

# Price Setting in Online Grocery Markets: The Case of Chocolate

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## 1 Introduction

Online markets are developing rapidly in many industrialized countries and have already reached a rather mature status for some product categories. This, however, is not the case in the food sector. In Germany, the online food market captured still less than 1 % of total food sales in 2014. Despite this small share of the online market, the segment is clearly increasing and major players on the offline grocery market engage themselves on the online market, too, or they plan to do so. It is intended in this paper to contribute to our knowledge on competitive strategies of multichannel suppliers and pure online traders which are active on this growing market segment. A major element of competitive strategies on the online market for foods is pricing. We concentrate on pricing strategies of multichannel firms and pure online traders on the German online market and present evidence for the product group chocolate.

More and quicker price information for consumers will become available with the development of online markets. Theory suggests that buyers' search costs will be lowered and market efficiency will be improved. With lower search costs, it is expected that price dispersion will be reduced, i.e. markets will tend towards the law of one price for identical goods, and that the price level will decline and adjust rapidly. It may, however, happen that online markets induce new search costs for consumers as the variety of products offered will also increase substantially. It is an empirical question whether the level and the dispersion of prices will actually fall as the online supply of foods grows. The increasing empirical evidence on non-food markets indicates that remarkable differences between various suppliers persist with the growing importance of online markets and prices remain relatively rigid over time. Different explanations for these patterns are offered in the literature including a growing importance of product differentiation and non-price strategies on online and offline markets.

Given this background, it is the objective of our contribution to describe, to measure and to explain price setting on the German online market for foods. After a brief review of the theoretical literature and major players on the German online market for foods, we will answer the following questions empirically: (i) Do major suppliers on the online market price homogeneous products identically? (ii) If not, how do prices vary across suppliers on the online market and between multichannel retailers and pure online traders? (iii) How do prices differ online and offline? (iv) How often do prices change on the online market? Are those prices really more flexible than offline? (v) Do pricing strategies on the internet follow the same pattern as in the established retailing sector, e.g., with regard to the major importance of price promotions in the competitive strategy of firms? Finally we intend to provide some tentative answers on why differential strategies of price setting can be observed across online food retailers. All questions of the contribution will be answered on the basis of primary data, in particular online data on prices of chocolate products.

## 2 Theoretical and Institutional Background

### 2.1 Price Formation in Online Markets: A Selective Review of the Literature

Theoretical expectations on price formation in electronic marketplaces, derived from information economics, are outlined by BAKOS (1997). According to the author, market inefficiencies are reduced by lowering buyers' search costs. Consequently, lower market prices should arise. As it becomes easy for buyers to compare prices across sellers, prices should move towards the perfectly competitive level. As electronic markets lead to a much higher market transparency with regard to prices, one might also expect a lower price dispersion across sellers for a uniform commodity.

Theoretical analyzes on search costs and price strategies go beyond the standard commodity argument for reduced buyer search costs. Incentives of buyers, sellers and independent intermediaries to engage in these markets are also investigated (BAKOS 1997). As product differentiation will also increase with electronic marketplaces, it may well be that search costs may actually increase in differentiated product markets (ANCARANI 2002). Sellers will engage in price and product differentiation and choose strategies to make it difficult for buyers to compare the increasingly complex information on product quality and offerings across sellers. Hence, two opposite effects arise: (i) reduced search costs on prices and (ii) additional search costs on products and qualities (ANCARANI 2002: 681). It is theoretically possible that price levels as well as price dispersion may actually rise. Given these theoretical predictions, it was tested empirically how the introduction of online markets actually affected prices. The focus of empirical studies was mainly on non-food products, e.g. on books and CDs (BRYNJOLFSSON and SMITH 2000), the online book industry (CLAY et al. 2002), digital cameras and flatbed scanners (BAYLIS and PERLOFF 2002) and standardized DVD brands (TANG and XING 2001). Although individual studies confirm a convergence of the price level (e.g. CLAY et al. 2002), other studies reveal consistently that price dispersion persists after the introduction of online markets even for homogeneous goods (BRYNJOLFSSON and SMITH 2000; TANG and XING 2001; BAYLIS and PERLOFF 2002).

The remaining price dispersion is explained by BAYLIS and PERLOFF with the observation that firms differentiate prices between informed and uninformed consumers. Other authors argue that sellers tend to avoid pure price competition and rather use non-price strategies such as product differentiation or changes in service quality (e.g. CLAY et al. 2002). In their comparison of pure online and multichannel retailers, TANG and XING (2001) argue that the latter group tries to limit the price-decreasing effect of online pricing on its offline supply.

