# ARE PRIVATE LABELS A STRATEGIC INSTRUMENT FOR CUSTOMER LOYALTY? 

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#### Abstract

The increase of private labels in the food market and the retailers' high expenditures for establishing those raises one central question: Do consumers really consider private labels as "real" brands and develop loyalty towards them. That means that consumers repeatedly buy a certain brand, e.g. a certain private label because they are committed to this private label. Thus, in measuring brand loyalty it is important to consider both the duration of periods of repeated purchases and the underlying attitude. In this study we will analyse consumers' purchase pattern with regard to two strong national brands focusing on similarities and differences in comparison with the group of private labels. We use panel data on household food purchases. Because they reflect actual purchase behaviour of individual households over a long term they are appropriate to analyse periods of repeated purchases. However, the attitudinal component of brand loyalty can not be observed directly. Thus, after discussing the concept of brand loyalty, we report on an empirical investigation on the duration of periods of repeated purchase with respect to national brands and private labels. Finally, potential approaches to identify the underlying attitudinal component by using panel data are presented.


Keywords: brand loyalty, private labels, food retail industry, duration analysis

## 1. Introduction

The food retail industry in most of the industrialised countries has been subject to great alterations in the last two or three decades. During the 1970's food retailing companies could be largely qualified as acting as the vicarious agents of the food processors. In the course of time retailers were able to emancipate themselves changing from being the extended arm of the processors to be on an equal footing with them (Nieschlag et al. 1994). Today, to some extend retailers dominate the agri-food business. A major determinant for this development is the concentration process on the retail level, for e.g., in 2006 the German top five retailers had a cumulative market share of about 67 percent and the top 8 retailers had an aggregated market share of about 95 percent (BVL 01.08.2007). This concentration indicates that retailers face a fierce competition. Due to the fierce competition in the retail sector, retailers have to increase their endeavours to distinguish them from their rivals in order to create loyal customers which do not switch to competing retailers. In this context, a key concept is retail branding, i.e. many retail firms establish retail brands and convert their shop name to a brand itself. Thus, since some years it is observable that retailers have been using the instrument of retail branding more intensive, mirrored in the steady increase of the market share of retail brands, respectively private labels. As figure 1 demonstrates in almost all European countries private labels play a major role.


Figure 1: Private labels by share in total volume of non-durable goods by country (Source: PLMA 2008)

However, the increase in market share has its price. Nowadays in Germany retailers spend several hundred million euros annually on marketing. Gaining market share and simultaneously investing so much money into branding raises the question whether retailers are being considered by the consumers to be a 'real' brand. In this paper, we want to address this question by analysing whether retailers are able to get customers committed to their private labels. More specifically, we will use a panel data analysis to study whether we can identify significant differences in customers' 'loyalty' between national brands and private labels. In order to conduct our research aim, we will proceed as follows. First, we will clarify the construct brand loyalty. Here, we want to highlight the difference between 'true' loyalty and spurious loyalty. Furthermore, by clarifying the construct loyalty we are also able to determine its characteristics so that they can be used afterwards for the panel analysis. The analysis will be conducted for the German frozen pizza market. Over ten years this market experiences a dramatic increase in volume (Deutsches Tiefkühlinstitut 30.05.2008). The paper is finalised by discussing our results and giving some suggestions for further research.

## 2. Theoretical considerations of brand loyalty

As shown in the introduction, the market share of private labels in the food sector has been significantly increasing over the last three decades. During the past ten years, even growth of private labels is observable in the premium segment, resulting in an even stronger competition between branded and retail branded products. With increasing competition, there is little doubt that achieving loyal consumer behaviour is one of the central goals for all firms. Reasons are that loyal consumers are less likely to switch to competitors going hand in hand with higher profit and success. For example, loyal customers spread positive word-of-mouth advertising. Furthermore, it has been shown that referrals are a very important source of new customers. Loyal customers are more tolerant to increases in price than non-loyal consumers, so that firms can achieve a price premium (Reichheld and Sasser 1990, Reichheld and Teal 1996). All these arguments indicate the economic importance of loyal customers for firms.

