HOW DO RETAILERS COMPETE ON PRICE PROMOTIONS? EVIDENCE FROM A TEMPORARY PROMOTION BAN IN BELGIUM

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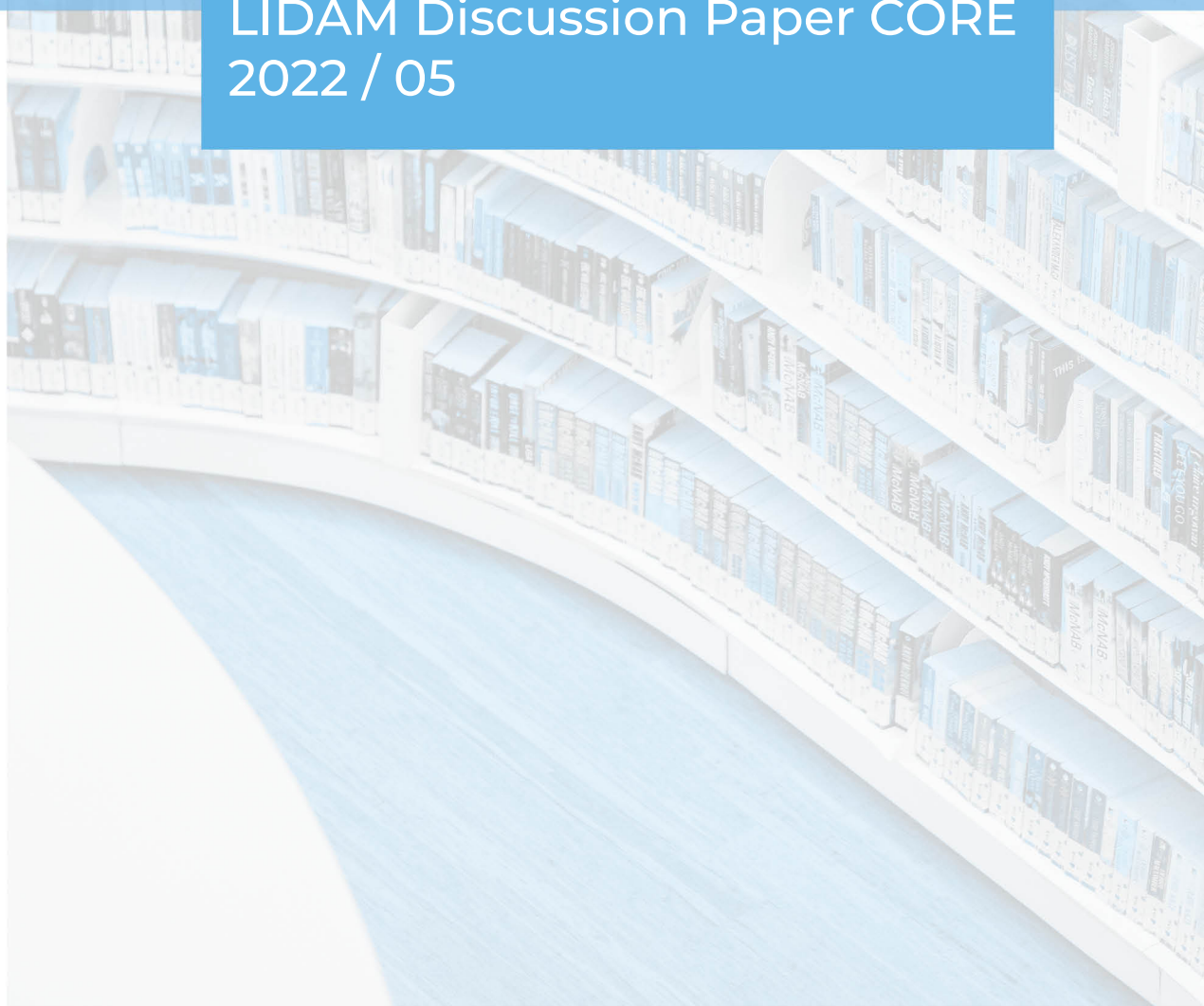

