An Analysis of Asymmetric Consumer Price Responses and Asymmetric Cost Pass-Throught in the French Coffee Market*

Celine Bonnet† and Sofia B. Villas Boas‡

4 décembre 2012

Résumé

The occurrence of asymmetric price transmission has important welfare and, hence, policy implications. The contribution of the present paper is to estimate in a structural model and then propose a formal framework to investigate one possible cause of asymmetric price transmission in the markets. In particular, we highlight the possible role of asymmetries in demand as causes of asymmetric firm price transmission of upstream cost shocks into retail prices consumers observe. The approach consists of two steps, where in the first we estimate a demand model allowing for the possibility of asymmetric demand price sensitivities and using consumers' actual purchase data and price variation in the French Coffee Market. In the second step, we account for the structure of this industry, and in particular the horizontal and vertical interactions between manufacturers and retailers. From estimates of consumers' demand on the French Coffee Market, we are able to recover price cost margins and estimated marginal costs from a supply model as in Bonnet and Dubois (2010). Thanks to simulations of cost shocks, we estimate cost pass-through and by implementing positive and negative cost shock simulations, we will test the asymmetry of cost pass-through. The results suggest that a positive cost shock is more transmitted than a negative one.

*This version is very preliminary. Please do not cite without permission.

† Toulouse School of Economics (GREMAQ, INRA)

‡ University of California, Berkeley

1 Introduction

Although according to standard economic price theory, there is no foundation for prices to adjust asymmetrically to cost upturns relative to downturns, empirical findings suggest there to be in fact such asymmetric price responses in a variety of markets (for a survey see Meyer and Cramon-Taubadel, 2005). For example, Borenstein et al. (1997) in the U.S., and Noel (2009) for the Canadian market, found that gasoline prices tend to respond faster to crude oil increases than to decreases. In a cross market study for 77 consumer goods and 165 producer goods Peltzman (2000) finds there to be asymmetric price adjustment more generally than one would think : on average, the short term response to a positive cost shock is at least twice the magnitude of the response to a negative shock ; and that symmetry in price adjustments is rather an exception among the goods considered.

The occurrence of asymmetric price transmission has important welfare and, hence, policy implications. If for example, firms do not pass on the price reductions, consumers may not benefit as much expected from policy reforms involving say a tax reduction. Beyond documenting the occurrence, understanding the causes behind such a phenomenon is also an important step for policy. Although there are many potential causes advanced to explain the phenomenon of asymmetric and imperfect pass-through(such as menu costs, market power, inventory, as in Peltzman, 2000) to date there is a lack of empirical work establishing causal relationships between possible factors leading to asymmetric price transmission. In an attempt to investigate heterogeneity in the degree of asymmetric price transmissions across markets, Peltzman (2000) investigates in a reduced form setting possible correlates with asymmetric price transmission. He finds significant heterogeneity in the degree of asymmetry, moreover, the degree of asymmetry is negatively correlated with input price volatility, and his results find no significant correlation between the asymmetries and proxies measuring inventory costs, the existence of menu costs, and market power in these markets. In the policy debate asymmetric price transmission is very often considered a result of the abuse of market power (Cramon-Taubadel and Meyer, 2001).[1] In oil markets, for instance, the recent policy debate centers on whether a reduction in gasoline taxes would result in gasoline price reductions at

[1] According to the survey in Cramon-Taubadel and Meyer (2001) asymmetric price transmission is related to concentration in the slaughter industry and retail sector.

the pump. The concern there would be that the firms involved in refining and distributing gasoline would strategically adjust their margins resulting in a less than complete pass-through of the tax reduction into final gasoline prices (The New York Times, April 2008).

Since the empirical method used to detect this asymmetric price transmission in Peltzman (2000), and in similar past related studies (e.g. to be added), is reduced form, it does not allow us to investigate formally the possible causes of asymmetric price transmission. Indeed reduced form approaches find, at most, correlated factors and not causal factors. The contribution of the present paper is to estimate in a structural model and then propose a formal framework to investigate one possible cause of asymmetric price transmission in the markets. In particular, we highlight the possible role of asymmetries in demand as causes of asymmetric firm price transmission of upstream cost shocks into retail prices consumers observe. The intuition is that, if firms face demand asymmetries, in terms of a much larger response to a price increase than to a price reduction of similar magnitude, they be more reluctant to pass through price increases in the same rate as price savings into final retail prices.

