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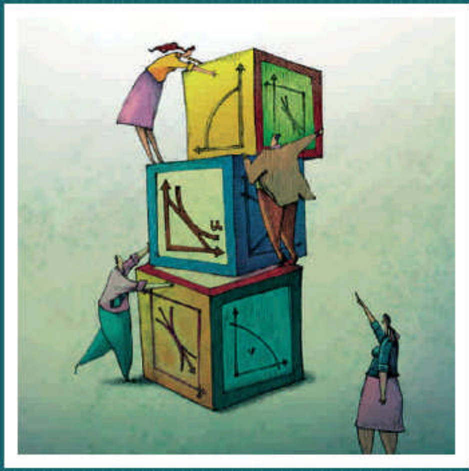

Nº 304 **REVEALING BARGAINING POWER THROUGH ACTUAL WHOLESALE PRICES**

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Revealing Bargaining Power through Actual Wholesale Prices *

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Abstract

In vertical relationships in which manufacturers and retailers bargain over a volatile surplus, negotiated wholesale prices determine both payoffs and risk-exposure. We use actual wholesale prices to study the profit-sharing and risk-sharing behavior of manufacturers and retailers in the coffee industry in Chile. We find that small manufacturers are able to earn a sizable fraction of the pie and that most cost shocks are absorbed by upstream manufacturers. Thus, our results do not support the standard assumption that bargaining firms deal equally well with risk. Calibration of a Nash bargaining model confirms small manufacturers' substantial bargaining power.

1 Introduction

In an environment characterized by channel surplus volatility, wholesale prices, negotiated between manufacturers and retailers, play a dual role. These prices determine both the share of the pie each player earns (profit-sharing) and the amount of risk each player bears (risk-sharing). For instance, channel surpluses in vertical relationships where commodities account for a large fraction of upstream production costs typically exhibit substantial volatility as retail prices are usually more stable than commodity prices.

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We use actual wholesale prices to study profit-sharing and risk-sharing between manufacturers and retailers in the coffee industry in Chile. Our main contribution is to characterize bargaining outcomes in an environment featuring surplus volatility using wholesale prices, which are usually unavailable to academic researchers. As a preview of our results, we find that upstream manufacturers earn a large portion of the pie and absorb most, if not all, cost shocks.

We focus on the coffee industry for a number of reasons. First, the market is relevant in terms of volume being the second largest commodity market after oil (Nakamura and Zerom (2010)). Second, there is a large surplus volatility caused by massive fluctuations in the price of green coffee beans, which account for approximately 50 percent of production costs. The international price of green coffee beans can oscillate as much as 40 percent over the span of a few weeks. Third, coffee manufacturing uses a simple production technology that is homogeneous across coffee producers (Sutton (1991)). This allows us to estimate production costs based on the prices of green coffee beans and the share of non-coffee costs. Fourth, there are large differences in size across upstream manufacturers in Chile. Nestlé accounts for almost 80 percent of the market while the remaining 20 percent is accounted for by 15 other manufacturers. Thus, we are able to study how profit-sharing and risk-sharing vary across manufacturers of different size.

Our data are especially well suited for studying bargaining in this industry. They include barcode-specific wholesale prices paid by the two largest retailers, which account for 80 percent of the coffee market. The data also include weekly barcode-level retail prices and quantities covering approximately 180 supermarket stores operating in Santiago de Chile over the 2005-2007 period.

On the econometric side, we follow two approaches to determine profit-and risk-sharing behavior: a reduced-form approach and a structural approach. In the reduced-form approach, we examine the pattern of payoffs and cost pass-through across different manufacturer-supermarket pairs without imposing the structure of a bargaining model. To estimate these payoffs, we construct upstream production costs using the input requirements described in Sutton (1991). In the structural approach, we use a Nash bargaining model with risk-averse players to rationalize the data. In this model, the estimator of bargaining power is a function of agreement and disagreement payoffs. The latter are the payoffs earned by each player in the absence of an agreement. Thus, we need to estimate unobserved disagreement payoffs to identify bargaining power parameters, taking costs, wholesale prices and retail prices as given. We estimate a structural demand model to simulate the counterfactual scenarios used in the computation of disagreement payoffs.

Our main findings on profit-sharing from the reduced-form approach indicate that small producers are able to earn a sizable fraction of the pie. We consistently find that non-Nestlé manufacturers obtain between 30 and 50 percent of the surplus despite their small market shares, while Nestlé obtains approximately 70 percent. This evidence is contrary to the view that retailers are able to extract most of the surplus.

Our main findings on risk-sharing from the reduced-form approach support that most cost shocks are absorbed by upstream manufacturers. To quantify the risk exposure of each player, we study pass-through from cost shocks to wholesale prices. We find that less than 10 percent of cost shocks are passed through, with Nestlé absorbing more risk than small manufacturers.

Following the structural approach, we are able to rationalize the above findings using a Nash bargaining model. Regarding profit-sharing, our structural estimations suggest that disagreement payoffs have little impact on the measure of bargaining power because of limited brand substitution. Overall, our evidence challenges the widely held belief that small manufacturers have no bargaining power(Clarke, Davies, Dobson, and Waterson (2002), Lynn (2006), Smith (2002)). Regarding risk-sharing, we find that manufacturers and supermarkets have heterogeneous willingness and/or ability to bear risks. In fact, we find that supermarkets behave as though they were risk-averse, especially those pursuing more stable prices. We conjecture that this behavior reflects the fact that upstream manufacturers have comparative advantages to address risk exposure due to better inventory technology and hedging management.

Despite the importance of bargaining in vertical channels with surplus volatility, empirical work is scarce. This is largely because data on negotiated wholesale prices between upstream and downstream firms are usually not available to researchers. Thus, most empirical work on vertically organized supply chains has typically inferred wholesale prices. To estimate unobservable wholesale prices, previous papers rely on optimal pricing rules in models of Bertrand competition with differentiated products (Sudhir (2001), Villas-Boas (2007), Ho (2009), Bonnet and Dubois (2010), Draganska, Klapper, and Villas-Boas (2010)) and Crawford and Yurukoglu (2012) among others). The equilibrium conditions of the model allow them to express unobservable wholesale prices as a function of retail prices, market shares, and demand parameters.[1]

Our paper is among the few recent papers with access to the negotiated transaction prices to study bargaining. Allen, Clark, and Houde (2012) measures search costs and switching in the Canadian mortgage market. Allen, Chapman, Shum, and Echenique (2012) examine the efficiency of an overnight interbank lending market, and the bargaining power of its participants. Grennan (2013) observes the prices of medical devices negotiated between manufacturers and hospitals to study price discrimination. We focus on the supermarket industry where views on bargaining power remain unconfirmed.

The remainder of this paper is organized as follows. Section 2 presents our

[1]See Sudhir and Datta (2008) for a survey.

data and the industries studied in this paper. Section 3 provides reduced-form analysis of bargaining power. Section 4 presents the structural analysis using a Nash bargaining model. Finally, Section 5 presents our conclusions.

2 Industry Description and Data

This section presents our data and provides a brief description of the coffee manufacturing sector and the Chilean supermarket industry.

2.1 Data

Our proprietary data consist of weekly retail prices (prices faced by consumers), wholesale prices (prices negotiated between manufacturers and supermarket chains[2]), and quantities sold in Santiago de Chile. Our transaction data are recorded at the barcode and store level and span the period of 2005-2007. We also gather information on supplier identity and coffee characteristics, such as whether the variety is ground, instant, or whole-bean and whether it is decaffeinated or flavored. Finally, we include publicly available (spot and future) prices of green coffee beans traded in the international commodity market.

The retail data cover all major supermarket outlets in Santiago over 94 weeks. They include 120,884 weekly observations of scan data for 180 stores located in 34 counties.[3]

The wholesale data include prices agreed upon between the two major supermarket chains and all the coffee suppliers. It should be noted that in Chile, there are no intermediaries between retailers and major manufacturers of packaged coffee. These wholesale prices include shipping and handling costs and are common across stores, as each chain negotiates at the national level. Our final wholesale data identify 5,175 observations that match an important subset of our retail data.[4]

Our wholesale cost data include the standard measures used in the industry. In one chain, the costs provided by the retailer are replacement costs. This price is the cost that a retailer would incur to acquire an extra unit of the product. In the other chain, wholesale prices correspond to the average acquisition cost (AAC), which is an average of the historical costs at which items in inventory

[2]In what follows we use the terms "supermarket chain" and "retailer" indistinctively. Instead, we use "store" to refer to a particular outlet within a chain.