Additionally, price rigidity in online markets seems to be relatively high (TANG and XING 2001). This is a surprising finding given the fact that it is technically very easy to adjust prices on electronic marketplaces quickly and often.

Only very few studies have analyzed online pricing strategies on food markets (for an exception, see DOPLBAUER 2015). However, it has been elaborated in detail for German grocery retailing how prices are set offline. Several studies confirm that high-low (HiLo) pricing as well as everyday-low-price (EDLP) strategies coexist in German grocery retailing (FASSNACHT, KÖTTSCHAU and WRIEDT 2012: 575). Retailers who pursue an EDLP strategy offer the products at permanently low prices. Suppliers with HiLo pricing provide their products at higher base prices and engage in frequent price promotions. The price level under promotions can be lower than the price level of an EDLP strategy (HOCH, DRÈZE and PURK 1994: 16). The most important instrument of price promotion is the special offer. A special offer is a price reduction of at least 5 % of the regular price for a maximum of four weeks (HANSEN 2006: 19). HiLo pricing is usually applied by supermarkets and consumer markets, whereas discounters typically utilize EDLP strategies (HANSEN 2006; HOFFMANN 2012; HERRMANN, MÖSER and WEBER 2009). Apart from special actions under HiLo pricing, food prices in grocery retailing tend to be rather rigid and much less volatile than prices on world markets of the agricultural commodities (HERRMANN, MÖSER and WEBER 2005; LOY and SCHAPER 2014).

### 2.2 Online Food Markets in Germany and the Market for Chocolate Products

In the following Section 3, price setting in German online grocery markets will be analyzed for national brands of chocolate bars. A brief overview of the German market for confectionery and chocolate products and a description of major players on the German online market for foods are provided first.

In 2014, the sector confectionery, pastry goods and ice cream accounted for 8.4 %, i.e. the fourth-largest share of the total turnover of the German food industry (with 172.2 billion Euros) (BVE 2015: 13-14). The most

important product category was chocolate products with a share of more than two fifths (5.3 million Euros) (BDSI 2015: 43).

The market research institute FITTKAU & MAAB CONSULTING (2014) has conducted a survey on the topic of online food buying. More than 5,000 online shoppers and prospective online customers participated in the survey and more than 60 % of them had already bought confectionery and chocolate products online. Given the importance of this product category within the segment of online food shopping, we decided to examine the online market for chocolate, in particular the product chocolate bars.

The price-setting behavior of eight suppliers on the German online market for foods was considered. We observed the four multichannel retailers REWE Online, real,- Drive, EDEKA24 and myTime.de as well as the four pure players Lebensmittel.de, Foodstore, World of Sweets and suesswarenhaus24.

REWE was the first major food retailer who started an online delivery service for foods in 2011. **REWE Online** offers a full range of products from all product categories (LODERHOSE 2011: 1; REWE.DE 2016).

Real operates with **real,- Drive** an online shop where goods can be ordered online and picked up in a stationary market by the customers or be delivered to their homes (REAL-DRIVE.DE 2016).

Even the largest German food retailer has a presence in online grocery trading. However, the product range of **EDEKA24** is considerably smaller than in the stationary markets (EDEKA24.DE 2016).

The online shop **myTime.de** has operated since 2012 by the trading group Bünting. Bünting pursues a different strategy online than offline: the online assortment is with 34,000 products much larger and offers more high-quality products (BÜNTING.DE 2016).

**Lebensmittel.de** started its shop in 2009. Meanwhile, this pure player provides more than 24,000 products (RODE 2012: 73; LEBENSMITTEL.DE 2016).

The Amazon third-party providers **Foodstore**, **World of Sweets** and **suesswarenhaus24** use the Amazon marketplace as a sales platform for their products. The assortment of these pure players is significantly smaller compared to the other analyzed suppliers (AMAZON.DE 2016).

### 3 Empirical Findings

#### 3.1 The Database

As consumers are often geared to brands (WARD and LEE 2000: 16), a product range of twelve chocolate bars was selected for this analysis, consisting of national brand products. The chocolate bars of brands such as Milka, Ritter Sport, Alpia, Kinder Schokolade, Yogurette, Toblerone, Sarotti and Lindt were selected in the commercial packaging size of 100 grams. Data collection for daily prices of these products was carried out for every retailer. Altogether, the prices were collected for 93 days from August to November 2013 once a day from the respective websites of the providers. To compare the online prices with offline prices, data collection was carried out by the first author at selected Edeka, Real and Rewe on November 25, 2013, in Giessen, Hesse, in Germany.

