Mail Stream as a Platform:
Patterns of Recipients' Reactions to Advertisement

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Mail Stream as a Platform: Patterns of Recipients' Reactions to Advertisement

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Abstract

Letter volumes in advanced economies decreased significantly in the past decade, and postal operators are reconsidering their pricing strategies in light of mail's value compared to electronic substitutes. This paper empirically examines interdependencies between various mail types and recipients' reaction to advertisement by using a Swiss data set of 2016 and applying a multinomial logit model. It shows that a balanced mail mix of advertisement and transactional mail significantly increases the probability of the recipient reacting positively to addressed advertisement (direct mail). For example, higher shares of non-advertisement as well as private mail in the recipients' mailbox increase positive response rates to advertisement, thereby increasing the advertisers' willingness to pay for postal services. Moreover, we find that females show a significantly lower odd of showing a positive reaction conditional on the mail mix than men do and that the odds of a firm using advertisement mail to attract customers being contacted are significantly higher for recipients with a positive mail mix. A similar finding holds for the odds of searching the internet for more information on advertised goods. Our findings suggest significant interdependencies between various types of mail, which postal operators should take into account in their product development and pricing strategies.

Keywords: Mailmix, advertisement, recipient reaction

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1 Introduction

Letter volumes in advanced economies decreased significantly in the past decade. From 2006 to 2016, aggregate mail volume declined by more than a quarter on average and more than halved for some posts (IPC, 2017). The electronic substitution reduces the demand for transactional mail disproportionate compared to direct mail. Direct mail is letter mail sent for advertising proposes while transactional mails refers to mails which typically have a personal connection or a transactional purpose. Competition has evolved differently in the two types of mail: new postal operators typically focus on bulk mail while transactional mail originating from households remains mostly uncontested. The types of mail also developed in various ways in respect of mail prices and its volumes.

Postal operators (POs) and regulators reconsider their pricing and policy based on the value of mail with electronic competition. Several studies have examined demand for mail and its drivers, most of them from the perspective of senders of mail. Even if the senders' mail value is more crucial for the channel decision (electronic or letter mail), the recipients' preferences and appreciation of mail should also be studied in order to fully understand the value of mail. Especially because the recipients' mail value determines part of the sender's mail value. The relationship between the composition of mail, recipient's attention and direct mails sender can be seen in Figure 1. This paper shows empirically the connection between the mail mix and recipient's reaction, pictured in Figure 1 as dark arrow.

The recipients' perception of the mail they receive depends on the composition or the mix of mail (further on referred to as "mail mix"): various types of mail interact with each other. Some types of mail are perceived positively and contribute to the attractiveness of the mail channel, thereby increasing the value of other mail. Other types tend to annoy the recipients and degrade the quality of the channel as a means of communication. As a side effect, in many countries "do not mail lists" have emerged. Hence, the mail stream can be interpreted as a platform with multiple market sides: senders of various types of mail and recipients.
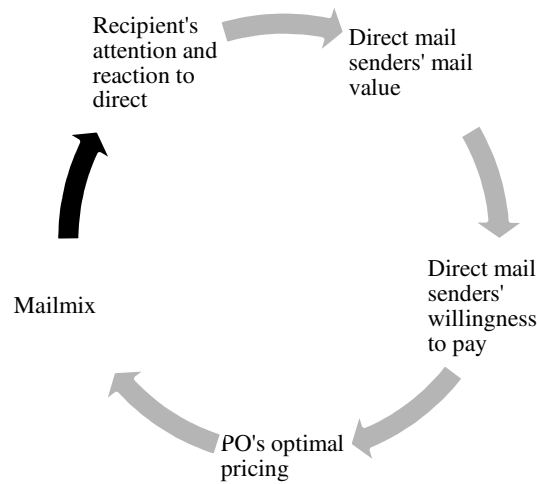
Figure 1: Impact of the mail mix.

