Bargaining Power Revealed by Wholesale Prices*

Carlos Noton† — University of Warwick

Andrés Elberg‡ — Universidad Diego Portales

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Abstract

We reveal bargaining power between upstream manufacturers and downstream supermarkets using proprietary data on product-specific wholesale and retail prices of the two largest supermarket chains in Chile. We study two dimensions of players' bargaining power: the share of total profits each earns, and the risk exposure to cost shocks each bears. We focus on the coffee industry to take advantage of the idiosyncratic features of the market that facilitate measuring bargaining power. We find that Nestle, who accounts for almost 80% of the market, obtains about 70% of the total profits generated by their products in both retailers, while non-Nestle manufacturers obtain between 30% and 50% despite their small market shares. We see this as direct evidence of bargaining power driven by brand differentiation rather than market size. Regarding risk exposure, we find that less than 20% of cost shocks are pass-through to wholesale prices. Despite important supermarket-specific heterogeneity, we observe small manufacturers absorbing more risk than larger players.

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†C.Noton@Warwick.ac.uk

‡Andres.Elberg@udp.cl

1 Introduction

Recent decades have witnessed a remarkable transformation of the food retail industry. In several developed countries and increasingly in emerging markets, the industry has evolved towards larger formats, a higher prevalence of retail chains, and concentration among retailers.[1] These massive changes in the retail sector has spurred interest of both practitioners and academic researchers to understand causes and consequences of the bargaining between upstream manufacturers and downstream retailers.[2] Moreover, a long tradition of models of bargaining between upstream and downstream firms have studied incentives and predictions over a large variety of outcomes aiming to match the new scenario.[3]

Despite the importance of this issue, little evidence has been provided since negotiated wholesale prices are usually not available. Prior empirical work on vertically organized supply chains have typically relied on estimates of wholesale prices (Crawford and Yurukoglu (forthcoming), Villas-Boas (2007), Bonnet and Dubois (2010)) or wholesale prices paid by a single retailer (Hellerstein (2008)), or average wholesale prices (Leibtag, Nakamura, Nakamura, and Zerom (2007)).

We aim to reveal empirical features of bargaining power based on the wholesale prices between the upstream manufacturers and downstream supermarkets. First, consistent with Nash-product maximization, we focus on the share of total profits that each player is able to earn, accounting for endogenous disagreement profits. Second, we focus on the risk exposure to cost shocks that each player bears as another potential asymmetry in bargaining power.

Our distinctive data includes product-specific wholesale prices paid by the two largest retailers in Chile. Additionally, we have weekly product-level data on retail prices as well as quantities covering about 180 stores from 12 supermarkets operating in Santiago de Chile over the period 2005-2007.

We focus on the coffee industry to take advantage of salient characteristics that are suitable to study bargaining power between manufacturers and supermarkets.

First, we benefit from the simple and homogenous technology among coffee manufacturers, whose dominant input is green coffee beans (Sutton (2007)). Thus, we are able to estimate production costs using the international prices of green coffee beans and calibrating the share of non-coffee costs. Moreover, the fluctuations in the international commodity markets

[1]See Clarke, Davies, Dobson, and Waterson (2002).

[2]For example see Federal Trade Commission (2001).

[3]Some examples of incentives in theoretical models are: merger incentives (Horn and Wolinsky (1988)), technology incentives (Inderst and Wey (2003)), product-variety incentives (Inderst and Shaffer (2007)), foreclosure incentives (Bolton and Whinston (1993)).

are definitely exogenous cost shocks for Chile, who is a small-scale importer.[4]

Second, we benefit from the large variation in size between Nestle and non-Nestle manufacturers. The Swiss multinational corporation Nestlé is the largest coffee manufacturer in Chile, accounting for almost 80% of the market shares in the two largest retailers. Thus, we are able to identify the effect of manufacturer size on the empirical bargaining outcomes.

Third, we benefit from the heterogenous pricing strategy of our two largest retailers of relatively similar size. Our largest retailer follows the so-called *Every-Day-Low-Prices* strategy (henceforth EDLP) in which the retailer maintains shelf prices as low as possible and only rarely offers specials or discounts. The second largest supermarket follows a *High-Low* strategy (henceforth HL) characterized by the combination of relatively high shelf prices with frequent promotions and discounts. Examples of US-based retailers are Walmart for the former strategy and Safeway's for the latter. In terms of size, both retailers have similar market shares for coffee, with 49% for EDLP and 40% for HL respectively. Thus, we are able to identify the effect of pricing strategy (if any) on the empirical bargaining outcomes.

Other relevant characteristics of the Chilean coffee market are the absence of supermarket's brands and the high rotation of these products. Supermarkets' own brands (also known as private labels) play no role in this particular market avoiding potential distortions. Also, given the high rotation of the coffee products and current technology, supermarket inventory costs seem minimal with real time despatching taking place. This fact emphasizes the tight relationship between contemporary wholesale and retail prices.

Assuming the maximization of the Nash product by the players, the estimator of bargaining power is the share of the total profits (net of disagreement payoffs) that each player earns. Since we know the actual retail and wholesale prices, we just have to estimate the disagreement payoffs and upstream production costs to identify the size of the pie and the portion that each player gets. To compute the disagreement payoffs, we estimate a structural demand to capture the consumer's substitution and calculate counterfactual profits for each supermarket. To calculate production costs, we follow the vast literature in this topic for the coffee industry. Basically, we use the fact that technological requirements of coffee beans and proportions of the non-coffee costs are well known. Furthermore, we focus on marginal costs given the constant returns to scale in production (Sutton (2007)).[5] We complement our data with anecdotal information on allowances, which are fixed payments paid in advance by manufacturers to

[4]According to FAOSTAT, Chile accounted for 0.25 percent of world imports in 2007.

[5]Notice that fixed costs play no role in the bargaining parameter estimations since those costs are not conditional on the players' agreement.

retailers.

We consistently find that Nestle obtains about 70% of the total profits generated by their products in both retailers while non-Nestle manufacturers obtain between 30% and 50% despite their small market shares. Counterfactual demands have little impact on the overall results since the consumer substitution between brands is rather limited. We see this as direct evidence of bargaining power driven by brand differentiation rather than market size.

In order to identify the risk exposure of each player, we study pass-through behavior from cost shocks to wholesale prices. We find that less than 20% of cost shocks are pass-through to wholesale prices, with small manufacturers absorbing more risk than larger players. We reject full pass-through at the retail level finding remarkable supermarket specific features suggesting heterogenous risk preferences. The different risk-sharing policies are consistent with retailers' pricing strategies targeting different consumers. We also find no evidence of asymmetric responses at any level of value chain.

We believe that our paper supports a strong link between the economic literature on bargaining and the marketing literature on retailers' pricing strategy and consumer brand loyalty. Heterogeneity in the demand side, namely different degrees of brand loyalty and aversion to price volatility seems utterly related to the bargaining outcome of wholesale prices between upstream manufacturers and downstream retailers.

We start with the usual descriptive sections to provide the background of our empirical approach, section 2 introduces details about the coffee and retail industry in Chile and section 3 presents our novel data. Section 4 presents the analysis of bargaining power associated with the actual profit sharing in our data. Section 5 present the risk sharing behavior of the agents given by the pass-through analysis. Finally, section 6 concludes.

2 The Coffee and Retail Industry in Chile

This section provides the background of the Chilean industries analyzed in this paper. Subsection 2.1 introduces features about the coffee manufacturing industry while section 2.2 describes the most important characteristics of the retail in Chile, especially for the two largest supermarkets whose wholesale prices are in our data.

2.1 The Coffee Industry

As an introduction to the coffee market, we follow Sutton (2007) who presents a neat picture of the market that is divided into two basic segments: i) *roast* or *ground* coffee (sometimes referred to as "regular" or ground coffee); and ii) *instant* coffee (sometimes referred to as soluble coffee).[6]

Regarding the production function of the coffee manufacturing sector, we know that the technology is simpler for the ground coffee segment which involves roasting the coffee beans and grinding them to a consistency suited to local preparation methods (percolation, filtering, espresso, etc.). Instead the production of instant coffee additionally requires the extraction (dissolving ground coffee in water) and drying. From consumer's point of view, the only differences lie in flavor and in ease of preparation. The two products are sold through the same channels of distribution, advertised in similar style in the same media, and lend themselves equally well to the creation of an effective brand image.

To introduce the worldwide players, we start with the Swiss multinational Nestlé who is the market leader in instant coffee. Its leading brand Nescafé dominates the retail market for instant coffee in various countries (Italy, Japan, France, Germany, UK) although the US based General Foods, outsells Nestlé in the United States with its Maxwell House brand. Instead in the ground coffee segment the leader manufacturer is usually country specific (General Foods, Procter & Gamble, among others).

Focusing on our particular scenario, Chile is a net importer of green coffee beans, the main input into the production of packaged coffee. According to the International Coffee Organization (2006) most coffee beans are imported from other Latin American countries, especially Brazil.[7] One relevant feature of the Chilean market is the relatively high popularity of instant coffee. Instant coffee accounts for about 95 percent of the volume of coffee sold in Chile over the period 2005-2010 (Euromonitor International, 2011).

The upstream industry is highly concentrated since Nestlé possess a market share close to 80% only followed by Tres-Montes-Luchetti with 11-12 percent of the market. The third and fourth largest players account for 4% and 2.3% respectively. The other 16 coffee manufacturers have less than 0.5% each.[8]

Regarding the top brand names, Nestlé produces brand Nescafé which star product Nescafé Tradición tops the ranking of product loyalty elaborated by AC Nielsen reaching alone almost 60% of the market shares.

[6] Decaffeinated coffee may be either roast/ground or instant, so it will be classified as part of these categories.

[7] In 2002, 73.8% of coffee came from Brazil, 12.9% from Peru and 9% from Colombia (International Coffee Organization (2006)).

[8] Appendix section A presents detailed market share data.

2.2 The Retail Industry

The coffee industry and the retail sector are increasingly interconnected, since most coffee for in-home consumption is purchased in supermarkets. According to AC Nielsen, 89 percent of the volume of coffee is sold through supermarkets and only 11 percent through the traditional sector ("mom & pop" stores). In line with developments observed in advanced countries, the supermarket industry in Chile has evolved over recent years towards greater concentration.[9]

Two major supermarket chains dominate the Chilean supermarket industry during the period of analysis (2005-2007): Distribución y Servicio (D&S) and Cencosud. By 2006, D&S and Cencosud accounted for more than 60 percent of the Chilean food market and about 88 percent of the coffee market. Cencosud manages two major supermarket banners: Jumbo and Santa Isabel. Jumbo has the largest portion of Cencosud's sales while Santa Isabel was acquired by the group in 2003. D&S' brands include its main banner Lider and the small banner Ekono since late 2007. In terms of size, both retailers have similar market shares for coffee products with D&S having 49% and Cencosud 40%.

These two major retailers differ in their type of pricing strategy. D&S follows the so-called *Every-Day-Low-Prices* strategy (henceforth we use EDLP for supermarket D&S) in which the retailer maintains shelf prices as low as possible and only rarely offers specials or discounts. Cencosud follows a *High-Low* strategy (henceforth we use HL for supermarket Cencosud) characterized by the combination of relatively high shelf prices with frequent promotions and discounts. Examples of US-based retailers are Walmart for the former strategy and Safeway's for the latter. The marketing literature has found that HL strategy is intended for *Cherry-pickers* with their large promotion activities, whereas EDLP strategy is intended for larger basket shoppers who seek a stable low average price.[10]

Other differences can be also established as supermarket EDLP might be perceived by consumers as cheaper, not elegant but more than decent quality, intended for regular people. Instead, supermarket HL is perceived as a fancier retailer with a larger variety of products and intended for upper-class consumers. This perception has historical reasons since supermarket HL started in the richest locations of Santiago whereas EDLP started in the non rich locations both more than 20 years ago. Over the years, both chains have expanded successfully to the entire city but still keeping their initial image.

Table 1 shows the split of market shares of coffee manufacturers among retailers while table 2 shows the split of market shares of supermarkets

[9]For details on the concentration trend see Foster, Haltiwanger, and Krizan (2006), Holmes (2001) and Clarke, Davies, Dobson, and Waterson (2002).

