\mathcal{C}}}\right) \circ (I_r S_{-j} I_r \gamma)\right] + w\theta + \eta \tag{5}$$

where $\frac{1-\lambda_{\mathcal{C}}}{\lambda_{\mathcal{C}}}$ is the J-dimensional vector of parameters that corresponds to the ratio of the Nash bargaining weights between channel members when upstream firms choose to separately negotiate wholesale prices of products (scenario 2). S_{-j} is a $J \times J$ matrix with market shares as diagonal elements and changes in market shares as off-diagonal elements, that is

$$S_{-j} = \begin{pmatrix} s1(p^*) & -\Delta s_2^{-1}(p^*) & \cdots & -\Delta s_J^{-1}(p^*) \\ -\Delta s_1^{-2}(p^*) & s_2(p^*) & \cdots & -\Delta s_J^{-2}(p^*) \\ \vdots & \vdots & \ddots & \vdots \\ -\Delta s_1^{-J}(p^*) & -\Delta s_2^{-J}(p^*) & \cdots & s_J(p^*) \end{pmatrix}$$

We finally estimate the vector of bargaining weights ($\lambda_{\mathcal{C}}$) and the vector of cost shifters (θ) from (5) by nonlinear least squares, and hence we recover the manufacturers' margins (Γ).

As mentioned previously, we also specify three other scenarios of vertical interactions. Being a mixture of the two scenarios exposed in the present section, we will not introduce them to avoid redundancy.

5 Empirical results

The approach adopted can be summarized as follows. Based on the demand model, which allows to capture consumers' behavior, we compute margins for each retailer. From the retail margins and demand parameters, we estimate the Nash bargaining weights of firms within the vertical chain, and hence we recover the margins of manufacturers under each scenario.[37] Finally, we are able to infer the model that fits better the data by using the Rivers and Vuong (2002) test, and analyze the sharing of industry profits.

5.1 Demand Side

To estimate the parameters of the demand model, we use a subsample of $100,000$ observations. Based on Revelt and Train (1998), we estimate the random coefficient logit model by maximizing the simulated log-likelihood function written as follows

$$\mathrm{SLL} = \sum_{i=1}^{I} \sum_{j=1}^{J} \sum_{t=1}^{T} \delta_{ijt} \times \ln\left(\tilde{s}_{ijt}\right)$$

where δ_{ijt} is a dummy variable equals to 1 if consumer i chooses product j at period t and 0 otherwise, and $\tilde{s}_{ijt}$ represents the individual simulated market share of product j at period t.[38] The estimated parameters of the random coefficient logit model are shown below in the Table 4.

[37] Note that in our estimation procedure we estimate the demand-side and the supply-side parameters sequentially. Although a joint estimation of both models has the advantage of increasing the accuracy of the estimated parameters, the main drawback of such approach applied to our setting is that estimates of the demand parameters would be affected by the specification of the supply-side. Therefore, separately estimate the demand-side parameters and the supply-side parameters ensures to have consistent estimates of the demand parameters even in the presence of supply-side misspecifications.

[38] The individual simulated market share can be written as follows: $\tilde{s}_{ijt} = \frac{1}{R} \sum_{r=1}^{R} \frac{e^{\delta_{b(j)}+\delta_{R(j)}+\delta_t-\left(\alpha_{nb(j)}+\alpha_{pl(j)}+\sigma\nu_i^r\right)p_{jt}+\varphi\hat{v}_{jt}}}{\sum_{k=0}^{J} e^{\delta_{b(k)}+\delta_{R(k)}+\delta_t-\left(\alpha_{nb(k)}+\alpha_{pl(k)}+\sigma\nu_i^r\right)p_{kt}+\varphi\hat{v}_{kt}}}$ where R corresponds to the total number of Halton draws for each consumer i. Note that in order to obtain each ν_i^r, we use the Halton sequence for the prime number 3. Moreover, based on Train (2000), we decided to use 100 Halton draws for each consumer i so as to obtain the smaller simulation variance in the estimation of mixed logit parameters.