This paper is the first attempt to test empirically the effect of the mail mix composition on the recipients' reaction to mails. To our knowledge, there is yet no empirical research available on this important topic in addition to Geissmann et al. (2017) which is a preliminary study to the present paper. This paper first examines the relevance of interdependencies between various types of mail in analogy to other platform markets. It then empirically analyzes the interdependencies of various mail types based on a Swiss data set of 2016. It shows that a balanced mail mix increases the probability of the recipient reacting positively to addressed advertisement significantly. For example, a higher share of non-advertisement mail in the recipients' mailbox increases response rates to direct advertisement, thereby increasing the advertisers' willingness to pay for postal services. Hence, postal services with a high share of advertisement mail might, in particular if they are not restricted by direct competition from competing deliverers, aim to reflect the described interdependencies between different mail types in their pricing. More explicitly, such postal services might want to differentiate prices between advertising mail and transactional mail with a relatively high price for the former and a relatively low price for the latter (due to their positive effect on the value of advertising mail). This is not consistent with the current price structures of postal operators that tend to not reflect these interdependencies in their prices.

The remainder of the paper is structured as follows: Section 2 discusses the literature related to platforms and the postal sector. In Section 3 the analytical framework to

analyze the postal sector is developed with reference to the media sector. Section 4 presents the empirical analysis and results on recipients' reaction to the mail mix. Section 5 derives conclusions from our analyses for POs.

2 Literature

There is no empirical research yet on the effect of the mail mix on the recipients' attention and the value of the mail channel for advertisers. For other platforms, e.g. newspapers and TV channels, the interaction between the various types of content and their role in the competition for readers and viewers has been studied extensively. How customers interact and value content on a platform is also of crucial importance for online advertising based social networks. With space in their News Feed being limited, Facebook for example announced in the beginning of 2018 to show more posts from friends and family, and less public content, including videos and other posts from publishers or businesses (Facebook, 2018). The aim of this paper is to gain a better understanding of a PO's platform operation. Therefore, a general knowledge of the literature on platforms and the postal sector is necessary.

A platform handles at least two distinct groups of agents, where the utilities of the agents in one group depend on the actions of the agents in the other group. Cases of asymmetric interaction of the utilities between the groups on the platform are of particular interest. For example, group one exerts a negative effect on group two on the platform, while group two exerts a positive effect on the former. This contradictory interaction between the groups' utilities complicates the profit-maximizing price setting for the platform provider (Jaag & Bach, 2016). A literature on such platforms and two-sided markets has emerged with Rochet and Tirole (2003), Armstrong (2006), as well as Rochet and Tirole (2006) as remarkable starting points.

The media sector, i.e. radio, newspapers and television channels are the classic example of platforms with asymmetric external effects, where one group consists of the consumers of editorial content and the other group of the advertisers. The economics of media platforms have been studied extensively. Common to all models is the breakdown

of the platform's agents into two sides, advertising firms and content consumers. For example Anderson and Gabszewicz (2006) model the media sector as a two-sided market in which they include the influence of advertising on media usage. The model is applied in the particular context of television by Anderson and Coate (2005). In addition, Gode et al. (2009), Crampes et al. (2009), as well as Reisinger (2012) analyze the competition between media companies applying a platform model, which also integrates external effects of advertising on the media content consumers. Peitz and Valletti (2008) compare the advertising intensity and content differentiation of free television channels with the ones with subscription free using a platform design. Advertising is both theoretically and empirically found to exert negative externalities on media content consumers, see e.g. Gabszewicz et al. (2004) and Wilbur (2008).

This paper builds on the theoretical framework provided in Jaag and Bach (2016), who model the mail stream as a platform carrying two types of mail (transactional and direct mail) with three groups interacting on the platform: recipients of mail, senders of transactional mail, and advertisers, i.e. senders of direct mail. Both types of senders are interested in the recipients' attention to their items. In particular, the attention for direct mail is affected by the mail mix the recipient receives in his letterbox. Jaag and Bach (2016) conjecture that transactional mail exerts a positive effect on the recipient's attention to his mail. Consequently, the demand for transactional mail and the demand for direct mail are interdependent: Direct mail receives more attention by recipients who receive more transactional mail.

