

Does the Quality of Store Brands Affect the Number of National Brand Suppliers?

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Abstract

This paper examines how the increased market shares of store brands affect the entry and survival of national brand suppliers. The analysis is performed on monthly scanner data for a number of household- and personal-care products covering June 2001 through May 2004. An increased market share of medium-priced store brands was found to decrease the number of suppliers of national brands. However, no statistically significant impact was found of low-priced store brand market shares on the number of national brand suppliers. It thus seems that it is mainly medium-priced store brands that compete with national brands.

Key words: Scanner data, household products, count data, private labels.

JEL classification: L13, L81.

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1 Introduction

The purpose of this paper is to examine the entry and survival of national (and regional) brand name suppliers in Sweden as store brand patronage has increased.¹

The rapid increase in the number and market share of store brand products is one of the most distinctive and important changes in the retail food market in recent years. The Private Label Manufacturers Association (PLMA) estimates that it worldwide exist more than 3,200 manufacturers and suppliers of store brands. According to a Wal-Mart executive: "in time I believe you will see only two offerings per category on the shelf - the national brand leader and the store brand. There will be no space available for the second or third brand player in the category" (Berlinski, 1997, p. 19).

During the first quarter of 2005, store brand sales grew by 5% on average across 38 countries, while the average sales of national brands increased by only 2% (AC Nielsen, 2005). On the other hand, the market share of store brands varies widely across countries. In Switzerland in 2005 the market share of store brands was approximately 45%, while in Greece it was only 4% (although growing rapidly).

National brands in general seem to be loosing market share to store brands in recent years (see e.g., Hoch, 2002; Sayman and Raju, 2004). However, these studies considered store brands as a homogenous product group, but store brands do not only compete with national brands on price. Chain-store operators often sell two kinds of store brands, one a low-priced brand that has a substantial discount compared to the market-leading national

¹In the literature, store brands are often referred to as private labels, private brands, own-labels, own-brands, distributor brands, and retail brands (McWilliam and de Chernatony, 1989; Ossiansson, 2004). Here, we will use the term store brands.

brand, and the other a medium-priced alternative comparable to the national brand in price, quality, and packaging.²

Low-priced and medium-priced store brands might influence the entry and survival of national brand suppliers differently (Bontemps et. al., 2005; Gabrielsen and Sorgard, 2006). Low-priced brands are often considered of lower quality, products that the retailer can use strategically to provide the consumer with a greater price-range. Medium-priced store brands, on the other hand, are of comparable quality to the national brand leader. Thus, there might be less product differentiation between national brands and medium-priced store brands, which must then compete more fiercely with the national brands, making their entry more difficult. And indeed store brand's market share has been shown to be higher among product-groups where the quality of the store brands is fairly high (Hoch and Bajeri, 1993).

In order to study the impact of increased store brand market shares on the entry and survival of national brand name suppliers, we analyzed scanner-data from AC Nielsen in Sweden on sales of household- and personal-care products during the period June 2001 through May 2004, using an integer valued autoregressive regression model of order one (INAR1-model). In the data, we are able to distinguish between the market shares of low-priced and medium-price store brands. Thus, we focused on whether the entry and survival of national brand suppliers was influenced by store brand quality.

Increased market shares of medium-priced store brands were found to reduce the number of national brand suppliers. However, no statistically

²In some countries (e.g., the United Kingdom) there is a third line of store brands, so-called premium store brands, considered of higher quality than the leading national brand, and sold at a higher price.

significant effect was found of low-priced store brand market shares on the number of national brand suppliers. It thus seems that it is mainly medium-priced store brands that compete with national brands, and that it is important to consider differences in quality among store brands when investigating their influence on the entry and survival of national brand suppliers.

The next section presents the basic analytical framework for describing what determines the number of national brand suppliers, while section 3 describes the data, the empirical model, and the results. Section 4 summarizes and draws conclusions.