But, what is the meaning of a loyal consumer respectively, what can be understood as a loyal behaviour? Most people believe to know the meaning of this phenomenon. However, we assume that we all know perfectly well what it is until someone asks us, since "loyalty" has multifaceted meanings in the everyday language. Hence, as a first step, it is important to clarify the term brand loyalty, respectively clarify what is understood as a loyal behaviour to a brand. Thus, in this chapter we will build the theoretic framework about the construct brand
loyalty. First, we highlight the difference between 'true' loyalty and spurious loyalty in (2.1). The importance of the duration in which the same brand is bought, we demonstrate in (2.2).

### 2.1 Brand loyalty vs. spurious loyalty

In general, the term loyalty is used if any recurrent behaviours and / or emotions occur. For example, person A can be loyal to person B if A continually meets B. But A can also be loyal to an organisation (firm) C if A constantly consumes its services or products. This demonstrates that loyalty can be used in many different situations and environments and hence includes different levels of affection. Thus, loyalty can be studied in many different scientific disciplines. The strand of research that specialises in "brand loyalty" studies loyalty in the context of consumer firm interaction. In this context, it is viewed as a source of repeated behaviour for achieving profit and growth. As Assael (1984) suggests, "Success depends not on the first purchase but on repurchase."
It was thought for a long time that brand loyalty could be measured as a repeated purchasing frequency. However, it was questioned because it uses a black box approach i.e. it just covers what the consumer eventually does neglecting the psychological meaning of loyalty. For example, this definition of loyalty does not differentiate between a customer who always buys the same private label of frozen pizza because it is the cheapest and a customer who buys the same private label because he prefers it. It also does not take into account situations, in which the customer buys this private label because it has the most favourable shelf space or because it is the only nationally advertised and distributed brand carried by the store in which he shops (Day 1969). These examples demonstrate that all these customers buy repeatedly the same brand but the reasons of the repeated purchase are different. Thus, one can assume that not all of these behaviours represent loyal behaviour.
Acknowledging these problems, Jacoby (1971) developed a conceptual definition of brand loyalty which is based on the premise that brand loyalty is only one source of repeated purchasing behaviour. Jacoby and Kyner (1973) also distinguished brand loyalty from simple repeat purchasing behaviour and defined six necessary and collectively sufficient conditions. First, we will present these six conditions and afterwards they will be explained. The six conditions for brand loyalty defined by Jacoby and Kyner (1973) are that brand loyalty is:
(1) biased (i.e., non-random),
(2) behavioural response (i.e., purchase),
(3) expressed over time,
(4) by some decision-making unit,
(5) with respect to one or more alternative brands out of a set of such brands, and
(6) a function of psychological (decision-making evaluative) processes.

In other words, brand loyalty describes a preference which is manifested in an actual behaviour towards a certain brand out of a larger field of alternative brands. The individual or the household must have an opportunity for being disloyal, i.e. the consumer must have a choice to be disloyal. Therefore, it is necessary that the purchase act occurs at least at two different points in time. Whereas the early loyalty studies focused primarily on behavioural patterns of consumers, the definition of Jacoby and Kyner includes with the last condition (6) an attitudinal component, based for instance, on satisfaction or trust. A simultaneous appearance of both behavioural and attitudinal components is important for defining brand loyalty. As aforementioned, brand loyalty is only one source of repeated purchasing behaviour. Condition (6) as the attitudinal component of loyalty, states that loyal behaviour is the result of a decision-making evaluative process, like satisfaction. But in the same way it is not enough to make the consumer satisfied. He also has to exhibit a behavioural response (purchase) expressed over time.