Apart from Jaag and Bach (2016) and Geissmann et al. (2017), the postal sector has so far not been studied from a two-sided market perspective in which there is an interdependency between different types of mail. Jaag and Trinkner (2008) model the mail market as a two-sided market, too, but they only consider senders and recipients as the two sides of the market. They provide arguments in favor of the subsidization of recipients by senders' trough the senders-pays-principle since it is natural outcome of the two-sidedness of the market. Boldron et al. (2009) make an analogous distinction. They show in a two-sided market model with network externalities that the benefits of senders (per addressee) increase in the size of the high-quality delivery network and that such externalities should be considered in the pricing of postal services. Rohr et al. (2011) conclude in their empirical study based on discrete choice experiments that senders do

care about the attributes of the postal platform provided on the recipient side, and that the services offered on the sender side are important to recipients. Based on this result it is therefore possible to say that if the mail mix matters for recipients, senders also care about it. The present paper is also somewhat related to Bradley et al. (2015), who analyze the demand for "saturation", i.e. untargeted advertising mail and "targeting" advertising mail in competition for the recipients' attention. De Donder et al. (2011) study the pricing and welfare effects of bulk mail, which is divided into the two distinct markets of advertising and transactional mail. The costs of providing those services are assumed to be the same but the price elasticities of the two kinds of senders are different. They assume that demands in these markets are independent of each other, what we put into question.
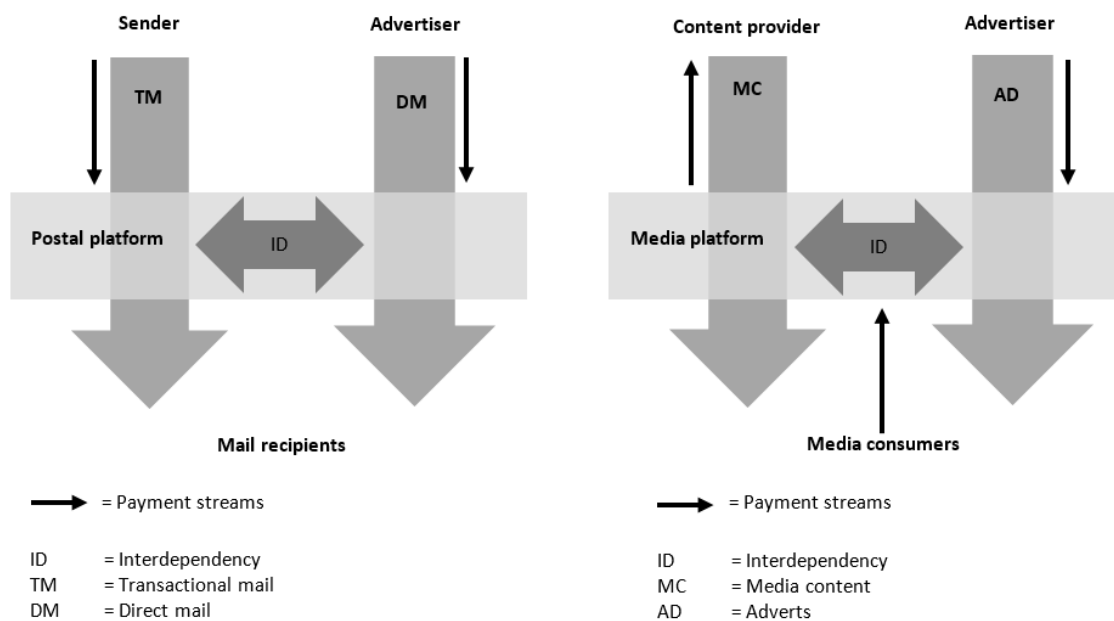
3   Mail Stream as a Platform

A comparison of the mail stream as a platform with standard examples of platforms from the media sector is necessary to understand the characteristics of the mail stream. Such comparison shows significant similarities. Most importantly, all platforms contain advertisers on one side of the market and consumers of content mail or editorial content on the other side. Consumers and advertisers are thus two distinct groups. This aforementioned as well as other apparent analogies between the television, print media, and mail platforms are presented in Table 1.

Both, the media platform and the mail stream, have various groups of senders respectively publishers. In the case of the postal mail platform, there are in the first market (i.e., one side of the platform) various sender groups, e.g. transactional and direct senders, and in the second market recipients (i.e., on the other side of the platform). In fact, the media sector also can be modeled with three groups: Consumers, advertisers and content providers. The structure of the postal and media platform with three groups are illustrated in Figure 2.

Table 1: Analogies between television, newspaper and postal mail platforms.

		Television Channel	Print Media Newspaper	Mail Mail stream / Mailbox
Market side 1: Marketers	Demand side	Advertisers	Advertisers	Senders / Advertisers
	Good	Time slot	Page space	Various mail types
	Price	Price per advert	Price per advert	Postage fee
Market side 2: Consumers	Demand side	Viewers	Readers	Recipients / Readers
	Good	Televised content	Editorial content	Various mail types
	Price	Subscription or zero fee	Subscription or zero fee	Zero fee

Source: Jaag and Bach (2016)

Figure 2: Illustration of the structure of the mail stream and media platforms.
Source: Jaag and Bach (2016).