Our work builds on the efforts by previous papers that find and document the existence of demand asymmetries. Müller and Ray (2007) show that asymmetric price adjustment exists in a retail grocery chain of Chicago. Krishnamurthi, Mazumdar and Raj (1992) suggest that consumers would react more to perceived prices losses than to price gains in their quantity choice and that only loyal consumers responds differently to gains and losses in brand choice decisions. Kalyanaram and Little (1994) identify a region of indifference such that changes in price within this region produce no changes in perception (price thresholds) due to historical benchmark price (consumers remember the price encountered on past purchase occasions) or competitive benchmark price (a benchmark price is formed during the purchase occasion on the basis of the price observed, ie shelf prices of competing products). Han, Gupta, Lehmann (2001) find asymmetric thresholds and particularly larger thresholds for price decrease versus price increase in the coffee category. Pauwels, Srinivasan and Franses (2007) find evidence for asymmetric thresholds and for different sign and magnitude of elasticity transitions in a large supermarket of Chicago. Price thresholds can be justified by adaptation level theory and saturation effects. In the case of negative price gap, that is equivalent to a consumer gain, even consumers perceive and recognize discounts, they may not react strongly if they are waiting for still better deals (Kalyanaram and Little, 1994 ; adaptation level theory). Moreover, saturation effects for gains (Gupta and Cooper, 1992) in retail market may originate from consumer limits to purchasing, transporting, and stockpiling products. For positive price gap, that is consumer loss, a loss must exceed a consumer's price threshold in order to be perceived (Kalyanaram and Little, 1994 ; adaptation level theory) and core loyal consumer base with a strong need or desire for the focal good (Jacoby and Chestnut, 1978 ; saturation effects).

The approach followed in this paper consists of two steps, where in the first we estimate a demand model allowing for the possibility of asymmetric demand price sensitivities along the above mentioned literature. In doing so, using consumers' actual purchase data and price variation, we assess the asymmetric price response of consumers in their brand choice in the French Coffee Market. Given the estimated demand model, we investigate in a counterfactual framework, whether the estimated asymmetric price demand model would result in firm level simulated asymmetric cost pass-through, and estimate the magnitude of the asymmetry in price cost transmission as a function of demand factors.

This paper uses structural econometric models that allow to account for the structure of this industry, and in particular the horizontal and vertical interactions between manufacturers and retailers. From estimates of consumers' demand on the French Coffee Market, we are able to recover price cost margins and estimated marginal costs from a supply model as in Bonnet and Dubois (2010). We choose the same two part tarif model as in Bonnet and Dubois (2010), Bonnet and Requillart (2012) and Bonnet et al. (2012). Assumptions on relationships between manufacturers and retailers and on vertical restraints may change the magnitude of the retail price transmission as Bonnet et al. (2012) show. However the level of pass through is out of the scope of this paper, we are interesting in the identification of an asymmetric cost pass through. Thanks to simulations of cost shocks, we estimate cost pass-through and by implementing positive and negative cost shock simulations, we will test the asymmetry of cost pass-through.

Section 2 describes the French Coffee market and available data. Section 3 presents the estimation method allowing to estimate asymmetric price response of consumers and asymmetric price threshold in their brand choice behavior. Section 4 develops the method used to estimate cost pass-through by recovering price-cost margins, estimating marginal costs and simulating cost shock. Section 5 describes demand results, asymmetric consumer behavior and asymmetric pass-through. Section 6 concludes.

2 French Coffee Market and Data

We focus our empirical analysis on the French Coffee Market during the period 1998-2006. The French Coffee market is third in the world. In 2006, behind USA and Germany, the French per capita average consumption amounts to 5 kilograms per year and then consumption stagnates in the last decade. During this long period of analysis we take advantage of price variations on raw coffee price and product prices. As Figure 1 shows, in the raw coffee price (composite indicator price of the International Coffee Organization in US cents per lb), we have a global decrease until 2001, then a global increase, and there are a lot of ups and downs. Figure 2, that represents the evolution of raw coffee price and brand prices in a retailer, shows an asymmetric product price adjustment when raw coffee price decreases or increases and also shows that price variations of coffee products on the French market are product specific. Raw coffee price increases seems to be more transmitted than raw coffee price decreases. Table 1 presents a reduce form analysis of retail price on raw coffee price where we see the impact on retail price being larger when we observe an increased raw price than a decreased one. Indeed, Raw^{+} represents the raw coffee price interacted with a dummy which is equal to one if the raw coffee price at the period t is larger than the raw coffee price at period t-1. Raw^{-} is the raw coffee price in the case of negative change. The coefficient related to Raw^{+} is indeed larger meaning that raw coffee prices impact more retail prices when they increase rather than they decrease. From the reduced form estimates we conclude that the French Coffee market consists of an interesting market to analyze the possible forces behind asymmetric price transmission of a cost shock into retail prices.

The French coffee market is concentrated at both manufacturer and retailer levels. The retailing industry of the French Coffee market represents 90% of the total consumption of coffee and is composed of seven main retailers (70% of the coffee purchases in the data) and four main

TAB. 1 – **Reduced form analysis of the impact of raw price on coffee retail price.**

Price	Mean (std)	Mean (std)
Raw	0.008 (0.002)	
Raw^+		0.011 (0.002)
Raw^-		0.007 (0.002)
Product fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
R^2	0.75	0.75

manufacturers which produce six national brands (71% of the coffee purchases in the seven main retailers in our data). Market shares of the six brands vary from 2.5% to 10%. We take into account private labels of retailers on this market which represent 14% of the market share of our sample. On average, the 49 products considered, which are defined as a brand in a retailer, represent 52% of the total purchases each period, where a period consists of 4 weeks.