#### 3.2 Price Levels in the Online Market for Chocolate Bars: Uniform Prices for Homogeneous Goods?

As there are lower search costs in online markets compared to the stationary trade, the online market for chocolate bars might have all of the characteristics of a perfectly competitive market. Thus, the law of one price might hold for all individual national brands. Therefore, we first analyze price levels in the online market for the selected chocolate products in order to test this hypothesis. Descriptive and inductive statistics are used to measure and to compare the price levels of the various suppliers, the pricing strategy of the retailers and the price dispersion.

The distribution of online prices for the individual products was not normally distributed. In order to compare price levels of different suppliers, the median  $\tilde{x}$  is then an appropriate indicator. In Table 1, the median values  $\tilde{x}$  for the various suppliers and national chocolate products are presented.

There are significant price differences between the various suppliers. An example: All multichannel retailers offered "Milka Alpenmilchcrème" for less than one Euro, while the prices of the pure players ranged between 1.13 Euros (Lebensmittel.de) and 1.35 Euros (suesswarenhaus24). Although we might assume lower search costs at Foodstore, World of Sweets and suesswarenhaus24, as they act as Amazon third-party providers on one single platform, the median prices were still high. That controverts the results of BAKOS (1997: 1691) that reduced search costs lead to lower prices.

**Table 1: Comparison of Price Levels of Chocolate Bars across Online Retailers**

Chocolate Bars \ Retailer	REWE Online	real,- Drive	EDEKA 24	MyTime.de	Lebensmittel.de	Foodstore	World of Sweets	Suesswarenhaus24
Milka Alpenmilch	0.95 <sup>a</sup>	0.89 <sup>b</sup>	0.95 <sup>a</sup>	0.89 <sup>c</sup>	- <sup>2)</sup>	1.19 <sup>d</sup>	1.22 <sup>e</sup>	- <sup>2)</sup>
Milka Alpenmilchcrème	0.95 <sup>a</sup>	0.89 <sup>b</sup>	0.95 <sup>a</sup>	0.89 <sup>c</sup>	1.13 <sup>d</sup>	1.19 <sup>e</sup>	1.22 <sup>f</sup>	1.35 <sup>g</sup>
Milka Noisette	0.95 <sup>a</sup>	0.89 <sup>b</sup>	0.95 <sup>a</sup>	0.89 <sup>c</sup>	1.03 <sup>d</sup>	1.19 <sup>e</sup>	1.22 <sup>f</sup>	1.35 <sup>g</sup>
Ritter Sport Edel-Vollmilch	0.89 <sup>a</sup>	- <sup>2)</sup>	1.09 <sup>b</sup>	0.75 <sup>c</sup>	1.39 <sup>d</sup>	1.08 <sup>e</sup>	1.11 <sup>f</sup>	1.40 <sup>g</sup>
Ritter Sport Nugat	0.89 <sup>a</sup>	0.85 <sup>b</sup>	1.09 <sup>c</sup>	0.75 <sup>d</sup>	1.43 <sup>e</sup>	1.19 <sup>f</sup>	1.11 <sup>g</sup>	1.40 <sup>h</sup>
Alpia Alpenmilch	0.65 <sup>a</sup>	0.49 <sup>b</sup>	- <sup>2)</sup>	0.69 <sup>c</sup>	- <sup>2)</sup>	0.89 <sup>d</sup>	0.77 <sup>e</sup>	- <sup>2)</sup>
Alpia Edel-Nougat	0.65 <sup>a</sup>	0.49 <sup>b</sup>	- <sup>2)</sup>	0.69 <sup>c</sup>	- <sup>2)</sup>	- <sup>2)</sup>	- <sup>2)</sup>	- <sup>2)</sup>
Kinder Schokolade	0.99 <sup>a</sup>	0.95 <sup>b</sup>	1.19 <sup>c</sup>	0.99 <sup>a</sup>	- <sup>2)</sup>	1.29 <sup>d</sup>	1.29 <sup>d</sup>	1.39 <sup>e</sup>
Yogurette	0.99 <sup>a</sup>	1.09 <sup>b</sup>	0.99 <sup>a</sup>	0.99 <sup>a</sup>	1.17 <sup>c</sup>	1.19 <sup>d</sup>	-	-
Toblerone	1.29 <sup>a</sup>	1.19 <sup>b</sup>	1.39 <sup>c</sup>	1.19 <sup>b</sup>	1.56 <sup>d</sup>	1.69 <sup>e</sup>	1.11 <sup>f</sup>	1.89 <sup>g</sup>
Sarotti Schwarze Herren Edelbitter	0.99 <sup>a</sup>	- <sup>2)</sup>	1.19 <sup>b</sup>	1.19 <sup>b</sup>	- <sup>2)</sup>	- <sup>2)</sup>	1.44 <sup>c</sup>	1.99 <sup>d</sup>
Lindt Excellence 70 % mild	1.95 <sup>a</sup>	- <sup>2)</sup>	- <sup>2)</sup>	1.95 <sup>a</sup>	- <sup>2)</sup>	- <sup>2)</sup>	2.18 <sup>b</sup>	- <sup>2)</sup>

1) This table shows the median in Euros. - 2) Because of missing prices not calculable. - <sup>a, b, c, d, e, f, g, h</sup> Median values with the same superscript index in one row are not significantly different from each other.

