The Long-Term Effects of Online Channel Adoption in Grocery Retailing

Long-term Effects on Category, Customer and Retailer

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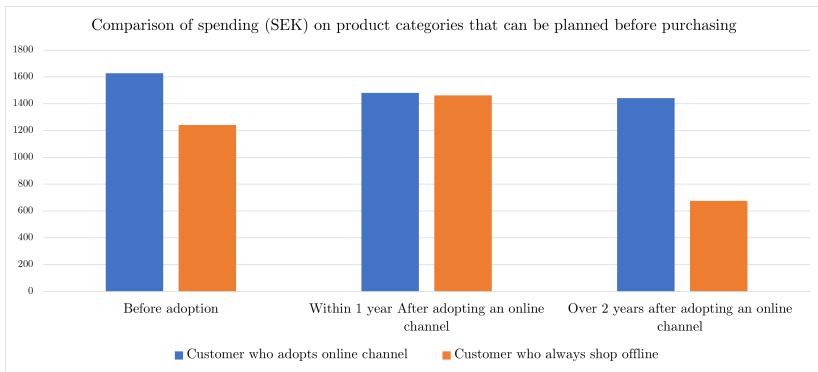[1]Stockholm School of Economics

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Executive Summary

- Channel additions are typically beneficial for retailer, but it is unclear how online channel adoption impacts grocery purchase behaviors in the long term
- We explore the long-term effects of online channel adoption on grocery retailing by comparing (multichannel) customers who adopt an online channel with customers who do not
- Multichannel customers had their purchasing habits disrupted and this led them to change in the long run
  - They buy more products in categories with high perceived online ordering convenience and fewer products in categories with high perceived ordering risk
  - They do not change their purchase frequency, the monetary value (per visit) increases
  - They still have higher total expenditure and thus long-term revenue to the retailer

Effects of Online Channel Adoption on Grocery Retailing

- Previous (academic) findings suggest:
  - Channel additions are typically beneficial for retailers (Ansari et al. 2008; Kumar & Venkatesan 2005; Venkatesan et al. 2007), but this effect holds primarily for hedonic rather than functional products (Kushwaha& Shankar, 2013)
  - In durable and apparel retailing, customers have been shown to revert to their regular consumption pattern after three years
  - It also depends on channel experience (Melis et al., 2015; R. J.-H. Wang et al., 2015)
- What we don't know:
  - How the addition of an online channel will impact spending in a retail grocery context in the long run
  - Particularly, how customers' online adoption affects their purchasing habits in specific categories, which are affected from the grocery channel choice, and their overall visits to and spending from the grocery retailer over a longer period of time

(Model-free) Evidence

Comparison of spending (SEK) on product categories that can be planned before purchasing

- Customer who adopts online channel
- Customer who always shop offline

- Customers who adopt online grocery tend to keep buying more product categories that can be planned (e.g. butter, frozen foods) over time

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(Model-free) Evidence

Comparison of spending (SEK) on product categories that are heavy/bulky

- Customer who adopts online channel
- Customer who always shop offline

- Customers who adopt online grocery tend to keep buying more product categories that are heavy (e.g. pet food, bottle of waters) over time

(Model-free) Evidence
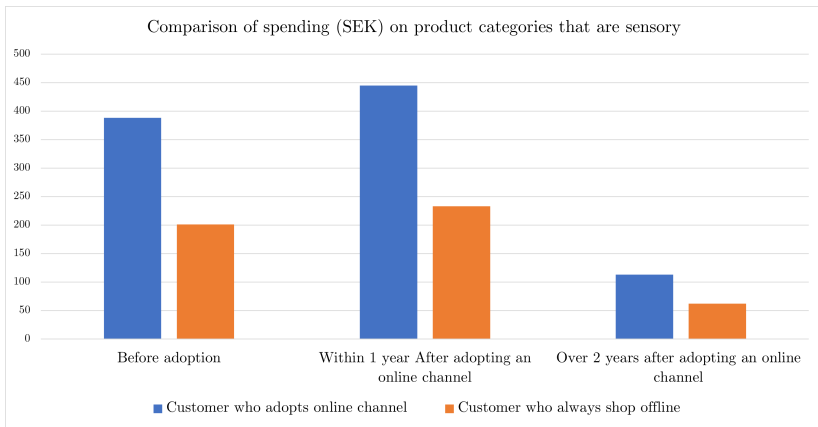
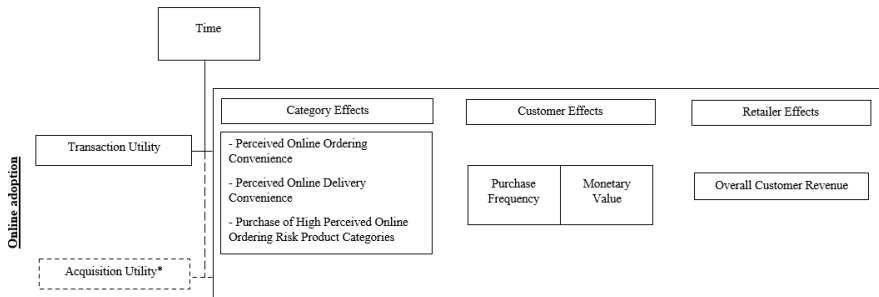Comparison of spending (SEK) on product categories that are sensory