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How do retailers compete on price promotions? Evidence from a temporary promotion ban in Belgium

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Abstract: In March 2020, the Belgian government imposed a two-week promotion ban to contain panic buying at the beginning of the Covid-19 Pandemic. Using a unique daily dataset tracking list prices and promotions in different retail chains at the store level, we investigate how retailers set price promotions once the ban was lifted. We find that both frequency and size of promotions reverted to the pre-ban but only several months after the ban was lifted. This effect presents large heterogeneity across retailers: one chain acted as a promotion leader, reintroducing promotions quicker than others. Another large chain acted as a promotion follower, reintroducing promotions more gradually but eventually setting more frequent and larger price promotions than in the pre-ban period. Overall, the promotion ban was a major factor driving up sale prices in Belgian stores.

JEL Codes: D22, E30, E31, L11.

Keywords: price promotions, promotion ban, retailers, competition.

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1. Introduction

Price promotions are a fundamental strategy employed by retails to compete with one another. They can critically affect consumers' behaviors and explain significant price dispersion (Hitsch et al., 2021). Moreover, if consumers form beliefs about some products being on discount, they may buy these products only when in promotions and retail chains may keep competing on promotions to secure these consumers (Anderson and Fox 2017). Yet, little is known about how competition on promotions takes place and whether retail chains respond to changes in their rival's behaviors.

To shed some light on the dynamic of competition and how promotions are formed, we exploit a natural (unexpected) experiment that occurred in Belgium at the start of the COVID-19 pandemic in 2020. In order to contain panic buying and excessive stockpiling in grocery chains for two weeks starting from March 19, retail chains were forbidden to offer products on promotions, both via price and volume discounts.[1] The ban was lifted after two weeks amid concerns about the sale price hike.

The Belgium promotion ban offers a unique yet interesting opportunity to study the dynamic of competition among retail chains after a period in which competition is restricted. In particular, this paper addresses two research questions. First, did retail chains get back to their pre-ban promotion activities once the ban was lifted and, if yes, how quickly? Second, were there any strategic interactions among retailers when the promotion ban was lifted?

To answer these questions, we track the daily changes in price promotions at the store level several months after the promotion ban and study whether they reverted to the pre-ban level. We find that in the first 3 months after the ban was lifted (on April 4), the frequency of promotions remained lower by approximately 5 percentage points (p.p.) than the pre-ban level, which was around 14-17%. Promotion frequency reverted to the pre-ban level only during the second half of 2020, suggesting inertia in the effect of the ban. Overall, the sale price (i.e., the expected price for consumers buying on "sale") increased by approximately 6% during the ban but also (almost) reverted to the pre-ban level in the

[1] Starting from March 19, one day after the implementation of the lockdown, Belgian supermarkets were forbidden from offering discounted prices in the first two weeks of the pandemic. See l'arrêté ministériel, March 18, 2020. http://www.ejustice.just.fgov.be/eli/arrete/2020/03/18/2020030331/moniteur. From April 4 to May 4, only promotions decided before the ban were allowed. Note that our results apply qualitatively when removing observations during this period. After May 4 when also the mobility restrictions were removed, all sort of restrictions on promotions were lifted.

second half of the year. Interestingly, we find a large degree of heterogeneity across retail chains. One large chain restored promotions immediately after the ban was lifted, while another major chain restored promotions progressively to end up offering more frequent and larger promotions than before the ban.

Our paper contributes to different streams of the literature. First, it identifies the heterogeneous effect of promotion bans on competition between retail chains. Second, it contributes to the marketing literature pointing out the importance of promotions in the competition between retailers (see Hitsch et al. 2019).

The paper is organized as follows. In Section 2, we discuss our dataset. In Section 3, we present our results. In Section 4, we present concluding remarks.