Table 4: Results of the random coefficient logit model

Parameters	Mean	Std. Dev.	Parameters	Mean
Price (p_{jt})		0.62 (0.00)		
$\times$ PL	2.34 (0.00)			
$\times$ NB	1.46 (0.00)			
2SRI term ($\hat{v}_{jt}$)	4.41 (0.00)			
Retail fixed effect				
R_1	6.53 (0.00)		R_5	3.45 (0.00)
R_2	0.12 (0.00)		R_6	0.54 (0.00)
R_3	0.53 (0.00)		R_7	ref.
R_4	-1.08 (0.00)			
Brand fixed effect: Cola				
B_2 (PL)	0.12 (0.00)		B_{22}	-2.02 (0.00)
B_{13}	-1.34 (0.00)		B_{23}	1.80 (0.00)
Brand fixed effect: Other Soda				
B_4 (PL)	-1.08 (0.00)		B_{16}	-2.06 (0.00)
B_5	-3.45 (0.00)		B_{17}	0.04 (0.00)
B_{10}	-0.30 (0.00)		B_{19}	-6.98 (0.00)
B_{11}	0.30 (0.00)		B_{20}	-2.51 (0.00)
B_{14}	1.01 (0.00)		B_{21}	4.03 (0.00)
B_{15}	-2.42 (0.00)		B_{24}	-0.21 (0.00)
Brand fixed effect: Juice/Nectar				
B_1 (PL)	6.53 (0.00)		B_{18}	4.43 (0.00)
B_8	1.21 (0.00)		B_{25}	0.48 (0.00)
B_{12}	2.25 (0.00)			
Brand fixed effect: Ice-Tea				
B_3 (PL)	1.53 (0.00)		B_7	-1.11 (0.00)
B_6	0.54 (0.00)		B_9	-1.72 (0.00)
Time fixed effect not shown.				
Log-likelihood				-345,275
Number of observations				100,000

Standard errors are in parenthesis. (PL) corresponds to *private label*.

First of all, we can observe from Table 4 that the average effect of the price on utility, which is allowed to differ between private labels and national brands, is negative and significant. Consumers are in average more sensitive to the private labels' price variations than those from national brands, which underlines the loyalty effect of consumers regarding national brands. Our estimates show that the standard deviation of the random coefficient is significantly positive which indicates heterogeneity among consumers regarding the marginal price disutility. The coefficient associated to the control parameter ($\hat{v}$) is also significantly positive, suggesting that the unobserved products characteristics correlated with the price variable have a positive effect on the utility of consumers.[39] The retail fixed effects reveal some heterogeneity in the preference of retail chain. This result is consistent with the study published by the European Commission (2007). Interestingly, the brand fixed effects suggest that private labels are perceived differently across categories of beverages. For instance, private labels for the "Juice/Nectar" segment are, in average, valued more than national brands, while private labels for the "Other Soda" segment seem to be less valuable than national brands.

Using the estimated parameters of the demand model in Table 4, we are able to compute the own and cross-price elasticites with respect to each product. Table 5 depicts the average estimated own price elasticities by brand.

[39] Ignoring the endogeneity problem would underestimate the negative effect of the price on utility (Petrin and Train, 2010).

Table 5: **Average own-price elasticities of the brands**

Brands	Own-Price Elasticity	Brands	Own-Price Elasticity
Cola			
Brand 2 (PL)	-3.25 (0.56)	Brand 22	-4.14 (0.28)
Brand 13	-2.89 (0.31)	Brand 23	-3.64 (0.18)
Other Soda			
Brands	**Own-Price Elasticity**	**Brands**	**Own-Price Elasticity**
Brand 4 (PL)	-4.21 (0.58)	Brand 16	-3.09 (0.27)
Brand 5	-3.24 (0.26)	Brand 17	-4.74 (0.31)
Brand 10	-3.54 (0.36)	Brand 19	-2.98 (0.07)
Brand 11	-4.18 (0.43)	Brand 20	-4.15 (0.14)
Brand 14	-4.62 (0.27)	Brand 21	-17.65 (0.75)
Brand 15	-2.97 (0.29)	Brand 24	-4.05 (0.74)
Juice/Nectar			
Brands	**Own-Price Elasticity**	**Brands**	**Own-Price Elasticity**
Brand 1 (PL)	-8.24 (0.99)	Brand 18	-9.66 (0.90)
Brand 8	-7.62 (1.50)	Brand 25	-6.34 (0.65)
Brand 12	-7.92 (0.59)		
Ice-Tea			
Brands	**Own-Price Elasticity**	**Brands**	**Own-Price Elasticity**
Brand 3 (PL)	-5.42 (0.83)	Brand 7	-5.61 (0.68)
Brand 6	-4.37 (0.44)	Brand 9	-3.83 (0.31)

Standard deviation in parenthesis refers to variation across retailers and periods.

