

The Importance of Brand Name and Quality in the Retail Food Industry

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Abstract

This paper analyzes the role of brand name recognition and product quality on the competition between national brands and private labels in the retail food industry. Theoretical and empirical evidence is provided to show that both marketing tools play a significant role, but in quite different ways. Quality improvements by one firm will intensify the competition; one firm will gain at the expense of its competitor. Whereas, increasing brand name recognition relaxes the competition, and both firms can gain.

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1. Introduction

This research investigates the impact of brand name recognition and product quality on the retail price premiums that national brand products typically command over private labels (store brands) in the retail food industry. Previous studies do not separate these two effects. Historically, private labels have been considered close substitutes of the national brands. And in this view researchers have mainly focused on the relationship between prices and market concentration (Weiss (1989), Cotterill (1994)), profits and concentration Connor and Peterson (1992), and brand proliferation in price setting (Putsis 1997). Even though these studies found that successful private label penetration lowers the average price of national brands, they did not address the quality issue; moreover, they assumed that intrinsic quality of both, private labels and national brands, is the same. Only a few studies have considered the relationships among quality, branding, and prices in one framework. Milgrom and Roberts (1986) showed theoretically that advertising and prices are credible signals of quality, and Montgomery and Wernerfelt (1992) argued that brand names help reduce buying risk. These studies, however, cannot be used to analyze the retail food industry where retail food products are considered *experience goods* Nelson (1970) and, therefore, their quality is evident, and there is no need for quality signaling through branding or pricing.

Defining this "substitution relationship" between national brand and private labels in terms of both brand name and quality has two advantages over previous work. First, I can model cases where one manufacturer produces both private labels and national brands, a situation in which products are of identical intrinsic quality but are distributed under different brand names. In addition, I can account for the competitive advantage that national brands have over private labels as a function of branding, regardless of the quality differences. The second advantage of this definition is its empirical contribution. Both quality and brand name are variables that can be measured or estimated, thus empirical evidence can be provided to test the hypotheses of interest.

In the first of two models of this paper, I consider price competition between national brands and private labels, treating both quality and brand name as exogenous, and by that focusing the analysis on the impact of both quality and brand name on the market. One interesting outcome of this model is the different effect these product attributes have on competition. Specifically, a quality increase by one firm is shown to lead to an increase in its price which, in turn, will trigger a price decrease by the competing firm. But an increase in brand name recognition, as a result of, for instance, effective advertising by one firm will cause both firms to increase prices. Thus, this model proposes that quality intensifies competition while brand name lessens competition.

This hypothesis is tested empirically. Data are collected from *Consumer Reports* on 756 brands from 78 different food categories. Using OLS, fixed and random effects regression estimations, I show that quality has a positive impact on own price and a negative impact on competitor's price, while brand name has a positive impact on both prices.

The paper's second model relaxes the restriction that product quality is exogenous, and models a setting of a two-stage game in which firms first choose quality and in the second stage set prices. In this case, the first finding is that national brand firms produce high quality products compared to private labels. In addition, it is shown that branding inversely impacts the quality level of products; as branding increases, the branding firm lowers its product's quality whereas the unbranded firm increases its product's quality.

2. General Model Description

Consider a framework in which two firms sell directly to the consumer closely substitutable products, which differ in quality and brand name. Following the work by Mussa and Rosen (1978) and Cooper (1984) on self-selection, consumers choose the one product that will give them the highest utility (self-selection). Let consumer c 's utility from consuming product i be

$U_i^c(q, b) = \alpha^c q_i + \beta^c b_i + w^c - p_i$ where q_i and b_i are the objective quality and brand name recognition levels of product i respectively, and α^c and β^c are consumer c 's willingness to pay for quality and brand name respectively, and w^c is the consumer's wealth. Note that the products considered in this paper are experience goods, and therefore, it is natural to assume that consumers know the objective quality of the products. Brand name recognition, on the other hand, is not objective; each consumer perceives brand name differently. Thus, I will assume that the consumers are homogeneous in their willingness to pay for quality ($\alpha^c = \alpha$ for all consumers) but are heterogeneous in their willingness to pay for brand name (β varies across individuals).