[10]See Bell and Lattin (1998) for more details on the targeted consumers.

among coffee manufacturers.[11]

Table 1: **Market Share of Coffee Suppliers by Retailer**

	EDLP	HL	Others	Total
Nestle	78.9	80.4	91.3	80.9
Non Nestle	21.1	19.6	8.7	19.1
Total	100.0	100.0	100.0	100.0

Table 2: **Market Share of Retailers by Coffee Supplier**

	Nestle	Non Nestle	Total
EDLP	47.4	53.9	48.6
HL	39.3	40.8	39.6
Others	13.3	5.4	11.8
Total	100.0	100.0	100.0

3 Data Description

This section describes in detail our particular proprietary data. The data consist of retail prices, wholesale costs and quantities sold by store in nearly all major supermarket outlets in Santiago de Chile over the period 2005-2007. The weekly transactions are recorded at product-level identified by UPC (Universal Product Code) or EAN (European Article Number). Data on retail prices and quantities sold come from an international market research company which collects barcode data from major supermarkets.

The final retail data includes 120,884 weekly observations of scan data, for 180 stores own by 12 supermarkets located in 34 counties within Santiago during 94 weeks between 2005 and 2007.[12] We also gather information on the supplier identity and other coffee characteristics like being decaf, ground, instantaneous, flavored and bean.

Data on wholesale costs were directly provided by the two largest supermarket chains. Naturally, the chains negotiate and purchase from suppliers at a national level. Hence, retailers have one representative store per chain to keep track of wholesale prices. Our final wholesale data identify 5,175 observations that match an important subset of our retail data.

Regarding the measures of wholesale prices, the cost information available from the retailers correspond to different concepts. In HL data, the

[11]Appendix section A contains figures with the evolution of the market shares over time.

[12]We keep the observations with coffee products with size between 100 and 250 grams; and transactions with quantities over 20 units per store weekly. This covers more than 80% of the total universe of coffee market.

reported costs correspond to the average acquisition cost (AAC) that is an average of the historical costs at which items in inventory were purchased in a given week.[13] Given the popularity of the coffee category, we expect a high rotation speed such that the stock is constantly renewed using an instantaneous delivery system. The fast delivery system should make our wholesale data closer to retailer's marginal costs. This measure of cost is the same reported in *Dominick's* data set has been used by several studies on retail pricing (Besanko, Dubé, and Gupta (2005), Peltzman (2000)). If the replacement speed is not fast enough, then the lags of prices might matter for pass-through analysis. We perform this robustness check in the proper sections.

The measure of costs provided by retailer EDLP, in contrast, corresponds to current prices charged by sellers at the wholesale level and are treated by the retailer as a measure of replacement cost (i.e. the cost that would be incurred by the retailer for acquiring an extra unit of the product). These costs are inclusive of shipping and handling costs and include any discounts applied by the seller. It should be noted that the coffee distribution chain in Chile is characterized by the absence of middlemen intermediating between major manufacturers of packaged coffee and retailers. Thus, the measure of wholesale cost in the data corresponds to the wholesale price charged by the manufacturer to the retailer.

We have focused on the coffee category subsample of the broad data set that contains about 190 categories. See Elberg (2011) for a more detailed description of this data.

One piece of information that is not included in the data is a measure of the lump-sum payments made by manufacturers to retailers. There is ample evidence that contracts between manufacturers and retailers include lump sum upfront payments known as slotting allowances. Rey, Thal, and Vergé (2006) define slotting allowances to encompass: "slotting fees for access to (sometimes premium) shelf space, advertising fees for promotional activities, fees related to the introduction of new products, or listing and pay-to-stay fees that suppliers pay to be or remain in the retailer's (formal or informal) list of potential suppliers". Anecdotal evidence indicates that this type of payments are a common practice in the Chilean supermarket industry. We gather informal knowledge of this payments to be used in the empirical section.

[13] Besanko, Dubé, and Gupta (2005) provide the following formal definition of AAC:

$$AAC_t = [P_t^w Q_t^m + (I_{t-1} - P_t Q_t) \, AAC_{t-1}] \, I_t^{-1}$$

where P_t^w is the wholesale price paid by the retailer in period t, Q_t^m are units of the product purchased by the retailer in period t, I_t are inventories of the product at the end of period t, P_t is the retail price and Q_t the quantity sold by the retailer in period t.

4 Share of Total Profits and Bargaining Power Analysis

This section performs an empirical analysis of the bargaining power based on the share of total profits of the Chilean coffee market that each upstream and downstream producer gets. In this section as in the rest of the paper we refer to production cost as the variable cost of the upstream manufacturer of coffee (such as Nestle) who buys green coffee beans from international commodity markets and produce packaged coffee. Additionally, we refer to wholesale prices as the negotiated prices that upstream coffee producers agree to trade with downstream supermarkets. Finally, we refer to retail prices as the final price charged by the downstream supermarkets to the final coffee consumers.

Subsection 4.1 presents the model, subsection 4.2 presents the cost estimation for the coffee manufacturers and subsection 4.3 studies the profits in the Chilean supermarket industry. Section 4.4 introduces the structural demand to be used in the calculation of the counterfactual disagreement payoffs for retailers. Finally, the results are presented in subsection 4.5.

4.1 Bargaining Model

We use the Nash bargaining model to describe the relationship between the upstream coffee manufacturers and the downstream supermarkets. Since we know the actual outcome of the negotiation, we are able to reveal bargaining power.

The theoretical literature in bargaining has studied different solutions to the bargaining game described in Nash (1950). The standard assumption in empirical work is that the solution maximizes the called Nash-product between players with heterogeneous bargaining power parameters. The Nash-Product, NP, is defined as follows:

$$NP = \left(\pi^D - \pi^D(na)\right)^{\lambda} \left(\pi^U - \pi^U(na)\right)^{1-\lambda} \tag{1}$$

where $\lambda \in [0,1]$ is the normalized bargain parameter of the downstream retailer D with upstream manufacturer U; and $\pi^D(na)$ and $\pi^U(na)$ refer to the profits that the players get if there is no agreement (na). These payoffs are usually referred as the disagreement points.

Previous empirical papers on bargaining power needed to jointly estimate bargaining parameters and unobservable negotiated prices. For example, Ho (2009) and Crawford and Yurukoglu (forthcoming) compute the equilibrium prices that minimize the violations of the Nash equilibrium assumptions accounting for the interlinked payoffs using the inequality constrain approach developed by Pakes, Porter, Ho, and Ishii (2006). Another approach was developed by Villas-Boas (2007), who infers unobservable negotiated prices using static optimality conditions along the chain value. These optimality conditions ensure the equilibrium outcome and allow to express unobservable wholesale prices as a function of retail prices and other observable variables as in Bonnet and Dubois (2010).

Our data contains the negotiated wholesale prices, hence we observe the equilibrium outcome of the bargaining game. Therefore, *we consider the observed negotiated wholesale prices as given.* In that sense, our empirical approach is similar to the models of rent-sharing in the labor market (for example see Blanchflower, Oswald, and Sanfey (1996)).

In order to derive the empirical estimator of the bargaining parameter λ, we write the Nash-Product as a function of payoff deviation ε between retailer D and manufacturer U. Therefore, for a given $\lambda \in [0,1]$, $NP(\varepsilon)$ is given by:

$$NP(\varepsilon) = \left[\pi^D - \pi^D(na) + \varepsilon\right]^{\lambda} \left[\pi^U - \pi^U(na) - \varepsilon\right]^{1-\lambda}$$

If the maximum NP is achieved at the actual profits then the derivative should be zero evaluated at $\varepsilon = 0$.[14] Taking derivatives, it yields:

$$\frac{\partial NP(\varepsilon)}{\partial \varepsilon} = \lambda \left(\frac{\pi^D - \pi^D(na) + \varepsilon}{\pi^U - \pi^U(na) - \varepsilon}\right)^{\lambda-1} - (1-\lambda)\left(\frac{\pi^D - \pi^D(na) + \varepsilon}{\pi^U - \pi^U(na) - \varepsilon}\right)^{\lambda}$$

Therefore, the relationship at the optimum must yield:

$$\begin{aligned} \frac{\partial NP(\varepsilon)}{\partial \varepsilon}|_{\varepsilon=0} = 0 \quad \Leftrightarrow \quad \frac{\lambda}{1-\lambda} &= \left(\frac{\pi^D - \pi^D(na)}{\pi^U - \pi^U(na)}\right) \\ \Leftrightarrow \quad \lambda &= \frac{\pi^D - \pi^D(na)}{\pi^D - \pi^D(na) + \pi^U - \pi^U(na)} \end{aligned}$$

Consequently, if the players maximize the Nash product, then the best estimator of the bargaining parameter of the retailer is just the proportion of retailer's profits (net of disagreement payoffs) out of total profits. Before turning into the actual estimation, we list our empirical assumptions in order to be fully transparent:

Assumption 1 The bargaining outcome maximizes the Nash-Product of the game. For theoretical justification on this assumption see Binmore, Rubinstein, and Wolinsky (1986).

Assumption 2 The upstream disagreement payoffs are zero, $\pi^U(na) = 0$. Under no agreement, the upstream manufacturer U does not incur in the cost of production for supermarket D and his payoffs with the other retailers are unaffected. The underlying assumption is that the availability of a particular coffee brand does not change the supermarket choice. We argue that the supermarket choice is based primarily on transport

[14]Formally, if $\max_{\varepsilon \in \mathbb{R}}\{NP(\varepsilon)\} = NP(0)$ then $\frac{\partial NP(\varepsilon)}{\partial \varepsilon}|_{\varepsilon=0} = 0$.

cost and a large consumption basket. The weight of any coffee brand in the consumer' basket is not large enough to induce supermarket switching.

Assumption 3 Downstream disagreement payoffs are positive, $\pi^D(na) \geq 0$. If a coffee brand is not available then consumers substitute in some degree to the available brands. Hence, under no agreement, the retailer's revenues in other coffee brands increase.

Assumption 4 Fixed cost payments (such as marketing expenditure, R&D, or any other investment) are not conditional to the agreement between the players. Although fixed costs are important to examine the total profitability of the retail and manufacturing industry, they play no role for the bargaining power estimation. Note, that this argument does not apply to the in-advance payments called allowances between supermarket and producers, that are conditional on the annual agreement.

Therefore, our estimator simplifies to

$$\widehat{\lambda}_{(U,D)} = \frac{\pi^D - \pi^D(na)}{\pi^D - \pi^D(na) + \pi^U} \tag{2}$$

Notice that bargaining power is weakly decreasing with respect to the disagreement payoff.[15] The intuition is clear: given the fixed profits of both players (i.e. for given production costs, wholesale and retail prices), a larger disagreement payoff for player D is consistent with lower bargaining power because the marginal value of the agreement is smaller for D but the agreement payoffs are constant for both players.

4.2 Production Cost of Coffee Manufacturers

This section presents the estimates of production costs for the coffee manufacturers, which in turn will allow us to estimate the upstream manufacturers profits since we observe the revenues of the coffee manufacturers.

We aim to estimate the cost function without using our information on wholesale prices. The reason is simple, we do not want to impose a particular structure to link the bargaining outcome with the underlying manufacturer's marginal cost. In fact, we chose the coffee industry precisely because the production function and marginal costs have been identified in a very clear way in the literature. This literature relies on the simple and well known standard technology that makes the cost estimation quite straightforward. First, the usual approach estimates the costs related to green coffee beans, which are internationally traded with public and frequent information on prices. The second step is to provide a magnitude of the other cost components to estimate total variable costs.

[15] Formally, $\frac{\partial \widehat{\lambda}_{(U,D)}}{\partial \pi^D(na)} \leq 0$.

The relatively simple process of coffee roasting has the obvious dominant input in green coffee beans. The literature has made clear that to make one kilogram of roasted coffee, approximately 1.19 kg of beans is required.[16] Instead, one kilogram of soluble coffee requires 2.6 kilogram of green coffee beans. There are few economies of scale in coffee roasting and grinding, so marginal costs are largely independent of output, and companies have similar marginal cost functions in spite of varying size.[17]

Recall that the instant coffee in Chile dominates the consumption with more than 80% of the market shares and Nestlé alone accounting for most of it. Actually, Nestle does not sell ground coffee in Chile. Also, there is some supermarket heterogeneity since EDLP trades less ground coffee than HL. Tables 4 and 3 give the full picture by retailer.