Source: Own data collection and calculations.

Furthermore, it was investigated whether the prices of the individual chocolate bars were significantly different across various retailers during the period of analysis. Since the data are not normally distributed (Kolmogorov-Smirnov test:  $p\text{-value} (0.000) < \alpha (0.05)$ ), nonparametric tests were used. The Kruskal-Wallis test showed that the prices of individual suppliers were significantly different from each other ( $p\text{-value} (0.000) < \alpha (0.05)$ ). Therefore, the suppliers were analyzed in pair-by-pair comparisons. The results of the Mann-Whitney tests can be seen based on the superscripts in Table 1. There are median values which are significantly different from each other (different indices ( $p\text{-value} \leq \alpha (0.05)$ )), and other median values with no significant difference (same indices ( $p\text{-value} > \alpha (0.05)$ )). It is striking that there was often no significant price difference between multichannel retailers. As an example: For "Yogurette", no significant differences were found for three of four multichannel retailers (REWE Online, EDEKA24 and myTime.de). Apparently, the median of prices which multichannel retailers charge is often the same. In contrast, almost all median prices differ significantly from each other for pure players. Overall, significant price differences turn out between all suppliers. There is no retailer who offers all products at the lowest median price (see Table 1).

In Table 2, the pricing of the two operating forms multichannel retailers and pure players is compared.

**Table 2: Comparison of Pricing between Multichannel Retailers and Pure Players**

Form \ Operating	Multichannel Retailers	Pure Players
Milka Alpenmilch	0.89 <sup>a</sup>	1.19 <sup>b</sup>
Milka Alpenmilchcrème	0.89 <sup>a</sup>	1.22 <sup>b</sup>
Milka Noisette	0.89 <sup>a</sup>	1.22 <sup>b</sup>

Ritter Sport Edel-Vollmilch	0.89 <sup>a</sup>	1.11 <sup>b</sup>
Ritter Sport Nugat	0.89 <sup>a</sup>	1.19 <sup>b</sup>
Alpia Alpenmilch	0.65 <sup>a</sup>	0.89 <sup>b</sup>
Alpia Edel-Nougat	0.65	- <sup>2)</sup>
Kinder Schokolade	0.99 <sup>a</sup>	1.29 <sup>b</sup>
Yogurette	0.99 <sup>a</sup>	1.19 <sup>b</sup>
Toblerone	1.19 <sup>a</sup>	1.69 <sup>b</sup>
Sarotti Schwarze Herren Edelbitter	1.19 <sup>a</sup>	1.99 <sup>b</sup>
Lindt Excellence 70 % mild	1.95 <sup>a</sup>	2.18 <sup>b</sup>

<sup>1)</sup> This table shows the median in Euros for the operating forms multichannel retailers and pure players. -

<sup>2)</sup> Because of missing prices not calculable. - <sup>a, b</sup> Median values with the same superscript index are not significantly different from each other.

Source: Own data collection and calculations.

It can be seen, e.g., that the multichannel retailers offered "Ritter Sport Nugat" for 0.89 Euros, while the median value for pure online retailers was 1.19 Euros. The absolutely lowest price difference can be observed for "Yogurette" with 0.20 Euros, the highest for "Sarotti Schwarze Herren Edelbitter" with 0.80 Euros. The computed Mann-Whitney U-tests suggest in all cases that national chocolate brand products are offered significantly more expensively by pure online retailers than by multichannel retailers. We know from selected non-food markets such as for DVD brands that the reverse holds true (TANG and XING 2001: 319). Apparently, chocolate bars and DVDs are different with regard to the price structure in online markets and, possibly, food and non-food markets may be generally different in that respect.

Our conclusion from Tables 1 and 2 is that each pure player has a higher price level than multichannel retailers and the operating form multichannel retailer generally outperforms pure players. That multichannel retailers set lower prices could be due to the fact that the offline trading subsidized online trading (MALCHER 2013: 84). It might also be that pure players often sell chocolate bars in combination with other high-value foods or non-foods and that this allows the pure players to capture a price premium on cheaper products such as chocolate bars.

