# Measuring Brand Power by a Pricing Experiment:A Case Study of Kao's Pricing Research for Disposable Diaper 'Merries' in 1988

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# Measuring Brand Power by a Pricing Experiment: [1]

## A Case Study of Kao's Pricing Research for Disposable Diaper 'Merries' in 1988.

**Kohsuke Ogawa (Director of the Center for Business and Industrial Research, Hosei University)**

## 1. A Research Design for Pricing Disposable Diapers

Kao Corporation, a leading manufacturing company of toiletry and household products, had been suffering from weakening its market position in the disposable diaper market. After Procter and Gamble introduced its "New Pampers" brand into the Japanese market in 1987, Kao was losing a sizable sales volume to under 30% of market share (Figure A-1). Once in 1982-1984, Kao's "Merries" with newly invented polymer technology had grabbed a market share of more than 40%.

The marketing research department in Kao planned to conduct a price research to help a brand management team in charge of two sister disposables brands, Merries and Merries-E (economy-type of Merries). A market survey was designed to diagnose brand power and price sensitivity of Merries and Merries-E as well as competitor's brand power.

In 1988, there were five major brands in the disposable diaper market of Japan; i.e., "Pampers" (P&G), "Merries" (Kao), "Merries-E" (Kao), "Moony" (Uni-Charm), and "Mammy Poco" (Uni-Charm). Merries-E and Mammy Poco brands were both positioned to be popular or of an economy type. Other three brands were marketed as premium brands. Total share of these five brands accounted for more than 80 percent of the entire market (Figure A-1).

Since it is not permitted to disclose the specific brand names in public, alphabetical symbols (A to E) are used to represent these five brands. The questionnaire which the mothers had to respond comprised of two blocks. The first block consists of demographics of respondents, such as age of mother, age of baby (in terms of months), the number of children or babies they were caring. Face sheet also includes questions about which brands the respondents purchase most frequently, and at what types of retailers (supermarket or drug-store) they more often shop.

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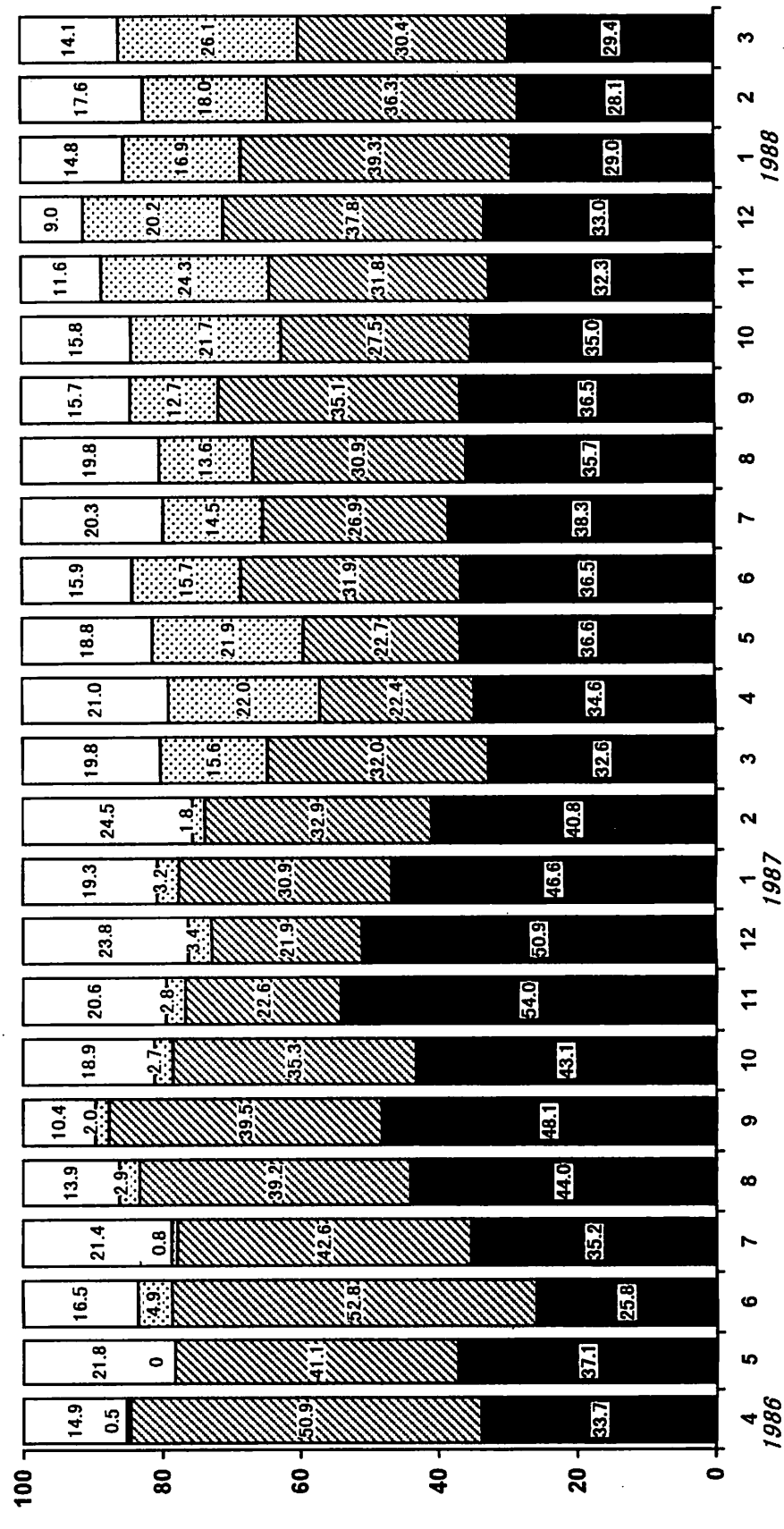
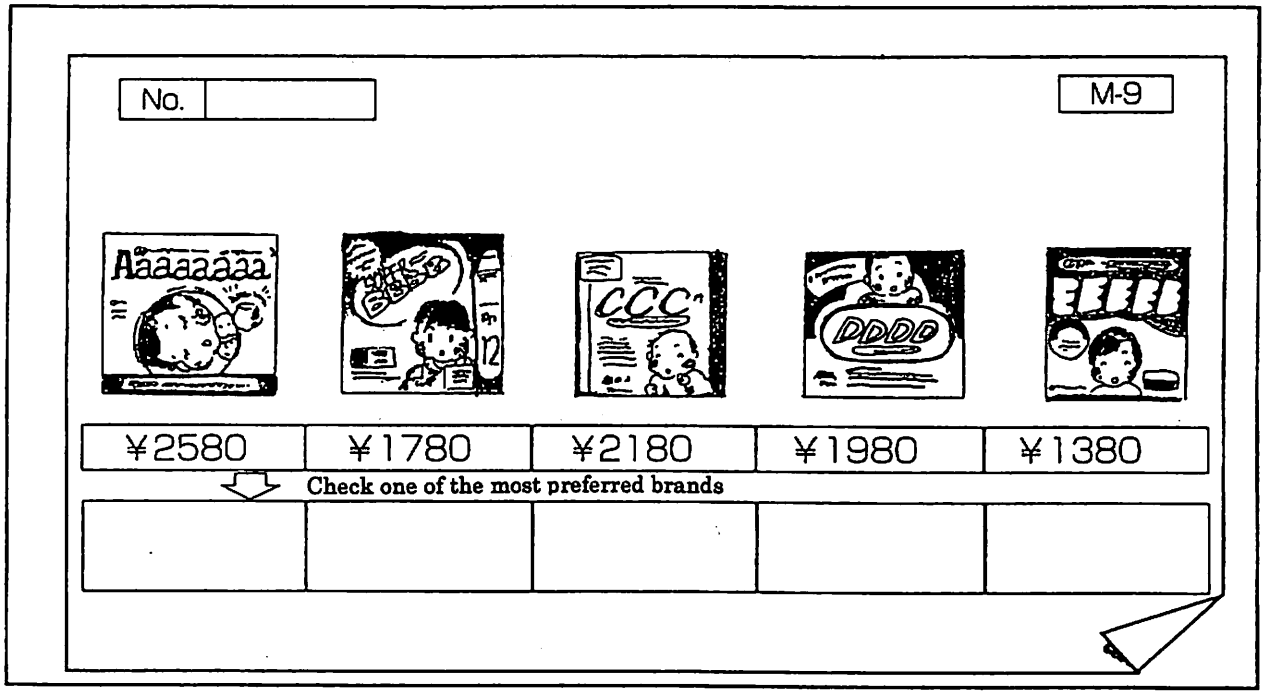
[1] Original article of this manuscript appeared in the February 15 (1996) issue of "Chain Store Age" (Japan). Ms. Kyoko Aoki helped me to translate original Japanese version into English.