Table 3: **Market Share by coffee type and manufacturer in EDLP**

	Nestle	Non Nestle	Total
Instant Coffee	71.1	15.2	86.3
Ground Coffee	0.0	4.1	4.1
Others	7.8	1.8	9.6
Total	78.9	21.1	100.0

Table 4: **Market Share by coffee type and manufacturer in HL**

	Nestle	Non Nestle	Total
Instant Coffee	73.8	11.0	84.8
Ground Coffee	0.0	6.8	6.8
Others	6.6	1.8	8.4
Total	80.4	19.6	100.0

As found by Durevall (2004), other inputs such as labor and energy, packaging, transport and physical capital, etc, usually each make up less than 5% of total variable costs and rarely more than 10%. Koerner (2002) found that no individual input apart from coffee beans accounted for more than 5% of total production value in the US and Germany during the 1990's. In fact, labor costs and freight costs are not significant in her cost estimation. There is general consensus that on average, coffee beans should account for more than half of the marginal costs. This is roughly consistent with industry estimates of the magnitude of non-coffee costs reported in Yip and Williams (1982), the estimates of Leibtag, Nakamura, Nakamura, and Zerom (2007) based on the Survey of Manufacturers, and the assumptions in Bettendorf and Verboven (2000) for the Dutch coffee market.

[16]See Koerner (2002) and Durevall (2004).
[17]See Sutton (2007).

We follow closely the literature to estimate upstream production costs using our Chilean data. First we compute the coffee component of the marginal costs, denoted by m^C. To compute the non-coffee components of variable costs, like packaging, freight and labor cost we calibrate their fraction $\alpha \in (0, 1)$ of the total costs. We denote these other inputs by m^O. This implies that the non-coffee component is $\alpha/(1-\alpha)$ times the average coffee component denoted by $\mathbb{E}(m^C)$.[18] Also we include the value added tax rate of 19%, denoted by ν.

Hence, total marginal cost MC is given by:

$$MC = (1+\nu)(m^C + m^O) = (1+\nu)\left(m^C + \frac{\alpha}{1-\alpha}\mathbb{E}(m^C)\right) \tag{3}$$

Therefore, we have expressed total variable costs as a function of only two unknowns: the coffee component m^C and the share α of non-coffee costs.

To compute the coffee cost component m^C, we construct the required quantity in grams of coffee-beans for each particular product, accounting for the different level of coffee loss given by their type (ground versus instant). Using the international price of green coffee beans and the nominal exchange rate, we express those product-specific prices in Chilean pesos.[19]

We construct lower and upper bounds for production cost estimations, denoted by MC^L and MC^U respectively. The lower bound MC^L assumes that the non-coffee cost share $\alpha = 30\%$ of the total variable costs. Also, the lower bound weights the international prices based on their import shares (Brazilian coffee price by 70% and the Colombian coffee price by 30%), where the former is always cheaper than the latter as shown in figure 1. Instead, for the cost upper bound MC^U we consider a weight increase of the expensive Colombian prices up to 50% and also increases the non-coffee cost share to $\alpha = 40\%$ of the total variable costs.[20]

The cost estimation allows us to calculate product-specific price-cost markups given by $MK_j = (WP_j - MC_j)/WP_j$ where WP_j and MC_j are product j's wholesale price and estimated marginal cost respectively.[21]

Figure 2 shows the lower bound for markups by producer in each retailer. The solid lines depict the larger Nestle markups while the dotted lines present the smaller but decent non Nestle markups. The Nestle markups look stable while the non Nestle markups seem to follow the same cycle of the international price of coffee beans of figure 1.

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[18]Trivially if $m^O = \alpha(m^C + m^O)$ then $m^O = \left(\frac{\alpha}{1-\alpha}\right) m^C$.

[19]There is no tariff for coffee imports from South America.

[20]Packaging has been estimated to be the largest of the non coffee costs. The actual average unit cost of the tin cans for 2005 and 2006 leads to average values below a third of our estimated costs, m^O, leaving large room for other variable non coffee costs.

[21]Appendix section B contains more detailed tables regarding bound cost estimations and wholesale prices for Nestle and non Nestle manufacturers.

Figure 1: **International price of coffee beans and nominal exchange rate**

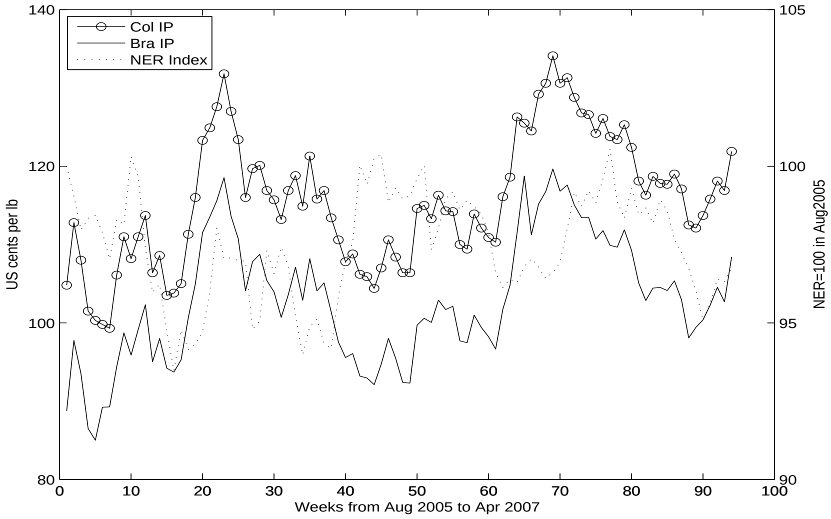


Figure 2: **Lower Bound Markups for Coffee Manufacturers**

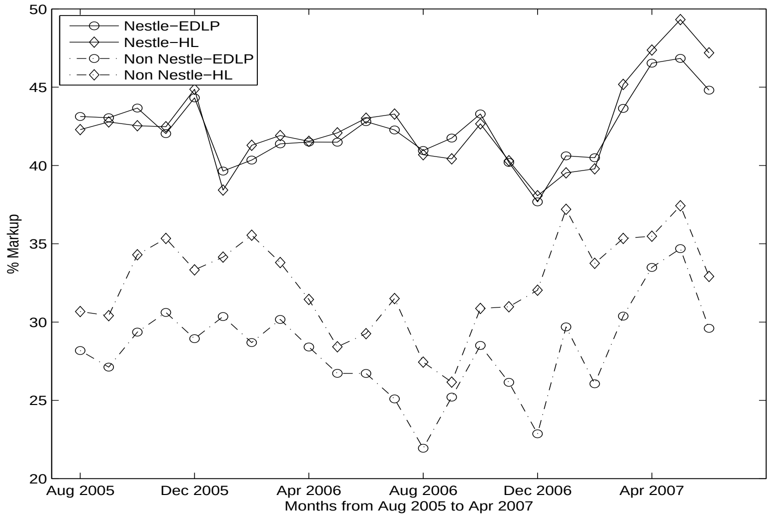


Table 5: **Markups [%] of Nestle in Instant Coffee**

	MC^U at EDLP	MC^L at EDLP	MC^U at HL	MC^L at HL
Mean	55.4	47.0	53.5	44.7
Std Dev	11.1	12.7	12.2	14.3

Table 6: **Markups [%] of Non-Nestle Manufacturers in Instant Coffee**

	MC^U at EDLP	MC^L at EDLP	MC^U at HL	MC^L at HL
Mean	36.7	25.6	33.2	22.0
Std Dev	12.0	13.1	17.3	19.1

Table 7: **Markups [%] of Non-Nestle Manufacturers in Ground Coffee**

	MC^U at EDLP	MC^L at EDLP	MC^U at HL	MC^L at HL
Mean	55.6	46.4	52.3	42.4
Std Dev	5.8	7.0	7.1	8.4

The descriptive statistics of the markups are presented in tables 5 and 6 for instant coffee; and in table 7 for ground coffee by manufacturer (Nestle vs non Nestle) and by retailer (HL vs EDLP).[22] Our results are consistent with Leibtag, Nakamura, Nakamura, and Zerom (2007), who estimate the manufacturer's gross margin for the coffee and tea industry. Their estimation is the difference between the manufacturer's selling price and the manufacturer's noncapital costs. Based on the Annual Survey of Manufacturers data from the coffee and tea category, they divide the value of total shipments minus material and labor costs by the value of total shipments. The average of aggregated margins is 39% for the American manufacturers of coffee and tea. Their estimates indicate that manufacturers' gross margins and coffee bean prices are inversely correlated.

Recall that there is no supermarket-specific production, hence if a given product is sold in both supermarkets, they must share the same unitary production cost. Hence, the markup differences are explained by wholesale prices. Roughly speaking, Nestle and non Nestle ground coffee have the higher markups because Nestle brand achieves high wholesale prices, and ground coffee brands benefit from lower costs that are not offset by wholesale prices. Instead, the non Nestle brands of instant coffee have lower markups than the other categories. Note that these brands are the direct competitors with the giant Nestle.

Regarding differences between retailers notice that the markups for Nestle and non Nestle ground coffee do not vary much between supermarkets. Instead, the non Nestle instant coffees achieve on average a slightly better deal in EDLP than in HL. In terms of volatility, markups at HL

[22]Ground coffee is produced by non Nestle manufacturers only.

consistently have larger variance than EDLP in every cell.[23]

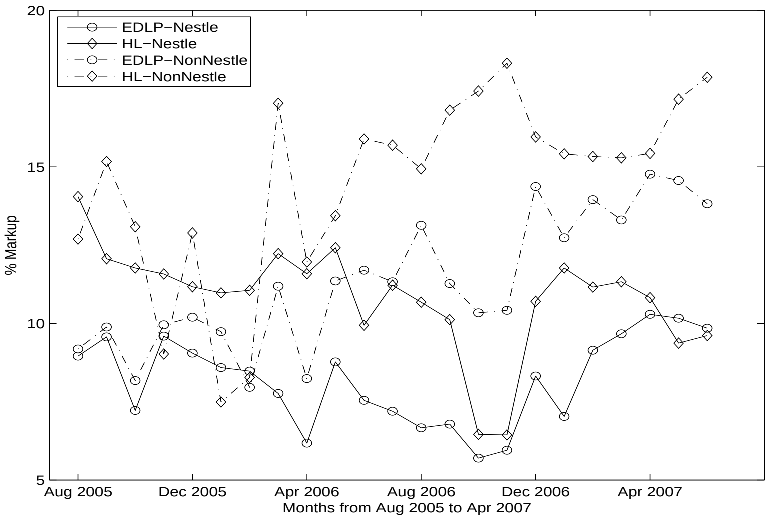
4.3 Markups of the Supermarkets

This section analyzes the Chilean retailers' pricing behavior in the coffee category. Recall that our data include the wholesale and retail price information at barcode level for both giant supermarket chains, thus we observe the actual markups without any further assumptions.

As a general description, retailer EDLP systematically sets cheaper retailer prices than HL for Nestle and non Nestle products while supermarket HL shows a larger variance than EDLP. Interestingly, this pattern is replicated in their wholesale prices suggesting that their different pricing strategies are transmitted upstream.[24]

The markups for the average prices are plotted in figure 3 for each retailer-manufacturer combination where markups are given by $MK_j = (RP_j - WP_j)/RP_j$ where WP_j and RP_j are product j's wholesale price and retail price respectively.

Figure 3: **Markups of Retailers**



In general, we could argue that retailer markups for Nestle products are smaller and more stable than those for non Nestle products. Summary statistics of retailer's markup are shown for instant coffee in table 8 and for ground coffee in table 9.

Comparing the markups between retailers, EDLP has lower markups than HL in every category. In general, the largest markups were on non

[23]Appendix B contains more details on manufacturer's features.
[24]Appendix C contains more details on retailer's features.