[3]We utilize the observations for coffee products with sizes between 100 and 250 g, and transactions with quantities of over 20 units per store per week, which includes more than 80 percent of the total coffee market.

[4]In this paper, our dataset is a subsample of the dataset used by Elberg (2013), which contains 190 product categories.

were purchased.[5] It should be noted that replacement costs might differ from average acquisition costs. If this is the case, then lags of wholesale prices may be important for the analysis. We address this issue in a robustness check in Section 3.2.

One piece of information that is not included in our data is a measure of allowances. These are lump sum payments made by manufacturers to retailers that include display allowances (payments made to induce retailers to display a given item when a price promotion is being run) and slotting allowances (payments to the retailer for accepting and testing a new product). It is well known that these types of payments are common in the supermarket industry. We obtained first hand information on allowances paid by coffee manufacturers from interviews with industry insiders. We use this information in the empirical section.

2.2 The Coffee Industry

As described by Sutton (1991), the coffee industry has two major segments: (1) *roast* or *ground* coffee, and (2) *instant* or *soluble* coffee.

The technology employed in manufacturing coffee is simple. To produce ground coffee, green coffee beans are roasted and ground to a consistency suited to local preparation methods (percolation, filtering, espresso, etc.). Producing instant coffee involves extra steps, including extraction (dissolving ground coffee in water) and drying. From a consumer's viewpoint, the only difference lies in the flavor and ease of preparation. The two types of products are sold through similar channels of distribution.

The industry is characterized by large fluctuations in the price of its main input. The large swings in the international price of green coffee beans are apparent from Figure 1, which shows the pattern of weekly spot prices for Brazilian and Colombian coffee beans over the 2005-2007 period. Prices oscillate by as much as 30 percent over the span of a few weeks.

Nestlé is the market leader in instant coffee worldwide. Its leading brand, Nescafé, dominates the retail market for instant coffee in various countries, including Italy, Japan, France, Germany, and the UK.

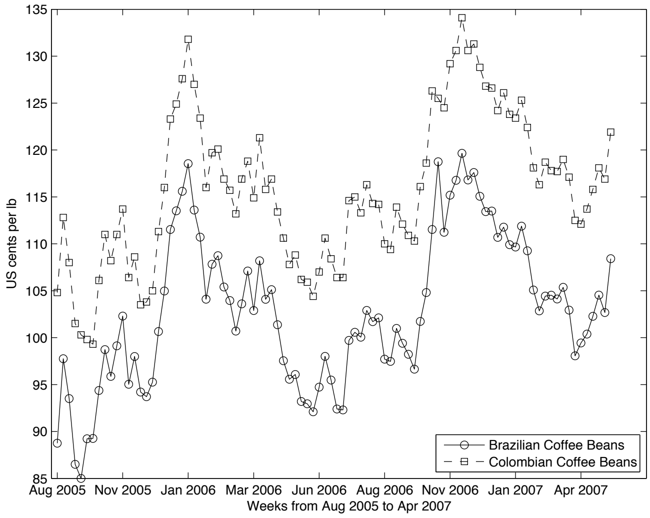
In Chile, instant coffee is by far the dominant segment. It accounts for 85 percent of the volume of coffee sold in 2005-2010. In contrast, ground coffee accounts for a tiny market share. Both types of coffee are mainly sold through

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

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

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 is the quantity sold by the retailer in period t.

Figure 1: **International price of green coffee beans**



supermarkets.

The upstream industry is highly concentrated. In our data, Nestlé, which only sells instant coffee, has a market share of close to 80 percent. The largest remaining manufacturers only account for approximately 11, 4 and 2 percent of the market. The other 16 coffee manufacturers account for less than 0.5 percent each (see Appendix A for further details).

2.3 The Chilean Supermarket Industry

Following a worldwide trend, the supermarket industry in Chile has become increasingly concentrated (Clarke, Davies, Dobson, and Waterson (2002)). As a consequence of a wave of mergers and acquisitions that occurred primarily in the late 1990s, two major supermarket chains came to dominate the market over the period of analysis. By 2006, these two chains accounted for more than 60 percent of the Chilean supermarket sales[6] and approximately 88 percent of the coffee sold through supermarkets. In terms of relative size, the two retailers account for 48.6 and 39.6 percent of the coffee market. It should be noted that both retailers negotiate with the same set of coffee suppliers, who offer the same array of products to both supermarkets.

These two major retailers differ in the type of pricing strategies they follow. One retailer, which we label EDLP, follows the so-called *Everyday Low Prices* strategy, in which the retailer maintains low shelf prices and only rarely offers

[6] CERET (2009).

specials or discounts. The other retailer, labeled HL, follows a *High-Low* strategy, which is characterized by the combination of relatively high shelf prices with frequent promotions and discounts.

3 Reduced-Form Analysis

This section presents an empirical analysis of the different dimensions of bargaining using a reduced-form approach. To assess the profit-sharing dimension, we estimate the payoffs that each player earns. To study the risk-sharing dimension, we perform a pass-through analysis to identify who absorbs cost shocks.

3.1 Profit-Sharing

To carry out the profit-sharing analysis, we study the pattern of payoffs that each player earns. The payoff for each downstream retailer D is given by

$$\pi^D = \sum_{i \in \mathcal{D}} (p_i^r - p_i^w) Q_i \tag{1}$$

where $\mathcal{D}$ is the set of coffee varieties sold by retailer D, and Q_i, p_i^r, and p_i^w are the quantity, retail price, and wholesale price of variety i, respectively. Because our dataset includes all terms in Equation 1, we are able to directly compute the retailers' payoffs.

For upstream coffee manufacturer U the payoff is given by

$$\pi^U = \sum_{i \in \mathcal{U}} (p_i^w - \widehat{c}_i) Q_i \tag{2}$$

where $\mathcal{U}$ is the set of coffee varieties sold by manufacturer U and $\widehat{c}_i$ is the marginal cost of producing variety i.[7]

Production Costs of Coffee Manufacturers. Because our dataset does not include a measure of marginal costs, $\widehat{c}_i$, they must be estimated to compute the manufacturers' payoffs.

Unlike the previous bargaining literature, we estimate production costs without using our information on wholesale prices to avoid imposing a particular structure linking the bargaining outcome to the manufacturer's underlying marginal cost.

[7] In defining payoffs in 1 and 2 we did not include fixed costs. Our dataset does not include a measure of the fixed costs incurred by retailers and manufacturers. However, fixed costs in the coffee industry are known to be low Sutton (1991). In addition, given the multiproduct nature of the upstream and downstream industries, it is not obvious how fixed costs should be allocated to the coffee category in particular.

The simplicity of coffee production technology makes cost estimation quite straightforward as stressed by Sutton (1991). Green coffee beans are the dominant input in the production of packaged coffee. There are few economies of scale in coffee roasting and grinding, so marginal costs are largely independent of output, and companies of different sizes have similar marginal cost functions. The total marginal cost of product variety i, $\widehat{c}_i$, can be expressed as the sum of the coffee and non-coffee components:

$$\widehat{c}_i = m_i^C + m^O \tag{3}$$

where m_i^C is the coffee component and m^O is the non-coffee component of variety i (including packaging, freight, and labor). There is widespread agreement that coffee beans should, on average, account for more than half of marginal costs (Yip and Williams (1982), Leibtag, Nakamura, Nakamura, and Zerom (2007)). Other inputs, such as labor, energy, packaging, transport, and physical capital, usually make up less than 5 percent of total variable costs each and rarely more than 10 percent (Durevall (2007), Koerner (2002)).

Expressing m^O as a function of the fraction of non-coffee costs over total costs, which we denote by α, the marginal costs can be written as[8]

$$\widehat{c}_i = m_i^C + \left(\frac{\alpha}{1-\alpha}\right)\mathbb{E}(m^C) \tag{4}$$

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

We compute the barcode-specific coffee cost component, m_i^C, as the product of the required quantity of coffee beans and the international price of green coffee beans expressed in local currency. For input requirements, we use the fact that producing one kilogram of roasted coffee requires 1.19 kg of beans and producing one kilogram of soluble coffee requires 2.6 kg of beans. For international prices, we use the trade-weighted average of Brazilian and Colombian coffee prices. According to the International Coffee Organization, most coffee beans in Chile are imported from Brazil (approximately 70 percent) and Colombia (approximately 10 percent).