2 Estimating the Number of National Brand Suppliers

Following Rudholm (2001) and Daunfeldt et al. (2006), it is assumed that markets for household- and personal-care products are imperfectly competitive, and that national and regional brand name suppliers enter until the present value of their profits, after deducting entry cost are driven to zero for each period, that is until

$$E[\pi_{mt}] = \sum_{k=1}^K p_{mt}^k(Q_{mt}^k)q_{mt}^k - \sum_{k=1}^K C_{mt}^k(q_{mt}^k) - F_{mt} = 0 \quad (1)$$

where $E[\pi_{mt}^k]$ is the expected profit in product-category m in period t ($t =$ June 2001, ... , May 2004); $p_{mt}^k(Q_{mt}^k)$ is the price of product k as a function of total sales of that product in product-category m ; q_{mt}^k is the potential entrant's sales of product k in product-category m , conditional on entry; and $C_{mt}^k(q_{mt}^k)$ is potential entrant's total sales-costs as a function of its sales-volume of product k . Thus, $E[\pi_{mt}]$ represents the total expected profit for

a firm selling a total of K household products.

We assume that a potential entrant's expected profit is the average profit of incumbents in that product category, i.e., $E[\pi_{mt}] = \pi_{mt}$. This is of course a naive form of expectations, but a more sophisticated form would require using a dynamic model with time-lags, and thus dropping some observations. When the period is fairly short, as in our sample, this is not desirable (Ilmakunnas and Topi, 1999).

The term F_{mt} in Equation (1) is the entry cost corresponding to the zero profit condition, i.e., when additional entrants are unable to make profits. The presence of the entry costs means that the profits of incumbents can be positive without attracting entry. Following Rudholm (2001), we let F_{mt} take the form:

$$F_{mt} = c_0 + \varphi_1 N_{mt} + \varphi_2 \Delta N_{mt} + \boldsymbol{\eta}' \mathbf{X}_{mt} + \xi_{mt} \quad (2)$$

where c_0 is a constant term; N_{mt} is the number of national brand suppliers observed by the potential entrant facing the zero profit condition in period t , and $\Delta N_{mt} = N_{mt} - N_{mt-1}$ is a measure of net entry. Entry cost also depends on a vector of other explanatory variables (\mathbf{X}_{mt}) which will, among other things, reflect the impact of increased store brand market shares. Finally, entry cost also contains a random component (ξ_{mt}) with zero mean and constant variance.

The profit opportunity of a potential entrant in the absence of entry cost is then $E[\pi_{mt}^0] = \sum_{k=1}^K p_{mt}^k(Q_{mt}^k)q_{mt}^k - \sum_{k=1}^K C_{mt}^k(q_{mt}^k)$. Substituting equation (2) into equation (1) and solving for N_{mt} , the number of national

brand suppliers in category m , gives

$$N_{mt} = \psi N_{mt-1} + \alpha_0 + \gamma \pi_{mt}^0 + \boldsymbol{\beta}' \mathbf{X}_{mt} + \varepsilon_{mt} \quad (3)$$

where $\psi = \varphi_1/(\varphi_1 + \varphi_2)$; $\alpha_0 = -c_0/(\varphi_1 + \varphi_2)$; $\gamma = 1/(\varphi_1 + \varphi_2)$; $\boldsymbol{\beta}' = -(1/(\varphi_1 + \varphi_2))\boldsymbol{\eta}'$, and $\varepsilon_{mt} = -\xi_{mt}/(\varphi_1 + \varphi_2)$ is a random component again with zero mean and constant variance. The parameter ψ can be interpreted as the survival probability for the existing national brand suppliers in period $t - 1$ (Brännäs, 1995a, 1995b); α_0 is a constant; γ measures how potential profits affect entry; and $\boldsymbol{\beta}'$ is the parameter vector corresponding to the additional explanatory variables, including store brand market shares. All variables used in the estimation of equation (3), and thus related to equation (2) above, are discussed thoroughly in the empirical section.

3 The Empirical Analysis

3.1 Data

The data-set, consisting of monthly data from June 2001 through May 2004, was obtained from AC Nielsen in Sweden, which used stratified sampling to ensure that the data are representative with respect to store-type, geography, and store-size. The four biggest chain-store operators in the Swedish retail food market, ICA, COOP, Axfood, and Bergendahls, are all included. Together they had a total market-share in 2005 of almost 88% (Swedish Competition Authority, 2006).

The data includes total sales and average price for each product supplier. Each chain-store operator has also categorized their own store brands, as well as their competitors' store brands, into two categories: low-priced and

medium-priced. Hence the data also includes total sales and average price for low-priced and medium-price store brands in each product category. This makes it possible to distinguish between the market shares of low-priced and medium-priced store brands.