Following all these six conditions, the decision-making unit (household for example) develops a degree of commitment to the brand in question. Commitment inclusion provides an essential basis for distinguishing between (true) brand loyalty and other forms of repeated purchasing behaviour, called spurious loyalty. The difference between true brand loyalty and spurious brand loyalty is that true brand loyalty is a function of psychological (decisionmaking evaluative) processes which are resulting in brand commitment, whereas spurious brand loyalty is a function of inertia (Bloemer and Kasper 1995). Spurious loyalty means that consumers stick to the same brand because they are not prepared to spend effort and time to search for other brands. For a better understanding of the difference between true brand loyalty and spurious brand loyalty, we will present some examples from the food market. Considering the situation of purchasing frozen pizza, there are a couple of reasons for repeated purchases, but not all these reasons are a basis for (true) brand loyalty. For example, if a certain frozen pizza brand is repeatedly purchased due to lack of alternatives because all other frozen pizza brands have been sold out, this act is called spurious loyalty. It is called so because there is no opportunity for being disloyal. Another example for spurious loyalty is if a repeated purchase is done because of inertia, i.e. out of habit and not due to a preference to a
favourite frozen pizza brand (Meyer and Oevermann 1995). Such consumers lack any attachment to brand attributes, and they can be immediately captured by another brand that offers a better deal, a coupon, or enhanced point of purchase visibility through displays or other devices (Day 1969). In addition, loyalty is also called spurious if price dictates the choice of a brand. In this case the (lower) price rather than the commitment to a brand triggers the purchase. Consumers buying a certain frozen pizza brand repeatedly because they are satisfied with this frozen pizza are brand loyal. The reason is that satisfaction as a psychological, respectively emotional condition has a positive influence on (brand) commitment (Homburg and Koschate 2007). Thus, satisfaction is an important premise for a preferred brand. True loyalty is a result of commitment, respectively a strong intrinsic preference to a brand and its unique characteristics.

The comments above reflect the traditional view of brand loyalty. It implies a brand-specific commitment to repurchase. In effect, the consumer desires to repurchase, but similar to any "good intention," this desire may be an anticipated but unrealized action. Thus, Oliver (1999) introduced the term "action loyalty". This term contains the commitment to the action of rebuying. Thus, "action loyalty" is the result of an actual re-buying based on a psychological (decision-making evaluative) process.

### 2.2 Duration of brand loyalty

The example of a satisfied customer in the last paragraph showed that satisfaction is a necessary condition of true brand loyalty. However, although loyal consumers are typically satisfied, satisfaction is an unreliable precursor to loyalty (Jones and Sasser 1995, Stewart 1997). For example, in the automobile industry, in which 85 percent to 95 percent of the customers report that they are satisfied, only 30 percent to 40 percent return to the previous choice (Reichheld and Teal 1996). Hence, also customers, who are satisfied, change their (most) preferred brand for another alternative. Such behaviour is not limited to automotives; instead it is easy to image that it also occurs in the food market, for example the market for frozen pizza where a multitude of (similar) products are being offered. For example, various brands - national brands and private labels - of frozen pizza are being offered. Furthermore, there are a multiplicity of various pizza types like pizza with cheese and tomato, pizza with salami and so forth. Moreover, not all brands / producers offer all types of pizza so that consumers might have to switch the brand in order to get a certain type of pizza.

Having shown that brand switching i.e. disloyal behaviour can be caused from market stimuli, we would also like to notice that disloyal behaviour can be triggered by consumer preferences themselves. For example, there are heterogeneity preferences in different occasions (e.g. the social context of consumption) or for multiple uses (Laurent 1978). In some cases one can say that although a psychological commitment is given the consumers still alter the brands. Such behaviour is called variety-seeking (McAlister and Pessemier1982). It describes customer's desire for variety, respectively for a new experience. Thus, it is not a lack of commitment to brand A, or a lack of preferences for brand A that triggers the choice of brand B. It is just the desire for a new experience. It also means that the consumer can always return to brand A . The phenomenon of variety seeking indicates that in order to describe (true) loyal behaviour, further characteristics have to be added. Jacoby and Kyner (1973) add that brand loyalty has to be expressed over time. The term brand loyalty is a repeated purchase which results in commitment, but is limited to certain duration. Thus, a continuance has to be in place within a certain time span. It is incidental that a continuum of loyal behaviour exists ranging from 100 percent loyal consumers (hard-core loyal consumers) which always buy the same brand up to the point where the so called switchers do not have any commitment to their purchased brands. Thus, brand loyalty has to include a duration in which the same brand is bought.