The data used in this paper are collected by TNS WordPanel and market shares, prices and promotion rates for all products at each period are computed from household coffee purchases from 1998 to 2006. We also are able to compute from the consumer purchases the characteristics of the product such as the rate of arabica coffee and ground coffee. In our data, during the period 1998-2006, we have roughly 50% of price increase. This proportion is the same for all brands and all retailers considered in this paper, except for brand 4 where the proportion of price increases is lightly greater (55%). Descriptive statistics of these data are presented in Table 2 and 3. There exists some heterogeneity of the price and market shares among brands. Prices are between €5.02 and €9.60 and market shares between 2.69% and 14.30%. Brand 1 is the most expensive, which could be explained by the weakest promotion rate (9.77%) and the higher rate of arabica coffee, and brand 5 the cheapest, that could be explained by the highest promotion rate (38.69%). The private label product is sold at €5.49 on average and has the higher market shares. Interestingly there is no heterogeneity in price across retailers despite a large heterogeneity in market shares among them. For arabica, bean and caffeine-free coffee types we remark there exists few heterogeneity among purchases in the different retailers. In terms of of product purchases, 60% originate from arabica coffee in all retailers, 1.7% are bean coffee and the caffeine-free product purchases are around 10%. The only heterogeneity remains in the robusta coffee rate (from 1.93% to 7.15% in average). Finally, descriptive statistics suggest a larger magnitude in coffee characteristics by brands.

Tab. 2 – **Descriptive Statistics.**

	Prices in € (std)	Shares in % (std)	Promotion rate in % (std)	Arabica coffee rate in % (std)	Robusta coffee rate in % (std)
Brands					
B1	9.60 (0.73)	9.26 (2.16)	9.77 (9.60)	99.92 (0.62)	0
B2	5.43 (0.81)	7.76 (1.98)	27.20 (17.16)	32.28 (12.53)	0.05 (0.39)
B3	7.41 (1.05)	7.09 (1.27)	22.27 (11.54)	65.63 (1.30)	14.45 (10.49)
B4	7.51 (1.53)	10.20 (2.38)	21.49 (11.19)	66.50 (12.23)	0.05 (0.42)
B5	5.02 (1.29)	2.97 (0.92)	38.69 (24.37)	42.55 (23.67)	5.16 (11.61)
B6	8.30 (1.23)	2.69 (0.43)	16.30 (13.03)	75.19 (14.16)	0.01 (0.20)
B7	5.49 (0.67)	14.30 (2.46)	12.05 (9.06)	58.19 (14.82)	10.41 (14.28)
Retailers					
R1	6.67 (1.91)	6.80 (1.07)	26.48 (17.64)	59.88 (25.38)	4.96 (11.60)
R2	6.86 (2.05)	9.24 (1.50)	22.69 (17.90)	63.16 (25.26)	4.86 (9.61)
R3	7.17 (1.84)	5.37 (1.75)	15.74 (14.11)	62.33 (23.92)	7.15 (14.28)
R4	7.15 (1.93)	10.63 (1.67)	15.87 (12.92)	61.69 (25.26)	4.00 (6.26)
R5	6.67 (1.76)	13.55 (1.76)	23.75 (17.11)	62.50 (24.74)	3.11 (6.96)
R6	7.08 (1.83)	5.19 (1.24)	19.41 (16.83)	65.30 (23.80)	4.12 (9.68)
R7	7.18 (1.98)	3.49 (0.96)	23.61 (19.71)	65.62 (24.77)	1.93 (5.95)
Outside Option		45.69			

Tab. 3 – **Descriptive Statistics (cont.).**

	Bean coffee rate in % (std)	Caffeine-free coffee rate in % (std)
Brands		
B1	2.52 (2.37)	8.40 (4.72)
B2	1.34 (1.90)	16.92 (7.36)
B3	2.69 (3.13)	11.09 (6.65)
B4	1.49 (1.63)	11.25 (5.40)
B5	0.81 (4.75)	3.32 (6.28)
B6	0.24 (1.07)	7.49 (8.11)
B7	2.08 (2.21)	13.75 (6.95)
Retailers		
R1	1.37 (2.25)	10.91 (8.88)
R2	1.56 (2.37)	9.12 (6.42)
R3	2.04 (4.64)	10.01 (7.58)
R4	1.73 (2.47)	10.93 (7.79)
R5	1.67 (1.92)	11.12 (6.47)
R6	1.68 (2.95)	11.30 (8.72)
R7	1.13 (1.93)	8.91 (7.64)

3 Estimation Method of the Asymmetric Consumer Price Response

3.1 Demand Model

To model consumer behavior and asymmetric demand responses to a price change, we use a standard brand choice model such as a random coefficients logit model as in Berry, Levinsohn, Pakes (1995) and Nevo (2001). This model allows flexible substitution patterns with respect to the standard multinomial logit model taking account for consumer heterogeneity. We assume that I consumers can choose among J products during T periods. The utility of a consumer i purchasing the product j at period t can be written as :

$$U_{ijt} = V_{ijt} + \varepsilon_{ijt} = \delta_j + \eta_t - \alpha_i p_{jt} + X_{jt}\beta_x + \xi_{jt} + \varepsilon_{ijt},$$

where δ_j is a product fixed effect capturing unobserved time invariant product characteristics, η_t is a time fixed effect allowing to capture seasonnal variations and trend of coffee consumption, p_{jt} is the price of the product j at period t and α_i represents the consumer price sensitivity, X_{jt} is observed product characteristics like promotion and β_x are corresponding coefficients. The term ξ_{jt} accounts for monthly changes in factors such as shelf space, positioning of the product among others that affect consumer utility, are observed by consumers and firms but are not observed by the researcher. ε_{ijt} is an i.i.d. type I extreme value distributed error term capturing consumer idiosyncratic preferences.