Thus, assuming that consumer c 's income is sufficiently high to purchase both goods the consumer c 's demand for national brands is; $D_n^c = \begin{cases} 1 & \text{if } \beta^c b_n + \alpha q_n - p_n > \alpha q_p - p_p \\ 0 & \text{if } \beta^c b_n + \alpha q_n - p_n < \alpha q_p - p_p \end{cases}$ and his demand for private labels is; $D_p^c = \begin{cases} 1 & \text{if } \beta^c b_n + \alpha q_n - p_n < \alpha q_p - p_p \\ 0 & \text{if } \beta^c b_n + \alpha q_n - p_n > \alpha q_p - p_p \end{cases}$ and, given these conditions, each consumer chooses one and only one of the two products and without any loss of generality I normalize the brand name level of the private label to be zero (i.e. $b_n = b$ and $b_p = 0$).

In deriving the market demand for the two products, suppose there is a continuum of consumers with β uniformly distributed on $[0, 1]$ with a density 1. The market will segment around the indifferent consumer, whose willingness to pay for brand name (β^I) is

$$\beta^I = \frac{p_n - p_p - \alpha(q_n - q_p)}{b}. \quad (1)$$

Since the total market is normalized to one and all consumers with $\beta < \beta^I$ prefer the private label product to the national brand the market demand for the private label firms is $D_p(p_p, p_n) = \beta^I$ and the market demand for the national brand is $D_n(p_p, p_n) = 1 - \beta^I$.

3. First Model: Quality and Brand Name Fixed

This model analyzes the case in which quality and brand name are predetermined. Even though, this simplifying assumption may be view as not very realistic, only in this setting the impact of quality and brand name on the market can be analyzed. Section 2 of this paper, however, relaxes this assumption and considers optimizing both quality and prices.

Sellers simultaneously set prices in a Bertrand-Nash competition to maximize profit and since quality and brand name are predetermined the production costs are treated as sunk costs and normalized to zero. Equilibrium values of price, market share and profit are reported in Table 1.

Table 1 Equilibrium Values

Optimal Value	National brand	Private label
Prices	$P_n^* = \frac{2}{3}b + \frac{\alpha}{3}(q_n - q_p)$	$P_p^* = \frac{1}{3}b - \frac{\alpha}{3}(q_n - q_p)$
Market Share	$1 - \beta^I = \frac{2}{3} + \frac{\alpha}{3b}(q_n - q_p)$	$1 - \beta^I = \frac{1}{3} - \frac{\alpha}{3b}(q_n - q_p)$
Profit	$\Pi_n^* = \frac{(2B + \alpha(q_n - q_p))^2}{9b}$	$\Pi_n^* = \frac{(B - \alpha(q_n - q_p))^2}{9b}$

Following the comparative static, reported in the appendix (Table 2A), we learn that an increase in brand name by the national brand will increase *both* prices which will consequently change market shares according to relative differences in quality, but ultimately increases the profits to both firms (in most cases). The intuition of this result is that brand name differentiation is non-threatening to the private label because the value of brand name is not the same to all consumers. Thus an increase in brand name affects only a segment of the market and both firms can increase prices. Quality, on the other hand, has a more uniform impact on the market given the nature of consumers' willingness to pay for it. An increase (decrease) in own (competitor) quality will increase (decrease) prices, market share and profits. Which leads to the following proposition: *Quality intensifies the price competition while brand name lessens price competition.*

4. Estimation

The proposition derived from the theoretical model is tested empirically, using data collected from *Consumer Reports*, on the pricing equations from Table 1, which predict that brand name positively impact *both* prices as opposed to quality which diversely impacts prices.