In Sweden the market share of store brands was 14% at the end of the first quarter 2005. The annual growth rate for store brands in Sweden in the end of the first quarter of 2005 was 10%, while national brands experienced a 2% decline. Sweden was the fifth among 38 countries in the share gains of store brands (AC Nielsen, 2005).

It is not possible to identify a specific chain-store operator directly from the data nor the suppliers of store brand products³, but this information is necessary in order to identify entry and survival of national brand suppliers. Since we know the maximum number of store brand suppliers and the market share of store brands in each category and time period, we use this information to identify store brand suppliers.⁴

The sample was collected from two relatively homogenous product groups (personal care, and household products) covering 52 product-types (shampoo, soap, etc). This fairly limited range of products means that out of sample inference should not be drawn.

Some products had not recorded sales during some months because of seasonal variation, although they had not exited the market. A supplier

³ICA, COOP, and Axfood; Bergendahls do not have any store brands.

⁴We have access to total sales and average prices for each supplier in each time period, but the name of the supplier is unknown. Additionally, we have information about sales and average prices grouped by low-price store brands, medium-priced store brands and national brands, respectively, for each category and time observation. Since a maximum of three chains (ICA, COOP and Axfood) offer store brands, we test all possible combinations of store brand suppliers that sum up to total store brand sales (the Matlab code is available from the authors on request). This information is used in order to identify store brand suppliers and, henceforth, the number of national brand suppliers.

was thus assumed to exit (enter) the market if there were sales (no sales) followed by three months in a row of no sales (positive sales).

Definitions of all the variables, as well as means and standard deviations, are given in Table 1. The variables included are discussed further in Section 3.2.

- **Table 1 about here** -

Figure 1 reports the average market share of national brands and Figure 2 of low-priced and medium-priced store brands for the products included in the study during the study period. Both low-priced and medium-priced store brands have persistently increased, while the market share of national brands has declined.

- **Figure 1 about here** -

- **Figure 2 about here** -

3.2 Econometric Methods

The dependent variable is the discrete-count variable N_{mt} , denoting the number of national brand suppliers for category m at time t . An important feature in panel data is unobserved heterogeneity. Moreover, our theoretical model implies feedback from the explanatory variables on the number of national suppliers, requiring a dynamic model. Specifying a dynamic model for count data is not as straightforward as with specifying a linear model, and including the lagged-dependent variable in the exponential mean function could lead to a rapidly exploding series. Blundell, Griffith and Windmeijer (2002) propose to deal with discrete count panel data by specifying a Linear

Feedback Model of Order 1 (LFM(1)) defined (in our case) as

$$N_{mt} = \psi N_{mt-1} + \exp(\gamma\pi_{mt}^0 + \beta' \mathbf{X}_{mt} + \nu_m) + \varepsilon_{mt} \quad (4)$$

The LFM has its origin in the integer-valued autoregressive (INAR) process and can be understood as an entry-exit process with the probability of survival ψ .⁵ We tried the specification in Equation (4), as well as the linear specification.

$$N_{mt} = \psi N_{mt-1} + \gamma\pi_{mt}^0 + \beta' \mathbf{X}_{mt} + \nu_m + \varepsilon_{mt} \quad (5)$$

Since the β s from these two estimations were similar, and the linear model corresponds directly to the theoretical model in Equation (3), we used Equation (5).⁶ In principle, it allows for individual specific fixed effects (ν_m) in the sense that different intercepts can be estimated for each product-category, m . Time-specific fixed effects (α_t) can also be included in the more general specification

$$\begin{aligned} N_{mt} = & \psi N_{mt-1} + \gamma\pi_{mt}^0 + \beta_1 DIF F_{mt} + \beta_2 M_LOW_{mt} \\ & + \beta_3 M_MED_{mt} + \alpha_t + \nu_m + \varepsilon_{mt} \end{aligned} \quad (6)$$

The vector of explanatory variables \mathbf{X}_{mt} include brand-differentiation ($DIF F_{mt}$); market shares for low-priced store brands (M_LOW_{mt}); and

⁵The integer-valued autoregressive model (INAR1) of McKenzie (1985) corresponds to the theoretical model developed in Section 2. This model has later been elaborated by Al-Osh and Alzaid (1987), as well as Brännäs (1995a, 1995b), among others.