(PL) corresponds to *private label*.

From Table 5, we can observe that own-price elasticities varies between -2.80 and -9.37 (with a peak up to -17.16 for brand 21 corresponding to an expensive specific brand as depicted in Table 1). These results are slightly higher than those found by Gasmi et al. (1992), but are consistent with Dubé (2005) regarding cola's products, and Bonnet and Requillart (2013) who did not include the "Juice/Nectar" segment in their analysis.[40] Not surprisingly, given their cost of production and consequently their high price level relative to other beverages, own-price elasticities are higher for brands belonging to the "Juices/Nectars" segment.

[40] Gasmi et al. (1992) estimated a linear demand model and obtained own-price elasticities varying between -1.71 to -1.97 for cola's products in the U.S. soft drink market from 1968 to 1986. Using a multiple-discrete choice model, Dubé (2005) estimated own-price elasticities for cola's products between -3.10 to -5.76 in the Denver area in the 90's. Bonnet and Requillart (2013) found an average of -3.52 for their estimated own-price elasticities in the French soft drink market in 2005.

Table 6: Own and cross-price elasticities aggregated by category of beverages

Random Coefficients Logit				
Category	**Elasticities**			
	Cola	Other Soda	Juice	Ice-Tea
Cola	-2.58	0.89	0.59	0.87
Other Soda	0.54	-3.73	0.48	0.55
Juice/Nectar	2.46	2.94	-2.98	3.29
Ice-Tea	0.29	0.30	0.27	-4.36

Table 6 depicts the own and cross-price elasticities aggregated by categories of beverages.[41] We can see that the own-price elasticity of juices and nectars at the category level is lower compared to the own-price elasticities at the brand level (see Table 5). This suggests that there might exist an important substitutability between brands within this category. In addition, we can observe that cross-price elasticities of the "Juices/Nectars" segment indicate that all other categories are close substitute from the consumer's perspective. These results emphasize the strong presence of private labels within this category. Given that they are not highly differentiated, which leads to an absence of a brand loyalty, a price increase result in a large diversion within and outside the "Juices/Nectars" segment. Overall, we can interestingly note that there exists a substitutability across categories of beverages. One can think that this substitutability might induce upstream firms to use their entire brand portfolio as bargaining threats to affect negotiations' outcomes.[42]

5.2 Supply Side

From the results of the demand model presented previously, we are able to recover retail margins and to estimate the Nash bargaining weights of firms within the vertical chain as well as the total marginal costs for each product under each scenario. Finally, using these estimates, we can compute manufacturers' margins, infer the model that best fits the data, and investigate the sharing of industry profits. Corresponding to the best supply model

[41] This table can be interpreted as follows: if the prices of all cola's products increase by 1%, the demand of ice-tea products would increase by 0.87%.

[42] The incentive to bargain all brands at once – included several must-stock brands – that can be seen to some extent as substitute from the consumer's perspective might come from the straightforward idea that it can reduce the bargaining position of retailers during the negotiation process.

according to the Rivers and Vuong (2002) test (see Appendix B), we only present results of the 4th scenario in which The Coca-Cola Company and Orangina-Schweppes decide to negotiate wholesale prices of all their brands at once with each retailer.

The total marginal cost estimates of the brands are shown in Table 7. We can observe that for each segment of beverage, marginal cost of the private labels are the lowest. Moreover, as expected, the two main national brands in the cola's segment have slightly the same total marginal cost. Unsurprisingly, brands belonging to the "Juices/Nectars" segment account for the highest total marginal cost, which is probably due to their expensive cost of production.