Figure A-1 Change in Sales Volume(Kao's POS Data in 1988 April)
Market Shares of Disposable Diapers



The other block in the questionnaire is for price experiment by trade-off analysis. This section consists of a series of 17 consecutive questionnaire sheets. Figure 1 shows the layout of each page. Photographs of the product packages are put on according to an alphabetical order of A to E, with the sales prices attached to each photo (Figure 1). The respondents were instructed to check one brand of their most favorable profile among five brands with proposed prices attached for each page. Figure 1 illustrates the 9th of 17 sheets.

**Figure 1 Questionnaire Layout (Sample)**




## 2. A Factorial Design of Price and Brand Combinations

In designing the questionnaire sheet, price levels for each brand were selected based on the POS data (Point of Sale data). Scanner data was collected from three stores in the areas where this survey was conducted.

Although there were three sizes for disposable diapers, i.e., size M, size L and size LL, actual prices of sizes L and LL were almost same. The numbers of diaper sheets per package were arranged so that the sales prices of size M and L/LL (denoted as L later on) should be same. POS data indicated that, as expected, retail price of each brand was fluctuating within its particular range. As such, we could set a price of each brand to be any one of four levels, which would represent a realistic sales price when respondents buy a disposable diaper at retail shop.

As Table 1 indicates, the price levels were set with an interval of 200 yen, maintaining a fixed range of price fluctuation of 600 yen for all brands. Although the maximum and minimum prices were different among brands, four price levels were set for each brand (Table 1). Table 2 shows a resulting factorial design of brand and price combinations. From 1st to 16th profiles, one of the four price levels could appear four times for each brand. In the last profile set (Case #17), we set all prices to be at the same level of 1,980 yen per package. In order to compare brand strength, choice share of brand under the same price would be useful.

**Table 1 Brand Price Levels**

| Brand | Pieces per package (M/L) | Price levels (Yen) | | | |
|---|---|---|---|---|---|
| A | 48/42 | 2,580 | 2,380 | 2,180 | 1,980 |
| B | 42/36 | 2,180 | 1,980 | 1,780 | 1,580 |
| C | 48/48 | 2,380 | 2,180 | 1,980 | 1,780 |
| D | 48/48 | 1,980 | 1,780 | 1,580 | 1,380 |
| E | 42/36 | 1,980 | 1,780 | 1,580 | 1,380 |

**Table2 Combination of Price and Brand** (Yen)

| Case | Brand | | | | |
|---|---|---|---|---|---|
| | A | B | C | D | E |
| 1 | 2,580 | 2,180 | 2,380 | 1,980 | 1,980 |
| 2 | 1,980 | 1,980 | 2,180 | 1,780 | 1,780 |
| 3 | 2,380 | 1,780 | 1,980 | 1,580 | 1,580 |
| 4 | 2,180 | 1,580 | 1,780 | 1,380 | 1,380 |
| 5 | 1,980 | 2,180 | 2,180 | 1,530 | 1,380 |
| 6 | 2,580 | 1,980 | 2,380 | 1,380 | 1,580 |
| 7 | 1,980 | 2,180 | 1,980 | 1,380 | 1,780 |
| 8 | 2,180 | 1,780 | 2,380 | 1,780 | 1,380 |
| 9 | 2,580 | 1,780 | 2,180 | 1,980 | 1,380 |
| 10 | 2,380 | 2,180 | 1,780 | 1,580 | 1,780 |
| 11 | 2,180 | 1,980 | 2,180 | 1,580 | 1,580 |
| 12 | 2,380 | 2,180 | 2,380 | 1,380 | 1,380 |
| 13 | 2,580 | 1,580 | 1,980 | 1,580 | 1,380 |
| 14 | 1,980 | 1,780 | 1,780 | 1,380 | 1,580 |
| 15 | 2,380 | 1,980 | 2,380 | 1,980 | 1,780 |
| 16 | 2,180 | 2,180 | 2,180 | 1,780 | 1,980 |
| 17 | 1,980 | 1,980 | 1,980 | 1,980 | 1,980 |

The survey was conducted in the suburban area of Nagoya City on February 22, 24 to 26, 1988. Two hundred and twenty-five mothers using disposable diapers for their babies were recruited to joint a central location test. Tables A-1 to A-4 show respondents' (their babies')

demographics for the entire sample and by size of diaper. The responses from this pricing research enables us to calculate choice shares of the five alternative brands, using first choice as the most preferred. Table 3 shows the choice results for all 17 price/brand combinations separately.