- Customers who adopt online grocery tend to keep buying more product categories that are sensory (e.g. pastries, fresh meat) in the short run

Research Question

- What are the long-term category effects of online channel adoption?
- What are the long-term customer effects of online channel adoption?
- What are the long-term retailer effects of online channel adoption?

Conceptual Framework

Time

Online adoption

Transaction Utility

Acquisition Utility*

Category Effects
- Perceived Online Ordering Convenience
- Perceived Online Delivery Convenience
- Purchase of High Perceived Online Ordering Risk Product Categories

Customer Effects

Purchase Frequency | Monetary Value

Retailer Effects

Overall Customer Revenue

*The grocery retailer has no difference in price and assortment across channels and thus acquisition utility is constant in our data.

The proposed framework links shopping utility (category level), to changes in purchase patterns in terms of shopping frequency and monetary value (customer level), and ultimately overall revenue (retailer level)

Data & Setting

- The retailer introduced an online channel in October 2015
- Point of sales data from loyalty cards from customers at one specific hypermarket in a mid-sized city
- Data come from two different datasets, We focus on customers that are available in both datasets
  - Oct 2014–Nov 2016 (Short-run period) and
  - Aug 2017–July 2019 (Long-run period)
- In total, we track 578 households (147 of which adopt the online channel) and 116,982 receipts with 1,749,812 products
- Total 358 product categories of which 205 are coded according to perceived online (a) ordering convenience, (b) delivery convenience, and (c) ordering risk

Variable Operationalization (I)

Variables of interest	Measures	Definition
Specific Categories Purchases		
Perceived online ordering convenience	Planning	Money spent on high perceived online ordering convenience categories. (This includes 205 grocery categories that have higher than 3.5 ratings on a 7-point planned purchase Likert scale (1 = not planned to 7 = usually planned) from Campo et al. (2021)) (local currency)
Perceived online delivery convenience	Heavy/bulky	Money spent on high perceived online delivery convenience products. (This includes 205 grocery categories that have higher than 3.5 ratings on a 7-point heavy/bulky Likert scale (1 = not heavy/bulky to 7 = very heavy/bulky) from Campo et al. (2021)) (local currency)
Perceived online ordering risk	Sensory	Money spent on high perceived online ordering risk products. (This includes 205 grocery categories that have higher than 3.5 ratings on a 7-point sensory Likert scale (1 = not sensory to 7 = very sensory) from Campo et al. (2021)) (local currency)

Variable Operationalization (II)

Variables of interest	Measures	Definition
Overall Shopping Behaviors		
Frequency	Frequency	Average number of purchase incidences per week (times)
Monetary value	Monetary	Average amount of money spent per purchase incidence (local currency)
Total Customers Revenues		
Total expenditures	Expenditure	The total amount of customers' money spent in a certain period of time (local currency)
Period of Time		
Before adopting an online channel	Pre	52 weeks prior to first purchase online of treated household
After adopting an online channel (short term)	Short	0-52 weeks following first purchase online
Over 2 years after adopting an online channel	Long	146-198 weeks following online introduction

Methodology

- Since customers self-select to the online channel, it may be that customers who adopt the online channel are genuinely different from those who do not, regardless of online channel adoption
 - To deal with this issue, we employ propensity score matching:

$$Treat_{i,\text{post}} = \alpha_0 + \alpha_1 Frequency_{i,\text{pre}} + \alpha_2 Monetary\ Value_{i,\text{pre}}$$
$$+ \alpha_4 Distant_{i,\text{pre}} + \varepsilon_i$$