We estimate upper and lower bounds for marginal costs, which are based on the fraction of non-coffee costs, α, and the weight of the more expensive Colombian coffee.[9] To compute the lower-bound cost, MC^L, we use $\alpha = 0.3$ and the Colombian coffee price weighted by 30 percent. To compute the upper-bound cost, MC^U, we increase the share of non-coffee costs to $\alpha = 0.4$ and the weight

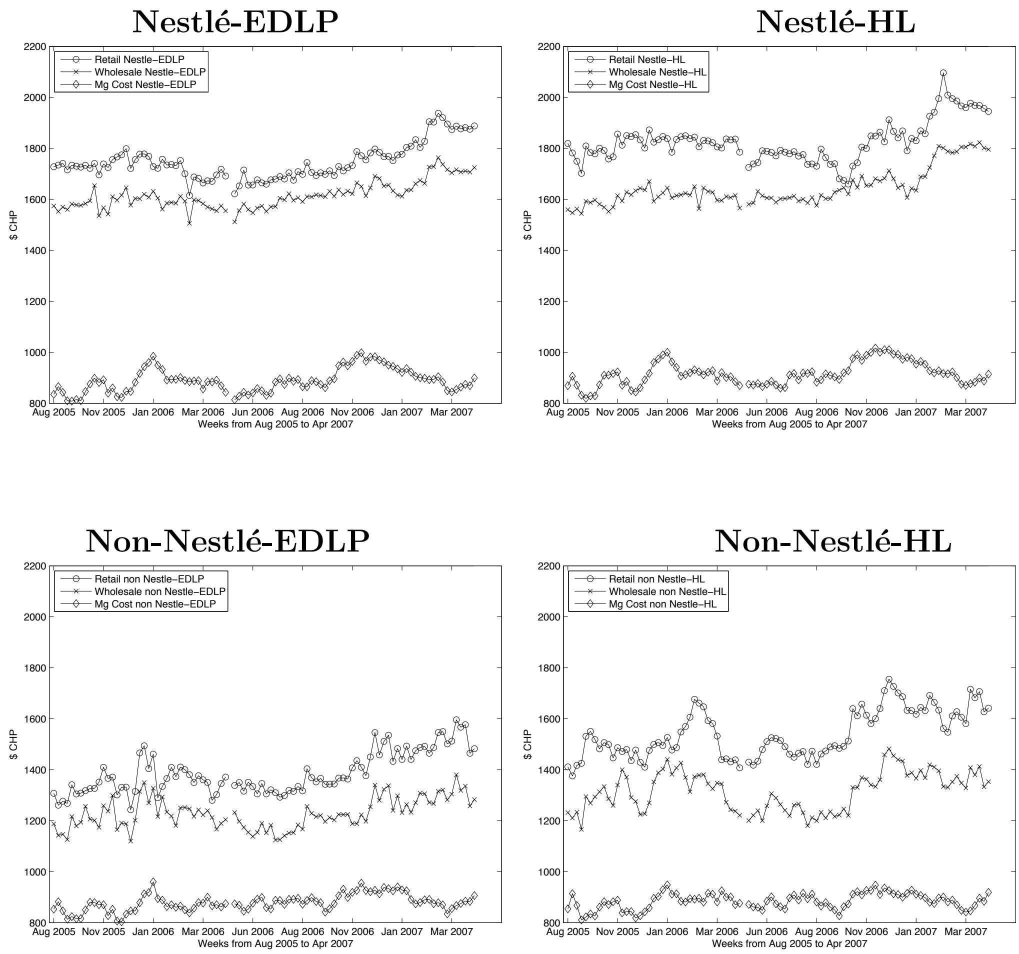
[8] If $m^O = \alpha(\mathbb{E}(m^C) + m^O)$, then $m^O = \left(\frac{\alpha}{1-\alpha}\right)\mathbb{E}(m^C)$.

[9] The remaining weight is fully allocated to Brazilian coffee.

of the Colombian prices to 50 percent. The details regarding these estimates can be found in Appendix A.

Profit-Sharing Analysis. To illustrate the pattern of profit-sharing, Figure 2 shows the behavior of the weighted average of production costs, wholesale prices, and retail prices for each pair of players over the period August 2005-April 2007.

Figure 2: **Weekly Average Mg Cost, Wholesale Price, and Retail Price.**



The following four facts are apparent from the figure. First, Nestlé obtains higher retail prices than non-Nestlé manufacturers. Second, Nestlé systematically negotiates higher wholesale prices than non-Nestlé producers. Third, wholesale prices are substantially larger than marginal costs.[10] Fourth, there are no large

[10]Consistently, Leibtag, Nakamura, Nakamura, and Zerom (2007) find that the average of the aggregate margins is 39 percent using survey data from American manufacturers of coffee and tea.

differences across supermarkets in the level of wholesale prices negotiated with a given manufacturer.

Table 1 presents the average portion of the total surplus obtained by retailers (EDLP and HL) for a given upstream manufacturer (Nestlé, non-Nestlé).[11] In addition to data on retail prices, wholesale prices, marginal costs, and quantities sold, we include information on allowance payments made by manufacturers to retailers. According to industry insiders, the average allowance payments in the coffee industry are 9 percent and 11 percent of the total purchases made by supermarkets from Nestlé and non-Nestlé producers, respectively.

Wholesale prices can be negotiated on a weekly basis, whereas allowances are negotiated on an annual basis. Furthermore, allowances, as a fraction of future purchases, are predetermined at the beginning of each calendar year, whereas the level of wholesale prices are free to vary over the year, as shown in Figure 2.

Table 1: **Share of Retailers in Total Profits.**

	Nestlé		**non-Nestlé**	
	EDLP	**HL**	**EDLP**	**HL**
Mean Retailer Share	0.33	0.36	0.58	0.56
Std Dev Retailer Share	0.02	0.04	0.05	0.06
Min Retailer Share	0.29	0.29	0.52	0.43
Max Retailer Share	0.37	0.43	0.71	0.67
Total Profits [MM USD]	6.15	4.99	0.94	0.86

In general, Table 1 confirms the observations derived from Figure 2. Nestlé obtains a sizable portion of the pie (approximately 65 percent) when negotiating with both supermarkets. Strikingly, non-Nestlé manufacturers manage to obtain more than 40 percent of the total surplus. Thus, the fraction of the pie obtained by non-Nestlé manufacturers seems inconsistent with the hypothesis that small producers are squeezed by large supermarket chains. We cannot tell, based on reduced-form evidence alone, whether the outcome of the negotiations in favor of manufacturers is driven by retailers' poor outside options, manufacturers' strong bargaining skills, or a combination of both. We shed light on this issue using a Nash bargaining model in Section 4.

We provide alternative explanations for the large payoffs obtained by small manufacturers that are not considered in Nash bargaining models. First, non-Nestlé producers may require large payoffs to cover large fixed costs. However, as noted by Sutton (1991), the coffee industry is characterized by small fixed costs. Moreover, the large heterogeneity in the size of non-Nestlé's payoffs would require

[11] We use the upper-bound for costs; thus, we present lower bounds for manufacturers' payoffs.

a peculiar distribution of fixed cost to prevent players from obtaining negative profits.[12] Second, small manufacturers may be able to exploit the existence of externalities. In terms of the negotiation process, non-Nestlé producers might enhance their bargaining power if retailers use them as a threat when bargaining with Nestlé along the lines of Bedre and Shaffer (2011)[13] Another type of externality that non-Nestlé producers can exploit is the presence of variety-loving consumers. Because variety-lovers derive utility from a larger array of brands in their choice set, they increase the value of the relationship between retailers and non-Nestlé manufacturers.