2. Data

We use a unique dataset of daily prices and promotions for the major retail chains in Belgium collected at the barcode levels by an external data broker (Daltix). We have data about the three major chains in Belgium: Delhaize, Carrefour, and Colruyt Group. Together, these retailers cover around 60% of the total market shares in Belgium. Delhaize adopts a uniform-pricing strategy, so its information was collected from a representative store. Carrefour and Colruyt Group adopt local pricing strategies, so their data were collected on a subset of the available stores, whose location covers the three regions of Belgium.[2]

Our dataset contains information on 137 products, belonging to 17 different categories. Products are identified using their Stock Keeping Unit, SKU, a scannable barcode. Within a category, products were selected from the major brands (e.g., Barilla, Minute Maid, Nutella) to compare homogenous products across stores and chains. A summary of all products available in our dataset is provided in Online Appendix (Table A1).

Promotions are mainly set at the national level, but the size of the discount can vary across stores both within and across chains. To avoid information redundancy, we aggregate daily information into weekly data using the mode of prices and discounts over that week. In the analysis, the *promo price* is the average price at which a product on discount is offered. Discounts can be of different types

[2] We have information about 47 Carrefour stores and 61 Colruyt stores.

(percentage, cents, quantity). When a consumer buys "on sale", she pays the regular price if no discount is available and the discounted price when there is a promotion. Therefore, the "sale price" is the regular price minus the expected discount[3]:

$$sale\ price = regular\ price - Prob\ (discount)\ \times\ discount$$

where the regular price is the list price set by the store.

3. Analysis and Results

To highlight the impact of the temporary ban on the frequency and depth of discounts, we employ a before-and-after specification over the period January 2019 – November 2020, excluding December 2019[4]. This analysis assesses the impact of the promotion ban on discounts by estimating the change in the frequency and size of discounts before and after the ban.

For the promotion frequency, we estimate the following equation

$$FREQUENCY_{ijkt} = \alpha + \beta_1\ BAN + \beta_2\ POSTtoJune + \beta_3 JulyToNov + \gamma_{ijk} + \varepsilon_{it},$$

where the variable $FREQUENCY_{ijkt}$takes the value of 1 if, during week *t*, a product *i* is in promotion in store *j* from chain *k*, and 0, otherwise. γ_{ijk} are the product-store-retailer fixed effects. *BAN* is an indicator that takes a value equal to 1 during the promotion ban (from March 18 to April 3) and zero otherwise. To identify the average effect once the ban was lifted, we include two additional dummies: (i) $POSTtoJune$ takes value equal to 1 in the period after the ban up to June 30 and captures the mid-term effect on promotions of the ban; (ii) $JulyToNov$ takes value equal to 1 in the period starting on July 1, and 0 otherwise. To account for seasonality in promotions, we run the analysis with and without monthly fixed effects at the product-store level.[5]

Using a similar approach, we also estimate the following equation

$$\log\ (p_{ijkt}) = \alpha + \beta_1\ BAN + \beta_2\ POSTtoJune + \beta_3 JulyToNov + \gamma_{ijk} + \varepsilon_{it},$$

[3] Our posted data do not allow us to observe whether consumers purchase on "sale" or not. This purchasing "on sale" is only observable with transactions data. So, in the following we define the sale price as the price conditional on purchasing "on sale".
[4] We remove December to isolate any effect related to Christmas promotions.
[5] Monthly fixed effects indicate the month (i.e., for January this is equal to 1 during January 2019 & January 2020).

where $p=\{promo, sale\}$ is the price of product i in store j, from retailer chain k, in the week t. All other variables are similar to the previous model. Our coefficients of interest are β, which can be interpreted as the average price variation during or after the implementation of the promotion ban across every store and product. Using a log-transformation of the dependent variable, the average price variation can be interpreted for small coefficients in percentage changes.[6]

[Table 1 here]

Table 1 presents the main results. Due to the composition of the sample, we estimate our regression by Weighted Least Squares (WLS) and use the market share of each retailer as weights.[7]