Table 7: Average total marginal cost of the brands

	Cola		
Brands	**Marginal cost (€/liter)**	**Brands**	**Marginal cost (€/liter)**
Brand 2 (PL)	0.20 (0.06)	Brand 22	0.64 (0.20)
Brand 13	0.37 (0.16)	Brand 23	0.39 (0.18)
Total	0.39 (0.22)		
	Other Soda		
Brands	**Marginal cost (€/liter)**	**Brands**	**Marginal cost (€/liter)**
Brand 4 (PL)	0.29 (0.06)	Brand 16	0.47 (0.06)
Brand 5	0.50 (0.10)	Brand 17	0.81 (0.06)
Brand 10	0.50 (0.14)	Brand 19	0.45 (0.02)
Brand 11	0.64 (0.14)	Brand 20	0.70 (0.03)
Brand 14	0.67 (0.22)	Brand 21	3.11 (0.12)
Brand 15	0.43 (0.08)	Brand 24	0.64 (0.17)
Total	0.77 (0.72)		
	Juice/Nectar		
Brands	**Marginal cost (€/liter)**	**Brands**	**Marginal cost (€/liter)**
Brand 1 (PL)	0.71 (0.09)	Brand 18	0.99 (0.20)
Brand 8	1.10 (0.61)	Brand 25	0.98 (0.42)
Brand 12	1.43 (0.10)		
Total	1.03 (0.40)		
	Ice-Tea		
Brands	**Marginal cost (€/liter)**	**Brands**	**Marginal cost (€/liter)**
Brand 3 (PL)	0.40 (0.08)	Brand 7	0.49 (0.14)
Brand 6	0.46 (0.09)	Brand 9	0.63 (0.07)
Total	0.48 (0.13)		

Standard deviation in parenthesis refers to variation across retailers and periods.

(PL) corresponds to *private label*.

Table 8 presents an average of the estimated Nash bargaining weights of the retailers (λ) with respect to each manufacturer.[43] Our results suggest that Nash bargaining weights of the retailers varies across manufacturers putting forward the idea that their exogenous bargaining power highly depend on their trading partners.[44] In contrast, we find that Nash bargaining weights of the manufacturers ($1 - \lambda$) are quite homogeneous across retailers except when they bargain with retailer 5 which appears to have a weak bargaining ability compared to his competitors despite the fact that he possesses a substantial market share as depicted in Table 2. Overall, we can see from Table 8 that the retailers have a stronger clout than the manufacturers, and therefore capture a higher share of the surplus generated by the bilateral negotiations net of the disagreements payoffs of firms.

Table 8: Estimates of the average Nash bargaining weights of the retailers (λ) by manufacturers

	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**
M1	0.62	0.65	0.65	0.60	0.31	0.71	0.60
M2	0.77 (0.34)	0.80 (0.35)	0.79 (0.35)	0.75 (0.34)	0.45 (0.22)	0.80 (0.34)	0.78 (0.33)
M3	0.38 (0.08)	0.37 (0.12)	0.39 (0.09)	0.37 (0.04)	0.45 (0.00)	0.39 (0.04)	0.37 (0.04)
M4	0.86	0.83	0.89	0.73	0.46	0.92	0.89
Total	0.72 (0.23)	0.71 (0.20)	0.75 (0.23)	0.66 (0.19)	0.40 (0.15)	0.79 (0.23)	0.74 (0.24)

Standard deviation in parenthesis refers to variation across brands and periods.

The total sharing of industry profits between manufacturers and retailers in the French soft drink market is depicted in Table 9 for each category of beverages. We can observe that the slice captured by each manufacturer varies across categories of products.[45] For instance, manufacturer 1 obtains in average 41.68% of the pie generated by his cola's products, while he gets only 1.83% of the profits generated by his ice-tea products, the remaining slice being captured by retailers. In addition, we can note that the slice captured by the manufacturers for a given segment of beverages varies between retailers (see the standard deviations in

[43]Table 8 must be interpreted as follows: retailer 1 has an average Nash bargaining weight of 0.62 when he bargains with manufacturer 1.

[44]Draganska et al. (2010) find a similar result in the German market for coffee.

[45]The slice capture by a manufacturer for a given bilateral negotiation with a retailer corresponds to his disagreement payoffs plus a share $(1 - \lambda)$ of the gains from trade net of the disagreement payoffs of both trading partners (see Appendix A for details).

parenthesis).

Table 9: Slice of the manufacturers by category of beverages

	Cola	Other Soda	Juice/Nectar	Ice-tea
Manuf. 1	41.68% (9.20)	6.58% (4.83)	4.23% (3.25)	1.83% (0.31)
Manuf. 2	12.75% (17.3)	2.48% (6.99)	77.6% (1.53)	.
Manuf. 3	.	.	.	54.8% (2.44)
Manuf. 4	.	17.0% (11.2)	8.75% (4.63)	.