Table 8: **Retailer Markups for Instant Coffee**
(by Manufacturer-Retailer pair)

	Nestle-EDLP	Nestle-HL	non Nestle-EDLP	non Nestle-HL
Mean	9.5	12.4	12.3	15.4
Weighted Av.	7.2	9.4	11.6	14.7
Median	9.7	12.5	11.7	16.2
Std Dev	4.6	5.6	5.4	11.3

Table 9: **Retailer Markups for Ground Coffee**
(by retailer since **Non Nestle** manufacturers only)

	EDLP	HL
Mean	10.3	16.1
Weighted Average	10.0	14.1
Median	10.9	15.4
Std Dev	8.3	10.3

Nestle instant coffee for both retailers, followed by the markups for ground coffee in the second place, while Nestle brands always show the lowest markups within a retailer. In general, the retailers obtain similar markups for non Nestle brands regardless of being either ground coffee or instant coffee. As expected from their pricing strategies, HL shows larger standard deviations in every category.

As the data section describes, all the stores within a supermarket chain share the same wholesale prices. In principle, retailers could set different retail prices across different geographic locations. To uncover this potential price discrimination, we compute markups for 3 different large counties with important income differences. We denote by *Rich* the richest county Las Condes, by *Mid* to the median income county La Florida and by *Poor* the low income county Maipu.

Table 10: **Mean of Retailer Markups by counties**

	EDLP-Rich	EDLP-Mid	EDLP-Poor	HL-Rich	HL-Mid	HL-Poor
Nestle	7.5	7.4	7.3	10.9	10.0	9.1
Non Nestle	10.8	11.7	11.7	15.0	14.9	14.4

Table 10 presents the markups for Nestle and non Nestle brands in each of the retailers. Surprisingly, retailers do not fully discriminate consumers as potentially they could, given the massive income differences. If something, retailer HL discriminates geographically in a stronger way than

EDLP, who does it very mildly. (Consistent with EDLP policy). These results are important to estimate the structural demand for each retailer in the forthcoming section.

In general, the mild geographic discrimination we documented and the low markups are consistent with a highly competitive retail sector. The high degree of competition in the Chilean retail sector has been also found by Díaz, Galetovic, and Sanhueza (2009) and Lira, Rivero, and Vergara (2007).[25]

4.4 Disagreement Payoffs for Retailers

This subsection presents the structural demand estimation that allows us to compute the counterfactual disagreement payoff for each retailer. The retailer's disagreement payoffs are the profits generated by consumers' substitution in the hypothetical case when a particular coffee brand is not available. This substitution makes the agreement less valuable since the marginal benefit of the agreement decreases as disagreement payoff increases.

Remind that counterfactual demands account for the substitution within a retailer and not between retailers. This assumption seems appropriate if the weight for coffee products in the basket of our multiproduct consumer is not large enough to cause change of the chosen retailer. We argue that the retailer choice is based on transport costs and total basket costs for which the coffee product is not pivotal.

We estimate a standard random coefficient model developed by Berry, Levinsohn, and Pakes (1995) (hereafter BLP). We briefly sketch the main features, for details see Nevo (2000). Since we estimate the demand by retailer, all the estimates are supermarket specific. Denote by U_{ijt} the utility of consumer i for coffee product j at time t:

$$U_{ijt} = -\alpha_i p_{jt} + x'_{jt}\beta + \xi_{jt} + \varepsilon_{ijt} \tag{4}$$

The distribution of the idiosyncratic price parameter α_i is given by:

$$\alpha_i = \alpha + \sigma_p v_i \qquad \text{where} \qquad v_i \sim \mathbb{N}(0,1)$$

where v_i is distributed as a standard normal shock and captures the unobservable consumer heterogeneity in price sensitivity. Define $\theta = (\alpha, \beta, \sigma_p)$ as the vector containing all the parameters of the model. Denote by A_{jt} the set of consumers who choose product j at time t. This is a function of all parameters θ, prices $(\mathbf{p}_t)$ and characteristics $(\mathbf{x}_t, \xi_t)$ in that market:

$$A_{jt}(\mathbf{x}_t, \mathbf{p}_t, \xi_t; \theta) = \{(v_i, \varepsilon_{i0t}, .., \varepsilon_{iJt}) | U_{ijt} \geq U_{ilt}, \forall l = \{0, .., J\}\}$$

[25] A multiproduct-pricing strategy by the retailers could be another potential explanation for low markups in the coffee category. This hypothesis deserves future research but so far we have no hard evidence.

The next step is to build the market shares consistent with this framework that given the population of each market will trivially deliver demand.[26] Assuming ties occur with zero probability, the market share s_{jt} of the product j is just an integral over the mass of consumers in the region A_{jt}, that depends on random variables $\varepsilon = (\varepsilon_{i0t}, .., \varepsilon_{iJt})$ and v_i. Thus, the market shares are given by:

$$s_{jt}(\mathbf{x}_t, \mathbf{p}_t, \xi_t; \theta) = \int_{A_{jt}} dF_\varepsilon(\varepsilon|v_i)d\Phi(v_i) = \int_{A_{jt}} s_{ijt} d\Phi(v_i)$$

Following the standard assumption of ε being i.i.d. with Type I extreme value distribution, we have a closed form for the individual probability s_{ijt}:

$$s_{ijt} = \frac{\exp(-\alpha p_{jt} + \beta x_{jt} + \xi_{jt} - p_{jt}\sigma_p v_i)}{1 + \sum_h \exp(-\alpha p_{ht} + \beta x_{ht} + \xi_{ht} - p_{ht}\sigma_p v_i)}$$

And the market shares are given by:

$$s_{jt}(\mathbf{x}_t, \mathbf{p}_t, \xi_t; \theta) = \int_{A_{jt}} \frac{\exp(-\alpha p_{jt} + \beta x_{jt} + \xi_{jt} - p_{jt}\sigma_p v_i)}{1 + \sum_h \exp(-\alpha p_{ht} + \beta x_{ht} + \xi_{ht} - p_{ht}\sigma_p v_i)} d\Phi(v_i)$$

The non-analytical integral over the individual shocks v_i is computed through simulation. The vector of unobservable characteristics, ξ_t, is the only unobservable that explains an imperfect fit with the actual market shares. To estimate $\widehat{\theta}$ we match predicted and actual market shares. However, the estimation procedure is not straightforward since unobservable vector ξ_t enters in a non-linear fashion in the predicted market shares, and moreover the unobservable random terms might be correlated with prices $\mathbf{p}_t$. To overcome this endogeneity issue we follow the instruments suggested by BLP (1995). To estimate the mixed logit model of BLP, we follow the MPEC approach suggested by Dubé, Fox, and Su (2010).

When estimating the demand system by county, we find elasticities changing with consumer's income, where richer consumers are less price sensitive as expected. This finding is not consistent with the retailer's pricing illustrated in table 10 showing almost no geographic price discrimination. Since the estimated elasticities are conditional on a given retailer, they are not capturing the highly competitive environment that forces the retailer to reduce markups and avoid price differences between counties. We discuss this issue when computing counterfactual payoffs.

We take as the representative market the large and middle income county *La Florida*. To summarize the demand results, tables 11 and 12 present the summary statistics of the estimated own-price elasticities in

[26] This approach considers a normalized outside good $j = 0$, that represents "not to buy coffee" ($U_{i0t} = \varepsilon_{i0t}, \forall(i,t)$).

each supermarket.[27]

Table 11: **Own Price Elasticities at EDLP**

	All	Nestle	Non Nestle
Mean	-8.3	-8.2	-8.6
Median	-7.5	-7.4	-7.8
Std	4.7	4.9	4.2

Table 12: **Own Price Elasticities at HL**

	All	Nestle	Non Nestle
Mean	-9.2	-8.2	-11.9
Median	-6.5	-6.5	-6.6
Std	17.0	7.3	30.1

These estimates are in line with the priors about consumers at supermarkets EDLP and HL. Basically, the median elasticity is higher at EDLP than HL. Also, there is a larger heterogeneity of price elasticities at HL than at EDLP. Finally, the demand is more inelastic for the popular Nestle products.[28]

An attractive feature of the BLP model is the possibility to estimate markups consistent with static optimization, observed prices and demand parameters. We compare predicted markups with our data on actual markups for the representative market. Table 13 presents the summary statistics for the real markups minus the BLP predicted markups. The general finding is that retailer EDLP is charging smaller markups than those predicted by the first order conditions whereas supermarket HL charges the predicted markups more closely. This characterization is robust across specification and other counties although the gap is large for richer counties. Although the standard deviation is large enough to not reject the null hypothesis of a zero difference, we acknowledge that there is some inaccuracy between the data and the static model that we have to account for in the result section. We find this supermarket-specific gap between predicted and actual markups very interesting but beyond the scope of this paper. Hence, we focus on the potential consequences for our bargaining power estimations that we discuss when presenting the profit sharing results.

[27]The own price elasticities are given by:

$$\eta_{jt} \equiv \frac{\partial s_{jt}}{\partial p_{jt}} \frac{p_{jt}}{s_{jt}} \quad = \quad -\frac{p_{jt}}{s_{jt}} \int |\alpha_i| s_{ijt}(1 - s_{ijt}) d\Phi(v_i)$$

[28]Appendix D contains histograms of the estimated elasticities.

Table 13: **Real Markups minus Predicted Markups**

	EDLP-Nestle	EDLP-Non Nestle	HL-Nestle	HL-Non Nestle
Mean	-8.1%	-4.8%	-2.1%	-1.7%
Median	-7.9%	-5.0%	-1.9%	-1.2%
Std	6.0%	5.6%	7.6%	7.7%

4.5 Profit Sharing Results

This section presents our estimates of bargaining parameters based on the profit sharing behavior between upstream and downstream players. We use our hard data on quantity, wholesale and retail prices plus the above estimations of manufacturer costs and counterfactual payoffs to identify the revenues and costs for each retailer-manufacturer combination.

Besides the marginal costs and revenues, we have to account for the allowances, which are fixed payments made by the manufacturers to the retailers in advance. Usually, allowances are associated with promotional efforts, and are granted on yearly basis. We have no hard data on allowances just most of the empirical literature. Hence, as a second best, we use the values obtained in informal conversations with insiders. They state that Nestle paid 9.5% of their annual revenues while the non Nestle producers paid 11%. In other words, abstracting from timing, an allowance of x percent is equivalent to a reduction of the wholesale price by x percent that is paid *ex-ante*. Based on the retail markups found in section 4.3, the allowances represent a large amount of the total revenues for the supermarkets. Notice that the percentage are not strikingly different despite the massive differences in terms of market shares. Since these are lump sum transfers, to compute the profit sharing under different values of the allowance rate just trivial one-to-one change.

Recall that our bargaining parameter estimator is given by $\widehat{\lambda}_{(U,D)} = [\pi^D - \pi^D(na)]/[\pi^D - \pi^D(na) + \pi^U]$, where the disagreement payoff, $\pi^D(na)$ subtracts the benefits that the retailers can reach due to the consumers substitution given the non-availability of one of the brands (Nestle or non Nestle).

Indeed, we have to compute the profits under the scenarios of agreement and disagreement between each retailer-manufacturer combination. Optimal prices under disagreement are always calculated using the first order conditions of the estimated model of Bertrand differentiated products as in BLP (1995). To compute profits under the agreement scenario, we have two options: to use the theoretical optimal prices (based on the first order conditions) or the actual retail prices (which not necessarily match the first order conditions as shown in table 13). We present both estimations that lead to similar conclusions.

To calculate $\widehat{\lambda}_{(U,D)}$, we sum up the profits for the respective player over the 94 weeks discounting the respective disagreement payoff and divide it by the total profits in the same markets. When considering disagreement payoffs, we consider the representative market only. As a robustness check, we also compute the bargaining parameters considering all the counties under zero disagreement payoffs and we obtain roughly the same results. Therefore, the large body of assumptions regarding the structural demand and counterfactual payoffs do not play a key role in our findings. Mainly, the disagreement payoffs are not crucial because the cross substitution between Nestle and non Nestle brands turned out to be very low.

Our main results of this section are in table 14 (with theoretical optimal prices for agreement and disagreement payoffs in the representative market), table 15 (with actual prices for the agreement payoffs but theoretical optimal prices for the disagreement payoffs in the representative market) and table 16 (with actual prices for the agreement payoffs and zero disagreement payoff including all the markets).