## Sample Composition of Respondents (%)

**Table A-1 By Sex**

| | Total | M-size | L-size |
|---|---|---|---|
| Male | 51.6 | 46.2 | 55.3 |
| Female | 48.4 | 53.2 | 44.7 |

**Table A-2 By Months after Birth**

| | Total | M-size | L-size |
|---|---|---|---|
| 1-3 months | 2.7 | 6.5 | — |
| 4-6 months | 13.8 | 31.1 | 1.5 |
| 7-9 months | 9.8 | 16.1 | 5.3 |
| 10-12 months | 14.7 | 11.8 | 16.7 |
| 13-15 months | 14.2 | 14.0 | 14.4 |
| 16-18 months | 13.3 | 9.7 | 15.9 |
| 19-24 months | 23.1 | 8.6 | 33.3 |
| 25 months — | 8.4 | 2.2 | 12.9 |

**Table A-3 By Birth Order of Babies**

| | Total | M-size | L-size |
|---|---|---|---|
| 1st child | 48.1 | 40.9 | 53.0 |
| 2nd child | 39.1 | 47.3 | 33.3 |
| 3rd child | 12.4 | 11.8 | 12.9 |
| 4th child — | 0.4 | — | 0.8 |

**Table A-4 By Type of Stores**

| | Total | M-size | L-size |
|---|---|---|---|
| Supermarket | 58.2 | 59.0 | 57.6 |
| Drug Store | 29.8 | 32.3 | 28.0 |
| Convenience Store | — | — | — |
| Grocery Store | — | — | — |
| Department Store | 2.7 | 4.3 | 1.5 |
| Discount Store / Home Center | 5.3 | 2.2 | 7.6 |
| Others | 4.0 | 2.2 | 5.3 |

**Table 3 Comparison between Observed Values and Estimated Values**
(Choice Probability in %)

| | A | | B | | C | | D | | E | |
|---|---|---|---|---|---|---|---|---|---|---|
| | Observed Values | Estimated Values | Observed Values | Estimated Values | Observed Values | Estimated Values | Observed Values | Estimated Values | Observed Values | Estimated Values |
| 1 | 5.8 | (10.6) | 22.2 | (22.3) | 3.1 | (4.2) | 39.6 | (36.0) | 29.3 | (26.9) |
| 2 | 25.3 | (27.7) | 20.0 | (25.2) | 2.2 | (3.4) | 30.3 | (25.1) | 22.2 | (18.7) |
| 3 | 5.8 | (5.4) | 28.9 | (32.9) | 5.8 | (7.2) | 34.2 | (31.2) | 25.3 | (23.3) |
| 4 | 7.6 | (5.7) | 32.0 | (29.0) | 4.4 | (6.6) | 32.4 | (33.6) | 23.6 | (25.1) |
| 5 | 25.3 | (21.9) | 5.8 | (8.0) | 2.2 | (1.5) | 27.1 | (28.9) | 38.2 | (38.5) |
| 6 | 5.3 | (3.9) | 24.0 | (20.2) | 3.6 | (2.7) | 50.7 | (52.5) | 17.8 | (21.9) |
| 7 | 24.9 | (21.3) | 6.7 | (7.8) | 7.1 | (6.4) | 49.7 | (50.2) | 11.6 | (14.3) |
| 8 | 7.6 | (8.9) | 29.3 | (30.8) | 2.2 | (1.5) | 16.0 | (20.0) | 44.9 | (38.8) |
| 9 | 4.0 | (4.3) | 32.4 | (34.5) | 3.1 | (3.0) | 11.6 | (14.7) | 48.9 | (43.5) |
| 10 | 6.2 | (7.5) | 13.3 | (12.0) | 17.8 | (15.2) | 46.7 | (43.3) | 16.0 | (22.1) |
| 11 | 7.6 | (10.8) | 34.0 | (24.3) | 3.6 | (3.3) | 38.6 | (35.3) | 26.2 | (26.3) |
| 12 | 6.2 | (4.8) | 14.7 | (7.7) | 1.8 | (1.5) | 44.9 | (49.3) | 32.4 | (36.8) |
| 13 | 4.0 | (3.1) | 36.9 | (36.4) | 4.0 | (5.4) | 18.2 | (23.6) | 36.9 | (31.5) |
| 14 | 13.8 | (16.1) | 20.0 | (22.5) | 5.3 | (7.5) | 46.7 | (38.1) | 14.2 | (15.9) |
| 15 | 5.8 | (9.3) | 35.6 | (36.8) | 2.2 | (2.8) | 20.4 | (23.9) | 36.0 | (27.2) |
| 16 | 17.3 | (18.0) | 12.4 | (16.4) | 3.6 | (5.4) | 52.5 | (40.5) | 14.2 | (19.7) |
| 17 | 35.6 | (30.8) | 24.4 | (28.0) | 16.0 | (9.3) | 12.4 | (18.2) | 11.6 | (13.6) |

The figures in parentheses are projected (or estimated) choice shares, which will be explained in the next section. As far as the brand choice share under the same price is concerned (figures in the last line of Table 3), it seems reasonable to consider that brand power or brand strength is represented in an alphabetical order, A, B, C, D, and E.

## 3. Multinomial Logit Formulation of Brand Choice Model

In order to calibrate brand power and price (dis-) utility empirically, we can use the well-known logit formulation of brand choice (McFadden 1973).[1] Let us start with introducing a concept of 'attractiveness' for each brand as a determinant of consumer's preference. 'Attractiveness' or 'utility' function of brand is designed to describe the difference of preference between brands.

In our case of disposable diaper, five profiles presented at one time lend weight to this concept. We hypothesize that attractiveness of each brand could completely explain the relationship between brand and price. Consequently, it seems reasonable to express the attractiveness of each profile as the sum of the value of brand j, $\alpha$ j and the (dis-) utility of price level i, $\beta$ i as follows:

$$Aj = \alpha j + \beta i + \varepsilon k \qquad (1)$$

where, $\varepsilon$ k denotes a random error term.

In choosing one from 5 profiles, demographic attributes of respondents might significantly influence brand choice behavior in their purchasing disposables. Such unobservable factors should be taken into account in terms of random choice probability. Given a proper distribution assumption, i.e., double exponential distribution to $\varepsilon$ k, the choice probability of one brand among others can be formulated in a familiar Multinomial logit-type function. Accordingly, the choice probability Pj of brand j is put as follows:

$$Pj = \exp(Aj) \,/\, \{ \sum_{i=1}^{5} \exp(Ai) \} \qquad (2)$$

[1] McFadden, D. (1973), "Conditional Logit Analysis of Qualitative Choice Behavior," in P. Zarembka, Frontiers of Econometrics, Academic Press.

## 4. Estimation of Brand Power and Price Utility

When estimating parameters of brand value $\alpha$ j and price utility $\beta$ i, it is important for us to approximate the actual choice shares (Pj) with the corresponding model-based theoretical choice probabilities calibrated by logit formula (1) in Table 3.

In order to obtain parameters in this case, we made use of Nakanishi and Cooper's method (1974).[1] Table 4 shows estimation results of brand power and price utility values by Log-Centering Method by Nakanishi and Cooper, which is a statistical variation of OLS (Ordinary Least Square) method to deal with the discrete choice situation. Specifically in this application, brand E and the maximum price level of 2,580 yen are defined as "base level" or zero utility. Any one of brand power value (for brand A to E) or price utility (for 1,350 yen to 2,580 yen) should be measured as difference from this "zero" base value.