Standard deviation in parenthesis refers to variation across retailers.

Overall, the bargaining power in the French soft drink market lies in the retailers' hands who capture the main share of the industry profits.

[TO BE COMPLETED]

6 Conclusion

In this paper, we analyze the vertical interactions and the sharing of industry profits between manufacturers and retailers in the French soft drink market. Paying particular attention to the bargaining process in which upstream firms may decide to negotiate wholesale prices of all their brands at once, we specify different scenarios of vertical relationship and infer the one that best fits the data. In our very preliminary results, we find that The Coca-Cola Company and Orangina-Schweppes jointly negotiate wholesale prices of a set of products which encompasses all their brands with downstream firms. Extending the work of Draganska et al. (2010) to multiproducts bargaining, our empirical model allows us to estimate the Nash bargaining weights of firms with respect to each bilateral negotiation. Then, computing profits generated by each bilateral agreement, we find that in average retailers capture a larger slice of the industry profits than manufacturers.

Although our analysis focuses on the soft drink industry, the methodology used can be applied to other setting. Indeed, one of the main advantages of our empirical model of bargaining is that it does not require any extensive dataset with informations on the supply-side which are rarely available in practice, especially for all market participants (e.g. data on wholesale prices or data on firms' marginal costs).

As a perspective for this article, we plan to design a game with *sequential-moves*, relaxing the assumption that retailers make conjectures on wholesale prices they negotiate with manufacturers when they set retail prices $\left(\frac{\partial p_j}{\partial w_j} \neq 0 \text{ and } \frac{\partial p_j}{\partial w_k} \neq 0, \forall j, k \in G^r\right)$. We also plan to extend the set of scenarios and perform some counterfactual analysis to investigate effects of preventing the use of multiproducts bargaining on retail prices and manufacturers profits.

Appendix

A Scenario 1: All manufacturers negotiate all their brands at once

In the current section, we solve in detail the bilateral negotiation between manufacturer f and retailer r over wholesale prices of a set of products wich encompasses all manfacturer f's brands.

Agreement payoffs Let $w_{\mathcal{B}_{fr}}$ denote the wholesale price vector negotiated between manufacturer f and retailer r, and p^* be the equilibrium retail price vector of products. Let's define the agreement profits generated by the set of products $\mathcal{B}_{fr}$ for manufacturer f and retailer r respectively as follows

$$\pi^f_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) = \sum_{j \in \mathcal{B}_{fr}} \left(w_j - \mu_j\right) M s_j(p^*)$$

$$\pi^r_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) = \sum_{j \in \mathcal{B}_{fr}} \left(p^*_j - w_j - c_j\right) M s_j(p^*)$$

Disagreement payoffs Let $w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}$ be the equilibrium wholesale price vector anticipated by manufacturer f's negotiator during the bilateral negotiation with retailer r. Denote $w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}$ the equilibrium wholesale price vector anticipated by retailer r's negotiator during the bilateral negotiation with manufacturer f. These two vectors encompass anticipated outcomes of all other bilateral negotiations involving manufacturer f and retailer r respectively. The disagreement payoffs of manufacturer f and retailer r are respectively given by

$$d^f_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}, p^*\right) = \sum_{\substack{k \in \mathcal{G}^f \\ k \notin \mathcal{B}_{fr}}} \left(w^*_k - \mu_k\right) M \Delta s_k^{-\mathcal{B}_{fr}}\left(p^*\right)$$

$$d^r_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}, p^*\right) = \sum_{\substack{k \in G^r \\ k \notin \mathcal{B}_{fr}}} \left(p^*_k - w^*_k - c_k\right) M \Delta s_k^{-\mathcal{B}_{fr}}(p^*)$$

Asymmetric Nash product Given $w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}$, $w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}$ and p^*, the *asymmetric* Nash product of the bilateral negotiation between manufacturer f and retailer r over $w_{\mathcal{B}_{fr}}$ can be written as follows

$$\max_{\{w_j\}_{j \in \mathcal{B}_{fr}}} \left[\pi^r_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) - d^r_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_r \setminus \{\mathcal{B}_{fr}\}}, p^*\right)\right]^{\lambda_{fr}} \times \left[\pi^f_{\mathcal{B}_{fr}}\left(w_{\mathcal{B}_{fr}}, p^*\right) - d^f_{\mathcal{B}_{fr}}\left(w^*_{\mathcal{G}_f \setminus \{\mathcal{B}_{fr}\}}, p^*\right)\right]^{1-\lambda_{fr}}$$