## 3. Empirical analysis

While the relationship between brand loyalty and repeated purchases was discussed in the previous section, we now turn to our analysis of German households' brand choice behaviour with regard to frozen pizza. We focus on periods of repeated purchases of individual brands, which are a necessary though not sufficient condition of brand loyalty. After introducing the data base in (3.1) we present our analytical approach, which focuses on the question whether the duration of periods of repeated purchase as well as this duration's determinants differ systematically between private labels and national brands (3.2). Results are discussed in (3.3).

### 3.1 Data

We use a panel data set on household food purchase in Germany over the period from January 2001 to December 2003. It is compiled from the 'ConsumerScan' panel of the GfK market research group (GfK 2008). The 14.000 households in the sample are representative of the German population and they report purchases via scanner technique and by manual input of additional information. The data reflect real purchase behaviour of individual households over
extended periods. Compared to qualitative interviews, they have the advantage to reflect actual behaviour rather than consumers' statements on their attitudes (see "action loyalty"). So, this panel data is a good basis for measuring the behavioural component of brand loyalty. Variables include prices and quantities of products and brands bought, respectively as well as some information on the display and promotion of brands in the store. In addition, the data set contains some demographic information on the household such as household size, household income and the age of the household head.

Our focus is on households which are frequent buyers of frozen pizza. ${ }^{1}$ Two producers of frozen pizza dominate the German market. In our sample 53 percent of packing units purchased carry one of the national brand labels 'Dr. Oetker' or 'Wagner'. Around 20 percent are products carrying private labels (retailer-owned labels). Although speaking of brands is not exact with respect to the group of retail labels, we will speak about three "brands" in this paper. We analyse consumers' repeated purchases as an indicator for brand loyalty of each of these brands, highlighting on similarities and differences between them. In our definition a period of repeated purchase is a period of at least two purchases of the brand with no purchases of any other brand in between. ${ }^{2}$

### 3.2 Duration analysis of periods of repeated purchase

Observed periods of repeated purchase range from one day to nearly the total observation period of four years, but very long periods are rare: for the three brands considered 97 percent of observed periods are below one year. Inference on the distribution of duration data can not be based on standard measures of location and distribution (means, percentiles, variance, etc.) for two reasons. Duration data usually follow a nonnormal distribution and for many observed periods we do not know their total length because the beginning or the end, or both are not

[^0]observed (censored observations). (Cleves et al. 2004) - Likewise, regressions using durations as endogenous variable yield biased results. Since our analysis focuses on the duration of periods of repeated purchases as an indicator for brand loyalty, we use techniques of hazard (or duration) analysis which are appropriate in this context (Kalbfleisch and Prentice, 2002). In particular, we estimate hazard functions which measure, for alternative durations, the probability of ending a period of repeated purchases conditional on having lasted up to that duration. This conditional probability (hazard rate) is modelled as depending on duration and a number of household characteristics, the covariates. From the information embedded in the hazard function, we will derive expected values of the duration of periods of repeated purchase as well as time (and covariate-) dependent probabilities of brand switching. For the hazard function $h(t, x)$ we choose the popular functional form
$h(t, \mathbf{x})=h_{0}(t) \exp \left(\beta_{0}+\mathbf{x} \beta_{\neq 0}\right)$
where $h_{0}(t)$ represents the baseline hazard, i.e. the hazard rate after duration $t$ with the covariates $x_{j}$ at reference level zero. We speak of a proportional hazard model because levels of $x$ carry over to $h()$ proportionally, i.e. independent of $t$.