Bargaining Parameters $\widehat{\lambda}_{(U,D)}$ under different assumptions:

Table 14: $\widehat{\lambda}_{(U,D)}$ **considering Counterfactual payoffs and Optimal Prices**

	EDLP-Nestle	EDLP-Non Nestle	HL-Nestle	HL-Non Nestle
Lower Bound	0.33	0.49	0.33	0.55
Upper Bound	0.38	0.69	0.38	0.78

Table 15: $\widehat{\lambda}_{(U,D)}$ **considering Counterfactual payoffs and Actual Prices**

	EDLP-Nestle	EDLP-Non Nestle	HL-Nestle	HL-Non Nestle
Lower Bound	0.26	0.37	0.28	0.42
Upper Bound	0.30	0.60	0.32	0.75

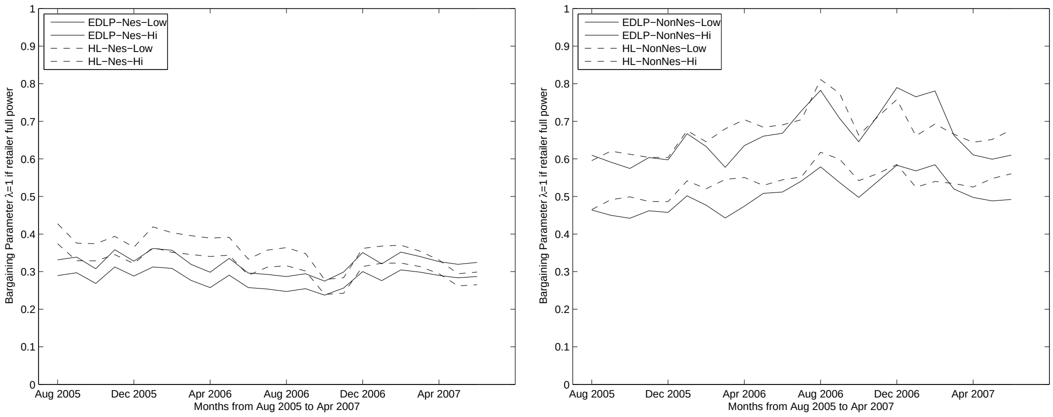
Table 16: $\widehat{\lambda}_{(U,D)}$ **considering Zero Counterfactual payoffs**

	EDLP-Nestle	EDLP-Non Nestle	HL-Nestle	HL-Non Nestle
Lower Bound	0.29	0.46	0.32	0.47
Upper Bound	0.33	0.58	0.36	0.56

To depict the evolution of the parameter over time in all markets, figure 4 shows our bound estimates over the 94 weeks (under no disagreement payoff). The figure considers only instant coffee to ensure the same coffee requirements. During our time period there were no important changes in the market structure of none of the industries involved. Most of the variations seem caused by the fluctuations in the international price of green coffee beans if comparing peaks with figure 1.

Figure 4: **Bargaining Parameters for Instant Coffee: by manufacturer**

Nestle **Non Nestle**



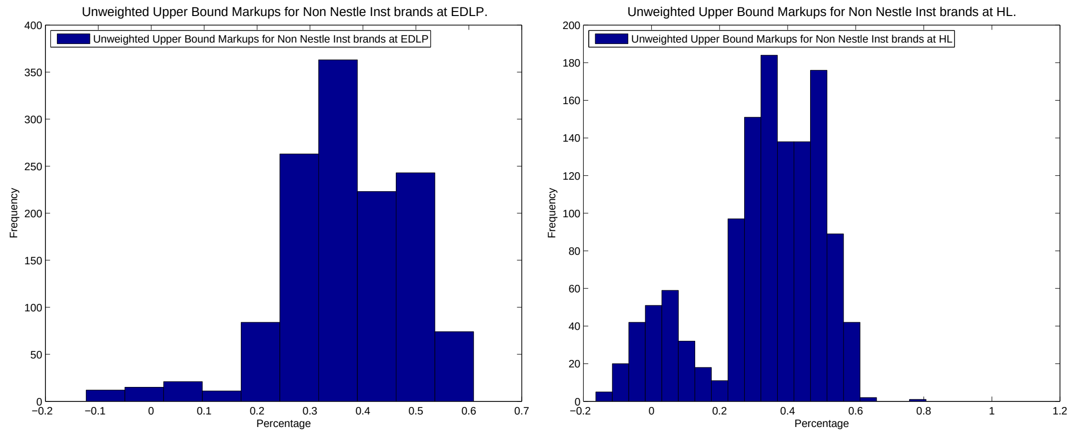
The most striking result is that non Nestle producers are able to obtain a large share of the profits despite their tiny market shares. This finding is against the common wisdom that sees in the market size the most important source of bargaining power. In our opinion, these results highlight the importance of brand loyalty and substitution patterns over market size.[29] Although market size and brand loyalty are naturally correlated, is the latter the one that grant bargaining power for those non Nestle manufacturers that achieve about half of the profits despite their small market shares. This evidence supports Ponte (2002) who argues that with massive investment in advertising the roasters have managed to keep control of the coffee chain despite the worldwide concentration in the food retail sector.

Since the disagreement points are not key and our data is exact regarding retail and wholesale prices, the most likely source of inaccuracy is the cost estimation. Recall that our upper bound cost estimates are already highly biased towards high costs. Nevertheless, a different cost estimation must have very particular features in order to switch our conclusions. First, the cost estimation should have a huge gap between Nestle and their competitors, which is against the evidence of standard technologies. Second, the mentioned technology gap should also be heterogeneous across non Nestle producers. Third, the gap should be large in 2005 but decrease in 2006, otherwise the non Nestle producers sold systematically below marginal cost for a long period of time in the second half of 2006. The second and third features seem hard to coexist with the histograms of non Nestle markups in figure 5. Those distributions show that is unlikely to increase the production costs for non Nestle producers without creating

[29]We stress the brand differentiation of the final products although the differentiation of the retailers also play a role as explored theoretically by Dobson and Waterson (1997).

negative markups for a large proportion of the transactions in 2006.

Figure 5: **Markup Upper Bounds for Non Nestle Instant Coffee**
EDLP **HL**



Of course, there are more potential explanations for small producers reaching more than decent shares of total profits. We list some that are consistent with the facts documented in this paper:

1) Retailers can use the non Nestle producers as a threat when bargaining with Nestle along the idea of Bedre and Shaffer (2011), although in their model is the upstream producer who use small retailers to threat the large downstream player. This argument justifies the agreement with non Nestle manufacturers, but not the high level of wholesale prices that they achieve.[30]

2) Nestle may set the standard in the industry in such a way that it generates spillovers to the other manufacturers. Because Nestle reaches very high wholesale prices, those become the framework for non Nestle negotiations. Hence, non Nestle wholesale prices are lower than Nestle but still grant a decent share of the profits to manufacturers.

3) Consumers as variety-lovers. If consumers value the extent of the choice set, the non Nestle manufacturers are grant with larger bargaining power. However, as in the first argument, this fact justifies the existence of the smaller players but not their large share of the profits.

[30] Similar conclusion in a different context can be found in Rey and Vergé (2004).

5 Risk Sharing and Pass-Through Analysis

In this section, we analyze the cost pass-through behavior of retailers and coffee manufacturers. Our motivation relies on the fact that we can identify who is bearing the risk of international cost shocks which seem to be the largest source of uncertainty in this market. The risk-sharing policies can give us a sense of another dimension of bargaining power between upstream and retailers that is not captured in the level of wholesale prices but in their volatility. Specifically, we focus on two events: i) the pass-through from international commodity prices to wholesale prices; and ii) the pass-through from wholesale prices to retail prices.

First, we study the pass-through from cost shocks to wholesale prices, which is the outcome of the bargaining between manufacturers and retailers. Although production cost is not observable for the coffee industry, the international price of green coffee beans gives us exogenous variation in the main component of the manufacturer's marginal cost. Our contribution is to test whether the uneven size of the manufacturers or the heterogenous pricing policies of the retailers imply different cost pass-through behavior.

Second, we study retail pass-through using a direct measure of the marginal cost given by wholesale prices. We test if retailers' pass-through behavior is homogenous across the two different supermarket pricing strategies known as "High-Low" pricing and "Every Day Low prices".

The closest paper to this pass-through analysis is Leibtag, Nakamura, Nakamura, and Zerom (2007) who study the retail and wholesale pass-through in the American coffee industry. The main difference is that they don't have product specific data but average retail prices and average market-level wholesale prices with no info on wholesalers' identities. Therefore, we extend their analysis accounting for the heterogeneity in each of the two levels: i) the heterogenous retail pricing strategy; and ii) the uneven size of the manufacturers.

5.1 Cost Pass-Through at the Wholesale level

This subsection studies the degree of pass-through from international prices of coffee to wholesale prices which are bargained with the retailer.

The standard bargaining model highlights how the players (manufacturers and retailers) split the profits based on the **level** of negotiated prices consistent with the relative bargaining power of the players. Since the bargaining models are static and both players are risk neutral, the models are silent about **volatility** of prices and which player bears the risk in uncertain environments.

Our pass-through coefficients are given by the panel data estimates of the following regression on the wholesale price for product j at time t, WP_{jt}:

$$\log(WP_{jt}) = \alpha \log(IP_t) + \beta \log(NER_t) + \gamma D_j + \varepsilon_{jt} \tag{5}$$

where IP represents the international price of green coffee beans and NER the nominal exchange rate.[31] A variety of specifications include time invariant dummies, D_j, by product, retailer, producer and coffee characteristics (decaf, ground, inst, flavored and bean).

We have several options to use as the coffee price in the international commodity market. We choose the Brazilian and Colombian price series[32] because they represent about 90% of the coffee imports in Chile. Figure 1 already illustrated the large variation in international prices and the mild variation in the Chilean nominal exchange rate. It also shows the high correlation between Colombian and Brazilian prices, where the Colombian coffee is always more expensive given its higher quality. Recall that the empirical path of the international prices for this data period is not systematically in favor of any of the players.

We run the panel data fixed effect regressions as equation 5 for Nestle and non Nestle wholesale prices separately in order to test the importance of the size in the cost pass-through behavior. Similarly, we run the regressions by retailer to test whether the supermarket pricing strategy allows for different cost pass-through into the bargained wholesale prices. The first two columns present the results using equally weighted observations, while the last two columns, namely 3-W and 4-W use quantity-weighted observations. We weight by quantity to capture the potential different pass-through behavior caused by more popular products.

The wholesale price regressions at supermarket EDLP are presented in table 17 and table 18 for Nestle and non Nestle products respectively. Tables 19 and 20 present the same combinations for supermarket HL.

We find strong evidence of incomplete pass-through from international prices of green coffee beans to wholesale prices as previous studies.[33] Our new piece of evidence shows that retailers' pricing strategies and manufacturer size are very important for the degree of pass-through.

At the EDLP supermarket the pass-through coefficient for Nestle products is higher than the coefficient for non-Nestle brands (21% versus 11%). Although, when weighting for quantity the results reverse with Nestle most popular products reducing the overall pass-through while the non-Nestle do not change much. These regressions suggest that Nestle is bearing less risk than the smaller producers. Nevertheless, the deal between Nestle and EDLP supermarket ensures a low volatility for the Nestle's star products.

[31] NER is the value of one US dollar expressed Chilean currency (pesos) since the commodity prices are set in the American currency.

[32] The series obtained from DATASTREAM.

[33] For example Leibtag, Nakamura, Nakamura, and Zerom (2007).