### 3.3 Dynamic Pricing Patterns in the Online Markets for Chocolate Bars: EDLP or HiLo Pricing?

Do EDLP or HiLo strategies play a significant role on the German online market for foods as they do in offline markets?

Retailers who pursue an EDLP strategy ought to provide all products at permanently low prices and without special offers (HOCH, DRÈZE and PURK 1994: 16). According to that, the price dispersion should be lower compared to a HiLo strategy. Price dispersion can be measured with the range ( $R$ ), i.e. the difference between the highest and the lowest price, the standard deviation ( $s$ ) and the coefficient of variation ( $CV$ ).

Once there are extreme values in the data set, the validity of the range  $R$  is limited. In this case, the standard deviation  $s$  and the coefficient of variation  $CV$  are preferable. Both incorporate each value of the data set. The coefficient of variation, as a relative measure of price volatility:

$$VC = \frac{s_x}{\bar{x}} \cdot 100$$

with  $s_x$  = standard deviation of prices,  $\bar{x}$  = mean price, seems particularly suitable.

The higher the coefficient of variation  $CV$ , the greater the volatility. If a retailer utilises an EDLP strategy without special offers and with a low volatility of prices, the range  $R$  as well as the standard deviation  $SD$  and the coefficient of variation  $CV$  are expected to be small.

We can derive from Tables 1 and 3 that the multichannel retailer myTime.de seems to follow an EDLP strategy. All chocolate bars were offered over the whole survey period at low and uniform prices. Both *R* and *CV* are 0.00 Euros or 0 % respectively (see Table 3). Each observed price  $x_i$  was equal to the mean  $\bar{x}$ .

The retailers REWE Online and real,- Drive used special offers during the period analyzed. The comparison of the two suppliers shows that real,- Drive adopts a stronger HiLo pricing than REWE Online. There was only one special offer for the Ritter Sport chocolate bars at REWE Online while real,- Drive used the promotional activities four times during the survey period.

In the online shop EDEKA24 no special offers were observed. Prices were consistently at a uniform level (see Table 3). *R* and *CV* were 0.00 Euros or 0 % for every monitored chocolate bar during the study period. Apparently, the firm does not apply HiLo pricing in the selected product category.

**Table 3: Comparison of Price Volatility for Individual Retailers**

Retailer Chocolate Bars	REWE Online		real,- Drive		EDEKA24		MyTime.de		Lebensmittel.de		Food-store		World of Sweets		Suesswarenhaus24		
	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	<i>R</i>	<i>CV</i>	
Milka									..)	..)	0.0	0.0	0.0	0.0	..)	..)	
Alpenmilch	0.00	0.00	0.30	9.12	0.00	0.00	0.00	0.00			0	0	0	0			
Milka Alpenmilchcrème	0.00	0.00	0.30	9.12	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	
Milka Noisette	0.00	0.00	0.30	9.12	0.00	0.00	0.00	0.00	0.30	3	0	0	0	0	0	0	
Ritter Sport Edel-Vollmilch	0.24	7.26	..)	..)	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0.0	0.3	
Ritter Sport Nugat	0.24	7.26	0.20	8.26	0.00	0.00	0.00	0.00	0.40	0	0	0	0	0	0	0	
Alpia					..)	..)			..)	..)	0.0	0.0	0.0	0.0	..)	..)	
Alpenmilch	0.00	0.00	0.10	7.53	..)	..)	0.00	0.00	..)	..)	0	0	0	0	..)	..)	
Alpia Edel-Nougat	0.00	0.00	0.10	7.53	..)	..)	0.00	0.00	..)	..)	..)	..)	..)	..)	..)	..)	
Kinder Schokolade	0.00	0.00	0.14	6.21	0.00	0.00	0.00	0.00	..)	..)	0	0	0	0	0	0	
Yogurette	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	1.47	0	0	..)	..)	..)	..)	
Toblerone	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0	0	0	0	0	
Sarotti Schwarze Herren														0.0	0.0	0.0	0.0
Edelbitter	0.00	0.00	..)	..)	0.00	0.00	0.00	0.00	..)	..)	..)	..)	0	0	0	0	
Lindt Excellence 70 % mild	0.00	0.00	..)	..)	..)	..)	0.00	0.00	..)	..)	..)	..)	0	0	..)	..)	

<sup>1)</sup> This table shows the range (*R*) and the coefficient of variation (*CV*) for every retailer. - <sup>2)</sup> Because of missing prices not calculable.

Source: Own data collection and calculations.

The pure player Lebensmittel.de distinguished itself by a flexible supply and price-setting behavior. In Figure 1, the price development for the offered chocolate bars is shown. At the end of the observation period, none of the twelve chocolate bars was offered anymore.