3.2 Risk-Sharing

In this section, we use pass-through regressions to study risk-sharing behavior in a vertical relationship characterized by surplus volatility. Specifically, we assess the extent to which negotiated wholesale prices absorb cost shocks due fluctuations of the international price of green coffee beans. Our estimates are based on the following relationship:

$$\ln\left(p_{jt}^{w}\right) = \alpha \ln(IntPrice_t) + \beta \ln(NER_t) + \theta_j + \varepsilon_{jt} \tag{5}$$

where p_{jt}^{w} is the wholesale price of barcode j at time t, $IntPrice_t$ is the international price of green coffee beans at time t, NER_t is the nominal exchange rate (expressed as Chilean pesos per US dollar) at time t, and θ_j are barcode fixed effects. We estimated the model at a monthly frequency for all four manufacturer-retailer pairs.

There is substantial evidence that coffee manufacturers use derivative contracts, such as forwards, to hedge their risk exposure to fluctuations in the price of green coffee beans. Thus, we use future prices as a proxy of the international price of green coffee beans, $IntPrice_t$.[14] We obtain qualitatively similar results when using spot coffee prices instead.

We reject cointegration for relationship (5) using the two years of monthly observations in our data for each of the four manufacturer-retailer pairs.[15] To avoid a spurious regression problem, all estimations were performed in first differences. We present the results in tables 2 to 5. Columns 1-2 show the results using non-

[12]See figure 4 in Appendix A.

[13]In Bedre and Shaffer (2011), the upstream producer uses small retailers to threaten the largest downstream player. Rey and Vergé (2010) draw similar conclusions in a different context.

[14]Future prices correspond to the monthly average close price of a future contract written on robusta coffee with a twelve-month delivery and traded at NYSE-Euronext. Deliveries are available only for odd months. We used the price of the nearest expiring contract to impute prices for even months.

[15]See online Appendix C for details.

weighted data, and columns 3-4 show the results using quantity-weighted data. Columns 2 and 4 exclude nominal exchange rates from the regression.

We find strong evidence of incomplete pass-through from the international prices of green coffee beans to negotiated wholesale prices. The results indicate that the pass-through coefficients are modest across all manufacturer-retailer pairs, being at most 0.1.

The magnitude of the pass-through coefficients is substantially larger in the case of small manufacturers. Non-Nestlé manufacturers pass-through approximately 8-9 percent of a change in international coffee prices into wholesale prices with both supermarket chains. Pass-through from Nestlé, in contrast, is approximately zero.

We explore whether the large differences between Nestlé and small manufacturers are robust to the use of spot prices and find that the differences are even larger. While Nestle's pass-through rates remain low, the estimated pass-through coefficients of non-Nestlé producers are higher (0.14 and 0.35, for EDLP and HL, respectively).[16]

Overall, the evidence is consistent with Nestlé absorbing more risk caused by fluctuations in the international price of coffee than small manufacturers. This could be due to a number of reasons such as differences in hedging policies, inventory management, or financial capacity.

To the best of our knowledge, we are the first to report how different wholesale pass-through rates vary across firms of different sizes. Although previous work has found evidence of incomplete pass-through from commodity prices to wholesale prices (e.g., Leibtag, Nakamura, Nakamura, and Zerom (2007)), they did not distinguish between different types of bargainers.

4 Structural Analysis

In this section, we use a Nash bargaining model to rationalize our profit-sharing and risk-sharing findings from Section 3. We present the model in Subsection 4.1. We describe how we compute agreement and disagreement payoffs in Subsection 4.2. Finally, we present the structural parameters of the Nash bargaining model that rationalize our data in Subsection 4.3.

4.1 Model

Similarly to most of the recent empirical work in bargaining, we assume that payoffs satisfy the bilateral Nash bargaining solution, as in Nash (1950), Horn and

[16]See online Appendix D for details.

Table 2: **Nestlé-EDLP**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	0.013 (0.005)	-0.001 (0.004)	0.003 (0.001)	0.005 (0.001)
$\Delta \log(NER_t)$	- 0.209 (0.099)		0.025 (0.003)	

Note: Sample size N=250. Robust standard errors in parentheses.

Table 3: **Non Nestlé-EDLP**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	0.070 (0.034)	0.066 (0.037)	0.084 (0.003)	0.097 (0.003)
$\Delta \log(NER_t)$	-0.060 (0.086)		0.190 (0.015)	

Note: Sample size N=313. Robust standard errors in parentheses.

Table 4: **Nestlé-HL**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	-0.001 (0.006)	-0.007 (0.005)	-0.014 (0.000)	-0.017 (0.000)
$\Delta \log(NER_t)$	-0.097 (0.031)		- 0.049 (0.002)	

Note: Sample size N=277. Robust standard errors in parentheses.

Table 5: **Non Nestlé-HL**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	0.003 (0.029)	0.001 (0.028)	0.093 (0.003)	0.122 (0.003)
$\Delta \log(NER_t)$	- 0.034 (0.182)		0.436 (0.015)	

Note: Sample size N=521. Robust standard errors in parentheses.

Wolinsky (1988), and De Fontenay and Gans (2004).[17] These models assume simultaneous and bilateral negotiations such that, in equilibrium, no party wants to renegotiate. Additionally, they do not consider the possibility of other contracts being renegotiated in the case of disagreement (Collard-Wexler, Gowrisankaran, and Lee (2012)).

The standard Nash bargaining models are ill-suited to studying risk-sharing behavior for two reasons. First, they do not consider random outcomes. As noted by Roth (1985), in the standard model, the concept of risk aversion refers solely to the risk of disagreement. Second, when applied to firms, models assume risk-neutral players. Hence, the models are silent regarding risk-sharing under surplus volatility.

We introduce two distinctive features to the standard model to study profit-sharing and risk-sharing behavior in an environment characterized by large surplus volatility: i) the size of the pie to split is random and ii) bargaining firms are not necessarily risk-neutral. To include risky outcomes, we consider random payoffs for both players as in Riddell (1981).[18] We assume there is a positive pie to share with probability one and that no renegotiation can take place after the random variable is realized. To allow for risk-averse firms, we consider concave utility functions to evaluate players' payoffs.

In our model, the equilibrium payoffs maximize the Nash product (hereafter, NP) defined as:

$$NP = \left(\mathbb{E}[v(\pi^D) - v(\pi^D(na))]\right)^{\lambda} \left(\mathbb{E}[u(\pi^U) - u(\pi^U(na))]\right)^{1-\lambda} \tag{6}$$

where $v(\cdot)$ and $u(\cdot)$ are the utility functions of the downstream retailer D and upstream manufacturer U, respectively; $\pi^k, k \in \{U, D\}$ is the random payoff of player k in the case of agreement (called "agreement payoff"); $\pi^k(na)$ is the random payoff of player k in the absence of agreement (called "disagreement payoff"); and $\lambda \in [0, 1]$ is the normalized bargaining power parameter of the downstream retailer (the upstream manufacturer bargaining power parameter is $1 - \lambda$). The expectations are taken over the random payoffs.

The maximization of NP implies the following condition:

$$\left(\frac{\lambda}{1-\lambda}\right) = \frac{\mathbb{E}[v(\pi^D) - v(\pi^D(na))]}{\mathbb{E}[u(\pi^U) - u(\pi^U(na))]} \times \frac{\mathbb{E}[u'(\pi^U)]}{\mathbb{E}[v'(\pi^D)]} \tag{7}$$

Condition 7 highlights the interaction between payoffs, bargaining power parameters, and the shape of the utility functions.

[17]The Nash model can be considered to be a reduced-form of a bargaining game because it does not follow a specific set of moves and countermoves in the bargaining process. Nevertheless, Binmore, Rubinstein, and Wolinsky (1986) present the conditions under which the Nash solutions are equivalent to the payoffs in the bargaining game of Rubinstein (1982).

[18]Other models of bargaining that explicitly incorporate risky outcomes are Roth and Rothblum (1982) and White (2008).

To illustrate the role played by risk aversion, we start by considering the case in which both players are risk-neutral with identical linear utilities. Under these assumptions, condition 7 takes the following form:

$$\left(\frac{\lambda}{1-\lambda}\right) = \frac{\mathbb{E}[\pi^D - \pi^D(na)]}{\mathbb{E}[\pi^U - \pi^U(na)]} \tag{8}$$

Notice that when payoffs are deterministic, we recover the standard Nash bargaining solution. In that case, bargaining power is related to the deterministic value of the agreement. With random payoffs, instead, the solution is based on the expected value of the agreement.