Quality: *Consumer Reports* uses laboratory tests, controlled-use tests, and expert judgment of purchased samples to evaluate product quality, and gives an overall quality rating to each brand by a line measured on an interval of zero to a maximum of 3.5 centimeters. To measure this rating I simply used a ruler, and reported this value as the objective quality value of each brand.

Price: The price of an item is based on a nationwide survey of supermarkets conducted by *Consumer Reports*. When the item varies by size or weight, its price per unit size or per unit weight is used. Finally, price data across different years are not deflated because the price levels are measured relative to the mean price of each product category, which is of the same year.

Brand name: products were classified into two groups: national brands and private labels using Stetler (1993) to identify the owner of the brand. And by assuming that national brand products have brand name recognition, as opposed to private labels, the brand name variable becomes a Dummy variable. The resulting sample consists of 756 products from seventy-eight product categories with at least one private label in each category.

To pool all the data into one regression equation the dependent variable 'price' was modified to the percent price in the product's product category. The independent variable 'own quality' was used as reported, whereas, the 'competitor's quality' is the average quality of all competing products in the category. Following the above adjustments the econometric model, is specified as follows:

$$P_i = \alpha_0 + \alpha_1 D_i + \alpha_2 I_i \cdot \Delta Q_i + u_i, \quad (2)$$

where $D_i = \begin{cases} 1 & \text{if } i = \text{National Brand} \\ 0 & \text{if } i = \text{Private Label} \end{cases}$ and $I_i = \begin{cases} 1 & \text{if } i = \text{National Brand} \\ -1 & \text{if } i = \text{Private Label} \end{cases}$, the error term $u_i \sim N(0, \sigma_u^2)$.

In Equation (2), the parameters α_1 and α_2 capture the effects of brand name and quality difference, respectively, on relative prices.

The empirical analysis consists of three linear model estimations. First the OLS model is used assuming there are no cross category differences, assuming that the error term is distributed $u_i \sim N(0, \sigma_u^2)$. The estimated parameters and t-values, reported in the first column of Table 2, show that both brand name and quality are positive, as predicted, and statistically significant (5%).

Table 2 Estimation Results of Empirical Models

Parameters	Theoretical Predictions	OLS		Fixed Effects		Random Effects	
		Estimates	t-values	Estimates	t-values	Estimates	t-values
Brand name α_1	Positive	0.2194	9.54	0.2413	9.64	0.2243	9.27
Quality gap α_2	Positive	0.0863	4.61	0.1016	4.92	0.0901	4.56
Constant α_0	Positive	0.8492	47.8			0.8469	43.3
Adjusted R ²		0.1819		0.2061		0.1839	
F-test: Fixed Effects vs. OLS Model				87.653		0.00 (p- value)	
Hausman test: Fixed vs. Random Effects Model				14.443		0.00 (p-value)	

To account for the variability across product categories fixed effects and random effects models were also estimated. The fixed effects model captures the price differences across product categories by estimating category-specific intercept terms, α_{0j} . When comparing the OLS model with the fixed effect model (second column of Table 2), we notice that the adjusted R^2 increases and the signs remain the same. In addition, the magnitude and statistical significance of the estimates are comparable across the two estimation methods, thus enhancing the confidence in the empirical results. Using the F test, we reject the OLS model in favor of the fixed effects model. The results of the third model which estimated the random effects by assumes that the intercept varies randomly across product categories; that is, $\alpha_{0j} \sim N(\alpha_0, \sigma_\alpha^2)$ are reported in the third column

Table 2). Even though, the results of this model are supportive of our theory, there is no added value in this estimation (based on Hausman test), thus, we retain the fixed effects model.

Overall, the estimated parameters are stable across the three estimations in support of the proposition that quality intensifies the competition between national brands and private labels in the food industry while brand name lessens this competition.