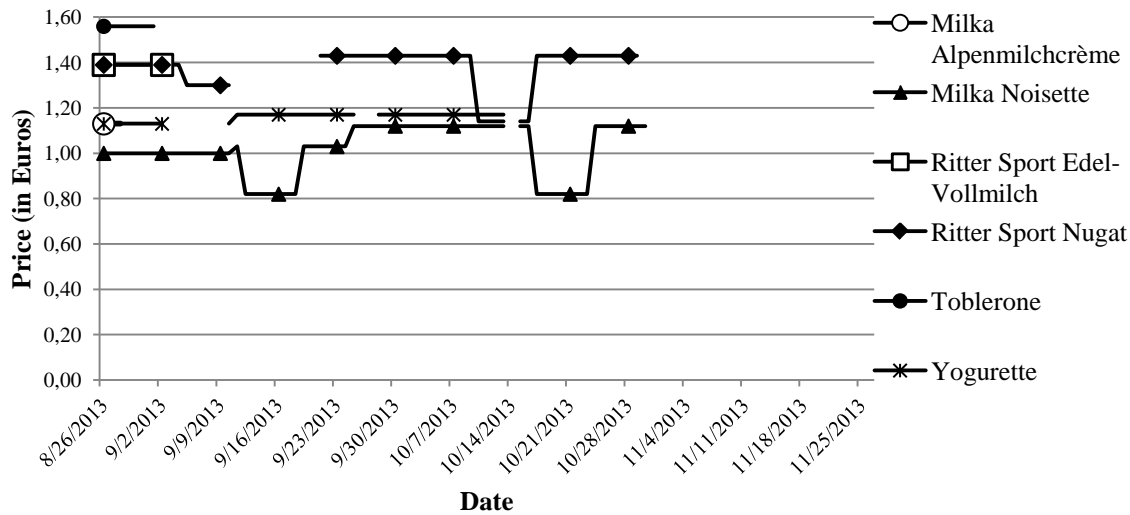


Figure 1: Price Dynamics for Chocolate Bars at Lebensmittel.de, 08/26/2013-11/26/2013 (Prices in Euros)

Source: Own data collection and calculations.

Some variations during the observation period are visible. The price range  $R$  for "Milka Noisette" was 0.30 Euros and for "Ritter Sport Nugat" even 0.40 Euros. It is remarkable that these values do not exist due to special offers, but because of frequent price changes. During those 65 days on which "Milka Noisette" was available, the price was changed six times. These frequent price changes indicate that menu costs are small online (BRYNJOLFSSON and SMITH 2000: 572).

The Amazon third-party providers also do not follow the pricing pattern of the stationary food-retailing sector. There were no special offers. Thus, no HiLo pricing can be observed. Predominantly high prices indicate that they did not follow an EDLP strategy either. On the whole, the third-party providers set their prices very differently, although we might expect that search costs on Amazon would be the lowest and prices very similar. Thus we might assume uniform prices, but unexpectedly we see very different prices. Remarkably, each chocolate bar was offered at only one price without any price variation (except "Ritter Sport Edel-Vollmilch" at suesswarenhaus24: 1.39 Euros to 1.40 Euros).

The results demonstrate that the multichannel retailers REWE Online and real,- Drive follow HiLo pricing and that myTime.de pursues an EDLP strategy, while none of the pure players shows one of the predominant pricing strategies prevailing in the grocery-retailing sector offline. Lebensmittel.de is distinguished by an untypically flexible price-setting behavior.

### 3.4 Comparison of Price Dispersion for Multichannel Retailers and Pure Players

To compare the price dispersion of multichannel retailers with the price dispersion of pure players the price range  $R$ , the standard deviation  $s$  and the coefficient of variation  $CV$  will be analyzed. Table 4 shows that there is price dispersion in multichannel retailing as well as in pure online retailing.

Table 4: Comparison of Price Dispersion for Multichannel Retailers and Pure Players

Chocolate Bars	Operating Form	Multichannel Retailers			Pure Players		
		$R$	$s$	$CV$	$R$	$s$	$CV$
Milka Alpenmilch		0.36	0.05	5.92	0.03	0.01	1.23
Milka Alpenmilchcrème		0.36	0.06	6.10	0.22	0.07	5.69
Milka Noisette		0.36	0.05	5.97	0.53	0.13	10.51
Ritter Sport Edel-Vollmilch		0.44	0.15	16.08	0.32	0.15	12.17
Ritter Sport Nugat		0.44	0.14	15.66	0.40	0.13	10.56
Alpia Alpenmilch		0.30	0.10	15.81	0.12	0.06	7.19
Alpia Edel-Nougat		0.30	0.10	15.81	— <sup>2)</sup>	— <sup>2)</sup>	— <sup>2)</sup>
Kinder Schokolade		0.24	0.09	8.89	0.10	0.05	3.62