We find that during the promotion ban, promotion frequency dropped from approximately 17% to zero. When considering the period of three months after the ban, the promotion frequency was reduced by 4.5 pp (equivalent to a promotion frequency of 12.5%).[8] In the second half of the year, the promotion frequency reverted to the pre-ban level and even increased by 1.1 pp (equivalent to a promotion frequency of 18.1%).[9]

We also find that the depth of the promotion decreased in the months immediately after the ban, but increased in the second half of the year. However, this result is obtained only when accounting for seasonality at the monthly level. Combining the effect of promotion prices with the fall of promotion frequency, we estimate the incidence on the sale prices paid by consumers.[10] The sale price increased on average by approximately 6.1%. The sale price increase persisted over time, with an average increase of approximately 2.7% within three months of the ban. In the second part of the year, the sale price increase was offset, but remained 1.2% higher than the pre-ban period.

[Table 2 here]

In Table 2, we present the heterogeneity analysis by retail chain to investigate patterns of competition. First, the frequency of promotions before the ban was highly heterogeneous and the ban

[6] Given that we include the product-store-retailer fixed effects, the identification of the coefficient β relies on a temporal comparison between the price of the same product sold in the same retailer-store before and after the implementation of the ban. Therefore, this can be interpreted as a *single difference* estimator.
[7] The weights are set such that each UP retailer represented by one store is weighted by its market share. For each LP retailers, each store is weighted as a fraction of this retailer's market share to add up to the total market share of this retailer.
[8] One retailer, Delhaize (the uniform pricing retailer), introduced a solidarity sales discount of 5% from April 3 on all product to "avoid a rush of specific promotions in stores."
[9] We find this increase only when controlling for monthly seasonality.
[10] The effect on the regular price is studied in a complementary work by Hindriks et al. (2021).

mostly impacted the strategies of the local-pricing retailers Carrefour and Colruyt Group. After the ban was lifted, Carrefour almost returned immediately to the pre-ban promotion frequency, whereas Colruyt was the most sluggish. However, in the second part of the year, while on average promotion frequency remained at a lower level, there was a high degree of heterogeneity: Carrefour fully returned to the pre-ban level, while Colruyt Group behaved even more aggressively further increasing the promotion frequency.

Significant heterogeneity was also present when considering the depth of promotions, which was reduced by almost all retail chains. Consistently adopting an aggressive promotion strategy, Carrefour did not only reintroduce promotions quickly (promotion leadership) but also increased their depth in the three months after the ban. However, this promotion boost was temporary as promotion size declined in the second half of the year. In contrast, Colruyt Group waited until that period to offer larger price promotions than before the ban (promotion price declined by -2.4%), leading to an overall sale price reduction. These dynamics are also illustrated in Figure 1 below.

[Figure 1 here]

4. Conclusions

In this paper, we tried to unveil the promotion competition dynamics in retail chains by exploiting a temporary ban on promotions that occurred in Belgium at the beginning of the COVID-19 pandemic. We show that even a temporary ban on promotions can have some long-lasting effects and change the tactics of retail chains, with heterogeneous effects. After the temporary restrain to competition of the promotion ban was lifted, retail chains have updated and resumed their promotion offers at different rates and depths. The shortcoming of our analysis is that by using posted prices and promotions we can only track the (supply side) change in promotion rate and depth but not the possible (demand side) change in the consumption behavior and the purchase on ‘sale” during the lockdown (Jaravel & O’Connell 2020). Yet, our results seem to be persistent over time extending beyond the period of strict home working rules. Our results also suggest that policymakers should be cautious when imposing temporary bans as it takes time for the price competition to resume when the ban is lifted. We also show that promotion competition across retail chains is a powerful driver of prices.