**Table 4 Results of OLS Method (by Log Centering Transformation)**

Results by Regression Analysis

| | |
|---|---|
| Standard Deviation of Y | 0.232 |
| Squared R | 0.944 |
| Sample Size | 85 |
| Degree of Freedom | 75 |

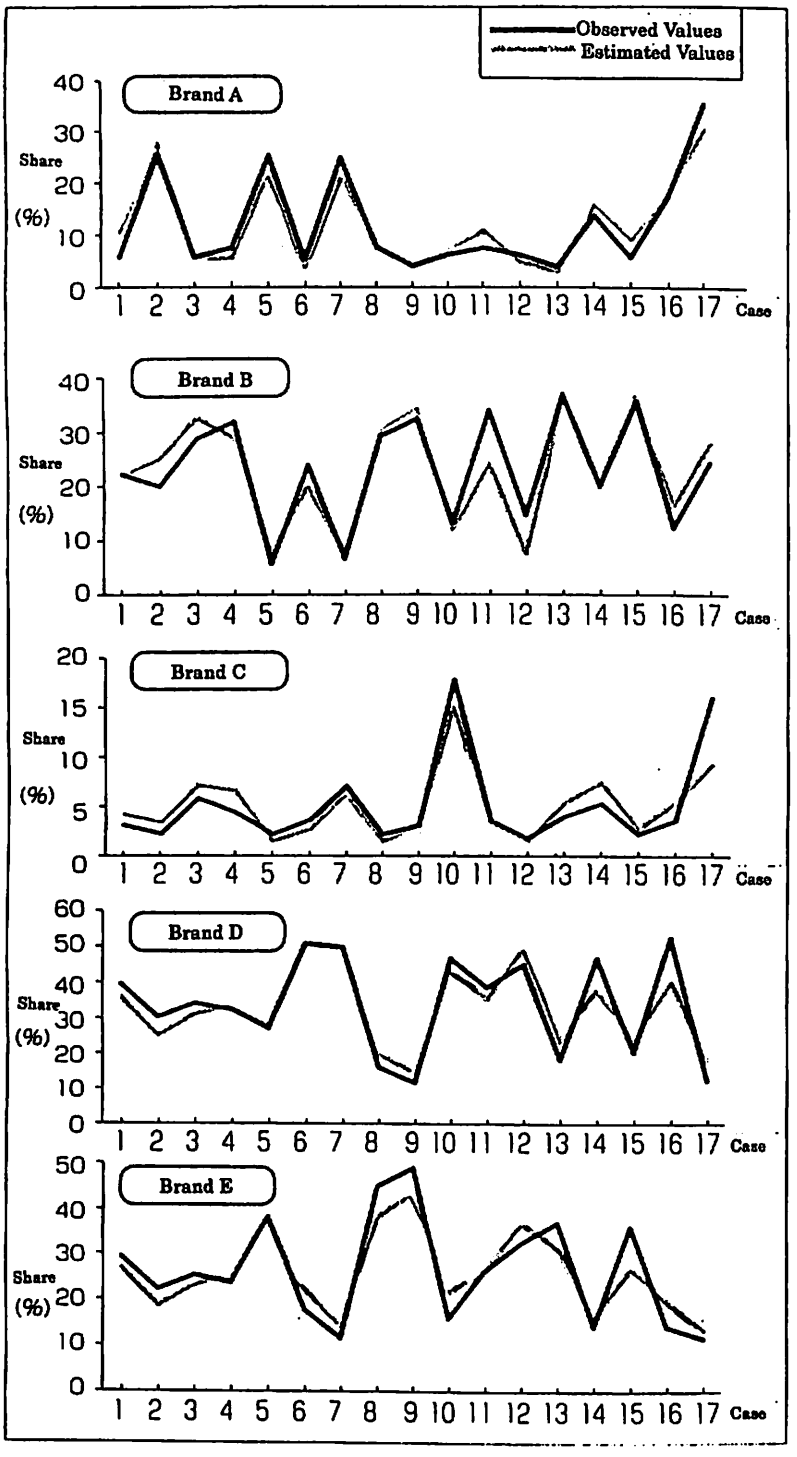
| Brand | Regression Coefficient | Standard Deviation | t-value |
|---|---|---|---|
| A | 0.82 | 0.12 | 6.67 |
| B | 0.72 | 0.10 | 7.39 |
| C | − 0.38 | 0.11 | − 3.39 |
| D | 0.29 | 0.08 | 3.67 |
| E | 0.00 | − | − |

| Price Level | Utility Value | | |
|---|---|---|---|
| ¥2,580 | 0.00 | − | − |
| ¥2,380 | 0.28 | 0.16 | 1.69 |
| ¥2,180 | 0.84 | 0.16 | 5.12 |
| ¥1,980 | 1.75 | 0.16 | 11.06 |
| ¥1,780 | 2.18 | 0.18 | 11.81 |
| ¥1,580 | 2.56 | 0.19 | 13.11 |
| ¥1,380 | 3.13 | 0.20 | 15.81 |

[1] Nakanishi, M. and L. G. Cooper (1974), "Parameter Estimation for a Multiplicative Competitive Interaction Model: Least Squares Approach," Journal of Marketing Research, 11, (August).

Substituting the estimated values for equation (2), we can calculate theoretical brand shares in the parentheses of Table 3. Although some estimated values show substantial deviations from aggregate choice probabilities, e.g., for brands C and D in Case #17, overall fitness of the projected to actual shares seems to be quite nice. The line graphs in Figure 2 reveal the differences between theoretical and projected shares, both for calculated on 5 profiles of brands A to E for 17 cases.

**Figure 2 Comparison between Observed Values and Estimated Values (Shares)**



The absolute error between actual and theoretical values is 2.8% on average, and standard deviation of discrepancies is about 2.2%. In essence, it is reasonable to conclude that these results demonstrate the utility of predictive validation of the logit formulations (1) and (2) discussed above.

In conclusion, estimated parameters of price sensitivity and brand strength must be reliable because of high R-squared value (.944) and significant t-scores (Table 4). To extend this analysis further, we will first split the entire sample into sub-groups, according to the types of stores and the birth order of babies. Then we move on to assess the accountability of the result of this questionnaire survey, comparing it with the POS data collected from three supermarkets operating in the research area. This will reveal that to what extent the result can explain changes in the sales share.