We allow for unobserved household heterogeneity in the price sensitivity throught a random component $\nu_i \sim N(0,1)$ in α_i and for an asymmetric consumer price response through both coefficient α^1 and α^2. The coefficient of price variable is then given by

$$\alpha_i = \left(\alpha^1 + \alpha^2 1_{[p_{jt}-p_{jt-1}>0]}\right) + \sigma\nu_i.$$

We suppose that the reference price of consumers is only the last price observed. This adjustment implies that consumers make an immediate and complete adjustment in their price expectations after an exposure to a price stimulus.

We introduce an outside good option, denoted good 0, to allow the possibility of consumer i

not buying one of the J marketed products and suppose that the utility is given by :

$$U_{i0kt} = \varepsilon_{i0kt}.$$

Let the distribution of ν_i across consumers be denoted by $F(\nu_i)$. The aggregate share S_{jt} of product j at period t across all consumers is obtained by integrating the consumer level probabilities :

$$S_{jt} = \int \frac{\exp(V_{ijt})}{1 + \sum_{k=1}^{J} \exp(V_{ikt})} dF(\nu_i). \tag{1}$$

This demand model allow to obtain own- and cross-price elasticities and we will show if there exists an asymmetric behavior in the price response of consumers.

3.2 Estimation and identification of Demand

To estimate the set of parameters $\theta = (\delta_j, \eta_t, \beta_x, \alpha^0, \alpha^1, \sigma)$, we use the GMM method as in Nevo (2001) and solve the endogeneity problem of prices by using input prices as instrumental variables such as oil, raw coffee price, arabica and robusta coffee price interacted with national brand or private label dummies. Raw coffee prices are a composite indicator prices computed by the International Coffee Organization and average composite prices for arabicas and robustas group. The oil price index is given by the French National Institute for Statistics and Economics Studies (INSEE). The interaction with national brand or private label dummies aims at capturing the fact that the cost of input may differ according to the brand and particularly differ between national brands and private labels.

4 Estimation Method of Cost Pass-Through

In this section, after deducing the price elasticities given demand, we then compute estimated marginal cost. Thanks to simulations comparing equilibrium prices in both cases, with and without a cost shock on the estimated marginal cost, we are able to estimate cost pass-through. We will then estimate the cost pass-through in both cases of positive and negative upstream cost shocks and we will expect significant different price changes.

4.1 Supply Model

Given the market considered, we assume an oligopoly model of two part tarif contracts between manufacturers and retailers to estimate price-cost margins and marginal costs. This model, introduced theoretically by Rey and Vergé (2004) and empirically implemented in Bonnet and Dubois (2010), allows a simple expression for price-cost margins in the case where we assume resale price maintenance with respect to linear pricing contracts, that are usually used. Moreover, these two part tarifs contracts with resale price maintenance are considered in several empirical studies of vertical contracts as a better model than the linear pricing one or two part tariff contracts without resale price maintenance (Bonnet and Dubois, 2008 and 2010; Bonnet, Dubois and Villas Boas (2009)).

Manufacturers offer two-part tariffs contracts which consists of wholesale prices w_j and franchise fees F_j paid by the retailer for selling the product j to the manufacturer but also retail prices p_j since manufacturers can use resale price maintenance. Then retailers simultaneously accept or reject the offers that are public information. If one offer is rejected, all contracts are refused. If all offers have been accepted, retailers simultaneously set their retail prices and demand and contracts are satisfied.

Let S_r define the set of products sold by the retailer r and S_f the set of products produced by the manufacturer f.

In the case of these two part tariffs contracts, the profit function of retailer r is

$$\Pi^r = \sum_{j \in S_r} [M(p_j - w_j - c_j)s_j(p) - F_j]$$

where c_j the constant marginal cost of distribution of product j and $s_j(p)$ the market share of the product j. The profit function of firm f is equal to

$$\Pi^f = \sum_{k \in S_f} [M(w_k - \mu_k)s_k(p) + F_k]$$

where μ_k represents the constant marginal cost of production of product j. Manufacturer f chooses the terms of the contracts (p_j, w_j and F_j) in order to maximize profits Π^f subject to the following retailers' participation constraints for all $r = 1, .., R$, $\Pi^r \geq \overline{\Pi}^r$.