Departing from the symmetric risk-neutral case, the bargaining solution is related to the shape of the utility functions. For simplicity, assume a risk-neutral upstream manufacturer negotiating with a risk-averse downstream retailer. Suppose the retailer utility function is given by $v(x) = x^\rho$ with $0 < \rho < 1$. Condition 7 yields

$$\left(\frac{\lambda}{1-\lambda}\right) = \frac{\mathbb{E}[(\pi^D)^\rho - (\pi^D(na))^\rho]}{\mathbb{E}[\pi^U - \pi^U(na)]} \times \frac{1}{\rho\mathbb{E}\left[(\pi^D)^{\rho-1}\right]} \tag{9}$$

Solving condition 9 numerically, we show below that as the retailer becomes more risk-averse, he or she is willing to accept a smaller and less volatile portion of the pie. Equivalently, the less risk-averse firm sells insurance to the other party.

4.2 Computing Payoffs

To take the model to the data, we need to compute agreement payoffs and disagreement payoffs for all four pairs of players. Using our cost estimates and data from Section 3.1, we treat agreement payoffs as observable. Because we have no episodes of relevant disagreements in the data, we will also need a structural model to estimate counterfactual disagreement payoffs. We take actual wholesale prices as given, and we do not infer counterfactual negotiations.

We use the following assumptions to compute payoffs:

Assumption 1: Bargaining between supermarket D and manufacturer U takes place over the entire bundle of U's products. Hence, disagreement implies the exclusion of all of U's products from supermarket D.

Assumption 2: Downstream competition takes place over a basket of product varieties, and there is no coffee brand in the consumer's basket having a weight large enough to induce supermarket switching. Hence, unavailable coffee brands would not imply changes in the choice of retailer.[19]

[19] As empirical support, the weight of coffee in the Chilean basket is less than one percent, as reported by the Chilean Agency of Statistics (INE).

Assumption 3: Consumers substitute among available brands whenever a coffee brand is unavailable. Hence, disagreement with a given brand weakly increases the revenues of the retailer in the remaining coffee brands.

Assumption 4: In the case of disagreement with U, retailer D can set new optimal retail prices for the remaining available brands.

Assumption 5: Fixed cost (such as marketing expenditures, R&D, etc.) play no role in the bargaining power estimation because they are not conditional on an agreement between players being reached and cancel out.

The value of the agreement for the upstream manufacturer U is defined as

$$\begin{aligned} \pi^U - \pi^U(na) &\equiv \sum_{i \in \mathcal{U}} (p_i^w - \widehat{c}_i) Q_i - \sum_{i \in \{\mathcal{U} \cap \mathcal{D}^{\mathsf{C}}\}} (p_i^w - \widehat{c}_i) Q_i \\ &= \sum_{i \in \{\mathcal{U} \cap \mathcal{D}\}} (p_i^w - \widehat{c}_i) Q_i \end{aligned} \tag{10}$$

where $\widehat{c}_i$, p_i^w, p_i^r, and Q_i were introduced in subsection 3.1; $\mathcal{U}$ and $\mathcal{U}^{\mathsf{C}}$ denote the set of coffee varieties produced by manufacturer U and the remaining manufacturers, respectively; $\mathcal{D}$ and $\mathcal{D}^{\mathsf{C}}$ denote the coffee varieties sold in supermarket D and the complement of that set, respectively. Because no consumer switches retailers in the event of an unavailability of U's varieties (*Assumption 2*), the value of the agreement for U equals the profits from supermarket chain D.

The value of the agreement for the downstream retailer D is defined as

$$\pi^D - \pi^D(na) \equiv \sum_{i \in \mathcal{D}} (p_i^r - p_i^w) Q_i - \sum_{i \in \{\mathcal{D} \cap \mathcal{U}^{\mathsf{C}}\}} (\widehat{p}_i^r - p_i^w) \widehat{Q}_i \tag{11}$$

where $\widehat{p}_i^r$ is the counterfactual retail price when U's varieties are unavailable (*Assumption 4*); and $\widehat{Q}_i$ is the counterfactual demand for coffee variety i when consumers face the restricted choice set $\mathcal{D} \cap \mathcal{U}^{\mathsf{C}}$ and the re-optimized retail prices (*Assumption 3*).

Disagreement Payoffs for Retailers. Because we do not observe instances of disagreements in our data, we need a structural demand model to compute the counterfactual disagreement payoffs.

We estimate a random coefficient model developed by Berry, Levinsohn, and Pakes (1995) (hereafter, BLP). Because we conduct the estimation by supermarket chain, all parameters are retailer-specific, and we omit the subscript for simplicity.

The utility of consumer h from coffee variety i at time t is denoted by U_{ith}:

$$U_{ith} = -\alpha_h p_{it}^r + x_{it}'\beta + \xi_{it} + \varepsilon_{ith} \tag{12}$$

where p^r_{it} is the retail price, x_{it} is the vector of observable characteristics of coffee variety i, ξ_{it} is an unobserved scalar variety characteristic, and ε_{ith} is a homoscedastic mean-zero stochastic term. β is a vector of taste coefficients common across consumers, and α_h is the individual-specific marginal utility of income with a distribution given by

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

where v_h is a taste shock capturing the unobservable consumer heterogeneity in price sensitivity. Define $\theta = (\alpha, \beta, \sigma_p)$ as the vector containing all the parameters of the model. The set of consumers who choose product i at time t is denoted by A_{it}. This is a function of all parameters θ, prices $(\mathbf{p}^r_t)$, and characteristics $(\mathbf{x}_t, \xi_t)$ in that market:

$$A_{it}(\mathbf{x}_t, \mathbf{p}^r_t, \xi_t; \theta) \;\; = \;\; \{(v_h, \varepsilon_{0th}, .., \varepsilon_{Ith}) | U_{ith} \geq U_{lth}, \forall l \in \{0, .., I\}\}$$

The next step is to build market shares given the population of each market.[20] Assuming ties occur with zero probability, the market share s_{it} of product i is the integral over the mass of consumers in the region A_{it} that depends on random variables $\varepsilon = (\varepsilon_{0th}, .., \varepsilon_{Ith})$ and v_h. Thus, the market shares are given by:

$$s_{it}(\mathbf{x}_t, \mathbf{p}^r_t, \xi_t; \theta) \;\; = \;\; \int_{A_{it}} s_{ith} d\Phi(v_h)$$

Under the assumption of ε being i.i.d. with a Type I extreme value distribution, we have a closed-form expression for the individual probability s_{ith}:

$$s_{ith} \;\; = \;\; \frac{\exp(-\alpha p^r_{it} + x'_{it}\beta + \xi_{it} - p^r_{it}\sigma_p v_h)}{1 + \sum_g \exp(-\alpha p^r_{gt} + x'_{gt}\beta + \xi_{gt} - p^r_{gt}\sigma_p v_h)}$$

The market shares are given by

$$s_{it}(\mathbf{x}_t, \mathbf{p}^r_t, \xi_t; \theta) = \int_{A_{it}} \frac{\exp(-\alpha p^r_{it} + x'_{it}\beta + \xi_{it} - p^r_{it}\sigma_p v_h)}{1 + \sum_g \exp(-\alpha p^r_{gt} + x'_{gt}\beta + \xi_{gt} - p^r_{gt}\sigma_p v_h)} d\Phi(v_h)$$

The non-analytical integral over individual shocks v_h is computed through simulation. To estimate the model, we match the predicted and actual market shares. However, the estimation procedure is not straightforward because the unobservable vector ξ_t enters the predicted market shares in a non-linear fashion. Moreover, the unobservable random terms might be correlated with retail prices. To overcome this endogeneity issue, we use the international prices of coffee as instruments. To estimate the mixed logit model of BLP, we follow the MPEC approach suggested by Dubé, Fox, and Su (2012).

[20] This approach also considers a normalized outside good, $i = 0$, that represents the choice of "not to buy coffee" $(U_{0th} = \varepsilon_{0th}, \forall(h,t))$.

To compute counterfactual prices when a given brand is unavailable, we exploit the first-order conditions of the multiproduct retailer problem,

$$s_{it}(\mathbf{x}_t, \mathbf{p}_t^r, \xi_t; \widehat{\theta}) + \sum_{k \in \mathcal{R}} (p_{kt}^r - p_{kt}^w) \frac{\partial s_{kt}(\mathbf{x}_t, \mathbf{p}_t^r, \xi_t; \widehat{\theta})}{\partial p_{it}^r} = 0, \quad \forall i \in \mathcal{R} \tag{13}$$

where p_{kt}^w is the wholesale price of variety k at time t and $\mathcal{R}$ is the set of coffee varieties excluding those brands sold by manufacturers with which the retailer did not reach an agreement. Solving the equation system above, we are able to estimate the counterfactual equilibrium prices and quantities using the estimates of the demand model.