⁶Since the variables that are in \mathbf{X}_{mt} are less than 1, then linear transformation $\beta' \mathbf{X}_{mt} + \nu_m$ is a good approximation for $\exp(\beta' \mathbf{X}_{mt} + \nu_m)$ because $\ln(1+x) \equiv x$ for small x .

market shares for medium-priced store brands (M_MED_{mt}).

As mentioned in Section 2, we assume that a potential entrant's expected profit is given by the average profits of incumbents in the product category, i.e., $E[\pi_{mt}] = \pi_{mt}$. Profit is calculated as the price-cost margin of the product times the quantity sold. Following Rudholm (2001) and Granlund and Rudholm (2007), the lowest price recorded in the category is used as a proxy for marginal cost when calculating the price-cost margin.

Brand-differentiation within a product category at a given time is measured as the relative price difference between the products with the highest and lowest prices. An increase in the relative price difference over time is thus seen as an increase in the level of product differentiation within that category.

We estimated Equation (6) using the within-estimator. To handle the problem of possible endogeneity, variables from product categories closely related to the ones included in the study were used as instruments.⁷ The idea is that close-matched product categories capture both time-variant production costs and category specific effects (Hausman and Leonard, 2002). Calculated profits, price differences, and market shares from one category can thus be used as instrumental variables for another category given that the stochastic category-specific effects are independent of each other. Unfortunately, two problems arose using this estimation strategy. First, the large time series variability of the independent variables resulted in very low correlation between the instruments and the endogenous explanatory

⁷Alternatively, Equation (6) can be estimated by GMM (see Chamberlain, 1992; Windmeijer, 2006) using N_{mt-2} and X_{mt-1} as instruments. Windmeijer (2006) studies the asymptotics for panel data models using GMM, and finds that for high values of ψ as the X_{mt} series become more persistent, the instruments become weaker, so that the one-step GMM estimator has large downward bias. Simple regressions indicate that ψ is around 0.8 in our data, which implies that lagged variables are weak instruments.

variables. As shown by Bound et al. (1995), the bias of the IV estimates approaches that of OLS as the R^2 between the instruments and the endogenous variable approaches zero. In our data, R^2 lies between 0.001 and 0.15 for various specifications of the first-stage regression. The other, more important, problem is the possibility that the instruments are also correlated with the error terms of the structural equation, since the instruments are from the same general microeconomic environment (i.e., from the same stores), making the category-specific effects dependent on each other. A weak correlation between the instrument and the endogenous variable will exacerbate any problems associated with possible correlation between the error and the instruments (Bound et al, 1995), and, even if the correlation between the error and the instruments is weak, this can produce inconsistencies in the IV estimations that are larger than in the within-estimates. We thus present only results from the within-estimations.

When estimating Equation (6) one might expect: (i) Intercept terms to differ among products with different product characteristics because barriers to entry may vary systematically with factors unobserved by the researcher. (ii) Entry of store brand suppliers to be more common in markets where potential profits are high. (iii) High product differentiation to increase the possibility of the potential entrant to niche their product. (iv) Increased store brand market share to decrease the number of national brand suppliers (Hoch, 2002; Sayman and Raju, 2004).

3.3 Estimation Results

We estimated three models of the linear specification (Eq. 6) using the first-difference in number of national brand suppliers as the dependent variable.⁸ Model I (Table 2, below) includes as an independent variable our measure of a potential entrant's profit opportunities. Model II adds our measure of product differentiation; and Model III adds the market shares of low-priced and medium-priced store brands.

Since lagged variables are used as regressors, we test for autocorrelation that can lead to inconsistent estimates. Under the null hypothesis of no autocorrelation, the residuals (e_{it}) were regressed on their lagged values (e_{it-k}), where $k = 1, 2, 3, 4$, plus all other independent variables in the original regression; and the White heteroskedasticity-consistent standard errors are reported. Individual t -tests of the estimated parameters e_{it-k} were then used to test for autocorrelation.