5. Second Model: Endogenous Quality

Common economic sense argues that quality and brand name is chosen to the extent that the marginal cost equals the marginal benefit (Dorfman and Steiner 1953). Thus, if all firms are identical, they will choose the same level of quality and brand name. If this were the case, following Bertrand's law, prices would equal marginal cost and the firms would make zero profits. To avoid this throat-cutting price competition, firms differentiate their products. Given primary focus this paper to analyze the competition between national brands and private labels, and that national brands are advertised nationwide while private labels are not, I will assume that national brands have brand name recognition while private labels do not.¹ Which leads to the question; given the difference in brand name to what extent will firms differentiate with respect to quality too? Given the difference in the impact of brand name versus quality on consumers, I show that in a pure strategy game, when one firm has brand name recognition advantage, firms will also choose to differentiate themselves through quality too. Even though this result seems to be in contradiction to the result presented by Vandebosch and Weinberg (1995), who claim that in equilibrium the two firms tend to choose positions which will present maximum differentiation on one dimension and minimum differentiation on the other dimension. The difference in the

¹ I make this distinction between product quality and brand name recognition for two reasons: First, product quality in the food industry in particular, is relatively easily modified (in terms of time), whereas, building brand name recognition requires a long time period. Second, if private labels increase their brand name they will lose their identification and become like any other competing brand (Mills 1995).

results of the two papers lays in the models' specification. Whereas they assume consumers vary in their willingness to pay for quality, in this paper consumers' willingness to pay for quality is uniform.

6. Model Description

This model is an extension of the one specified in the Section 1.2, except that now the sellers choose quality along with price (i.e., endogenous quality). For this purpose a general quality-cost function, as specified by Banker et al. (1998), is used, where the national brand firm's cost function is $C_n(q_n) = (v + \epsilon q_n) \cdot (1 - \beta^I) + f + \phi(q_n)^2$ and the corresponding private label cost function is $C_p(q_p) = (v + \epsilon q_p) \cdot \beta^I + f + \phi(q_p)^2$. In this setting, the quality level affects the total production cost in two ways. First, the product's quality level impacts the marginal cost of production (ϵ). Second, investment in quality increases fixed cost (ϕ), which is increasing and convex in quality. There are also two parameters that are independent of the product's quality level; marginal unit costs (v) and fixed cost (f).

In solving this two-stage game, I start from the second stage, price setting, and then find the optimal quality, i.e., solving by backward induction. Given the cost function as specified above, the national brand profit function is; $\Pi_n(q_n) = (P_n - v - \epsilon q_n) \cdot (1 - \beta^I) - f - \phi(q_n)^2$, and the private label's profit function is $\Pi_p(q_p) = (P - v - \epsilon q_p) \cdot \beta^I - f - \phi(q_p)^2$. The first order conditions define the equilibrium in prices. Both profit functions are concave in prices, and thus, solving for both prices simultaneously yields a unique equilibrium as a function of the product quality. The optimal national brand price; $P_n(q_n, q_p) = v + \epsilon q_n + \frac{1}{3}[2b + (\alpha - \epsilon)(q_n - q_p)]$ and the optimal private label price is; $P_p(q_n, q_p) = v + \epsilon q_p + \frac{1}{3}[b - (\alpha - \epsilon)(q_n - q_p)]$. Note that the expressions in the square brackets

indicate the pricing over the marginal cost that is due to the product differentiation.² The quality equilibrium is found by inserting the optimal pricing equations (in terms of quality) into the profit functions, and differentiating them with respect to quality and equating the derivatives to zero.