- We estimate a difference in all our variables of interest between the matched pairs

$$Y_{i,t} = \beta_1 Short_{i,t} + \beta_2 Long_{i,t} + \beta_3 Volume_{i,t}$$
$$+ \beta_4 Deals_{i,t} + \beta_5 Family_{i,t} + \xi_t + \varepsilon_i$$

where $Y_{i,t}$ is the difference between the matched pair i in period t of the purchase behaviors (Planning, Heavy/Bulky, Sensory, Frequency, Monetary Value, and Expenditures)

Matched Samples
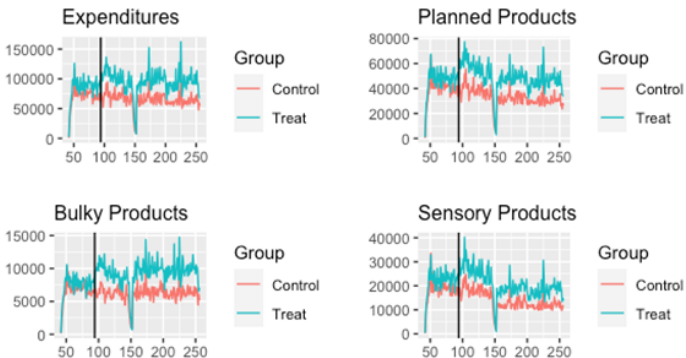
Purchasing behaviors over time of the treatment group, which represents customers who adopted an online channel, and control group, which represents customers who never adopted an online channel after adjusting for self-selection bias

Estimation of Difference

	Category Effects			Customer Effects		Retailer Effects
	Planning	Heavy/ Bulky	Sensory	Frequency	Monetary	Customers' Expenditure
Panel A: Multichannel Customer Purchases, total (online and offline channels)						
Short (β_1)	1114.53	247.33	570.62	-0.08	45.63	643.2
	(337.15)	(114.69)	(239.52)	(0.05)	(23.96)	(452.25)
Long (β_2)	6.55	338.29	-300.38	-0.11	103.56	566.24
	(343.77)	(116.95)	(244.23)	(0.06)	(24.43)	(461.15)
R-squared	0.88	0.73	0.69	0.41	0.23	0.93
Panel B: Multichannel Customer Purchases, online channel						
Short (β_1)	1156.47	624.51	-71.11	-0.33	431.73	703.2
	(359.3)	(122.11)	(231.3)	(0.07)	(57.71)	(438.89)
Long (β_2)	695.39	287.13	245.72	-0.35	307.47	-1842.49
	(347.54)	(118.11)	(223.73)	(0.06)	(55.82)	(424.53)
R-squared	0.93	0.8	0.88	0.69	0.23	0.97
Panel C: Multichannel Customer Purchases, offline channel						
Short (β_1)	-197.23	244.98	-138.2	0.03	-24.38	363.39
	(312.31)	(112.28)	(225.56)	(0.05)	(23.85)	(474.01)
Long (β_2)	-650.46	129.5	-309.66	-0.02	25.61	119.43
	(309.3)	(111.2)	(223.39)	(0.05)	(23.62)	(469.43)
R-squared	0.87	0.66	0.69	0.45	0.15	0.92

Results

- At the category level, there is no difference between the purchases of products with high perceived online ordering convenience (Planning) in the long-term period and the period prior to adoption, between the multichannel and the offline customers while purchases of products with high perceived online delivery convenience (Heavy/Bulky) are higher in the long-term period

- At the customer level, the results show that multichannel customers make fewer frequent purchases (Frequency) but in the long term spend a higher monetary value per purchase occasion (Monetary Value) compared to before adoption

- At the retailer level, the results suggest that multichannel customers have higher total expenditures (Expenditure) in the long-term period compared to the period prior to adoption

Recommendation

- The framework that links shopping utility (category level), to changes in purchase patterns in terms of shopping frequency and monetary value (customer level), and ultimately overall revenue (retailer level) can be used by retailers to better understand the bottom-up effect of offering a new channel starting with utility at the category level

- There exist benefits for retailers to offer several channels to existing customers in grocery retail