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Table 1: Change in promotions after the ban

	Not accounting for monthly seasonality			Accounting for monthly seasonality		
	Promo Frequency (percent point)	**Promo Price**	**Sale Price**	**Promo Frequency (percent point)**	**Promo Price**	**Sale Price**
Promo Ban	**-0.138***** 0.012		**0.061***** 0.004	**-0.170***** 0.019		**0.061***** 0.006
Post-ban (to June)	**-0.051***** 0.003	**-0.011**** 0.005	**0.029***** 0.001	**-0.045***** 0.002	**0.010**** 0.004	**0.027***** 0.002
Post-ban (July to November)	**-0.012***** 0.002	**-0.019***** 0.005	**0.012***** 0.003	**0.011***** 0.002	**-0.011**** 0.005	**0.012**** 0.005
Observations	1150491	157205	1150491	1148583	141413	1148583
ProductXRetailerXStore FE	Yes	Yes	Yes	Yes	Yes	Yes
ProductXRetailerXStoreXMonth FE	No	No	No	Yes	Yes	Yes
Ban included	Yes	No	Yes	Yes	No	Yes

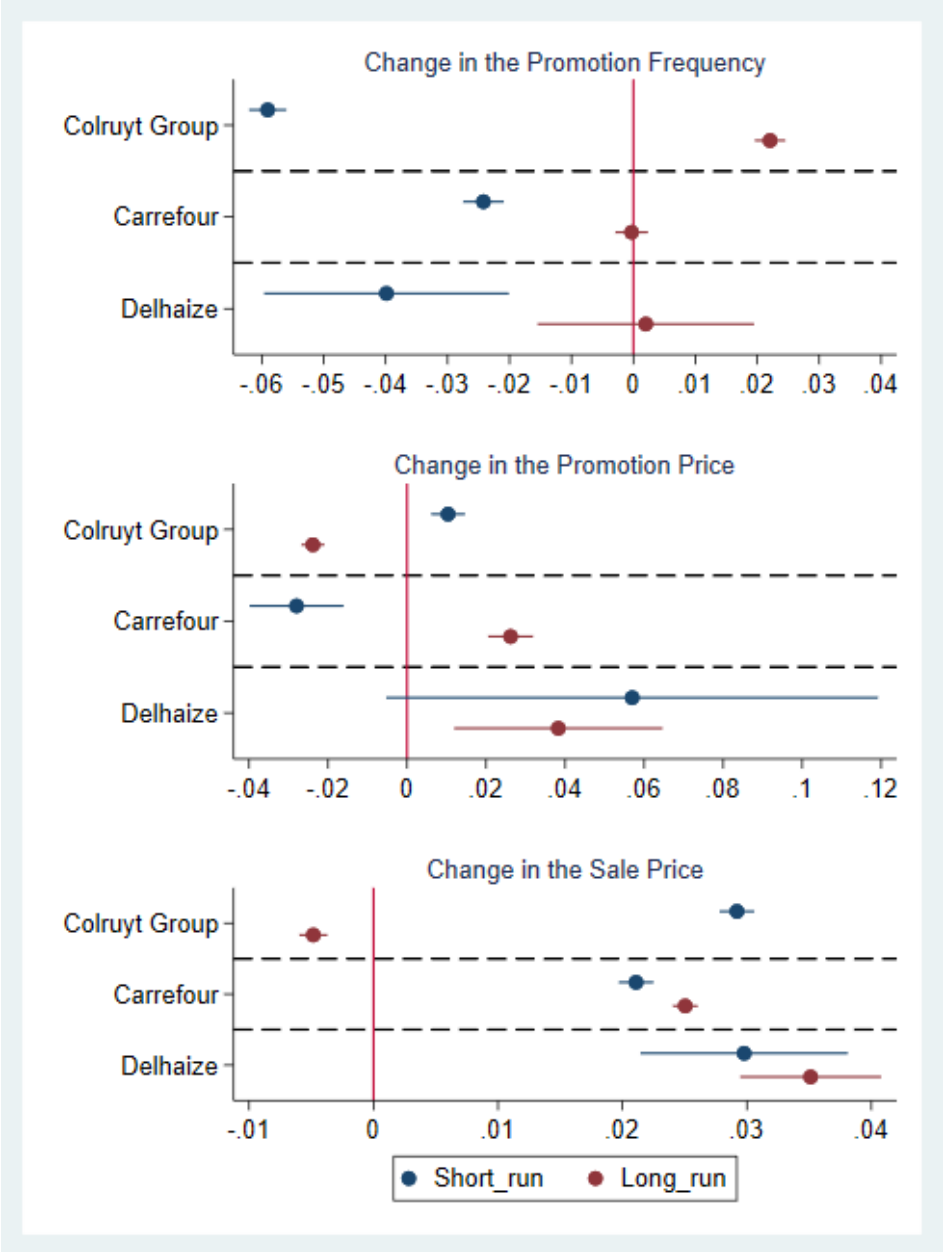
Note: Promo Ban refers to the period between March,19 and April 3 in which a ban on promotion was imposed. These observations are removed for the 'promo price'. Heteroskedasticity robust standard errors are below the estimated coefficients. Log-transformation of the dependent variable for promo and sale price. * p< 0.1, ** p<0.05, *** p<0.01. We estimate the coefficient using WLS. The weights are calculated based on the retailer‘s market shares. Weights are set so that each uniform-pricing retailer weights as its relative market share compared to other retailers. For local-pricing (LP) retailers, the weights are set so that each store weights as a fraction of the retailer’s market share. The sum of these weights then equals the market share of the LP retailer relative to other chains.