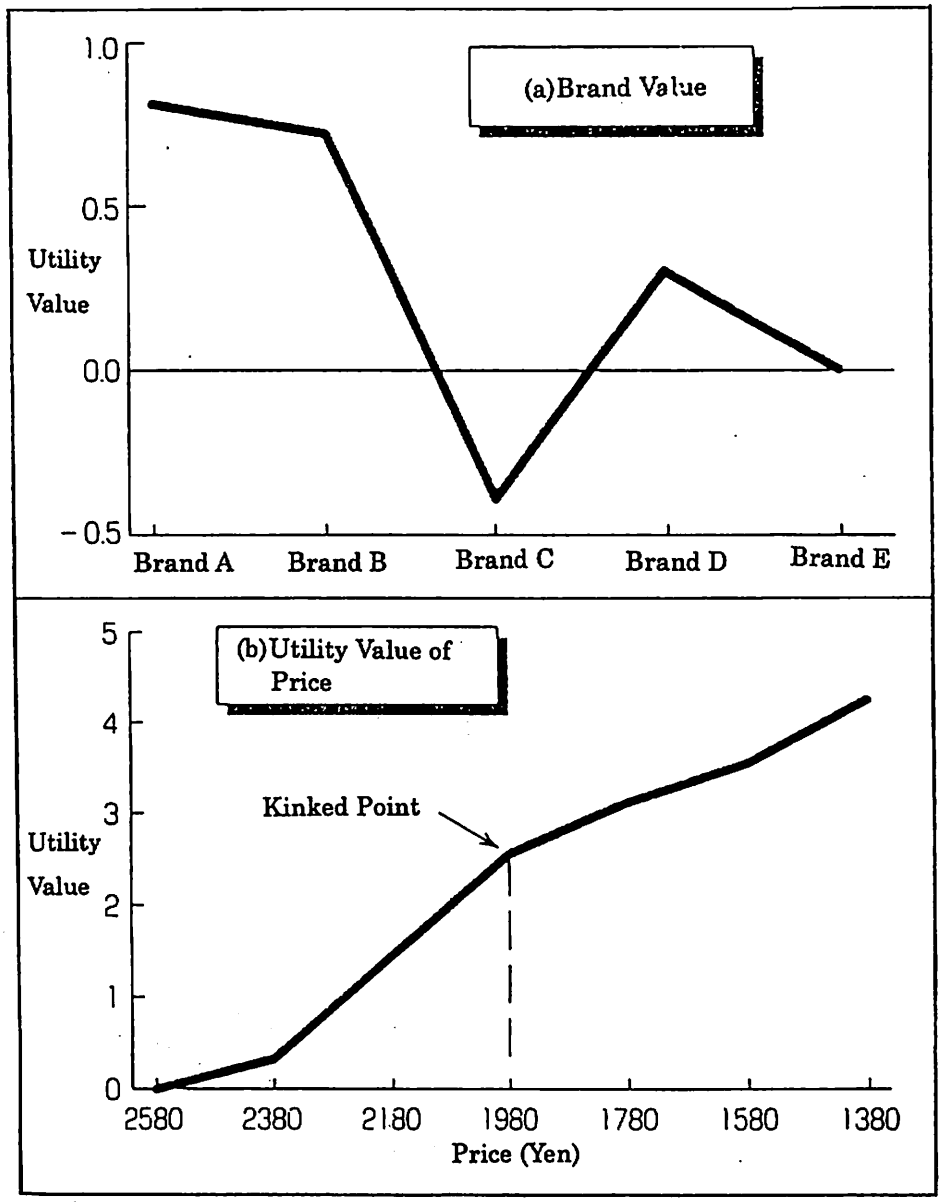
## 5. Brand Power and Price Sensitivity

The estimation results mentioned above reveal an unexpected finding concerning brand power. In preference order, brand C was ranked as third. However, trade-off analysis between brand power and price utility graded the strength of brand C at the bottom of all five brands with its corresponding utility value of -0.38 (Table 4). It is shocking all the more, because the choice share of brand C was 16.0%, ranked the third, when an identical price (1.980 yen) was presented for all five brands.

On the other hand, regarding the price utility value, we observed an interesting phenomenon that utility function of price suddenly decreases at the point of 2,000 yen (Figure 3). This sort of idea is the equivalent of 'kinked demand curve' in micro-economic theory. As Figure 3 shows, the price utility curve falls just after 2,000 yen (a curving point at 1,980 yen). To paraphrase this, a consumer tends to be more sensitive after the price hits the mark of 2,000 yen. On the contrary, as long as the price remains less than 2,000 yen, the slope of the price-utility curve tend to be relatively flat.

At around 1,980 yen, the price-utility curve shows a small 'hook' to the up-left direction. As is the case with other goods, once price level is fixed at a marginal point such as 1,980 yen, the price becomes unlikely to change, which the theory of kinked demand curve predicts.

**Figure 3 Brand Value and Price-Utility Curve (Whole Sample)**




## 6. Difference in Price Sensitivity by Segment

Figures 4 to 6 illustrate the brand value and price-utility curves by market segment. In Figure 4(b), the thick line represents for the segment of first babies, and the thin line for that of other babies. The slope of the thick line is flatter than that of the thin line. Obviously, since novice mothers are generally lacking in the knowledge both for baby products and nurturing, they tend to rely on advertisements, reputations, or brand names. It follows that, as a general tendency for them, the brand strength of expensive brands are relatively ranked high, and that the price sensitivity remains low.

As a mother becomes experienced, however, brand name becomes less important. As they

come to judge the quality of the baby products, price sensitivity increases. The relatively steep curve of the thin line supports this assumption. The same is true of the evaluation of brand strength. In Figure 4(a), mothers of first babies evaluate brand A and B higher than other mothers do. These two brands are generally considered as quality brands.