We use the estimates of the structural model to compute disagreement payoffs for each retailer-producer pair.[21] Disagreement payoffs for both retailers in the absence of Nestlé varieties are approximately 5 percent of agreement payoffs, while retailers' disagreement payoffs in the absence of non-Nestlé varieties are approximately 30 percent of agreement payoffs. These are the values that will feed the calibration exercise below.

4.3 Calibrating the Nash Bargaining Model

This subsection calibrates the parameters of the Nash bargaining model from Subsection 4.1 that rationalize the data. Unlike previous studies which use the model to derive wholesale prices from a given set of parameters, we infer the values of parameters based on our data, which include actual wholesale prices. Our contribution is to shed light on the link between players' characteristics (market size and pricing strategy) and the structural parameters that determine profit-sharing and risk-sharing behavior.

In our model, profit-sharing and risk-sharing behaviors are based on bargaining power and risk-aversion parameters. The retailer's bargaining power is captured by λ, the normalized weight in the Nash product, while the manufacturer's bargaining power is represented by $(1 - \lambda)$. In the Nash bargaining literature, λ has been referred to as "bargaining skills" that allow players to reach a more favorable point within the range determined by agreement and disagreement payoffs (Grennan (2012)). In addition, risk-sharing behavior depends on *relative* risk aversion between players. Consistently with the stylized fact that manufacturers tend to absorb cost shocks (Section 3.2), we assume that upstream manufacturers are less risk-averse than downstream retailers. Hence, we assume the retailers' utility function over payoff x is $v(x) = x^\rho$, where the degree of risk aversion is decreasing in $\rho \in [0, 1]$, and we normalize upstream manufacturers' ρ to one.

[21] See Appendix B.1 for details on demand estimates.

The intuition for identification is that different combinations of parameters $[\lambda, \rho]$ yield different combinations of moments of the payoff distribution, which we match with their empirical counterparts.

Our empirical approach is based on simulated moments. Our procedure is as follows. First, we fix $[\lambda, \rho]$ for a given retailer-manufacturer pair. Second, we re-sample 50,000 weekly surpluses for that pair of players. Third, we construct the Nash product for each surplus (Equation 6) using λ, ρ, and the expected disagreement payoffs from Subsection 4.2. Fourth, we seek the payoffs that maximize the Nash product for each sampled total surplus. Fifth, we compute the first three moments of the distribution of simulated payoffs. Finally, we perform a grid search over the combination of parameters $[\lambda, \rho]$ to find the one that minimizes the distance between the actual and simulated moments.

We take as our baseline set of parameters the case in which disagreement payoffs are zero and both players are risk-neutral. In this case, the portion of the surplus obtained by the retailer is equal to the bargaining power parameter. In our grid search, we explore values of λ close to the fraction of the profits earned by retailers (approximately 35 percent when considering Nestlé and approximately 50 percent when considering non-Nestlé manufacturers). Regarding risk-aversion parameters, we search over values of ρ in the neighborhood of one, consistent with the standard assumption of a risk-neutral retailer.

The results are presented in Table 6. Each panel contains moments of actual and simulated payoffs for a given retailer-manufacturer pair and a measure of the model's fit. The first column shows the moments based on the empirical distribution of payoffs, and the remaining columns show the moments based on the simulated payoffs for different combinations of $[\lambda, \rho]$. The last row of each panel shows the Euclidean distance between the vector of empirical moments and the vector of simulated moments. In bold, we present the parameter values that minimize the distance and the corresponding simulated moments.

The results lend support to our identification strategy in the sense that as the retailer becomes more risk-averse (lower ρ), he or she is willing to accept a smaller and less volatile portion of the pie.

Table 6: Actual and Simulated Moments of Payoffs Distributions

	Actual Data	$\lambda = .40$			$\boldsymbol{\lambda = .35}$			λ=.30		
	EDLP-Nestlé	ρ =1	ρ=0.9	ρ=0.8	ρ =1	ρ=0.9	$\boldsymbol{\rho}$**=0.8**	ρ =1	ρ=0.9	ρ=0.8
Mean Retailer EDLP	88,29	110,24	104,93	99,49	97,24	92,32	**87,35**	84,24	79,83	75,42
S.D. Retailer EDLP	28,66	35,26	33,61	31,96	31,05	29,54	**28,06**	26,85	25,52	24,24
Skew. Retailer EDLP	(0,12)	(0,27)	(0,28)	(0,28)	(0,27)	(0,28)	**(0,28)**	(0,27)	(0,28)	(0,28)
Mean Nestlé	178,95	156,00	161,31	166,76	169,00	173,92	**178,89**	182,00	186,41	190,82
S.D. Nestlé	60,14	50,72	52,43	54,14	54,95	56,52	**58,08**	59,18	60,58	61,95
Skew. Nestlé	(0,34)	(0,31)	(0,31)	(0,31)	(0,31)	(0,31)	**(0,31)**	(0,31)	(0,31)	(0,31)
Fit	-	33,78	25,92	17,92	14,56	7,45	**2,34**	5,46	11,71	18,15
	Actual Data	$\lambda = .40$			$\boldsymbol{\lambda = .35}$			λ=.30		
	HL-Nestlé	ρ=1	ρ=0.9	ρ=0.8	ρ=1	$\boldsymbol{\rho}$**=0.9**	ρ=0.8	ρ=1	ρ=0.9	ρ=0.8
Mean Retailer HL	78,52	89,99	85,79	81,48	79,51	**75,63**	71,69	69,03	65,55	62,07
S.D. Retailer HL	28,02	32,59	31,31	30,08	28,87	**27,71**	26,62	25,15	24,16	23,24
Skew. Retailer HL	(0,21)	(0,18)	(0,17)	(0,16)	(0,17)	**(0,15)**	(0,14)	(0,15)	(0,14)	(0,13)
Mean Profits Nestlé	138,26	125,75	129,95	134,25	136,23	**140,11**	144,04	146,71	150,19	153,67
S.D. Nestlé	52,90	45,09	46,44	47,77	48,85	**50,08**	51,27	52,60	53,69	54,72
Skew. Nestlé	(0,19)	(0,30)	(0,30)	(0,31)	(0,30)	**(0,30)**	(0,31)	(0,30)	(0,30)	(0,31)
Fit	-	19,23	13,21	7,45	4,72	**4,46**	9,20	13,03	18,06	23,12
	Actual Data	$\boldsymbol{\lambda = .55}$			$\lambda = .50$			λ=.45		
	EDLP-NN	ρ=1	ρ=0.9	$\boldsymbol{\rho}$**=0.8**	ρ=1	ρ=0.9	ρ=0.8	ρ=1	ρ=0.9	ρ=0.8
Mean Retailer EDLP	23,96	24,27	23,85	**23,42**	22,72	22,31	21,91	21,17	20,79	20,40
S.D. Retailer EDLP	10,00	11,37	11,07	**10,77**	10,38	10,09	9,80	9,39	9,12	8,84
Skew. Retailer EDLP	(0,03)	(0,30)	(0,32)	**(0,34)**	(0,31)	(0,33)	(0,35)	(0,32)	(0,34)	(0,36)
Mean Non-Nestlé	17,04	16,51	16,93	**17,36**	18,06	18,47	18,88	19,61	20,00	20,38
S.D. Non-Nestlé	7,54	5,76	6,04	**6,34**	6,64	6,93	7,22	7,55	7,83	8,11
Skewness Non-Nestlé	0,49	0,79	0,78	**0,77**	0,73	0,72	0,71	0,66	0,65	0,64
Fit	-	2,37	1,89	**1,61**	1,92	2,30	2,81	3,86	4,45	5,06
	Actual Data	$\lambda = .55$			$\boldsymbol{\lambda = .50}$			λ=.45		
	HL-NN	ρ=1	ρ=0.9	ρ=0.8	$\boldsymbol{\rho}$**=1**	ρ=0.9	ρ=0.8	ρ=1	ρ=0.9	ρ=0.8
Mean Retailer HL	20,88	22,47	22,05	21,63	**20,97**	20,57	20,16	19,47	19,09	18,71
S.D. Retailer HL	8,05	7,82	7,60	7,36	**7,13**	6,91	6,69	6,44	6,23	6,02
Skew. Retailer HL	(0,29)	(0,59)	(0,60)	(0,62)	**(0,60)**	(0,62)	(0,65)	(0,62)	(0,65)	(0,67)
Mean Non-Nestlé	16,33	14,58	14,99	15,41	**16,07**	16,48	16,88	17,57	17,95	18,33
S.D. Non-Nestlé	5,35	5,23	5,43	5,63	**5,79**	5,99	6,20	6,38	6,58	6,79
Skew. Non-Nestlé	(0,16)	(0,14)	(0,13)	(0,12)	**(0,14)**	(0,13)	(0,12)	(0,13)	(0,12)	(0,11)
Fit	-	2,40	1,87	1,44	**1,10**	1,40	1,88	2,70	3,28	3,87