If we consider the case where wholesale prices are such that the retailers add only retail costs to the wholesale prices and thus the retailer's price cost margins are zero ($p_k^*(w_k^*) - w_k^* - c_k = 0$), we deduce from this model, an expression for the price-cost margins of the manufacturer f :

$$\sum_{k \in S_f} (p_k - \mu_k - c_k) \frac{\partial s_k(p)}{\partial p_j} + s_j(p) + \sum_{k \in \{J',..,J\}} (p_k - \mu_k - c_k) \frac{\partial s_k(p)}{\partial p_j} = 0 \quad \text{for all } j \in G_f \tag{2}$$

where products in $\{J', .., J\}$ are private labels.[2]

Given the vertical supply model assumptions a price cost margin is obtained $\Gamma_{jt} = p_{jt} - \mu_j - c_j$ for the product j and a corresponding marginal cost $C_{jt} = \mu_j + c_j = p_{jt} - \Gamma_{jt} follows.$

4.2 Cost Shock Simulation

Given these marginal costs $C_t = (C_{1t}, ..., C_{Jt})$ and the other estimated structural parameters, we are able to simulate an upstream cost shock λ and equilibrium prices are deduced from the following minimization program

$$\min_{\{p_{jt}^*\}_{j=1,..,J}} \|p_t^* - \Gamma_t(p_t^*) - \lambda \times C_t\|$$

where $\|.\|$ is a norm of $\mathbb{R}^J$. In practice we will take the euclidean norm in $\mathbb{R}^J$.

The cost pass-through is estimated from the difference between observed prices and new equilibrium prices in the case of a cost shock. We investigate the asymmetry of cost pass-through simulating both a cost increase (for instance, $\lambda = 1.1$) and a cost decrease (for instance, $\lambda = 0.9$) and comparing the magnitude of this both cost pass-through given the structural model.[3]

5 Results

In this section, we first present results from the estimation of consumers demand to assess asymmetric consumer price response to an increase or decrease in retail prices. Then, we show how cost pass-through could differ in magnitude according to the sign of the change in cost.

5.1 Consumer Price Response

Table 4 shows the estimated instrumental variable demand parameters given a random coefficient specification under two models. Model 1 does not take into account the different consumer

[2] For expressions for private labels margins see in Bonnet and Dubois (2010).

[3] It has to be noted that equilibrium prices depend only on total marginal cost. Thus, the effect of production or distribution cost shocks that result in the same total marginal cost will always be the same.

TAB. 4 – **Demand Estimates (standard errors are in parenthesis).**

	Model 1 Mean (Std)	**Model 2** Mean (Std)
Price (α^1)	-0.74 (0.02)	-0.73 (0.03)
Price$\times 1_{[p_t - p_{t-1} > 0]}(\alpha^2)$		0.12 (0.06)
Price (σ)	0.16 (0.08)	0.18 (0.09)
Promotion rate	-0.24 (0.07)	0.43 (0.35)
Arabica coffee rate	2.63 (0.25)	1.64 (0.56)
Robusta coffee rate	-0.38 (0.11)	0.15 (0.30)
Bean coffee rate	-1.52 (0.25)	-2.09 (0.40)
Caffeine-free coffee rate	-0.27 (0.16)	-1.08 (0.43)
$\delta_j, \eta_{y(t)}$ and $\eta_{m(t)}$ not shown		
GMM objective (*df*)	3.67($\chi^2(7)$)	2.25($\chi^2(7)$)

price response when prices increased or decreased whereas the model 2 does so. According to the GMM objective function, the set of instruments used is valid since the test statistic of the Hansen (1982) test, the GMM objective, is lower than the critical value the a Chi Deux of 7 degree of freedom. While both models suggest a negative estimated price coefficient, when consumers are faced with a price increase, their price sensitivity significantly decreases. We note that the promotion rate is negatively correlated with utility when we do not account for asymmetric consumer price responses and the estimated coefficient becomes positive and non significant in model 2. We obtain the same behavior for the robusta coffee rate characteristics. For both models, the coefficient related to the arabica coffee rate is positive and significant, meaning that consumers prefer arabica characteristics relative to the bean and the caffeine-free characteristics.

The random coefficients logit model gives different and significant price elasticities when prices increase and decrease. Table 5 represents for each brand the own price elasticities in both cases and for each models. We obtain -4.58 (1.01) and -3.65 (0.65) for own price elasticities when prices increase in models 1 and 2 respectively, and –4.36 (1.00) and -4.20 (0.91) in the opposite case for models 1 and 2 respectively. Whether own price elasticities seem to be close when consumers face to a price decrease, we obtain a significant difference when prices increase. We over estimate consumer price response by 30% in average when they face to price increase if we do not take into account an asymmetric price response in the utility specification. We also see that own price elasticities are different across brands and the over estimation of own price elasticities could vary from 27% to 35% according the brand.