The national brand and private label firms' quality reaction functions

are: $q_n(q_p) = \frac{2(\alpha - \varepsilon)b - (\alpha - \varepsilon)^2 q_p}{9\phi b - (\alpha - \varepsilon)^2}$, and $q_p(q_n) = \frac{(\alpha - \varepsilon)b - (\alpha - \varepsilon)^2 q_n}{9\phi b - (\alpha - \varepsilon)^2}$ respectively.⁽³⁾

In addition to the general parameter restriction on the Nash solution (as specified in footnote 3) a boundary limit on the market share, $0 < \beta < 1$, must be imposed. This last restriction is

the most binding restriction on the parameters where $b > \frac{(\alpha - \varepsilon)^2}{3\phi}$. And given this restriction the

reaction curves intersect and the Nash solution for the national brand is $q_n^N = \frac{(\alpha - \varepsilon)^3 - 3B\phi(\alpha - \varepsilon)}{3\phi(2(\alpha - \varepsilon)^2 - 9\phi B)}$,

and the Nash for the private label is $q_p^N = \frac{(\alpha - \varepsilon)^3 - 6B\phi(\alpha - \varepsilon)}{3\phi(2(\alpha - \varepsilon)^2 - 9\phi B)}$.

It is interesting to see that the quality difference defined as

$$\Delta q^N \equiv q_n^N - q_p^N = \frac{B(\alpha - \varepsilon)}{9\phi B - 2(\alpha - \varepsilon)^2} > 0$$

is positive, i.e., the optimal quality level of the branded

product is higher than that of the non-branded product.

Table 2 summarizes the equilibrium values as a function of the exogenous variables; the brand name level of the nation brand product (b), consumers willingness to pay for quality (α), brand name (β) and other cost specific parameters (ϕ, f and v).

² If the two firms had the same product quality ($q_n = q_p$) and if the national brand had no brand name ($b = 0$), the two products would be identical, and the equilibrium prices would equal marginal costs.

³ This result is valid under the restriction that both functions are strictly concave in quality thus $\Rightarrow 9B\phi > (\alpha - \varepsilon)^2$.

Table 3 The Nash Equilibrium

	Branded Product	Unbranded Product
Prices	$P_1^N = v + \frac{2B}{3} + \frac{\varepsilon(\alpha - \varepsilon)^3}{3\phi(2(\alpha - \varepsilon)^2 - 9\phi B)} + \frac{(\alpha - \varepsilon)(1 - F(\beta^1))}{3\phi}$	$P_2^N = v + \frac{B}{3} + \frac{\varepsilon(\alpha - \varepsilon)^3}{3\phi(2(\alpha - \varepsilon)^2 - 9\phi B)} + \frac{(\alpha - \varepsilon)F(\beta^1)}{3\phi}$
Market Share	$1 - F(\beta^N) = \frac{6B\phi - (\alpha - \varepsilon)^2}{9B\phi - 2(\alpha - \varepsilon)^2}$	$F(\beta^N) = \frac{3B\phi - (\alpha - \varepsilon)^2}{9B\phi - 2(\alpha - \varepsilon)^2}$
Quality	$Q^N = \frac{(6B\phi(\alpha - \varepsilon) - (\alpha - \varepsilon)^3)}{3\phi(9\phi B - 2(\alpha - \varepsilon)^2)}$	$q^N = \frac{(3B\phi(\alpha - \varepsilon) - (\alpha - \varepsilon)^3)}{3\phi(9\phi B - 2(\alpha - \varepsilon)^2)}$

The results bring to mind two related questions; First, given the national brand's comparative advantage due to the brand name associated with the product that it is selling, why does it also find it optimal to produce a higher quality product? Second, why does the private label firm choose to produce an inferior quality product and not compensate for the lack of brand name with high quality?

The intuition for this result is as follows: In the absence of any quality differentiation, the branded firm has the higher market share, and the net premium for producing quality on each unit sold is $(\alpha - \varepsilon)$. Thus, the marginal benefit to quality is greater for the branded firm. The marginal costs of producing quality, ϕq^2 , are the same for the two firms. Thus, the branded firm will always find it optimal to invest in higher quality. This explanation does reflect some realities of the market place. Branded products usually do have larger shares than store brands. Thus, investments by branded product firms in producing quality have the opportunity to pay off across their large market shares. Accordingly, they will invest more in quality (e.g., R&D) than will the small-share, private label producers.