Yogurette	0.10	0.04	4.27	0.06	0.02	1.46
Toblerone	0.20	0.08	6.55	0.78	0.31	18.91
Sarotti Schwarze Herren Edelbitter	0.20	0.09	8.39	0.55	0.27	15.96
Lindt Excellence 70 % mild	0.00	0.00	0.00	0.00	0.00	0.00
average	0.28	0.08	9.12	0.28	0.11	7.94

<sup>1)</sup>This table shows the range (*R*), the standard deviation (*s*) and the coefficient of variation (*CV*) for the operating forms multichannel retailers and pure players. - <sup>2)</sup> Because of missing prices not calculable.

Source: Own data collection and calculations.

The price difference between the lowest and the highest price is on average 0.28 Euros in both operating forms. The price differences range from 0.00 Euros ("Lindt Excellence 70 % mild") to 0.44 Euros ("Ritter Sport" chocolate bars) for the multichannel retailers. Large ranges of prices are mainly seen for the products that were expelled as special offers during the survey period. Rarely, low price ranges can be observed for the chocolate bars that were offered by pure players: 0.00 Euros for "Lindt Excellence 70 % mild", 0.03 Euros for "Milka Alpenmilch" and 0.06 Euros for "Yogurette". Despite these examples, price dispersion is considerably higher for most other products. The largest difference between the lowest and highest price for the operating form pure player is 0.78 Euros for "Toblerone".

Comparing the standard deviations, multichannel retailers show smaller absolute dispersions from the average prices (average: 0.08 Euros) than pure players (average: 0.11 Euros). By contrast, the coefficient of variation for multichannel retailers shows an average of 9.12 %, while pure players result in an average CV of 7.94 %. This means that the absolute dispersion is greater for pure players while the relative measure of dispersion shows that pure players' prices fluctuate less around the mean than multichannel retailers' prices (on a percentage basis). The explanation for the differences in absolute and relative dispersion is the different price levels of multichannel retailers and pure players (see Table 2).

In comparison to the results of CLAY et al. (2002: 352-353), who detected a price dispersion of 27 % and 73 % for books in the online market, the price variations in the online market for chocolate bars are still at a very low level. This can be explained by the fact that consumers perceive chocolate bars price sensitive. Consequently, only small deviations from the average price are possible (SAP and GfK 2010: 21). Nevertheless, it can be seen that online suppliers provide homogeneous products at different prices. The law of uniform pricing has not been enforced in the online market for chocolate bars. The result of GROVER, LIM and AYYAGARI (2006: 318) is confirmed: online providers can pursue different strategies of pricing despite reduced search costs.

### 3.5 How Does Pricing Differ in Online and Stationary Markets for Chocolate Bars?

To verify if the price level online complies with the price level offline, prices for the selected chocolate bars were collected in selected stores of the stationary food retailers Rewe<sup>1</sup>, Edeka<sup>2</sup> and Real<sup>3</sup>. Real communicates a price promise, pointing out that the prices online are the same as in retail stores (HANKE and WESP 2010: 10). At the time of data collection in 2013, Rewe and Edeka also made this price promise. Meanwhile, especially Rewe clearly communicated that the online prices may deviate from the offline prices (REWE.DE 2016). In Table 5, the prices of chocolate bars offline and online are displayed. The differences between the current prices on the observation day are shown as well.

<sup>1</sup> Rewe, Grünberger Straße 114, 35394 Giessen, Hesse, Germany.

<sup>2</sup> Edeka, Hofmannstraße 14, 35392 Giessen, Hesse, Germany.

<sup>3</sup> real,- SB-Warenhaus, Gottlieb-Daimler-Straße 27, 35398 Giessen, Hesse, Germany.