Table 17: Wholesale Price Regressions for **Nestle-EDLP**
Standard deviations below the coefficient in parenthesis

	1	2	3-W	4-W
log(Int Price)	0.21	0.22	0.15	0.14
	0.06	0.06	0.01	0.01
log(NER)	- 0.12		0.31	
	0.11		0.03	
Sample Size	973	973	973	973

Table 18: Wholesale Price Regressions for **non Nestle-EDLP**
Standard deviations below the coefficient in parenthesis

	1	2	3-W	4-W
log(Int Price)	0.11	0.12	0.13	0.11
	0.05	0.05	0.01	0.01
log(NER)	- 0.22		0.61	
	0.11		0.04	
Sample Size	1,158	1,158	1,158	1,158

Table 19: Wholesale Price Regressions for **Nestle-HL**
Standard deviations below the coefficient in parenthesis

	1	2	3-W	4-W
log(Int Price)	0.14	0.13	0.14	0.14
	0.03	0.03	0.01	0.01
log(NER)	0.17		- 0.02	
	0.08		0.03	
Sample Size	1,121	1,121	1,121	1,121

Table 20: Wholesale Price Regressions for **non Nestle-HL**
Standard deviations below the coefficient in parenthesis

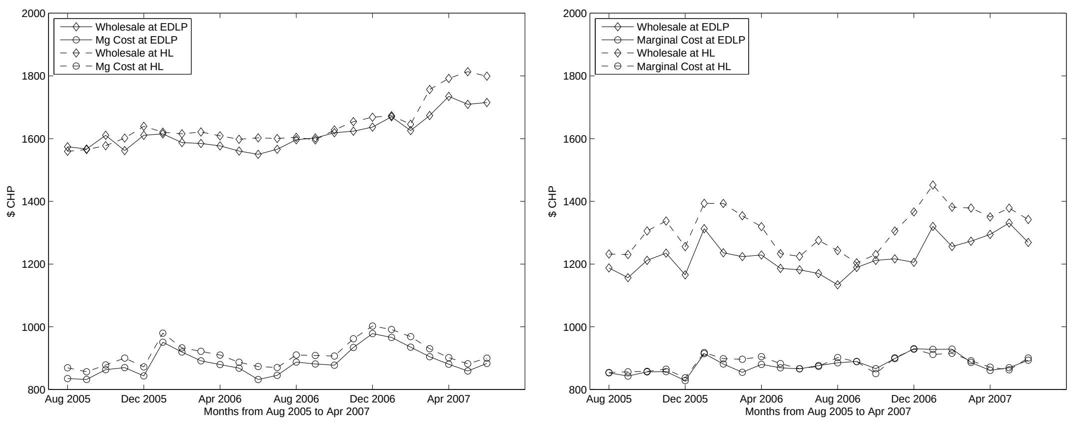
	1	2	3-W	4-W
log(Int Price)	0.12	0.12	0.35	0.33
	0.07	0.06	0.01	0.01
log(NER)	- 0.03		0.38	
	0.09		0.03	
Sample Size	1,897	1,897	1,897	1,897

Instead, at the HL supermarket the pass-through coefficients are roughly the same regardless the identity of the manufacturer. The pass-through of international prices to wholesale prices is about 13%. Interestingly, when accounting for market shares, the pass-through coefficients increase dramatically from 13% to 34% for the non-Nestle products. Thus, non Nestle products with larger market shares reach larger pass-through coefficients bearing less risk than the less popular brands.

To illustrate the degree of stability of cost and prices, figure 6 shows the weighted average production costs and wholesale prices.

Figure 6: **Marginal Costs and Wholesale prices of Nestle products**

Nestle **Non Nestle**



Regarding the incomplete pass-through from international commodity prices and wholesale prices, Leibtag, Nakamura, Nakamura, and Zerom (2007) cite Nestle comments in an investigation by the United Kingdom Competition Commission:

"*In making price changes, Nestlé was influenced first by the need to avoid price volatility that could confuse the customer and be difficult for the trade to manage. Secondly, Nestlé aimed to smooth price increases to avoid sharp changes that could damage the confidence of the consumer. The company said that the history of recent price changes, given below, led to results which were overall more satisfactory to consumers than prices which changed more frequently in response to changes in green-coffee-bean prices, which fluctuated daily*" (United Kingdom Competition Commission, 1991).

Along the same lines of the cite above, we argue that supermarket's pricing policy matters to deliver different degrees of incomplete pass-through. A retailer who pursues EDLP pricing faces consumers that are more sensitive to price volatility and therefore, for a given bargaining power, Nestle and the supermarket agrees to pursue a less volatile wholesale prices for the star brand. Instead, a HL supermarket targeting *Cherry pickers*, agrees a more volatile wholesale price scheme since by definition their consumers are less averse to price changes.

The pass-through from nominal exchange rates coefficients are not robust, changing signs and statistical significance but their inclusion does not affect our finding for the cost pass-through from international prices to wholesale prices.

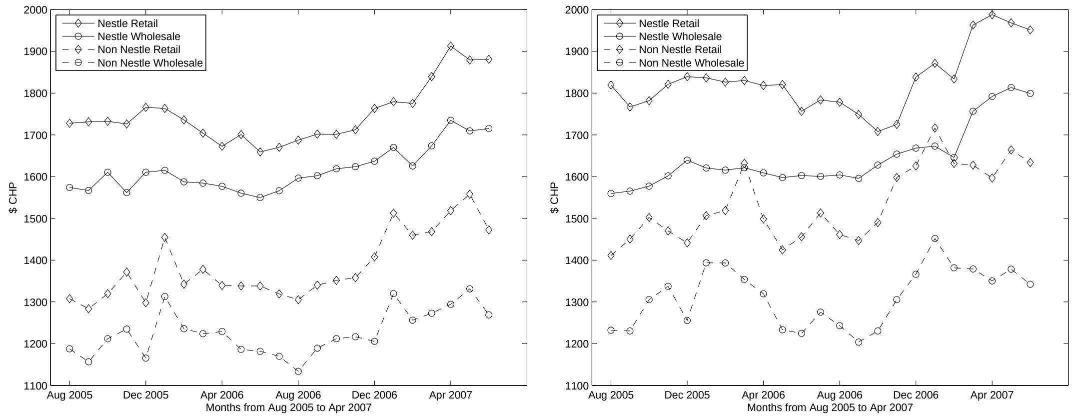
As robustness check we explore different specifications including levels, lags, different subsamples, using Colombian international price, and random effects instead of fixed effects. None of those results imply changes to our main findings. The robustness to the inclusion of different lags rules out the concerns regarding the differences between the supermarket-specific format of the wholesale prices discussed in the data section. It also discards the importance of rotation speed caused by inventory management. As an aside result, we strongly reject asymmetric pass-through from international prices or nominal exchange rates.

5.2 Retail Pricing Behavior

This subsection presents the degree of pass-through from wholesale prices to retail prices. To motivate and preview retail and wholesale prices, figure 7 plots the series of weighted averages of wholesale and retail prices by retailer-producer combination.

Figure 7: **Wholesale and Retail Price Index by Retailer**

EDLP **HL**



As discussed before, EDLP has lower and more stable prices whereas HL shows a larger volatility. Within a retailer, non Nestle products show a larger volatility than Nestle products. Let us stress that this figure uses the quantity weighted average, so most popular products are leading the figure. To study this issue in deep we estimate the pass-through coefficient by the following panel data fixed effect regression:

$$\log(RP_{jt}) = \phi \log(WP_{jt}) + \alpha \log(IP_t) + \beta \log(NER_t) + \gamma D_{jt} + \varepsilon_{jt}$$

where RP_{jt} is retail price, WP_{jt} is respective wholesale price for product j at time t, IP_t is the international price[34] and NER_t is the nominal exchange rate at time t. A consider a set of dummies, D_{jt}, by product, retailer, producer and coffee characteristics (decaf, ground, inst, flavored and bean) are included. We include monthly dummies and weekly dummies when possible since international price and the exchange rate are weekly and common across all the products.

As in the previous section, we exploit the fact that we have two types of retailers and two types of manufacturers. Tables 21 and 22 present the results for log-regressions for EDLP supermarket for Nestle and non Nestle respectively.

Table 21: Retail Price Regressions for **Nestle-EDLP**

Standard deviations below the coefficient in parenthesis

	1	2	3	1-W	2-W	3-W
log(WP)	0.73	0.73	0.75	0.61	0.61	0.60
	(0.02)	(0.02)	(0.02)	(0.00)	(0.00)	(0.00)
log(Int Price)	-0.00	0.00		-0.01	-0.02	
	(0.01)	(0.01)		(0.00)	(0.00)	
log(NER)	0.06			-0.20		
	(0.02)			(0.00)		
Sample Size	32,262	32,262	32,262	32,262	32,262	32,262

Table 22: Retail Price Regressions for **non Nestle-EDLP**

Standard deviations below the coefficient in parenthesis

	1	2	3	1-W	2-W	3-W
log(WP)	0.80	0.80	0.83	0.82	0.81	0.85
	(0.01)	(0.01)	(0.01)	(0.00)	(0.00)	(0.00)
log(Int Price)	-0.04	-0.03		-0.07	-0.06	
	(0.01)	(0.01)		(0.00)	(0.00)	
log(NER)	0.20			0.30		
	(0.04)			(0.01)		
Sample Size	23,933	23,933	23,933	23,933	23,933	23,933

We find high but incomplete pass-through. The equally weighted regressions suggest 75% for Nestle products and 82% for non Nestle. When weighted by quantity the Nestle products decrease to 61% stressing the low volatility of the top products of Nestle. Instead, for non Nestle brands, the

[34] We present the results using the Brazilian price but the results are robust if using Colombian price series.

weighted estimations show the same 82%. Hence, the retail pass-through is slightly higher for non Nestle in supermarket EDLP.

We find that the most popular Nestle products show lower pass-through, which implies lower volatility at retail level, along the same lines as suggested by the lower pass-through at wholesale level as shown in table 17. Top Nestle products are the less sensitive to the fluctuations of the international price of coffee beans.

Table 23: Retail Price Regressions for **Nestle-HL**

Standard deviations below the coefficient in parenthesis

	1	2	3	1-W	2-W	3-W
log(WP)	0.42	0.42	0.38	0.33	0.33	0.25
	(0.03)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)
log(Int Price)	-0.02	-0.01		0.00	0.01	
	(0.01)	(0.01)		(0.00)	(0.00)	
log(NER)	0.26			0.18		
	(0.03)			(0.00)		
Sample Size	23,191	23,191	23,191	23,191	23,191	23,191

Table 24: Retail Price Regressions for **non Nestle-HL**

Standard deviations below the coefficient in parenthesis

	1	2	3	1-W	2-W	3-W
log(WP)	0.40	0.40	0.40	0.54	0.54	0.53
	(0.03)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)
log(Int Price)	-0.09	-0.10		-0.11	-0.11	
	(0.01)	(0.01)		(0.00)	(0.00)	
log(NER)	-0.04			-0.04		
	(0.04)			(0.01)		
Sample Size	13,454	13,454	13,454	13,454	13,454	13,454

We now turn to replicate our analysis in the HL supermarket. Tables 23 and 24 present the pass-through behavior of Nestle and non Nestle products at supermarket HL. The pass-through coefficients are strikingly lower than those in EDLP supermarket. Most of the coefficients imply a pass-through between 40% and 50% regardless the brand. If something, the quantity-weighted estimations suggest that the Nestle top products have the lowest pass-through, whereas the non Nestle top products have highest pass-through at the retailer.

Leibtag, Nakamura, Nakamura, and Zerom (2007) find that retail prices adjust almost exactly cent-for-cent with changes in manufacturer prices when estimated in levels rather than logs, specification that they consider more meaningful. We replicate our estimations using levels and the results for EDLP show that one Chilean peso increase in the wholesale price implies an 85 cents increase in the Nestle retail prices and 92 cents increase in the non Nestle retail prices. Roughly speaking, these coefficients are closer to full pass-through in levels for EDLP, although the markups are not constant in percentage terms. The HL estimations in levels also show very low pass-through for both type of coffee producers. The results imply that one peso increase in wholesale prices lead to a 73 cents increase in Nestle prices and only 50 cents in the non Nestle prices. Hence, a large proportion of the wholesale price volatility is absorbed by retailer HL. Recall that the standard deviations of the retail prices and wholesale prices are in fact higher in HL than EDLP. This low pass-through suggests that the decisions on price changes are imperfectly correlated with wholesale prices fluctuations.

The estimated profiles of pass-through coefficients for each retailer are robust to consider different set of lags, firm subsamples, random effect estimations, international price (Colombian). As in the wholesale regressions, we strongly reject any asymmetric response.