TAB. 5 – **Own price elasticities from the Random Coefficients logit Model (standar errors are in parenthesis).**

	Model 1		Model 2	
	$\Delta p > 0$	$\Delta p \leq 0$	$\Delta p > 0$	$\Delta p \leq 0$
Brand 1	-5.96 (0.38)	-5.77 (0.33)	-4.40 (0.26)	-5.48 (0.31)
Brand 2	-3.95 (0.43)	-3.58 (0.43)	-3.10 (0.31)	-3.49 (0.40)
Brand 3	-5.08 (0.50)	-4.61 (0.55)	-3.87(0.34)	-4.44 (0.50)
Brand 4	-5.07 (0.73)	-4.66 (0.74)	-3.85 (0.46)	-4.48 (0.68)
Brand 5	-3.83 (0.80)	-3.24 (0.57)	-3.01 (0.57)	-3.17 (0.55)
Brand 6	-5.58 (0.49)	-5.07 (0.62)	-4.18 (0.32)	-4.86 (0.56)
Brand 7	-3.90 (0.39)	-3.66 (0.40)	-3.06 (0.28)	-3.57 (0.38)

5.2 Cost Pass-Through

From the demand model estimates, we are able to compute estimated margins from the supply model in section 4.1. We obtain in average 35.08% with a standard deviation 7.90. Taking the difference between observed prices and estimated margins, we can estimate marginal cost for each product at each period in our French Coffee data which amounts to €4.61 (1.61 for standard deviation).[4]

Given the estimated models, we simulate a range of negative and positive shocks (between -100% and 100%) to obtain a distribution of cost pass-through estimates. The first step is to estimate the impact of the cost shock on the total marginal cost of coffee products. We use an OLS regression of the marginal cost estimated from the demand and supply models on the raw coffee price and product and time fixed effects (see table 7 in appendix for results in both demand cases). Marginal cost changes correspond to 84% of the simulated raw cost shock, that is when the raw coffee shock increases by 10%, the impact of the total marginal cost is by 8.4%, and that is true for the marginal cost estimated from both demand models.

The cost pass-through estimated, which is defined by the ratio of the difference in final retail price and the difference in raw coffee cost shock, is illustrated by the Figures A and B when asymmetric consumer price response are and are not considered. Without considering asymmetric consumer price responses Figure A suggest that few difference exists between the effect of a positive and of a negative cost shock on retail prices. Both imply a pass-through around 1, event if a positive

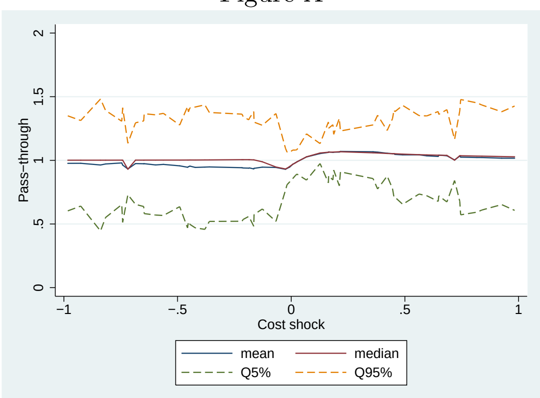
[4]In the model 1 case, that is without considering asymmetric consumer price response, margins are underestimated, 30.21 (7.29) on average, and marginal costs are then overestimated. Indeed we obtain 4.95 (1.73) on average, which consists in an error of estimation by 7% in average.

Tab. 6 – **Regression of Pass-through on cost shock variables and product characteristics.**

	With asymmetric consumer price response
Retailer 1	-0.002 (0.001)
Retailer 2	0.000 (0.001)
Retailer 3	0.002 (0.001)*
Retailer 4	0.006 (0.001)**
Retailer 5	0.001 (0.001)
Retailer 6	0.003 (0.001)**
Manufacturer 1^{+}	0.163 (0.002)**
Manufacturer 1^{-}	-0.047 (0.001)**
Manufacturer 2^{+}	0.081 (0.002)**
Manufacturer 2^{-}	0.010 (0.002)**
Manufacturer 3^{+}	0.045 (0.002)**
Manufacturer 3^{-}	-
Private labels^{+}	0.077 (0.002)**
Private labels^{-}	0.013 (0.002)**
Cost variation^{+}	0.233 (0.003)**
Cost variation^{-}	-0.245 (0.003)**
Cost variation$(> 50\%)^{+}$	-0.123 (0.003)**
Cost variation$(>50\%)^{-}$	0.132 (0.003)**
Const	1.073 (0.004)**
Month fixed effects	Yes

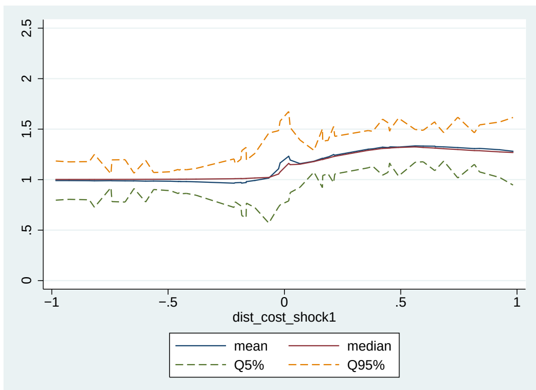
cost shock slightly implies a pass-through above one and a negative cost shock below one. On the contrary, Figure B suggest that a positive raw coffee shock is more passed on than a negative raw coffee shock when considering asymmetric price response. We also obtain that the pass-through tends to decrease after a positive cost shock greater than 50%. Small negative cost shock would slightly transmit more than 1 whereas after a negative 10% cost shock, the pass-through seems to converge to one. We also remark that a low cost shock (under 3% cost shock), whatever the sign of the shock, is more transmitted.