Regarding the bargaining power parameter λ, we find that despite their very small market shares, non-Nestlé manufacturers exhibit a large λ with respect to both retailers. Specifically, we find that Nestlé's parameters are approximately 0.65 for both retailers, while those of non-Nestlé manufacturers' are between 0.45 and 0.50 for EDLP and HL, respectively. Combined with the reduced-form evidence, this finding suggests that the large portion of the pie obtained by small manufacturers cannot be solely explained by disagreement payoffs. Moreover, given the observed agreement payoffs, larger values of retailers' disagreement payoffs would only be consistent with an even lower retailers' bargaining power. Therefore, our finding can be viewed as an upper bound of non-Nestlé manufacturers' bargaining power.

Regarding risk-aversion parameters, the evidence challenges the usual assumption of bargaining models that firms are equally well suited to managing risk. Specifically, we find that EDLP's risk-aversion parameter is approximately 0.8 for both manufacturers, while HL's is between 0.9 and 1 for Nestlé and non-Nestlé, respectively. Thus, EDLP is always more risk-averse than both upstream manufacturers, whereas HL is more risk-averse than Nestlé only.

We conjecture that differences in attitudes toward risk between manufacturers and retailers reflect advantages in inventory technology and hedging management. The following statement by Nestlé supports this conjecture: "*...input price volatilities and/or capacity constraints, could potentially impact Nestlé's financial results. The Group has policies, processes and controls in place to mitigate against such events.*" (Nestlé (2012), p. 52).

In addition, the results suggest that pricing strategies also play a role in explaining risk-aversion behavior. The EDLP supermarket chain, which pursues more stable prices, is more risk-averse than the HL retailer across all manufacturers.

Our structural results seem robust to alternative cost estimations. To change our conclusions regarding the sizable bargaining power of small manufacturers, we would require larger estimates of production costs for non-Nestlé producers. However, these alternative cost estimates seem implausible given the observed stability in wholesale prices. To prevent negative markups, the non-Nestlé cost increase should be heterogeneous across producers. However, heterogeneity across producers is difficult to reconcile with evidence on homogeneous marginal costs in coffee manufacturing (Sutton (1991)). Moreover, the cost increase should be heterogeneous across time to be consistent with the high international coffee price observed in 2005 relative to the price observed in 2006.

5 Conclusions

Our findings challenge two widely held beliefs about the profit-sharing and risk-sharing behavior of bargainers in a vertical relationship. First, our findings run against the common wisdom that large supermarket chains are able to extract most of the channel surplus. We find that even small manufacturers obtain a sizable portion of the pie, consistent with a strong bargaining power, despite their small market shares.

Second, our results do not support the standard assumption of bargaining firms managing risk equally well. In the context of a highly volatile channel surplus due to large swings in commodity prices, we find that upstream manufacturers absorb most cost shocks. We conjecture that these differences in cost absorption reflect the advantages of manufacturers relative to retailers in terms of inventory technology and hedging management. Along these lines, we see the dominant manufacturer, multinational Nestlé, absorbing shocks to a larger extent than small local manufacturers who may not be as resourceful as Nestlé in managing risk. Finally, pricing strategy may also play a role as retailer EDLP, who pursues a strategy of stable prices, has less volatile surplus than retailer HL, whose pricing strategy calls for frequent price promotions.

We argue that our findings for the coffee market in Chile can be generalized to developed countries and other market structures and product categories for several reasons.

First, the players in the Chilean coffee market are similar to those in advanced countries. In fact, upstream players in the Chilean coffee industry include multinational manufacturers who negotiate with retailers participating in a globalized market. As evidence of the latter, we can cite the recent acquisition of the EDLP retailer by US-based Walmart and the internationalization of HL to several other Latin American countries (including Argentina, Brazil, Colombia, and Peru).

Second, concentration in the Chilean retail market is likely to be an upper bound to the level of retail concentration in other countries. The Chilean retail market is particularly favorable to the view that supermarkets squeeze upstream players, given its unusual concentration by international standards. If local small manufacturers are able to earn large payoffs in Chile, this outcome should be more likely to hold in less concentrated retail markets.

Third, the distribution channel for coffee is similar to other channels characterized by highly volatile input prices. For example, the volatility of the channel surplus in the bread, poultry, chocolate, and cooking oil markets depends on the fluctuations of the prices of wheat, corn, cocoa, and oilseeds, respectively.

Finally, we believe that this paper opens up two new lines of research. First, having broken the tight link between market size and negotiated wholesale prices, alternative sources of bargaining power remain to be empirically confirmed. Second, our finding that most cost shocks are absorbed by upstream manufacturers warrants further empirical research on the relationship between cost absorption and inventory and/or hedging behavior in vertical channels under surplus volatility.[22]

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[22]Exploring the sources of bargaining power requires a richer dataset in terms of the number and characteristics of bargainers than those in the Chilean coffee market.

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6 Appendix

A Data Details

Table 7: **Average Market Shares of Coffee Manufacturers**

Name of Manufacturer	Market Share Percentage
Nestlé	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

Table 8: **Market Share of Coffee Suppliers by Retailer**

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

Table 9: **Market Share of Retailers by Coffee Supplier**

	Nestlé	Non Nestlé	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

Table 10: **Cost Estimation Bounds**

	$\mathbb{E}(m^C)$	$\mathbb{E}(m^O)$	VAT	Marginal Cost, $\widehat{c}_i$
Upper Bound	419	279	133	831
Lower Bound	409	175	111	695

Table 11: **Weighted Wholesale prices.**

	EDLP -Nestlé	HL-Nestlé	EDLP-Non-Nestlé	HL-non-Nestlé
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 12: **Weighted Retail prices.**

	EDLP -Nestlé	HL-Nestlé	EDLP-non-Nestlé	HL-non-Nestlé
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 3: **Lower Bounds for Nestlé's Markups**