Table 2: Heterogeneity across retail chains

	Promo Frequency	Promo Price	Sale Price
Promo Ban X Colruyt G.	**-0.186***** 0.002		**0.080***** 0.002
Promo Ban X Carrefour	**-0.205***** 0.011		**0.049***** 0.002
Promo Ban X Delhaize	**-0.073***** 0.000		**0.033***** 0.000
Post-ban (to June) X Colruyt G.	**-0.059***** 0.001	**0.010***** 0.003	**0.029***** 0.003
Post-ban (to June) X Carrefour	**-0.024***** 0.001	**-0.028***** 0.004	**0.021***** 0.002
Post-ban (to June) X Delhaize	**-0.040***** 0.000	**0.057***** 0.000	**0.030***** 0.000
Post-ban (July to November) X Colruyt G.	**0.022***** 0.001	**-0.024***** 0.002	**-0.005**** 0.002
Post-ban (July to November) X Carrefour	**-0.000** 0.001	**0.026***** 0.004	**0.025***** 0.002
Post-ban (July to November) X Delhaize	**0.002***** 0.000	**0.038***** 0.000	**0.035***** 0.000
Observations	1148583	141413	1148583
ProductXRetailerXStore FE	Yes	Yes	Yes
ProductXRetailerXStoreXMonth FE	Yes	Yes	Yes
Ban included	Yes	No	Yes

Note: Ban refers to the period between March,19 and April 3 in which a ban on discounts was imposed. These observations are removed for the 'promo price'. Heteroskedasticity robust standard errors are below the estimated coefficients. Log-transformation of the dependent variable for promo price and sale price. * p< 0.1, ** p<0.05, *** p<0.01

Figure 1: Heterogeneity across retail chains



Note: the figure displays the coefficient of Table 1 together with their 95% Confidence Interval. The blue dots are the estimated coefficients for the three months after the ban (i.e., Post-ban to June), which corresponds to the change in the short run. The red dots are the estimated coefficients for the second half to the year (i.e., Post-ban July to November), which corresponds to the change in the long run.