The parameter estimates for the lags of the residuals in Model III are 0.0407 (0.0562), 0.0751 (0.0553), -0.1080 (0.0619), and, -0.0026 (0.0540). Thus only the third lag is significant. However, using F-test, we cannot reject the null hypothesis that all the lag coefficients are zero. Thus, the results indicate no statistically significant autocorrelation in the residuals, which means that the estimates in Table 2 can be taken as consistent.

- Table 2 about here -

The effect of profits is positive and statistically significant at the 1% level in all models, indicating that higher profit opportunities are associated with

⁸This implies that the survival probability for the national brand suppliers is $\psi = 1 + \lambda$, where λ is the estimated coefficient of N_{mt-1} . This specification has the advantage that we can test directly for unit-root ($H_0 : \lambda = 0$) by using t -statistics of λ .

more national brand suppliers, an entirely intuitive result. The estimated coefficient indicates the increase in the number of national brand suppliers when expected profits increase by 1%. Thus, expected profits would have to increase by 35.7% to induce entry of an additional national brand supplier.

The coefficient for product differentiation is positive and significant, indicating that there are more national brand suppliers in highly differentiated markets, where there is a possibility for them to niche their products. However, where medium-priced store brands have high market shares, there are 0.13% fewer national brand suppliers for every 1% higher market share. This suggests that high market shares for medium-priced store brands act as an entry barrier and a source of exit for national brand suppliers. No such effect was found for low-priced store brands.

4 Remarks

The rapid introduction and market share growth of store brand products has attracted academic interest. In a symposium issue on store brands, Scott-Morton (2004, p.104) concluded that the findings: "leave researchers in this area with many more empirical and theoretical questions to explore".

This paper argues that a problem with previous studies is that they have not distinguished between store brands of different quality. Chain-store operators often sell at least two kinds of store brands, low-priced and medium-priced. Low-priced store brands are often considered of lower quality than national brands; whereas medium-priced store brands can often be seen as copies of successful national brands in price, quality and packaging. It has been suggested that retailers use store brands to increase their bargaining position in relation to national brand suppliers (Scott-Morton

and Zettelmeyer, 2004), and to differentiate themselves from other retailers in order to increase store loyalty (Ailawadi et al., 2001; Corstjens and Lal, 2000) and thus store profits (Sudhir and Talakdar, 2004). This implies that low-priced and medium-priced store brands might have different impacts on gross margins, the supply of products, the market share of national brands, and the number of national brand suppliers.

The purpose of this paper was to study whether store brand market shares of household- and personal care products reduced the number of national brand suppliers, and prevented the entry of new ones, during the period June 2001 through May 2004. The data-set used makes it possible to distinguish between the market shares of low-priced and medium-priced store brands, so we focused on whether the entry and survival of national brand suppliers was influenced by store brand quality.

The number of national brand suppliers was found to be higher in highly differentiated markets with high profit opportunities. However, an increase in the market share of medium-priced store brands reduced the number of national brand suppliers. A high market share of medium-priced store brands can thus be considered a combination of barrier to entry and a source of exit for national brand suppliers. No such effect was found for low-priced store brands. It thus seems important to consider differences in quality among store brands when investigating their influence on the entry and survival of national brand suppliers.

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Table 1: Means (SD in parentheses) and definitions of variables

Variable	Mean (SD)	Definition
Number of suppliers	12.44 (6.62)	Number of national brand suppliers in category m during period t .
ln Profit	0.55 (1.63)	The log of the average profit in product category m during period t , where profit is calculated as the markup of the product times the quantity sold.
Differentiation	67.84 (74.94)	The relative price difference between the product sold and the cheapest available product in category m during period t .
Market share low-priced store brands	0.046 (0.060)	Total sales for low-priced store brands divided by total sales for all brands in category m during period t .
Market share medium-priced store brands	0.062 (0.087)	Total sales for medium-priced store brands divided by total sales for all brands in category m during period t .
Number of obs.	2 014	

Table 2. Estimation results (SE in parantheses).