The comparative static results with respect to brand name (reported in table 3A in the Appendix) indicate that brand name increases prices of both firms, increases the market share of

the national brand at the expense of the private labels and decreases the quality of the national brand and increase the quality of the private label. The intuition of these results is as follows. Even though, brand name increases the attractiveness of the national brand over the private label, it lessens the competition between the two products (see *proposition* in section 3 above) which, results in an increase in the market power of firm in its market segment. To appropriate this opportunity the firms change prices and quality as shown.

Following the same line of reasoning from the first model, both firms increase prices as brand name increases. But since the national brand firm is selling the high quality product (see Table 2 for the case in which $q_n > q_p$), it increases its price and decreases its quality which results in loss of market share. The private label firm, on the other hand, now with the increase in its market share can afford an increase in quality (due to the relative decrease in production cost of quality) along with a price increase. As a result, in a new equilibrium of higher branding, the national brand firm offers a lower quality product (than before the brand enhancement) with a higher brand name to a smaller market at a lower cost with higher profits. Whereas, the private label firm offers a higher quality product to a larger market at a higher price making more profits.

7. Summary

In analyzing the competition between national brands and private labels, it is evident that these products are similar but are not the same. From previous studies it is clear that researchers were aware of similarity between the products (see for example: Sethuraman (1995) and Mills (1995)) but all have considered private labels as substitutes of the national brands. My contribution to the literature is in defining this substitution relationship in terms of brand name and quality. Private labels can become closer substitutes as they increase the quality of their products, and national brands can differentiate by increasing the brand name recognition or the quality of their products. As I have shown, the impacts of brand name versus product quality on the market (prices, market-

share, profits and consumers) are different. Holding quality and brand name are constant it is shown, both theoretically and empirically, that brand name and quality have different effects on the market not only in magnitude but also in sign. Among other findings it is shown that the impact of brand name (holding quality constant -- model one) is conditional on the relative difference in quality. Which leads to the next model where a more flexible model is estimated and firms choose both price and quality of their products in a sequential setting. In the second model we see the tradeoff between branding and quality, when increasing branding the own product quality decreases and the competitors quality increase. In equilibrium, holding branding constant, the branded firm finds it more efficient to produce a high quality product compared with the non-branded product. This result brings to mind the anecdotal evidence that national brands have higher product quality compared to private labels.

Expressions for Comparative Static Results – Model 1

Table 1A presents comparative static, which are obtained by taking the derivatives of the equilibrium values in Table 1 with respect to the exogenous values q_n , q_p , and b .

Table 1A **Comparative Statics**

		<i>Quality</i> (q_n)	<i>Quality</i> (q_p)	<i>Brand</i> (b)
Price	Branded P^*	$\frac{\alpha}{3}$	$-\frac{\alpha}{3}$	$\frac{2d}{3}$
	Unbranded p^*	$-\frac{\alpha}{3}$	$\frac{\alpha}{3}$	$\frac{d}{3}$
Market Share	Branded $(1-F^*)$	$\frac{\alpha}{3Bd}$	$-\frac{\alpha}{3Bd}$	$-\frac{\alpha}{3B^2d}(Q-q)$
	Unbranded F^*	$-\frac{\alpha}{3Bd}$	$\frac{\alpha}{3Bd}$	$\frac{\alpha}{3B^2d}(Q-q)$
Profit	Branded Π^*	$\frac{2\alpha}{9Bd}[2Bd + \alpha(Q-q)]$	$\frac{-2\alpha}{9Bd}[2Bd + \alpha(Q-q)]$	$\frac{[2B \cdot d + \alpha(Q-q)][2B \cdot d - \alpha(Q-q)]}{9B^2 \cdot d}$
	Unbranded π^*	$\frac{-2\alpha}{9Bd}[Bd - \alpha(Q-q)]$	$\frac{2\alpha}{9Bd}[Bd - \alpha(Q-q)]$	$\frac{[B \cdot d + \alpha(Q-q)][B \cdot d - \alpha(Q-q)]}{9B^2 \cdot d}$