ONLINE APPENDIX A

Table A1
Product categories

Alcohol	**Canned Vegs**	**Toppings**	**Sauces**	**Soda**
Absolute Vodka	Bonduelle Pois Chiches 310 gr.	Barilla Sauce Napoletana	Amora Mosterd 265g	Coca Cola Regular 1.5L
Bombay Dry Gin	Bonduelle Petit Pois 280 gr.	Barilla Sauce Bolognese	Bister impériale moutarde 12,363	Coca Cola Zero 1.5L
Eristoff Original	Bonduelle Lentille	Barilla Pesto genovese	Calvé Mayonnaise aux Œufs 500 ml	Fanta Orange 1.5L
Gordon Dry Gin	Elvea Cubes Tomates 800 gr.	Bertolli Pesto ouge	Devos Lemmens mayonnaise oeufs 750ml	Lipton Thé Glacé 1.5L
Havana Club 3 y.	Hak Pois Chiches 225 gr.	Bertolli Sauce arrabbiata	Devos Lemmens moutarde 450ml	Pepsi Regular Cola 1,5 L
Jameson Blended Whisky	Hak Green Beans 680 gr.	Miracoli sauce pâtes italiano750g	Devos Lemmens tomato ketchup 440ml	Sprite 1.5L
Jägermeister	Hak White Beans 360 gr.		Heinz Good mayonnaise 400ml	
Rum Bacardi carta bianca		**Flour and Sugar**	Heinz Tomato Ketchup 875 ml	**Milk**
Tanqueray London Dry Gin	**Cheese and butter**	Anco Farine Sluide	Heinz Ketchup 300ml	Alpro Soya Milk
Lawson Whiskey	Balade Beurre	Imperial Farine Fermentant	Hellmann's Mayonaise 430ml	Campina Lait demi-écrémé PET
	Balade Crème 25 cl	Imperial Sucre Vanilla	Kikkoman Soja 250ml	Campina Lait entier PET
Beer	Bertolli Margarile	Soubry Farine Patisserie	La William Mayonnaise 710 ml	Campina Lait frais
Chimay Bleu 33cl	Brie President	Soubry Farine pour pain blanc	Maille moutarde Fins Gourmets 340g	Fairebel Lait demi-écrémé
Corona Extra (35.4 cl)	Campina Crème 25 cl.	Sucre de tirlemont fin	Maille moutarde L'Originale 380g	Fairebel lait entier
Jupiler 25 cl.	Carlsbour Beurre		Zeisner Curry Ketchup 800ml	Joyvalle Lait AA Entier
Jupiler 50 cl.	Galbani Mozzarella	**Rice**		Pur Nature Bio Lait Frais
Jupiler can 33 cl.	Galbani Bufala	Bosto rice brown	**Jam/Chocopasta**	
Leffe Blonde 33 cl.	Leerdammer Original	Bosto basmati rice 1 kg	Boerinneke fondant noir 400g	**Water**
Liedemans Kriek 8x25 cl.	Mme. Loik Nature	Bosto basmati rice 4x125 gr	Côte d'or pâte à tart noir de noir	Bru 1.25 l
Maes 50 cl.	Planta Margarine	Bosto thai rice 4x125 gr.	Materne gelée groseilles rouges 450g	Evian 1 l
Stella Artois 50 cl.	President Camembert	Ebly Bib 10' 4*125g	Nutella 400g	Perrier 1 l
Stella Artois 25 cl.	Solo Cuir et rotir kitchen	Uncle Ben's rice complet	Pur Nature confiture fraise 450g	Spa Reine
Stella Artois can 33 cl.	Vitelma essential omega	Uncle Ben's rice long grain		Spa Intense
		Uncle Ben's rice basmati	**Snacks**	Vittel 1.5 minerale
Breakfast Cereals	**Coffee**		Delacre tea time 1kg	
Kellogg's Frosted Flakes	Jacqmotte Cafe Moka	**Pasta**	Kinder Delice	
Kellogg's Choco Pops	Douwe Egbers Moka	Barilla Farfalle	Lotus frangipane	
Kellogg's Corn Flaes	L'Or espresso capsule forza 104	Barilla Penne rigate	Lotus speculoos 700 gr.	
Nestlé Cookie Crisp	L'Or Lungo Profondo	Barilla Spaghetti	Lotus gaufre fourre vanille	
Nestlé Cheerios Bio	Nescafè Gold Dessert Instantanè	Soubry Macaroni coupè	Milka chocolate 100gr.	
Nestlé Fitness Chocolate Noir	Nescafè Lungo capsule	Soubry Spaghetti fin avoine	Oreo Original	
Nestlé Nequisk Duo Chocolate		Soubry Spaghetti fin al dente	Price ministar	
		Soubry Spaghetti integral	Delacre cafè noir	