Figure A



Without asymmetric consumer price responce

Figure B



With asymmetric consumer price response

Table 6 shows the results of the regression of estimated pass-through on cost shock variables and on product characteristics when we take into account the asymmetric price response of consumers in the demand model. We try to explain the estimated pass-through by a dummy for each retailer (the retailer 7 is in reference) that could capture the different price transmission behavior of retailers, by a dummy for each of the three manufacturers and for private labels as well allowing a different effect on pass-through computed from a negative cost shock and on ones computed from a positive cost shock. We also choose as explanatory variables the value of the cost shock differentiating negative and positive shocks and allow for different effects whether the cost shock is greater than 50%. We control for the time period as well. We find weak differences across retailers. Few coefficients of retailers fixed effects are significant and the value of significant ones is low. Concerning manufacturers dummies, their effect is larger on pass-through than the retailers dummies, meaning the role of manufacturers in the price transmission of cost shock is greater than the role of retailers[5]. We also see that private labels transmit more negative shocks that the three other manufacturers whereas their price transmission of a positive cost shock is lower than manufacturers 1 and 2. We face to some heterogeneity across manufacturers in the price transmission of a cost shock. Results from cost shock variables show that the pass-through from a positive cost shock increases with the level of the shock whereas we find the opposite result for negative cost shocks. We also find that large positive cost shocks (greater than 50%) are less transmitted and large negative cost shocks are more transmitted. Taken as a whole, we see that cost shocks are more transmitted to the consumer price than the variation in cost and positive cost shocks are more transmitted than negative ones as we saw in the previous graph as well.

6 Conclusion

In this paper, we present empirical evidence on the role of possible asymmetries in consumers' price responses into explaining asymmetric cost price pass-through. For that, we use a structural econometric model that allows to recover marginal costs from prices, market shares and product characteristics. Given the demand and supply model we estimate marginal cost. From estimated cost we simulate shocks and find the resulting simulated new equilibrium prices. Introducing the

[5] This result coul be seen as a consequence of the supply model assumed. Indeed, we consider that manufacturers have all bargaining power and they impose to retailers the consumer prices. However, Rey and Vergé (2010) show the price equilibrium would be the same whether one assume that retailers have all the bargaining power. Only the sharing of the profit would change. The estimated marginal cost and then the estimated pass-through would be the same. Hence, this result is not an artefact of this assumption.

possibility of consumers reacting differently to a price increase or decrease, we find that French households are less sensitive to a price increase than to a price decrease on the Coffee Market. This implies different magnitudes of a cost pass-through according to the sign of the cost shock simulated. A positive cost shock is more transmitted than a negative one.

For future research, this work could be extended estimating price thresholds from which the consumer differently reacts to a price variation. To taclke this point we need to use Bayesian method as in Terui and Dahana (2006).

7 Reference

Berry, S., J. Levinsohn and A. Pakes, 1995. "Automobile Prices in Market Equilibrium," *Econometrica*, 63 (4) : 841-890.

Bonnet C. and P. Dubois (2008), Non Linear Contracting and Endogenous Buyer Power between Manufacturers and Retailers : Identification and Estimation on Differentiated Products, IDEI Working Paper, n°519, décembre 2008

Bonnet C. and P. Dubois (2010), Inference on Vertical Contracts between Manufacturers and Retailers Allowing for Non Linear Pricing and Resale Price Maintenance, RAND Journal of Economics, vol 41(1), pp 139-164 .

Bonnet, C., P. Dubois, D. Klapper and S.B. Villas-Boas (2012), Empirical evidence on the role of nonlinear wholesale pricing and vertical restraints on cost pass-through, Review of Economic and Statistics, forthcoming

Bonnet C. and V. Réquillart (2012), Sugar Policy Reform, Tax Policy and Price Transmission in the Soft Drink Industry, TRANSFOP Working paper, n°4, January

Borenstein, S., Cameron, A.C. and Gilbert, R., 1997. Do Gasoline Prices respond asymmetrically to Crude Oil Price Changes ?, *Quarterly Journal of Economics,* 112 :305-339.

Gupta S. and L. G. Cooper (1992), The Discounting of Discounts and Promotion Thresholds, Journal of Consumer Research, 19 (Dec), 401-411

Han S., S. Gupta, and D. Lehmann (2001), Consumer Price Sensitivity and Price Thresholds, Journal of Retailing, 77, 417-424

TAB. 7 – **OLS regression of the marginal cost estimated.**

Marginal cost estimated	Model 1 Mean (Std)	Model 2 Mean (Std)
Raw	0.052 (0.001)	0.048 (0.001)
Product fixed effects	Yes	Yes
Time fixed effects	Yes	Yes
R^2	0.96	0.96
Number of observations	5671	5671

Kalyanaram G., and J. D. C. Little (1994), An Empirical Analysis of Latitude of Price Acceptance in consumer Package Goods, Journal of Consumer Research, 21(Dec), 408-418

Kalyanaram G., and R. S. Winer (1995), Empirical Generalizations from Reference Price Research, Marketing Science, 14 (3), G161-G169

Krishnamurthi L., T. Mazumdar, and S. P. Raj (1992), Asymmetric Response to Price in consumer Brand Choice and Purchase Quantity Decisions, Journal of Consuemr Research, 19(Dec), 387-400

Müller G., and S. Ray (2007), Asymmetric Price Adjustment : Evidence from Weekly Product-Level Scanner Price Data, Managerial and Decision Economics, 28, 723-736

Noel, M., 2009. "Do Retail Gasoline Prices Respond Asymmetrically to Cost Shocks ? The Influence of Edgeworth Cycles." *The RAND Journal of Economics* 40 (3) : 582-595

Nevo, A., 2001. "Measuring Market Power in the Ready-to-Eat Cereal Industry," *Econometrica* 69 (2) : 307-342.