These pass-through behavior can capture differences in the production function of each supermarket or particular demand features as the cost pass-through is linked to the super-elasticity as coined by Klenow and Willis (2006), that describes the change of the price elasticity after price changes, where uncertainty does not play a role. Instead, we think that the different estimated risk-sharing policies at wholesale level as well as retail level do not support the usual assumption that retailers and manufacturers are risk-neutral, and actually, suggest that might be a large heterogeneity in these risk preferences. The source of that risk-aversion heterogeneity can be the targeted consumers by their pricing strategies. This issue deserves a deeper analysis in our future research agenda.

6 Conclusions

We empirically study bargaining power using novel data on wholesale prices between supermarkets and coffee manufacturers for the two largest retailers in Chile. To uncover patterns of the bargaining outcome, we focus on the share of total profits each player earns and the level of risk exposure to cost shocks that each player bears.

Based on a Nash bargaining model, the bargaining power parameter is captured by the share of total profits (net of disagreement payoffs) that each player obtains. Disagreement payoffs and production costs are the only missing piece of information to identify the size of the pie and the portion that each player gets, since we know the actual retail and wholesale prices. We estimate a structural demand a la BLP to compute disagreement payoffs for retailers. To estimate production costs, we follow the literature in the coffee industry. We calculate conservative bounds for the production costs of coffee manufacturers. Moreover, we complement our data with anecdotal information on allowance (fixed payments paid in advance by manufacturers to retailers) to include non linearities in the contract.

We consistently find that Nestle obtains more than two thirds of the total profits generated by their products in both retailers. Non-Nestle manufacturers obtain a very respectable portion of the total profits despite their small market shares. Counterfactual demands have little impact on the overall results since the consumer substitution is rather limited. We see this as direct evidence of bargaining power driven by brand differentiation rather than market size.

In order to identify the risk exposure of each player, we study pass-through behavior from cost shocks to wholesale prices. We find that less than 20% of cost shocks are pass-through to wholesale prices, with small manufacturers absorbing more risk than larger players.

We find remarkable retailer specific features consistent with consumers preferences associated to their different pricing strategies. Consistent with Nestle bearing less risk than other coffee manufacturers, Nestle wholesale prices are more sensitive to cost shocks than non Nestle at EDLP supermarket. Instead, supermarket HL does not show large pass-through differences between Nestle and non Nestle wholesale prices although weighting observation per quantity increase the estimated pass-through for non Nestle producers.

In this paper, we have documented multiple novel facts about wholesale prices revealing interesting features of bargaining power between manufacturers and retailers. We stress the role of brand loyalty over upstream market size in terms of the bargaining power that rationalize the share of total profits that each player earns. We believe our paper supports a strong link between the traditional economic literature on bargaining and the marketing literature on retailers' pricing strategy and consumer brand loyalty.

Interesting, we find that risk-sharing behavior seems manufacturer-retailer specific, where different risk-sharing policies are agreed regarding the frequent and massive fluctuations of international prices. This suggest non-risk-neutral players that bargain under uncertainty of cost shocks. The issue of aversion to price volatility that seems utterly related to the bargaining outcome of wholesale prices between upstream manufacturers and downstream retailers is definitely in our future research agenda.

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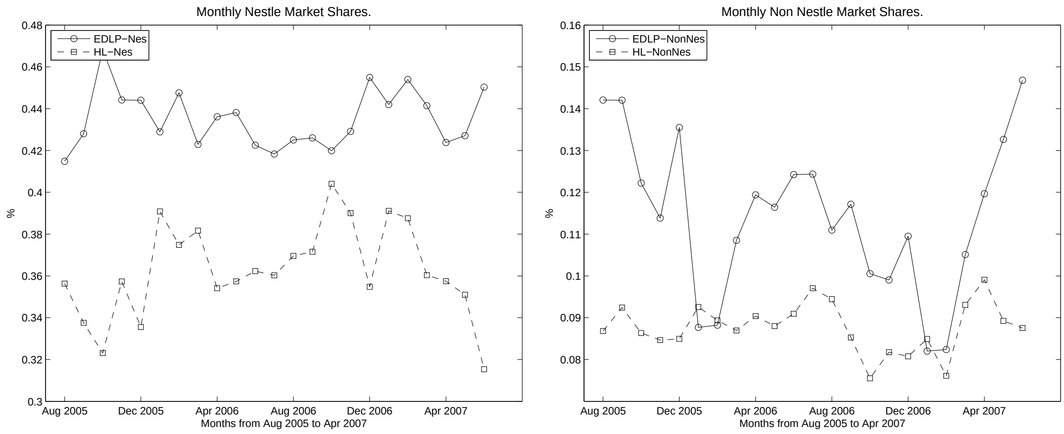
APPENDIX SECTIONS

A Details on Market Shares

Table 25: **Average Market Shares of Coffee Manufacturers**

Name of Manufacturer	Market Share Percentage
Nestle	80.9250
Tres Montes	10.9845
Cafe Haiti	3.9710
Iguazu	2.2976
Cafe Bomdia	0.4122
Comercial Caribe	0.3973
Kraft	0.3693
Colcafe	0.2601
Jumbo	0.2136
Cocam Cia	0.0691
Cabrales	0.0359
Melitta	0.0301
Cafe do Brasil	0.0139
Illy Cafe	0.0060
Di Carlo	0.0059
Quindio Gourmet	0.0037
Kruger	0.0024
Cafes Valiente	0.0019
Hansewappen	0.0005
Najjar SAL	0.0002
Total	100.00

Figure 8: **Coffee Market Shares by Supermarket and Manufacturer**



B Details of Manufacturers

This section provides further details about production cost estimation results. Tables 27 and 26 present lower and upper bound averages for the industry and by instant versus ground coffee. Tables 28 and 29 summarize wholesale and retail prices for easy comparison to costs.

The histograms for all the product specific markups by manufacturer in our weekly data for instant coffees in each of the retailers are shown in figures 9-12. The equivalent for the markups of the non Nestle ground coffees are in figures 13-14.

Table 26: **Cost Estimation Bounds**

	$\mathbb{E}(m^C)$	$\mathbb{E}(m^O)$	VAT	MC
Upper Bound	419	279	133	831
Lower Bound	409	175	111	695

Table 27: **Cost Estimations for Instant Coffee and Ground Coffee**

	$\mathbb{E}(m^C(\textbf{Inst}))$	MC(**Inst**)	$\mathbb{E}(m^C(\textbf{Gro}))$	MC(**Gro**)
Upper Bound	477	899	379	783
Lower Bound	465	762	370	648

Table 28: **Weighted Wholesale prices.**

	EDLP -Nestle	HL-Nestle	EDLP-non Nestle	HL-non Nestle
Mean	1,615	1,645	1,228	1,316
Std Dev	53	72	60	76
Min	1,506	1,545	1,120	1,166
Max	1,764	1,824	1,380	1,482

Table 29: **Weighted Retail prices.**

	EDLP -Nestle	HL-Nestle	EDLP-non Nestle	HL-non Nestle
Mean	1,747	1,827	1,387	1,540
Std	70	80	82	94
Min	1,615	1,660	1,243	1,376
Max	1,938	2,096	1,596	1,755