From the (categorised) information on households in the data source we selected as covariates a number of household characteristics in order to test their relationship with repeated purchase behaviour as an indicator for brand loyalty (Table 1). ${ }^{3}$

| Characteristic | Variable | Type | Definition |
| :--- | :--- | :--- | :--- |
|  |  |  |  |
| Household size | HSIZE | num | Number of household members |
| Per Capita monthly net <br> household income | LOWINC | Bin | Under 500€ per HH member |
| Age of main earner | YOUNG | Bin | Under 30 years |
| Frequency of pizza <br> consumption | PPPQ | Cont | Number of pizzas (packaging units) <br> purchased per quarter |

[^1]| Family Type | FAM | Bin | Fam w adolescent children |
| :--- | :--- | :--- | :--- |
|  | MACOUPLE | Bin | Middle aged fam without children |

Table 1: Household characteristics

### 3.3 Results

Figure 2 gives an impression of how the baseline hazard rate of ending periods of repeated purchases to Dr. Oetker pizza varies with duration. Being estimated from a (semiparametric) Cox proportional hazard function on a priori assumption on the shape of $h_{0}(t)$ is made. ${ }^{4}$ The decreasing trend signals negative duration dependence of the hazard rate. The interpretation of this is that ending periods of repeated purchase, which usually means switching to a different brand, becomes less likely the longer a customer sticks to one brand. The conditional probabilities of ending a period of repeated purchases are very small for any single time interval (day), they start at nearly 2 percent and decrease to almost zero over duration. After a long period of repeated purchases the risk to switch brands on any particular day is negligible. (To ease further interpretation below we will then switch from hazard rates to survivor rates, which reflect the same information in a different way.) We decided to approximate the Cox hazard model by a parametric specification employing the Weibull functional form (Kalbfleisch and Prentice 2002). This widely used specification restricts the hazard rate to be monotonous in duration, however, is flexible with respect to the sign of duration dependence. Visual comparisons of Weibull hazard functions with those from Cox models and comparison of results with respect to the impact of covariates indicated that this restriction is supported by the data. The parametric specification is more efficient than the semiparametric one (provided the distributional assumptions are justified) and allows to predict failure times and hazards for the entire time domain (whereas for the semiparametric model, predictions are only possible for durations actually occurring in the sample).

[^2]

Figure 2: Hazard of ending periods of repeated purchase: Dr Oetker

The hazard function in the Weibull specification is
$h(t, \mathbf{x})=p e^{\beta_{0}} t^{p-1} \exp (\mathbf{x} \beta)$
In this specification the shape parameter $p$ is smaller (equal, bigger) unity if hazard decreases (is constant, increases) with duration. The baseline hazard is jointly determined by $p$ and the location parameter $\beta_{0}$.

Estimation results for the three brands are summarised in table 2.