The first order condition of the Nash bargaining problem with respect to $j \in \mathcal{B}_{fr}$ is

$$(1-\lambda_{fr})\left[\pi^r_{\mathcal{B}_{fr}} - d^r_{\mathcal{B}_{fr}}\right]\left(\frac{\partial \pi^f_{\mathcal{B}_{fr}}}{\partial w_j}\right) + \lambda_{fr}\left[\pi^f_{\mathcal{B}_{fr}} - d^f_{\mathcal{B}_{fr}}\right]\left(\frac{\partial \pi^r_{\mathcal{B}_{fr}}}{\partial w_j}\right) = 0$$

Under the assumption that wholesale prices and retail prices are determined simultaneously, we have $\frac{\partial \pi^f_{\mathcal{B}_{fr}}}{\partial w_j} = M s_j(p^*)$ and $\frac{\partial \pi^r_{\mathcal{B}_{fr}}}{\partial w_j} = -M s_j(p^*)$. Consequently, the first order condition with respect to $j \in \mathcal{B}_{fr}$ boils down to

$$(1-\lambda_{fr})\left[\pi^r_{\mathcal{B}_{fr}} - d^r_{\mathcal{B}_{fr}}\right] - \lambda_{fr}\left[\pi^f_{\mathcal{B}_{fr}} - d^f_{\mathcal{B}_{fr}}\right] = 0$$

$$\Leftrightarrow \quad \left[\pi^f_{\mathcal{B}_{fr}} - d^f_{\mathcal{B}_{fr}}\right] = \left(\frac{1-\lambda_{fr}}{\lambda_{fr}}\right)\left[\pi^r_{\mathcal{B}_{fr}} - d^r_{\mathcal{B}_{fr}}\right]$$

$$\Leftrightarrow \quad \left[\sum_{j\in\mathcal{B}_{fr}} (w_j - \mu_j)\, s_j\,(p^*) \quad - \sum_{\substack{k\in\mathcal{G}^f \\ k\notin\mathcal{B}_{fr}}} (w^*_k - \mu_k)\,\Delta s_k^{-\mathcal{B}_{fr}}\,(p^*)\right]$$

$$= \left(\frac{1-\lambda_{fr}}{\lambda_{fr}}\right)\left[\sum_{j\in\mathcal{B}_{fr}} \left(p^*_j - w_j - c_j\right) s_j\,(p^*) \quad - \sum_{\substack{k\in\mathcal{G}^r \\ k\notin\mathcal{B}_{fr}}} (p^*_k - w^*_k - c_k)\,\Delta s_k^{-\mathcal{B}_{fr}}\,(p^*)\right]$$

$$\Leftrightarrow \quad \left[\sum_{j\in\mathcal{B}_{fr}} \Gamma_j s_j\,(p^*) \quad - \sum_{\substack{k\in\mathcal{G}^f \\ k\notin\mathcal{B}_{fr}}} \Gamma_k \Delta s_k^{-\mathcal{B}_{fr}}\,(p^*)\right] = \left(\frac{1-\lambda_{fr}}{\lambda_{fr}}\right)\left[\sum_{j\in\mathcal{B}_{fr}} \gamma_j s_j\,(p^*) \quad - \sum_{\substack{k\in\mathcal{G}^r \\ k\notin\mathcal{B}_{fr}}} \gamma_k \Delta s_k^{-\mathcal{B}_{fr}}\,(p^*)\right]$$

where $\Gamma_j \equiv w_j - \mu_j$ and $\gamma_j \equiv p^*_j - w_j - c_j$.