Figure 9: **Bounds for Nestle Markups in HL (Instant Coffee)**

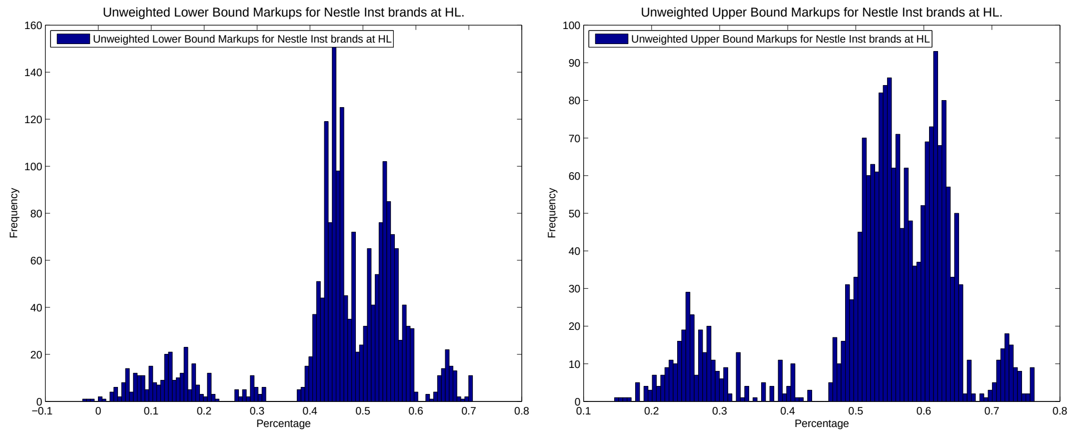


Figure 10: **Bounds for Nestle Markups in EDLP (Instant Coffee)**

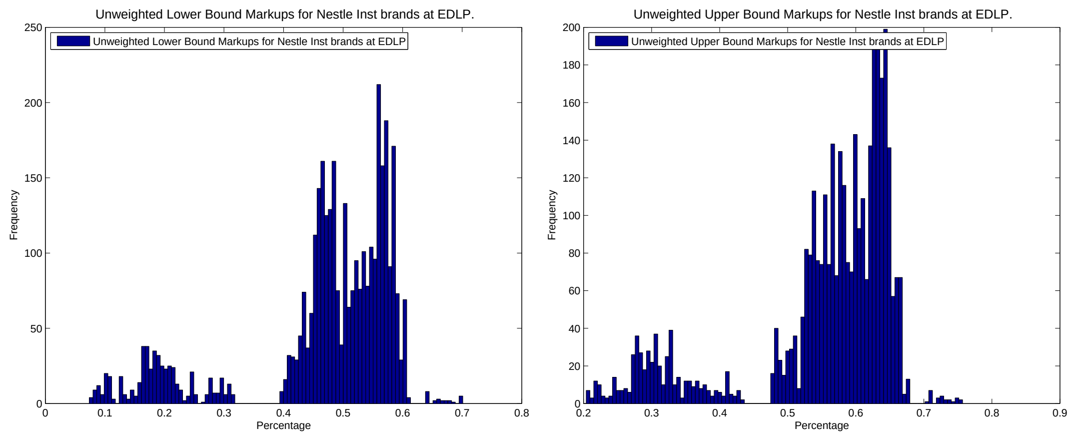


Figure 11: **Bounds for Non-Nestle Markups in HL (Instant Coffee)**

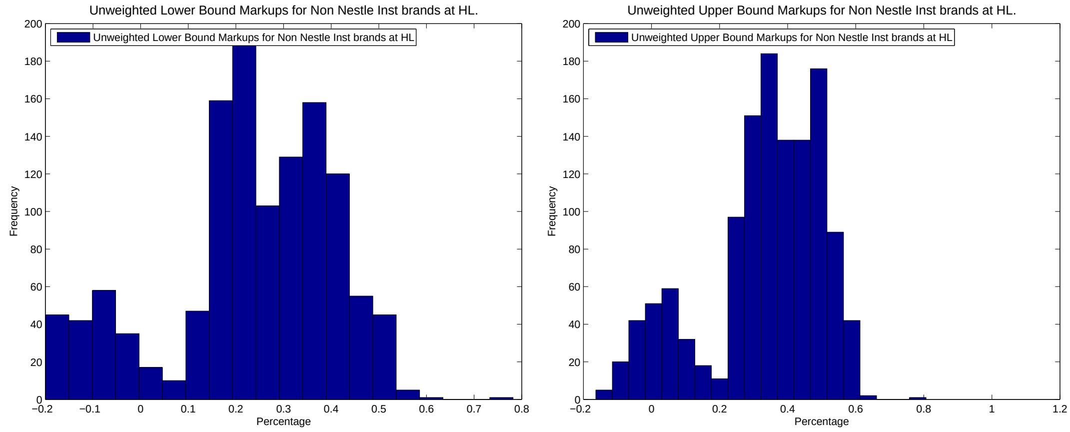


Figure 12: **Bounds for Non-Nestle Markups in EDLP (Instant Coffee)**

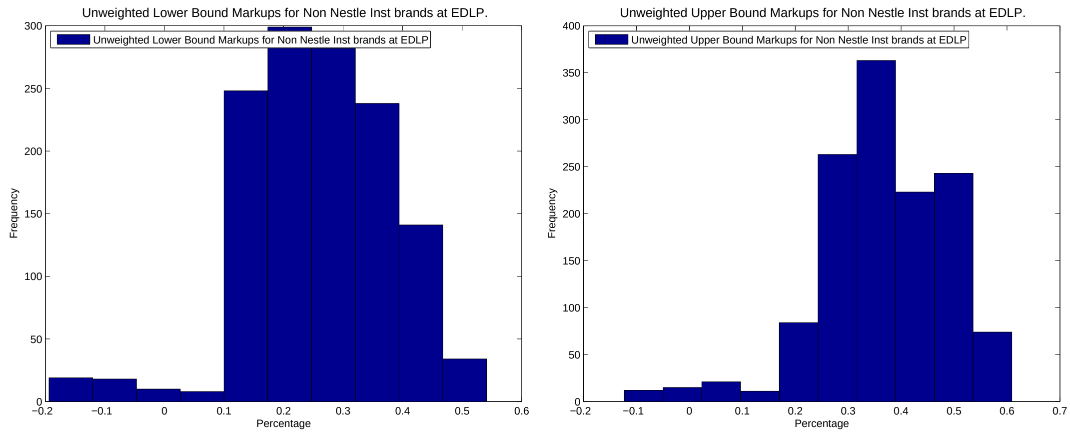


Figure 13: **Bounds for Non-Nestle Markups in HL (Ground Coffee)**

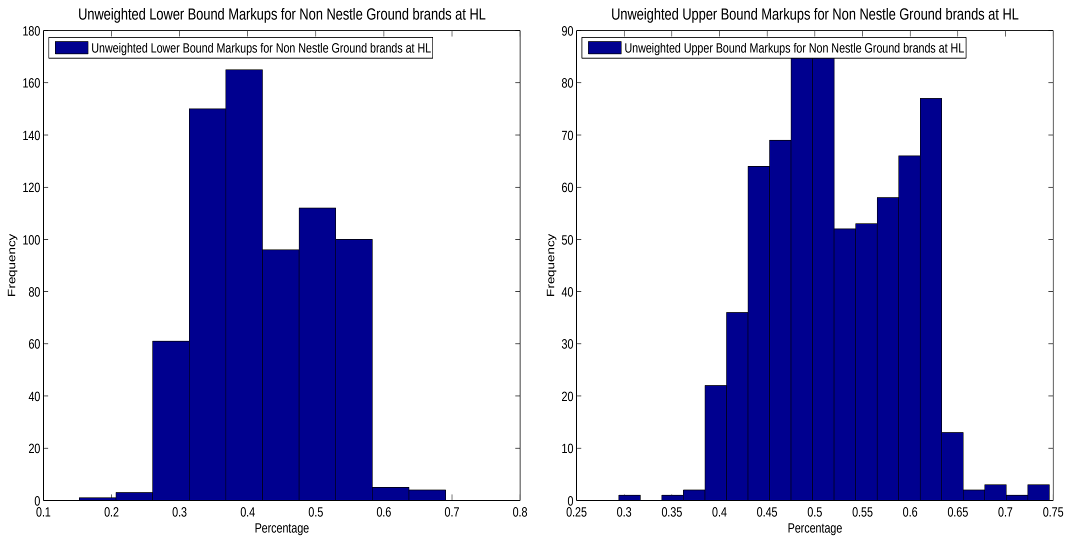
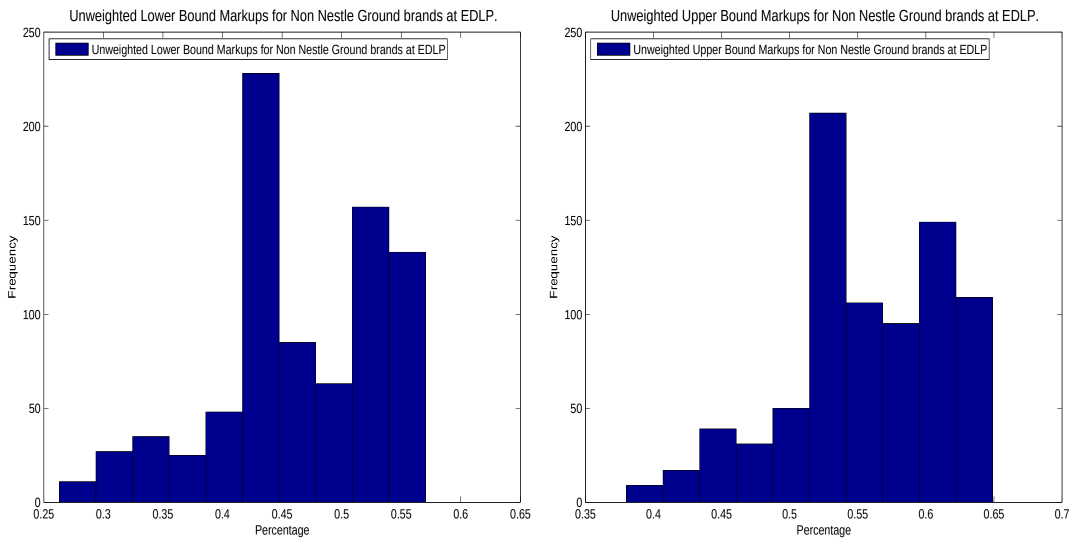


Figure 14: **Bounds for Non-Nestle Markups in EDLP (Ground Coffee)**



C Details of Retailers

This appendix section contains more details regarding the supermarket data. Below the histograms of the retailers' markups by manufacturer are shown in figure 15 for ground coffee while the instant coffee markups are presented in figures 16 and 17.

Figure 15: **HL Markups for Non-Nestle Ground Coffee.**

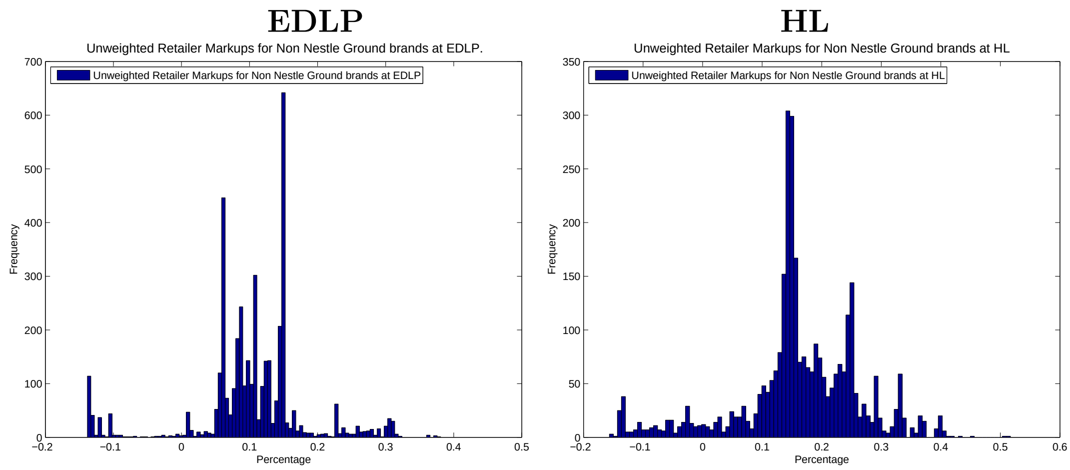


Figure 16: **EDLP Markups for Nestle and Non-Nestle Instant Coffee**

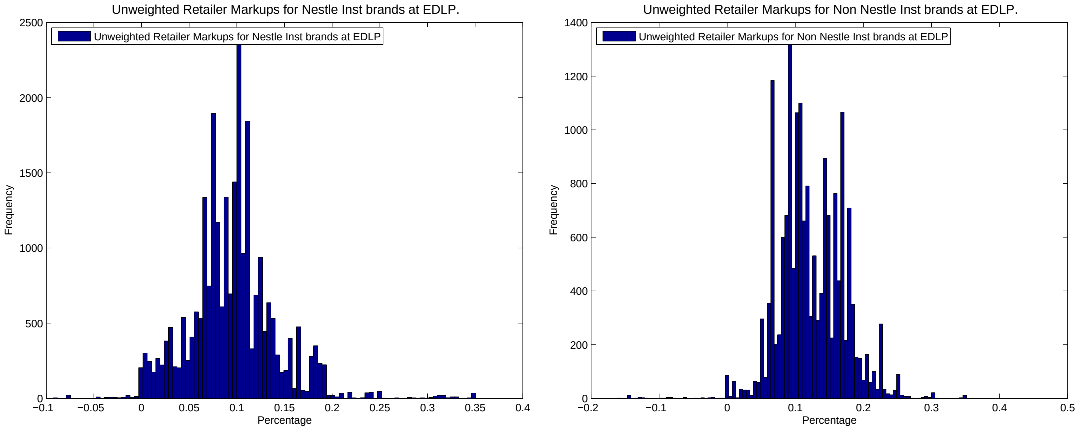
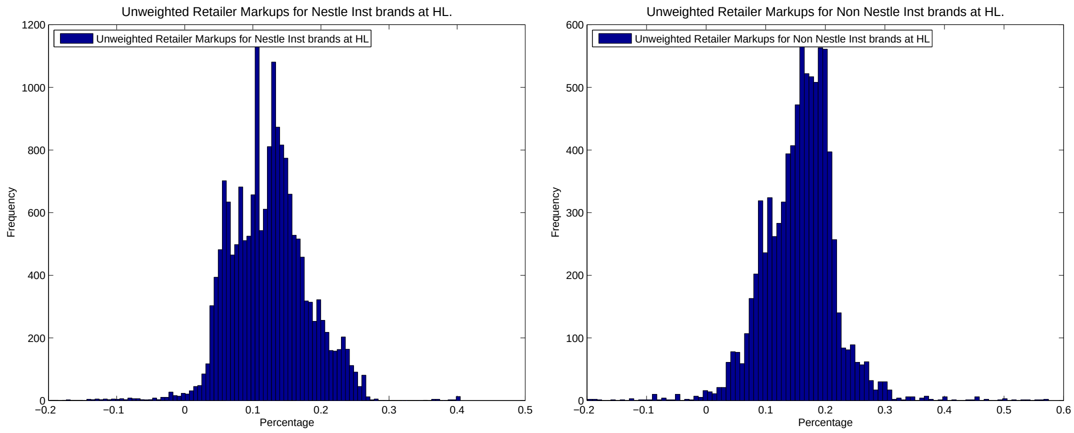


Figure 17: **HL Markups for Nestle and Non-Nestle Instant Coffee**



D Structural Demand Estimation

This section provides details of the structural demand a la BLP that is estimated in section 4.5. Figure 18 presents the histograms of the elasticities for the demand estimations in La Florida for supermarket EDLP and HL. Histograms of the predicted and real markups are depicted in figure 19.

Figure 18: **Elasticities in La Florida by Retailer**

EDLP **HL**

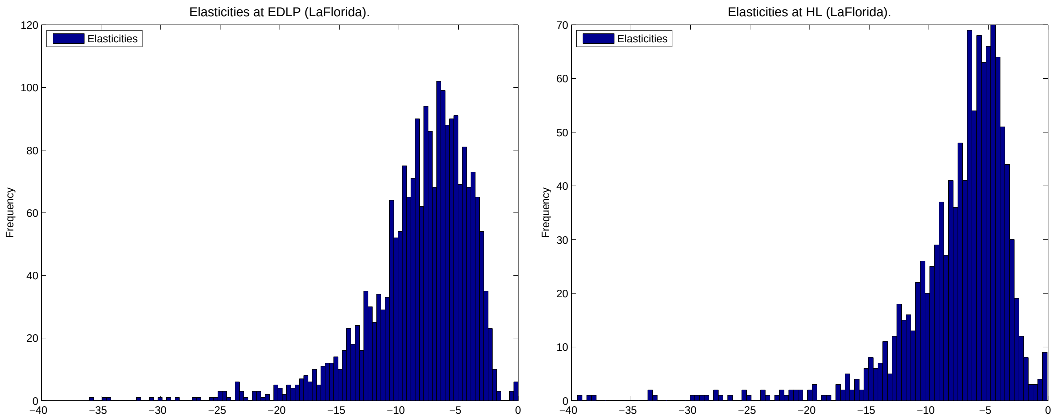


Figure 19: **Actual and Estimated Markups by Retailer**

EDLP **HL**