Pauwels K., S. Srinivasan, and P.H. Franses (2007), When Do Price Thresholds Matter in Retail Categories, Marketing Science, 26 (1), 83-100

Peltzman S. (2000), Prices Rise Faster than They Fall, Journal of Political Economy, 108 (3), 466-502

The New York Times, 2008. http ://www.nytimes.com/2008/04/30/opinion/30friedman.html ?

Terui N. and W. D. Dahana (2006), Estimating Heterogeneous Price Thresholds, Marketing Science, 25(4), 384-391

8 Appendices

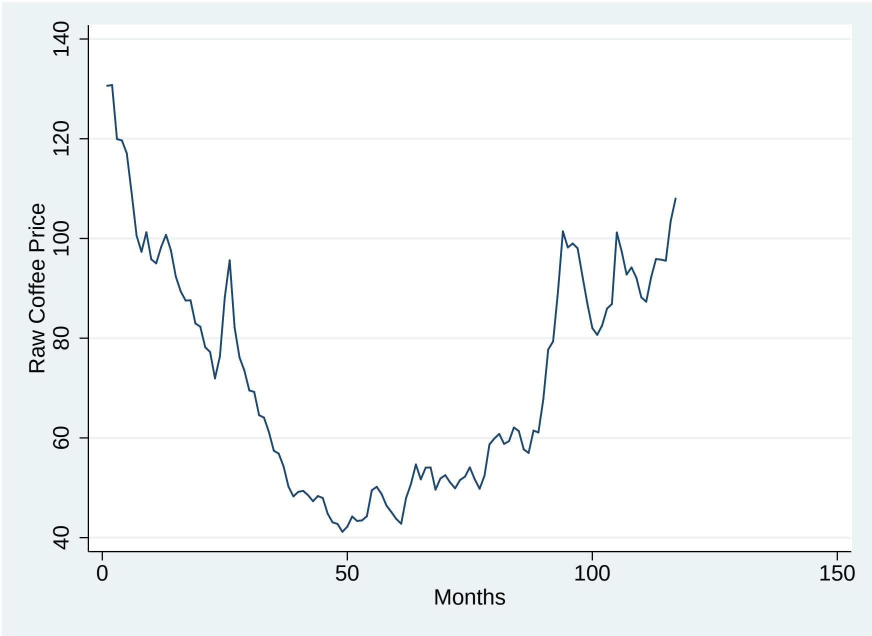


FIG. 1 – Raw Coffee Price from 1998 to 2006

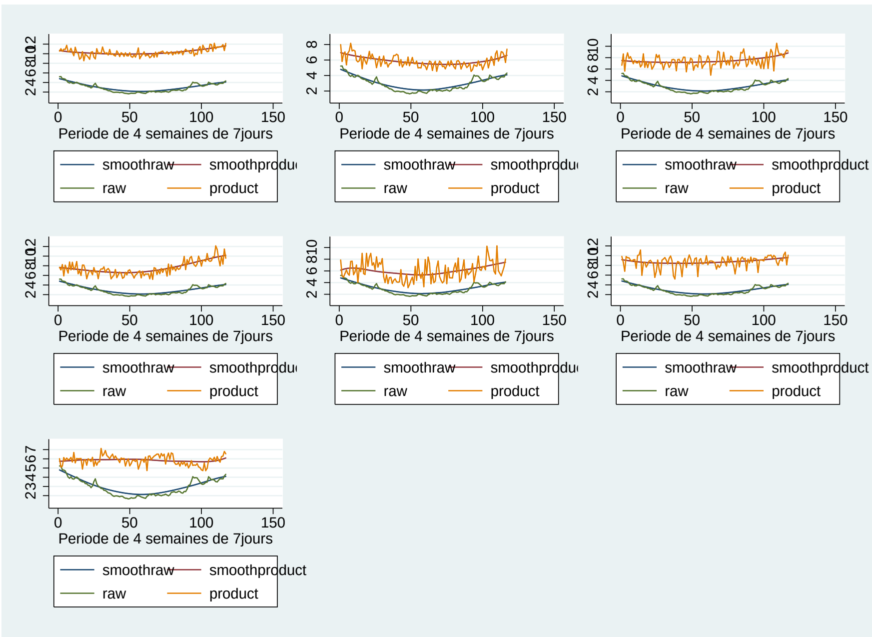


FIG. 2 – Raw coffee price and brand prices in a retailer.