**Figure 4 Brand Value and Price-Utility Curve (By Birth Order of Babies)**

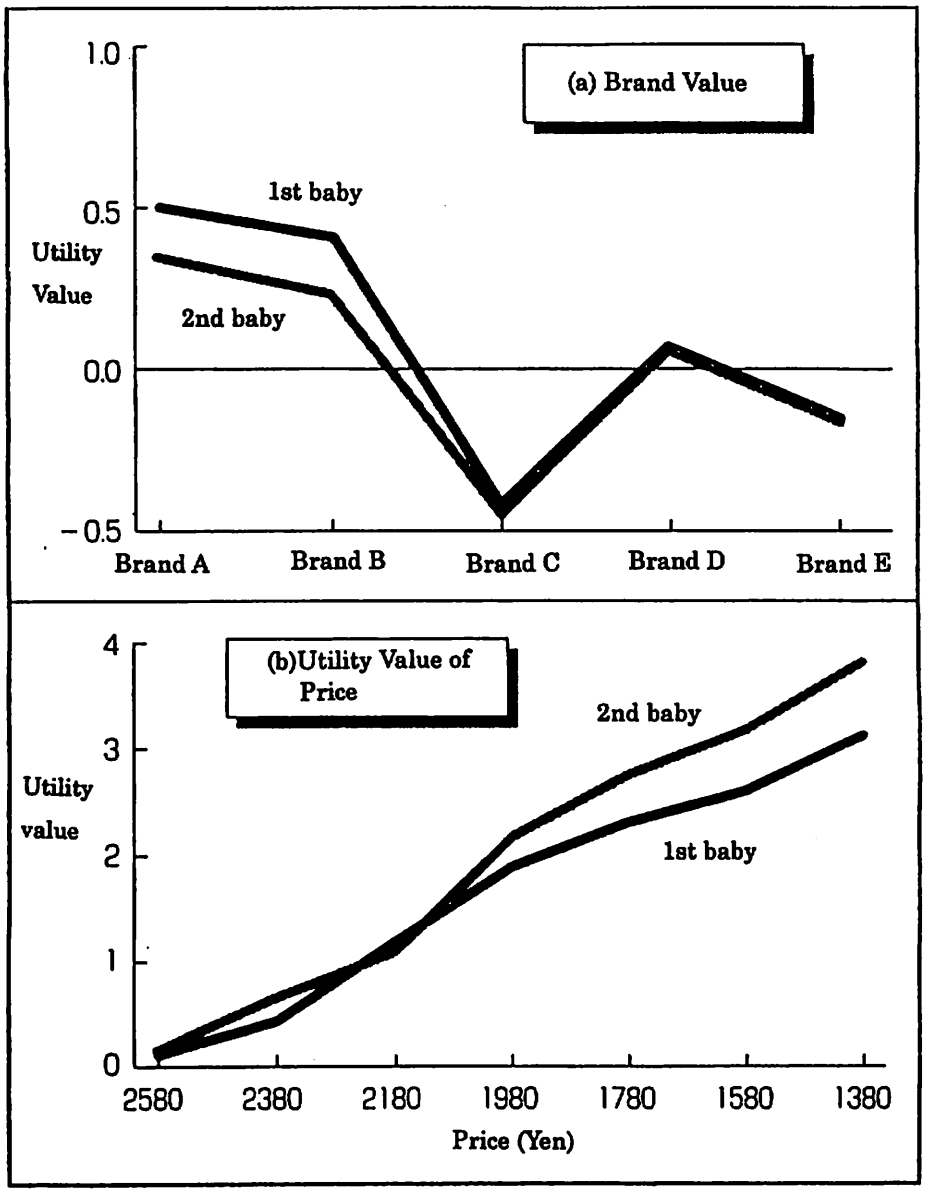
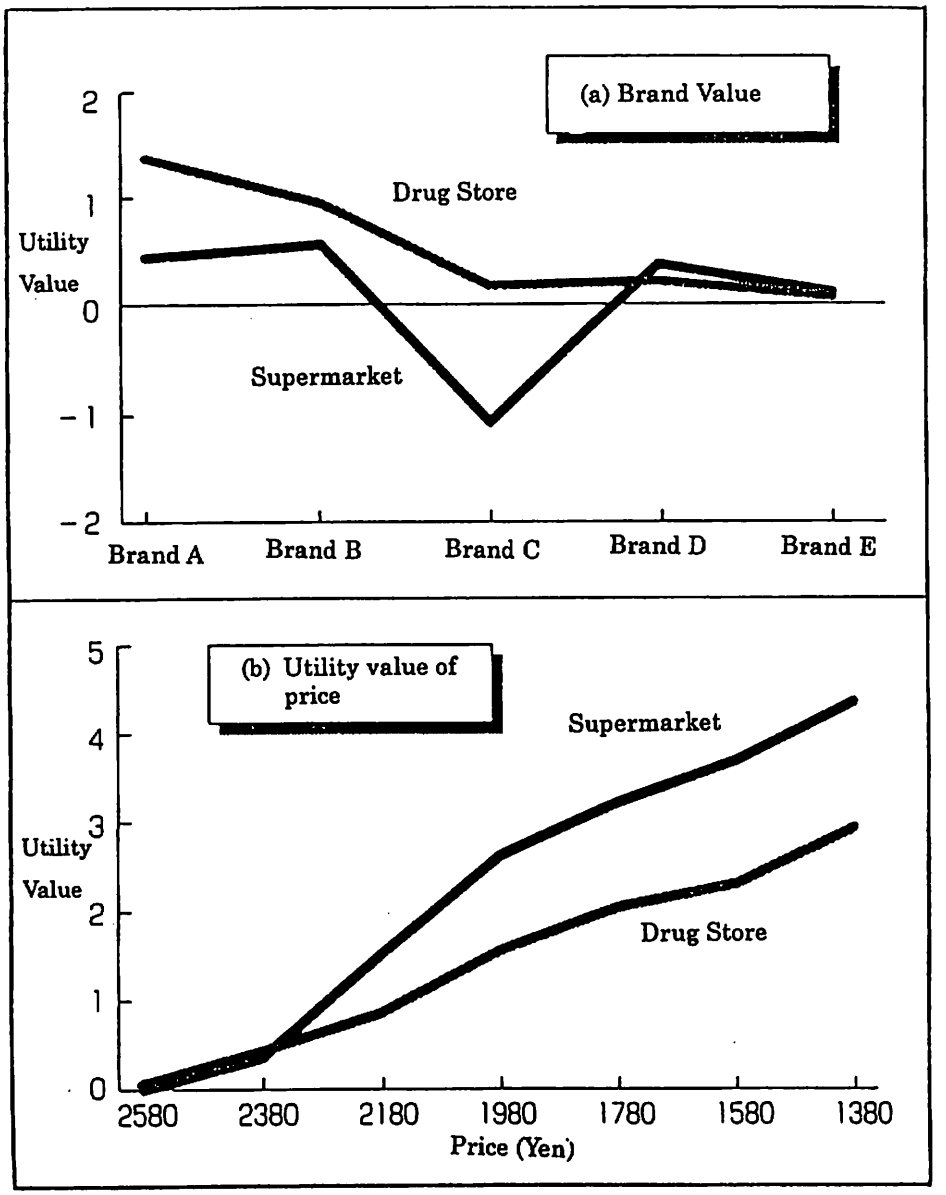



Figure 5 shows the result of the above analysis focused on the types of stores where the respondents usually bought disposable diapers. The thinner line in Figure 5(b) illustrates the reaction to price change by the mothers who mainly used to shop at drug stores. The thick line corresponds to those who used to buy at supermarkets.

The price-utility curve is steeper for super market users. It is reasonable to think that price-sensitive housewives bought disposables at supermarkets. On the other hand, arguably, consumers who bought them at drug stores were considered as more brand-oriented or price

insensitive.[1]