To gain some insight regarding the sharing of the bilateral profits between manufacturer f and retailer r, we can re-write the first order condition according to *the split-the-difference rule*

$$\sum_{j\in\mathcal{B}_{fr}} \Gamma_j s_j\,(p^*) =$$

$$\underbrace{\sum_{\substack{k\in\mathcal{G}^f\\k\notin\mathcal{B}_{fr}}}\Gamma_k\Delta s_k^{-\mathcal{B}_{fr}}(p^*)}_{\substack{\text{Disagreement payoffs}\\\text{of manufacturer } f\\\left(d^f_{\mathcal{B}_{fr}}\right)}}+(1-\lambda_{fr})\left[\underbrace{\sum_{j\in\mathcal{B}_{fr}}(\Gamma_j+\gamma_j)\,s_j(p^*)}_{\substack{\text{Total surplus of}\\\text{the bilateral transaction}}}-\underbrace{\left(\sum_{\substack{k\in\mathcal{G}^f\\k\notin\mathcal{B}_{fr}}}\Gamma_k\Delta s_k^{-\mathcal{B}_{fr}}(p^*)+\sum_{\substack{k\in\mathcal{G}^r\\k\notin\mathcal{B}_{fr}}}\gamma_k\Delta s_k^{-\mathcal{B}_{fr}}(p^*)\right)}_{\substack{\text{Sum of the disagreement payoffs}\\\text{of each trading partner}\\\left(d^f_{\mathcal{B}_{fr}}+d^r_{\mathcal{B}_{fr}}\right)}}\right]$$

From this expression, we can see that regardless of his Nash bargaining weight, manufacturer f always gain the first term on the right-hand side which corresponds to his disagreement payoffs. Then, depending on his exogenous bargaining power, manufacturer f is able to capture a fraction $1-\lambda_{fr}$ of the second term on the right-hand side which corresponds to the total surplus generated by the trade net of the disagreement payoffs of both parties. If this surplus is smaller than the sum of the disagreement payoffs of trading parties, the second term would be negative and the gain from trade would be smaller than what parties would obtain from not reaching agreement.

From all bilateral negotiations, we obtain the following system of $J\times J$ first-order conditions

$$\begin{cases}\left[\sum_{j\in\mathcal{B}_{11}}\Gamma_j s_j(p^*)-\sum_{\substack{k\in\mathcal{G}^f\\k\notin\mathcal{B}_{11}}}\Gamma_k\Delta s_k^{-\mathcal{B}_{11}}(p^*)\right]=\left(\frac{1-\lambda_{11}}{\lambda_{11}}\right)\left[\sum_{j\in\mathcal{B}_{11}}\gamma_j s_j(p^*)-\sum_{\substack{k\in\mathcal{G}^r\\k\notin\mathcal{B}_{11}}}\gamma_k\Delta s_k^{-\mathcal{B}_{11}}(p^*)\right]\\ \vdots\\ \left[\sum_{j\in\mathcal{B}_{FR}}\Gamma_j s_j(p^*)-\sum_{\substack{k\in\mathcal{G}^f\\k\notin\mathcal{B}_{FR}}}\Gamma_k\Delta s_k^{-\mathcal{B}_{FR}}(p^*)\right]=\left(\frac{1-\lambda_{FR}}{\lambda_{FR}}\right)\left[\sum_{j\in\mathcal{B}_{FR}}\gamma_j s_j(p^*)-\sum_{\substack{k\in\mathcal{G}^r\\k\notin\mathcal{B}_{FR}}}\gamma_k\Delta s_k^{-\mathcal{B}_{FR}}(p^*)\right]\end{cases}$$

where $\mathcal{B}_{11}$ corresponds to the set of products negotiated between manufacturer 1 and retailer 1, and $\mathcal{B}_{FR}$ represents the set of products negotiated between manufacturer F and retailer R.

Writing the system of first-order conditions in matrix notation we obtain

$$I_f S_{\mathcal{B}} I_f\begin{pmatrix}\Gamma_1\\\vdots\\\Gamma_J\end{pmatrix}=\begin{pmatrix}\frac{1-\lambda_{11}}{\lambda_{11}}\\\vdots\\\frac{1-\lambda_{FR}}{\lambda_{FR}}\end{pmatrix}\circ\left[I_r S_{\mathcal{B}} I_r\begin{pmatrix}\gamma_1\\\vdots\\\gamma_J\end{pmatrix}\right]$$

where

- $S_{\mathcal{B}}$ is the $J \times J$ matrix of market shares and changes in market shares

$$S_{\mathcal{B}}(b,k) = \begin{cases} s_k(p^*) \quad \text{if } k \text{ belongs to the } \mathcal{B}\text{th set of products} \\ -\Delta s_k^{-\mathcal{B}_{fr}}(p^*) \quad \text{otherwise} \end{cases}$$