From Table 2A, note the following:

1. All the comparative statics with respect to quality have an unambiguous sign.
2. The sensitivity of market shares with respect to b depends on the relative magnitudes of quality differences ($q_n - q$). The market share of the branded product increases with b , and the market share of the unbranded product decreases with B , if $q_n > q$, and vice versa.
3. The profit of the branded product increases with B . The profit of the unbranded product increases with b only if $q > q_n$. Otherwise, this impact is ambiguous. This result follows from the fact that in equilibrium market share is between zero and one, which bounds the effect of relative quality difference, $\alpha(q_n - q_p)$. Thus, a positive share of an unbranded product implies

$F(\tilde{\beta}) = \frac{1}{3} - \frac{\alpha}{3b}(q_n - q_p) > 0$, which implies $\alpha(q_n - q_p) < Bd$. Similarly, a positive share of branded product implies $[1 - F(\tilde{\beta})] = \frac{2}{3} + \frac{\alpha}{3b}(q_n - q_p) > 0$, which implies $-2b < \alpha(q_n - q_p)$.

Expressions for Comparative Static Results – Model 2

Table 2A presents comparative statics, which are obtained by taking the derivatives of the equilibrium values in Table 5 with respect to the exogenous variable B.

Table 2A **Comparative Static**

		<i>Brand Differentiation (B)</i>	<i>Sign</i>
Price	Branded P_1^N	$\frac{2}{3} - \frac{\partial Q}{\partial B} \left \frac{2\alpha - \varepsilon}{3} \right $	+
	Unbranded P_2^N	$\frac{1}{3} + \frac{\partial q}{\partial B} \left \frac{2\alpha + \varepsilon}{3} \right $	+
Market Share	Branded $(1-F^N)$	$-\frac{3\phi(\alpha - \varepsilon)^2}{[9B\phi - 2(\alpha - \varepsilon)^2]^2}$	-
	Unbranded F^N	$\frac{3\phi(\alpha - \varepsilon)^2}{[9B\phi - 2(\alpha - \varepsilon)^2]^2}$	+
Quality	Branded Q^N	$-\frac{(\alpha - \varepsilon)^3}{[9B\phi - 2(\alpha - \varepsilon)^2]^2}$	-
	Unbranded q^N	$\frac{(\alpha - \varepsilon)^3}{[9B\phi - 2(\alpha - \varepsilon)^2]^2}$	+
Production Cost	Branded C_1^N	$(v + \varepsilon Q^N) \frac{\partial(1-F^N)}{\partial B} + \frac{\partial Q^N}{\partial B} (\varepsilon(1-F^N) + 2\phi Q^N)$	-
	Unbranded C_2^N	$(v + \varepsilon q^N) \frac{\partial(F^N)}{\partial B} + \frac{\partial q^N}{\partial B} (\varepsilon F^N + 2\phi q^N)$	+
Profit	Branded Π_1^N	$\frac{2}{3} - \frac{\partial Q^N}{\partial B} \left \frac{2\alpha - \varepsilon}{3} - \frac{3\phi}{(\alpha - \varepsilon)} + (v + \varepsilon Q^N) + (\varepsilon(1-F^N) + 2\phi Q^N) \right $	+
	Unbranded Π_2^N	$\frac{1}{3} + \frac{\partial q^N}{\partial B} \left \frac{2\alpha - \varepsilon}{3} - \frac{3\phi}{(\alpha - \varepsilon)} + v + \varepsilon q^N + \varepsilon F^N + 2\phi q^N \right $	+

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