**Table 5: Price Levels Online and Offline (11/25/2013)**

Retailer \ Chocolate Bars	Rewe			Real			Edeka		
	Online	Offline	Online-Offline	Online	Offline	Online-Offline	Online	Offline	Online-Offline
Milka Alpenmilch	0.95	0.89	0.06	0.89	0.89	0.00	0.95	0.89	0.06
Milka Alpenmilchcrème	0.95	0.89	0.06	0.89	0.89	0.00	0.95	n.d.	- <sup>1)</sup>
Milka Noisette	0.95	0.89	0.06	0.89	0.89	0.00	n.d.	0.89	- <sup>1)</sup>
Ritter Sport Edel-Vollmilch	0.89	0.85	0.04	n.d.	0.85	- <sup>1)</sup>	1.09	0.89	0.20
Ritter Sport Nugat	0.89	0.85	0.04	n.d.	0.89	- <sup>1)</sup>	1.09	0.89	0.20
Alpia Alpenmilch	0.65	0.59	0.06	0.49	0.49	0.00	n.d.	0.59	- <sup>1)</sup>
Alpia Edel-Nougat	0.65	n.d.	- <sup>1)</sup>	0.49	0.49	0.00	n.d.	n.d.	- <sup>1)</sup>
Kinder Schokolade	0.99	0.99	0.00	0.95	1.09	-0.14	1.19	0.99	0.20
Yogurette	0.99	0.99	0.00	1.09	1.09	0.00	0.99	0.99	0.00
Toblerone	1.29	1.25	0.04	1.19	1.19	0.00	1.39	1.19	0.20
Sarotti Schwarze Herren Edelbitter	0.99	0.99	0.00	n.d.	0.99	- <sup>1)</sup>	1.19	0.99	0.20
Lindt Excellence 70 % mild	1.95	1.95	0.00	n.d.	1.95	- <sup>1)</sup>	n.d.	1.49	- <sup>1)</sup>

n.d. not distributed.-<sup>1)</sup> Because of missing prices not calculable.

Source: Own data collection and calculations.

25 % of the REWE online prices represent the prices of the Rewe supermarket. Seven products were more expensive online than in the supermarket. This may be due to the fact that the considered supermarket in Giessen does not match the reference market for the online surveys, a store in Frankfurt. It might be that prices in the Rewe store in Frankfurt are higher and, therefore, closer to the REWE online prices. According to BUSCHLE (1997: 171), a high price level was predominant in the Rhine-Main region in the 1990s. As Rewe is no longer communicating the price promise, this might be due to regional differences in the level of prices in food retailing.

The price level offered by Real corresponded online exactly to the price level offline, with one exception ("Kinder Schokolade"). It should be noted that Real keeps its price promise.

There were large differences between the price level online and offline for the multichannel retailer Edeka. Only "Yogurette" was offered online at the same price as offline. All other products were more expensive in the online shop. Five products showed an online price which was 0.20 Euros above the offline price. Despite regional price differences which were found for foods offline (BUSCHLE 1997), the high differences suggest that Edeka generally charges higher prices online than offline.

#### 4 Summary and Conclusions

Despite the increasing role of online markets for foods, studies on those markets in general and on price formation in particular have been rare. We contribute to the issue by investigating price setting and competition on the German online market for chocolate empirically. Online prices were collected for eight major suppliers and twelve products daily over a three-month period and prices of multichannel retailers were compared with the firms' offline prices. Major findings and possible explanations for those are the following:

1. The law of one price does not hold. Major suppliers on the online market do not price homogeneous products identically. Apparently, reduced search costs due to readily available price information are compensated by other factors so that price differentials persist. One of these factors might be an increase in search costs due to stronger product differentiation in the online food market.
2. There is a very clear pattern in the structure of median online prices across suppliers. In general, multichannel retailers charge lower prices than pure players on the online market. There seems to be a tendency that multichannel retailers do not deviate strongly from their offline prices which are affected by strong price competition in the German grocery-retailing sector. There seems to be the potential for pure players to raise the product price beyond the multichannel retailers' prices. A reason may be that the existence of complementarities with other products the pure players offer lead to lower price elasticities of demand for standard products such as chocolate bars.
3. Several multichannel retailers do not deviate significantly in their typical price level for the analyzed products online and offline, whereas one multichannel retailer offered most chocolate products online at higher prices than offline. As pure players charge higher prices online compared to their online competitors from multichannel retailing, we can conclude that prices of chocolate bars tend to be higher online than offline. This is very different from the non-food sector, where lower online prices have been identified as a threat for the established retailing sector.
4. Dynamic pricing is different online and offline. The dominating price strategies of EDLP or HiLo pricing in the stationary food-retailing sector are not as widespread on the online market. Only myTime.de could be characterized as an online supplier with an EDLP strategy. Discounter-type EDLP strategies, as observed on offline markets, are lacking. A HiLo strategy was identified for two multichannel retailers but the price variability remained still rather low. It is remarkable that prices are rather stable since price adjustments can be realized easily and cheaply on online markets.

It should be noted that all our conclusions refer to the product chocolate bars. It remains a task for future research whether these results are chocolate-specific or whether there are systematic differences for foods online and offline and between food and non-food products on online markets. It remains a major task as well to elaborate theoretically the reasons for differences in price formation online and offline and across products in online markets.

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