- I_f and I_r correspond to the $J \times J$ ownership matrices of manufacturers and retailers where
$$I_f(j,j) \; = \; \begin{cases} 1 \text{ if manufacturer } f \text{ owns product } j \\ 0 \text{ otherwise} \end{cases} \qquad \text{and} \quad I_r(j,j) \; = \; \begin{cases} 1 \text{ if retailer } r \text{ sells product } j \\ 0 \text{ otherwise} \end{cases}$$

- The mathematical symbol $\circ$ represents the Hadamard product operator (element-by-element multiplication).

From the above, margins of manufacturer f that come from the bilateral negotiation with retailer r can be derived as follows

$$\Gamma_f = (I_f S_{\mathcal{B}} I_f)^+ \left[\left(\frac{1-\lambda_{\mathcal{B}}}{\lambda_{\mathcal{B}}} \right) \circ (I_r S_{\mathcal{B}} I_r \gamma) \right]$$

where the vector $\frac{1-\lambda_{\mathcal{B}}}{\lambda_{\mathcal{B}}}$ is of dimension $J \times 1$ and corresponds to the ratio of the Nash bargaining weights of firms.

Therefore we can write the total margins of all manufacturers as follows

$$\Gamma = \sum_{f=1}^{F} \sum_{r=1}^{R} (I_f S_{\mathcal{B}} I_f)^+ \left[\left(\frac{1-\lambda_{\mathcal{B}}}{\lambda_{\mathcal{B}}} \right) \circ (I_r S_{\mathcal{B}} I_r \gamma) \right]$$

B Non-Nested Rivers and Vuong tests

Table 10: Rivers and Vuong test

	Scenario 1	Scenario 3	Scenario 4	Scenario 5
Scenario 2	-13.6	3.42	-16.6	-13.9
Scenario 1		16.7	-14.5	-5.6
Scenario 3			-16.2	-16.0
Scenario 4				16.9

Scenario 1: All manufacturers jointly negotiate all their brands.

Scenario 2: All manufacturers separately negotiate all their brands.

Scenario 3: The Coca-Cola Company jointly negotiates all his brands while all remaining manufacturers separately negotiate all their brands.

Scenario 4: The Coca-Cola Company and Orangina-Schweppes jointly negotiate all their brands while all remaining manufacturers separately negotiate all their brands.

Scenario 5: The Coca-Cola Company and PepsiCo jointly negotiate all their brands while all remaining manufacturers separately negotiate all their brands.

C Table of estimated margins

Table 11: Average total margins' estimates by brands

Brands	**Margins (%)**	**Brands**	**Margins (%)**
Cola			
Brand 2 (PL)	38.07 (8.34)	Brand 22	26.58 (1.27)
Brand 13	47.14 (20.1)	Brand 23	56.14 (20.8)
Total	38.64 (8.37)		
Other Soda			
Brands	**Margins (%)**	**Brands**	**Margins (%)**
Brand 4 (PL)	29.75 (5.93)	Brand 16	36.06 (3.26)
Brand 5	33.60 (2.89)	Brand 17	24.96 (1.64)
Brand 10	40.31 (14.1)	Brand 19	36.43 (0.76)
Brand 11	34.25 (12.3)	Brand 20	26.46 (1.11)
Brand 14	30.27 (5.23)	Brand 21	6.38 (0.33)
Brand 15	39.17 (7.78)	Brand 24	29.89 (3.32)
Total	47.21 (18.9)		
Juice/Nectar			
Brands	**Margins (%)**	**Brands**	**Margins (%)**
Brand 1 (PL)	14.03 (1.87)	Brand 18	51.44 (7.74)
Brand 8	15.52 (2.97)	Brand 25	17.93 (1.42)
Brand 12	15.26 (1.07)		
Total	37.66 (25.4)		
Ice-Tea			
Brands	**Margins (%)**	**Brands**	**Margins (%)**
Brand 3 (PL)	23.38 (4.95)	Brand 7	60.33 (6.34)
Brand 6	54.22 (5.85)	Brand 9	29.19 (2.16)
Total	34.54 (10.5)		

Standard deviation in parenthesis refers to variation across retailers and periods.

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