|  | DR Oetker |  | Wagner |  | Private labels |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| NOBS | 11061 |  | 7681 |  | 5281 |  |
| Parameter estimates |  |  |  |  |  |  |
|  | Coef | Std err | Coef | Std err | Coef | Std err |
| constant | -3.23 | . 0576 | -3.147 | . 067 | -3.447 | . 080 |
| p | . 737 | . 0111 | . 720 | . 0128 | . 828 | . 0163 |
| HSIZE | . 021 | . 0186 | -. 104 | . 023 | -. 113 | . 0220 |
| Fam w adolescent children | . 127 | . 0646 | . 104 | . 0702 | -. 115 | . 0740 |
| Middle aged fam without children | -. 218 | . 0897 | -. 035 | . 1047 | -. 230 | . 1666 |
| LOWINC | -. 181 | . 0946 | -. 115 | . 1249 | -. 037 | . 0862 |
| YOUNG | . 286 | . 0670 | . 039 | . 0775 | . 030 | . 0854 |
| PPPQ | . 021 | . 0025 | . 042 | . 0032 | . 055 | . 0040 |
| Predicted durations |  |  |  |  |  |  |
| Median of pred. durations | 47 | 10,0 | 49 | 11,7 | 45 | 11,4 |
| Mean of pred. durations | 94 | 19,8 | 100 | 23,9 | 77 | 19,7 |
| Predicted survivor function values after alternative durations |  |  |  |  |  |  |
| One day | 96.1\% |  | 95.8\% |  | 96.9\% |  |
| One week | 84.7\% |  | 84.0\% |  | 60.5\% |  |
| One month | 63.0\% |  | 62.2\% |  | 28.7\% |  |
| Three months | 35.0\% |  | 35.1\% |  | 15.8\% |  |
| One year | 4.7\% |  | $4.9 \%$ |  | $1.5 \%$ |  |
|  |  |  |  |  |  |  |

Table 2: Estimation results (Source: own computations from GFK ConsumerScan data)
Note: Coefficients in bold types are significantly different from zero at $10 \%$ level.

The deviation of the estimated parameters $p$ from unity signals the extent of duration dependence. The values for the two national brands Dr Oetker and Wagner are very similar ( 0.74 and 0.72 ) and indicate considerable negative duration dependence (as apparent from
figure 1 for the case of Dr Oetker). The p-parameter for the private labels ( 0.83 ) is considerably closer to one, which means that the hazard rate decreases not as rapidly with duration. To reflect the probabilities of brand switches along a duration range of, say, one year we use the survivor function rather than the hazard function with its very small "daily" probabilities. The survivor function indicates for each duration the probability to continue repeated purchasing of the same brand beyond that duration. This probability starts around 96 percent for the three brands. The decrease over duration follows a virtually identical pattern for the national brands Dr Oetker and Wagner, e.g. after 3 months the survivor decreases to 35 percent. The decrease for the private labels is considerably faster, to 16 percent after 3 months. Figure 3 visualises this difference: long periods of repeated purchases are more likely for buyers of the national brands than for customers buying private labels (irrespective of what particular private label).

Another informative description of periods of repeated purchase, carrying the same parametric information, is their expected duration. It is computed as median and mean values (over all spells) of durations predicted from the estimated hazard functions. (Arithmetic means are roughly twice the value of the median because very few very long periods exert a strong positive bias. These are hence no values to be typically encountered in the sample.) The expected duration of periods of repeated purchase (median) is 45 days for the private labels and 47 (Dr. Oetker) and 49 (Wagner) days for the national brands reflecting the same difference as the survivor functions.


Figure 3: Survivor function Proportional Weibull model

What is the impact of the covariates on the repeated purchase behaviour of pizza buyers? In the proportional model hazards at all durations are shifted proportionally by changes in the covariates. All coefficients (except the HSIZE and the PPPQ coefficients which refer to cardinal variables) express a factor shifting the hazard to discriminating between two groups of households: the households belonging to that group (e.g. Families with adolescent children) as in contrast to the average of the population not belonging to this group. The results differ markedly between national brands and private labels. Families with adolescent children for e.g. have a significantly higher tendency to end periods of repeated buying of Dr. Oetker pizza than the Dr Oetker consumers which do not belong to that group. The coefficient of 0.127 implies an over 13 percent higher hazard. This result differs strongly from consumers of private labels. Here this family type's repeated purchase behaviour is 12 percent lower than that of the other family types, they stick to those brands longer than others ${ }^{5}$; also, middleaged Dr Oetker consumers without children ( -0.22 ).

[^3]The tendency of households with a household head under 30 years and below a monthly per capita income of $500 €$ to end periods of loyalty is below average, as indicated by coefficients of -.18, -. 12 and -.04.