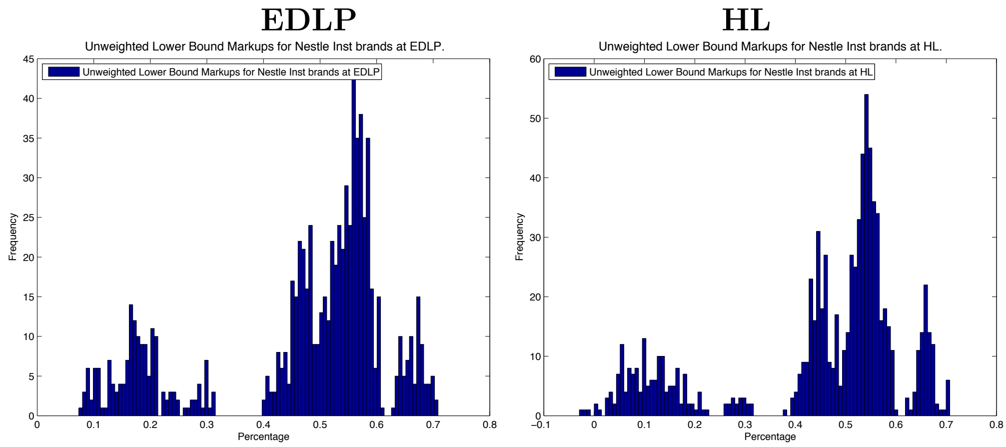
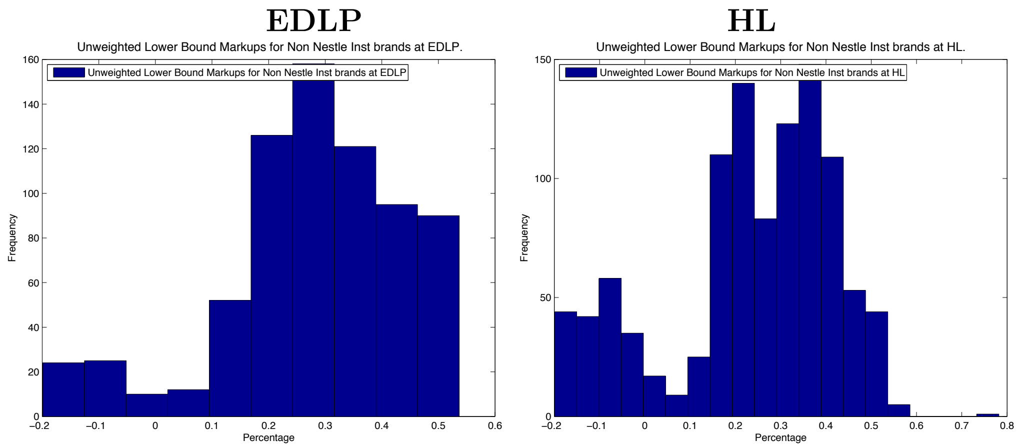


Figure 4: **Lower Bounds for non-Nestlé's Markups (Instant Coffee)**



B Appendix (For Online Publication)

B.1 Structural Demand Estimation

This appendix provides details of the structural demand a la BLP that is estimated in Section 4.3. As a representative market, we take the middle-income county, La Florida. Table 13 presents summary statistics of the estimated own-price elasticities in each retailer.

Table 13: **Own Price Elasticities**

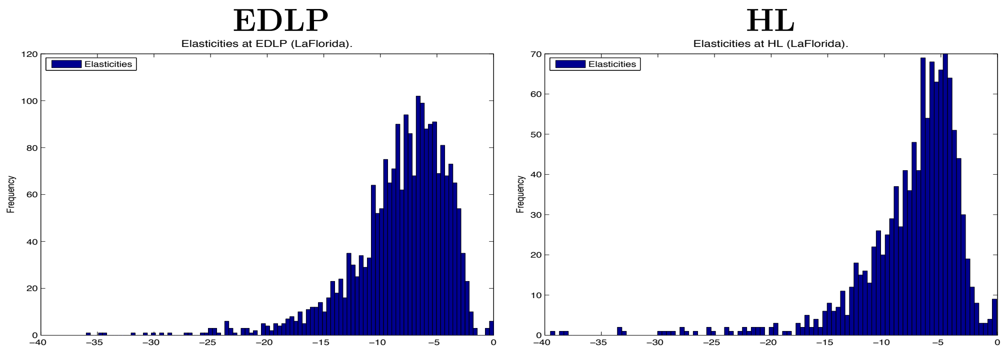
Panel A: EDLP

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

Panel B: HL

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

Figure 5: **Elasticities by Retailer**



C Unit Root and Cointegration Tests

This Appendix presents the results of unit root and cointegration tests that we performed prior to undertaking our wholesale passthrough analysis. We begin by presenting the results of nonstationarity tests on a univariate time-series framework conducted on the series of international coffee prices and the nominal exchange rate. We included three measures of the international coffee price: the future price of robusta coffee with a 12-month delivery, the spot price of Colombian coffee, and the spot price of Brazilian coffee.

Table 14 presents the results of performing Augmented Dickey Fuller unit root tests on the levels and first-differences of these two sets of variables. We used a general-to-specific approach to select the truncation lag. The results provide strong evidence that the international coffee price is nonstationary in levels and stationary in first-differences, indicating that it is integrated of order one, I(1). Specifically, we are unable to reject the hypothesis of a unit root in the level of any of the series at a 5 percent significance level. We reject a unit root in the first-differences of all series at any conventional significance level.

Table 14: Unit Root Tests on International Coffee Prices and the Nominal Exchange Rate

	Levels		First-Differences	
Variable	Test Statistic	lags	Test Statistic	lags
log(IP) (future)	-1.401	0	-4.645***	0
log(IP) (spot Colombian)	-2.001	0	-4.467***	0
log(IP) (spot Brazilian)	-3.274**	3	-4.318***	0
log(NER)	-2.847*	0	-4.869***	0

Notes. Test statistic corresponds to the Augmented Dickey-Fuller statistic. Lags correspond to the number of lagged first differences of the variables included in the regression. The truncation lag is obtained following a general-to-specific approach with an initial truncation lag equal to 1. (*),(**) and (***) stand for significant at the 10 percent, 5 percent, and 1 percent level, respectively.

To test for a unit root in wholesale prices negotiated between manufacturers and retailers we relied on more powerful panel unit root tests. Specifically, we used a test proposed by Demetrescu, Hassler, and Tarcolea (2006) which extends Choi (2001) inverse-normal combination test to the case in which p-values of individual unit root tests are cross-sectionally correlated. We performed the panel unit root test on the following four sets of wholesale prices: wholesale prices negotiated between EDLP and Nestlé; wholesale prices negotiated between EDLP and non-Nestlé; wholesale prices negotiated between HL and Nestlé; and, wholesale prices negotiated between HL and non-Nestlé. The results, presented in Table 15, lend strong support to the hypothesis that wholesale prices are integrated of order I(1). In all cases, we are able to reject the null hypothesis of a unit root when wholesale prices are expressed in first-differences (at any conventional significance level) but we are unable to reject the null hypothesis of a unit root in the level of wholesale prices.

Table 15: Panel Unit Root Tests for Wholesale Prices

Retailer-Manufacturer	Levels	First-Differences
EDLP_Nestle	2.794	-7.323***
EDLP_NonNestle	0.326	-6.760***
HL_Nestle	2.377	-4.925***
HL_NonNestle	0.273	-6.012***

Notes. Main entries correspond to the test statistic. Optimal number of lags obtained using the modified Akaike information criterion (MAIC). (***) stand for significant at the 1 percent level.

To test for the existence of a cointegrating relationship between wholesale prices, international coffee prices and the nominal exchange rate, we used a panel cointegration test developed by Westerlund (2007). The results presented in Table 16 strongly reject the null hypothesis of cointegration.

Table 16: Cointegration Tests

Retailer-Manufacturer	Test Statistic
EDLP_Nestle	-1.023
EDLP_NonNestle	2.252
HL_Nestle	0.722
HL_NonNestle	-0.629

Main entries correspond to the test statistic.

D Pass-through Analysis using Spot Prices

Table 17: **Nestlé-EDLP**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	0.030 (0.031)	0.032 (0.031)	-0.047 (0.001)	-0.047 (0.001)
$\Delta \log(NER_t)$	- 0.181 (0.090)		0.032 (0.003)	

Note: Sample size N=250. Robust standard errors in parentheses.

Table 18: **Non Nestlé-EDLP**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	0.068 (0.055)	0.069 (0.055)	0.084 (0.003)	0.142 (0.004)
$\Delta \log(NER_t)$	0.105 (0.135)		0.190 (0.015)	

Note: Sample size N=313. Robust standard errors in parentheses.

Table 19: **Nestlé-HL**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	-0.026 (0.005)	-0.026 (0.006)	-0.041 (0.000)	-0.039 (0.000)
$\Delta \log(NER_t)$	-0.101 (0.006)		- 0.082 (0.002)	

Note: Sample size N=277. Robust standard errors in parentheses.

Table 20: **Non Nestlé-HL**

Dep var: $\Delta \log(p^w_{jt})$	1	2	3-Weight	4-Weight
$\Delta \log(IntPrice_t)$	0.012 (0.070)	0.012 (0.069)	0.357 (0.004)	0.353 (0.004)
$\Delta \log(NER_t)$	-0.026 (0.179)		0.624 (0.013)	

Note: Sample size N=521. Robust standard errors in parentheses.

D.1 Details of Supermarkets

Table 21: **Retailer Markups for Instant Coffee**

	Nestlé-EDLP	Nestlé-HL	non-Nestlé-EDLP	non-Nestlé-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

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