**Figure 5 Brand Value and Price-Utility Curve (By Store Type)**

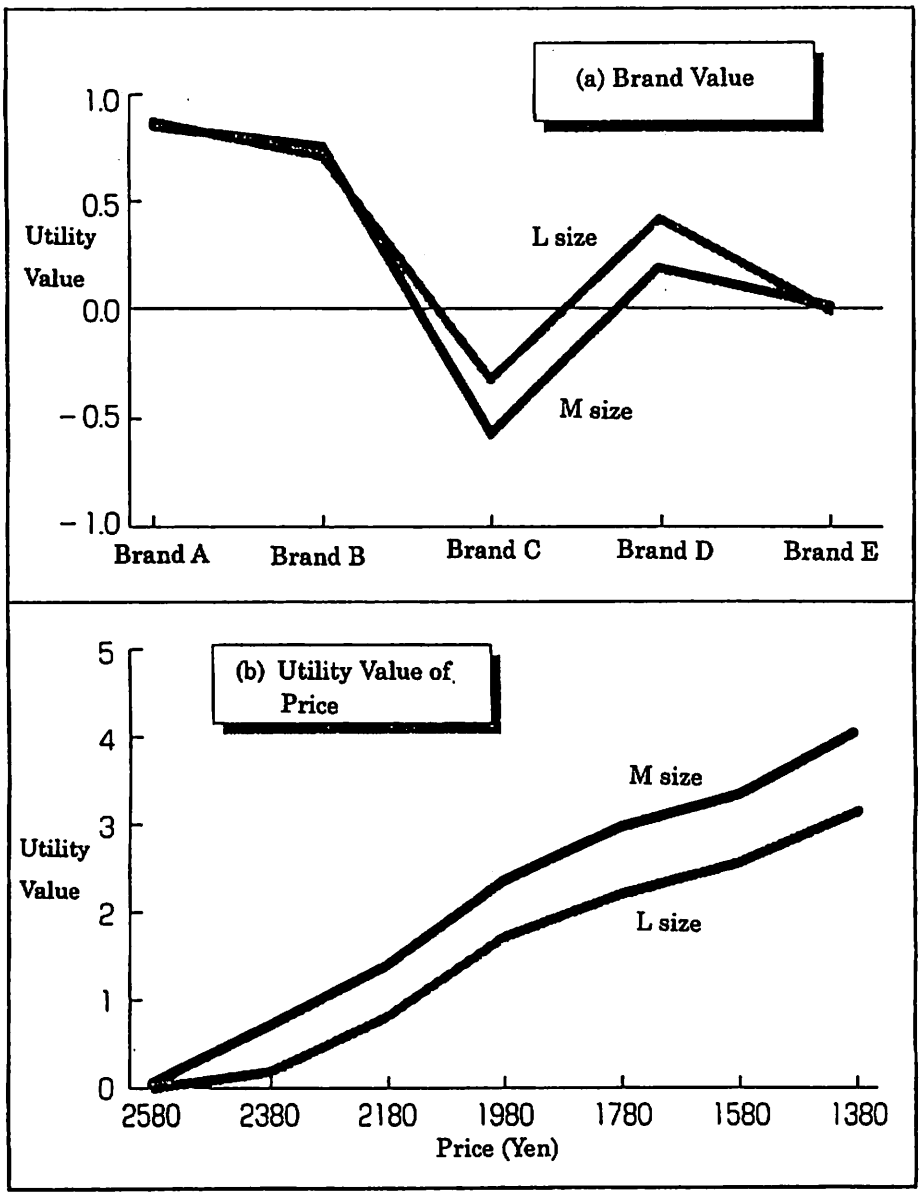



Segmenting the housewives by the store types they used, brand strength measures were estimated as in Figure 5(a). Here, again, graphs suggest that drug store users appreciated high quality more than supermarket users did. Viewed in terms of the size of diapers, as in Figure 6, it is possible to get an insight on how their experience as product users influenced price

[1] However, what should be remembered here is that this price experiment was conducted about ten years ago. Since discount-type drug stores have been rapidly increasing in number and share, a similar survey, if conducted, could now show reversed slopes of supermarkets and drugstores.

sensitivity, because usually, babies use size M until they reach 12th month, and size L/LL after that.

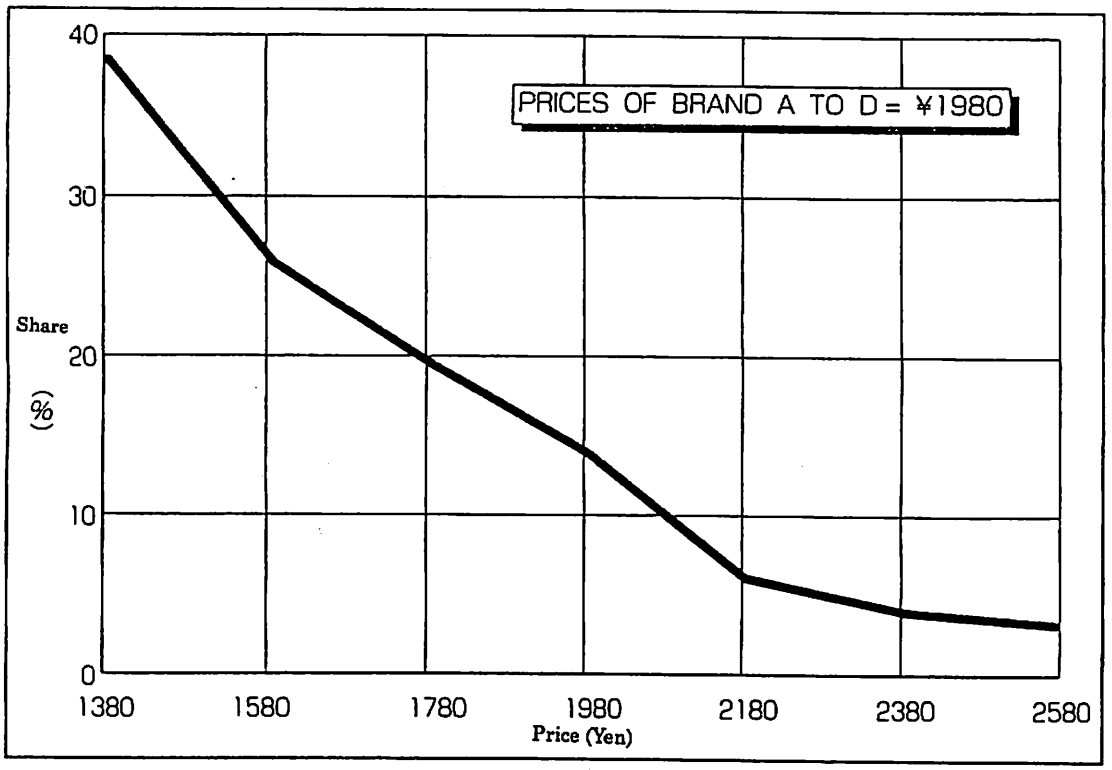
Figure 6 Brand Value and Price-Utility Curve (By Size)




## 7. Price Simulation: Brand E

Using estimates of brand power and price utility, we can simulate how the market share changes as price changes for any one of existing brands. Figure 7 demonstrates the result of 'price simulation' for brand E. In this case, the price of the other brands are fixed at an identical level (1,980 yen). The theoretical share of brand E was 13.6 %, when the price was same throughout all brands.

**Figure 7 Price Simulation**




Let the other brands beat the same price, and decrease the price of brand E gradually. Then at the minimum price level as low as at 1,380 yen, the aggregate choice share of brand E surges up to 39%. Reflecting the steep slope of the price-utility curve in Figure 3, its share soars rapidly as the price is below 1,580 yen.

Regarding the increase in price, the result is opposite. As the price rises from 1,980 to 2,180 yen, as it exceeds the mark of 2,000 yen, the share of brand E plummets, which, however, followed by a modest decrease. At the maximum price of 2,580 yen, brand E obtains merely a 3% share. This suggests that this brand E has quite a small number of loyal consumers who buy the brand regardless of the price.

Price simulation could be applied to the planning of sales promotion by retailers. For this purpose, the first thing to do is to calculate brand shares using POS data, which enables us to estimate the brand strength and price utility curve. Then the data of the planned prices for each brand was put into the model formula (2). This procedure supposedly makes it possible to simulate brand shares within a category.

## 8. Framework of Sales Tracking Survey

The price simulation in the last section is based on brand choice behaviour by the housewives surveyed. However, as we discuss later in details, this brand choice environment is

quite different from the actual sales conditions at the stores.

The difference between the actual and simulated shopping environments necessitates a further examination. To confirm the validity of questionnaire survey at the central location, we will check the theoretical shares, which are projected by the utility estimates from the questionnaire survey, with the brand sales performance at actual stores. Actual sales record was tracked for 16 weeks. Its basic research framework is as follows.