The continuous variable that measures the frequency of purchases of frozen pizza has a significantly positive impact on brand switching from the three brands. Each additional pizza per quarter increases the hazard of ending a period of repeated purchase 2 percent for Dr. Oetker, 4 percent for Wagner and 6 percent for the private labels.

The coefficients for household size are significantly negative for Wagner and the private labels: Larger households are less likely to switch from these brands than smaller households.

## 4. Conclusion and Outlook

This paper acts on the question whether retailers are being considered by the consumers to be a 'real' brand and develop loyalty towards them. The term brand loyalty implies that the consumers repeatedly buy a certain brand, in this case a certain private label because they are committed to this private label. Thus, in measuring brand loyalty, it is important to consider both the duration of periods of repeated purchases and the underlying attitude.

The study analyses the duration of periods of repeated purchases as an indicator for brand loyalty for selected brands of frozen pizza in Germany. We ask whether determinants of that duration differ between two strong national brands and private labels. The results of this empirical investigation provide an indication that there are differences between national brands and private labels.

- In general, long periods of repeated purchases are more likely for buyers of the national brands than for households buying private labels. This reflects the high value of strong national brands in contrast to private labels in marketing.
- For the three brands, the tendency to switch between brands diminishes the longer a period of repeated purchases lasts, but this negative duration dependence is considerably stronger for the national brands than for the private labels.
- The covariates on repeated purchase behaviour of pizza buyers also differ markedly between national brands and private labels. One example concerns households with a monthly per capita net income below $500 €$. Whatever brand they patronize, they are less likely than other households to end periods of repeated purchase, but the effect of belonging to that low-income-group is markedly stronger for the national brands (-. 18
and -.12 ) than it is for private labels (-.04).These results show that the probability to continue the periods of repeated purchases for households with a low monthly per capita income for national brands are much longer than for private labels. In addition, household characteristics have an influence on this duration. For example, households with a low monthly per capita income have a lower tendency to end periods of repeated purchases of national brands than for private labels. As shown by Dölle (2001) national brands are more expensive than private labels. This could be an indication for a true loyal behaviour to national brands.

The operationalisation of the attitudinal component of brand loyalty by using panel data might be a challenge for further research. Preliminary thoughts on this subject show that it could be a possibility to analyze cross-buying effects or consumers' tolerance towards price increases. For example, if being a repeated buyer of a pizza brand is found to have a significant impact on becoming a buyer of frozen vegetables of the same brand, this could be interpreted as an indicator of loyalty towards that brand. Likewise, a consumer who repeatedly buys the same brand while the price has increased and/or the prices of other alternative brands have decreased; he can be probably regarded as a loyal consumer.

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[^0]:    1 Households remaining in the panel for less than 3 quarters are excluded from the analysis as well as households which purchased less than 6 frozen pizzas per quarter on average during their lifetime in the panel.

    2 We consider periods of uninterrupted choice of the same brand as a reasonable proxy for periods of brand loyalty. An alternative definition has been tried defining terms of loyalty as those periods (of $a$ days) in which at least $n$ pizzas of the respective brand were bought and these represented at least $p$ percent of all frozen pizzas purchased during that term. A period of loyalty is then understood as the time span incorporating consecutive terms of loyalty to the same brand.

[^1]:    ${ }^{3}$ Since continuous characteristics like net income or age of main earner are coded as categories and not all of these categories have the same width, use as continuous variables is inappropriate and we further aggregated the strata to achieve a parsimonious specification.

[^2]:    ${ }^{4}$ To be exact what is being estimated is the cumulative hazard at each individual point (of observed failures) on the time scale. This yields a step function with undefined derivative (->hazard) at failure times and zero derivative elsewhere. The graph shows a smoothed function of hazard contributions at observed failure times.

[^3]:    5 The coefficients of this household type for loyalty to Wagner and to private labels are not significant.