Dependent variable: Number of national brand suppliers (N_{mt})			
Variable (parameter)	Model I	Model II	Model III
Constant (α_0)	3.26 (0.77)	4.01 (0.73)	3.04 (0.54)
ln Profit (γ)	0.24 (0.064)	0.19 (0.056)	0.028 (0.012)
Differentiation (β_1)		0.004 (0.001)	0.002 (0.001)
Market share low (β_2)			-0.008 (0.307)
Market share medium (β_3)			-0.26 (0.13)
Survival probability (ψ)	0.78 (0.045)	0.73 (0.043)	0.81 (0.032)
Category-specific fixed effects	Yes	Yes	Yes
Time-specific fixed effects	Yes	Yes	Yes
Number of obs	2014	2014	1672
R^2	0.139	0.204	0.112

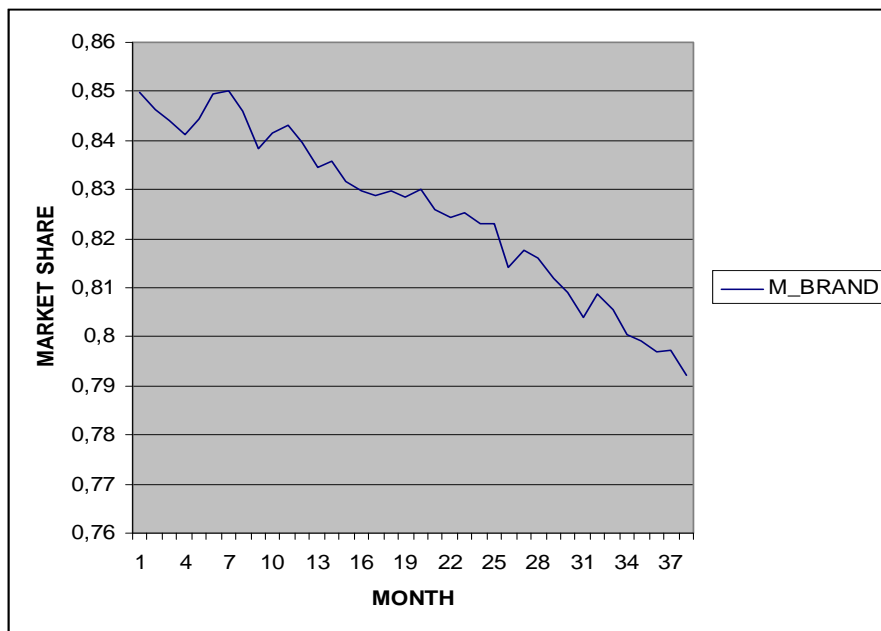


Figure 1: Market share, national brands, June 2001 - May 2004

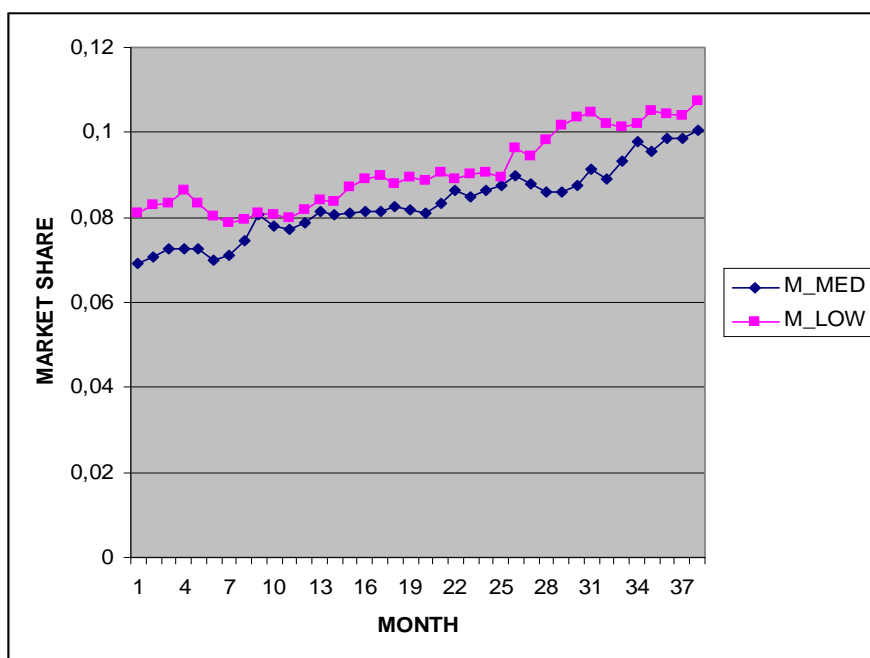


Figure 2: Market share, store brands, June 2001 - May 2004