After finishing the questionnaire survey, we chose GMS (General Merchandise Store) retailers equipped with POS system within the research area. At these stores, we controlled the prices of five disposable diaper brands as much as possible, tracking their daily sales by POS data. Researchers visited the affiliated stores every afternoon between 2 to 4 p.m., and checked the sales promotions such as feature layouts, end displays, aisle displays, recommended sales, and special discounts.

Then we compiled the daily POS data into weekly data, and compared them with the calculated or theoretical shares as follows:

First, based on the estimated parameter values, we complemented price utility value for each brand, using their daily sales prices. [1] Then, we calculated attractiveness of each brand, and by substituting it for the logit function, we obtained daily brand share (projected). The estimated brand share is averaged by week as the total share of daily share.

Incidentally, in computing market shares, we excluded the sales promotion activities variable collected from stores. The main reason of this is because there were strong correlation between the sales promotion variable and sales prices.

## 9. Comparison between Actual and Projected Shares

Figure 8 exhibits a time series comparison between the actually recorded shares and projected / theoretical shares of five brands on a weekly basis. As for the recorded shares by POS terminals, during this period, the store prices of Brand A, C, and E were often fluctuating markedly. [2]

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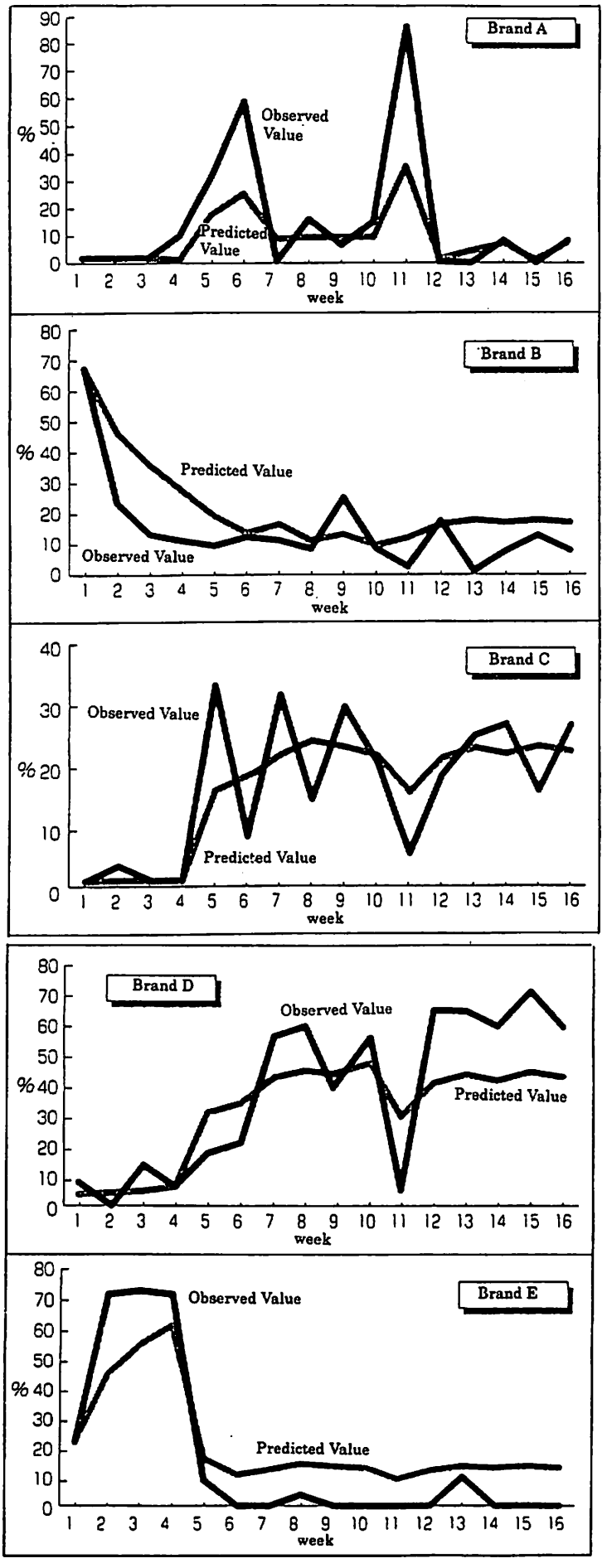
[1] The utility value at an optional price level is obtained by dividing the utility values measured 5 points proportionately by linear interpolation. For instance, since the price utility value of 1,680 yen is just in the middle of 1,580 and 1780 yen, so that (the price utility value of 1,680) = {(the price utility value of 1,580) + (the price utility value of 1970)} / 2 = (2.18 + 2.56) / 2.

[2] The price levels were planned to be manipulated for one brand.

## Figure 8 Observed and Predicted Values of Market Shares (Tracking Survey)



Those five graphs share three common characteristics.

① As far as weekly data is concerned, the predictive accuracy of market share is not very high. There is a marked prediction error of 2.0 to 2.5 at maximum. However,

② The difference between actually recorded and predicted values becomes much smaller for brands when the data are averaged by the whole survey period. And,

③ Compared with predicted shares, actual market shares tend to fluctuate up and down. What causes these results?

Such a deviation of theoretical from actual shares would make it difficult to apply our estimation proposed method to actual marketing decision making. However, given that the reasons of this deviation are identified, any modified model formulation could explain actual share changes much better.

It seems that there are three reasons why actual market shares would fluctuate around the predicted values.

The first reason is the sales promotion effect of merchandise displayed at store fronts. Generally speaking, brands at promotion are stacked massively vis-a-vis regular items and sold with price reduction, which attracts more attention at the store front than on the questionnaire survey. As a result, the total sales quantity on display tends to soar at stores.

The next reason is the effect of 'multiple purchases'. The questionnaire survey expected the housewives to buy only one unit of product at every purchase occasion. However, in reality, consumers often stack up more than one unit at sales. In this case, the sales quantity (or marked share) of a brand with more price reduction are likely to be greater than that on the survey situation at the central location.

Lastly, there is fluctuations in sales caused by consumers' 'stock piling' or 'advance purchase'. The stock keeping level of disposable diaper is high, since diaper has relatively durable. Usually it takes mothers two to three weeks to use up one package with 36 to 72 units of sheet. Accordingly, once a brand is sold on sale, it prompts multiple or advance purchase, and its stock at home increases. When sales promotion weeks continue every other week, the actual sales quantity fluctuates up and down more than in the predictive theoretical value.[1]

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[1] Nakajima (1993) proposed an improved model which theoretically covers such fluctuations in sales quantities as given. The main achievement of Nakajima's lies in the theorization of 'the effect of stock piling'. Nakajima, M. (1993), "Measurement of Price Elasticity and Scanner Data"' in Ogawa K. ed. (1993) 'POS and Marketing Strategy', Yuhikaku, Tokyo.

## 10. Overall Research Design

Figure 9 presents the overall design of 'Kao's Pricing Research Experiment.' One component is 'conjoint analysis' by questionnaire survey and the other is 'tracking survey' by POS data. Although the number of samples were 225, not so large though, this price research, which combined questionnaire survey and POS data, rigorously predicted brand power and price response variables at the same time. Thus, it pioneered a prototype of ambitious research design.

**Figure 9 Overall Research Design**