There are also important differences between the mail stream and media platform. On a postal mail platform, senders pay a postage fee to the platform provider, while for the recipients the use of the mail stream platform is free. Also, media platforms may be free of charge for content consumers, but providers in many cases ask for a subscription fee or a price per unit. Another difference between the mail stream and media platforms is that for the latter various options co-exist and customers can choose the platform(s)

they want to use. In contrast, there is normally only one mail platform (the mailbox) which is served by all POs.

Platforms like newspapers and television channels subsidize their editorial content in order to make their platform attractive both for their audience and advertisers. In the specific case of the postal mail platform, senders can be grouped in two categories: senders of transactional mail and senders of direct mail. Both sender types typically pay a postage fee to the platform provider. Direct mail is usually less expensive than transactional mail, reflecting differences in their direct cost and the competitive environments.

Jaag and Bach (2016) argue that it would be beneficial for POs to take into account the positive effect of transactional mail on direct mail by reducing the price of transactional mail and thereby increasing the attractiveness of the mail stream platform. This change in the pricing strategy could be compared to the popular subsidization of editorial content in the media sector. Jaag and Bach (2016) show that an improvement of the mail mix by adjusting prices for transactional and advertisement mail in favor of transactional mail is well possible for a monopolistic PO, who can fully internalize the interdependencies between the mail categories. However, in a competitive market with incumbent POs and entrant POs, the incentive to internalize the interdependency is lower. With open postal markets, entrant POs typically focus on bulk and direct mail. Hence, they can freeride on the mail mix provided by the incumbent PO. This reduces the incumbent's incentives to cross-subsidize transactional mail in an effort to make the mail stream an attractive platform for advertising. Hence, besides the long-term adverse effect of electronic substitution of mainly transactional mail, the mail mix also tends to degrade as a result of postal market opening, which indirectly might contribute to a substitution of direct mail, too. These considerations, as developed in Jaag and Bach (2016), strongly rely on the assumption that there is indeed an interdependency between various types of mail, i.e. that senders care about the recipient's mail mix. This is certainly the case if the recipients' reaction to their mail depends on their mail mix, too. The following section empirically explores this assumption.

4 Data

The effects of the mail mix (consisting of various types of mail) on recipients' behavioral patterns are estimated using a Swiss data panel of 2016. In what follows, we first describe the sampling and characteristics of the data. Second, various types of mail mix proxies are derived. Over the course of a week in March 2016, a random sample of Swiss recipients was asked daily via an online questionnaire about how many items of different types of mail they received and how they reacted to the direct—i.e., advertisement—mail they received. The data set consists of a panel of 11,198 observations (mail items) received by 544 recipients. Of the 11,198 mail items, 4,622 are addressed letters, 3,409 are newspapers and 2,836 are unaddressed items. For every mail item, the recipients reported the type of mail (see Table 1), and what they did with it. For advertising mail, recipients could choose among a series of possible alternatives (more details are given in the next subsection). Some observations contain missing information, especially observations regarding the reaction to addressed advertisement. All observations contained in the sample result from recipients that opened their mailbox. All recipients in the sample emptied their mailbox daily, which may be an effect of participating in the survey.

In order to investigate the interdependencies between distinct main types of mail items, three mail mix proxies are defined according to equations (1) to (3) below. Mail mix 1 represents the share of non-advertisement mail items. Mail mix 2 represents the share of private mail received, i.e. mail items which contain private massages. This category excludes mail sent by businesses as well as advertisement and represents our benchmark category, as it closest reflects mail that could be perceived positively, thereby contributing to the attractiveness of the mail channel. Mail mix 3—i.e., the share of "good mail"—is the share of mail items that are expected to be perceived positively (based on the authors' judgement) by recipients. Besides all private mail categories in the enumerator of mail mix 2, the enumerator of mail mix 3 also contains offers/quotes, payrolls, gifts, as well as letters containing confirmations.

$$\text{Mailmix 1} = \frac{\text{Non-advertisement mail}}{\text{Total mail}} \tag{1}$$

$$\text{Mailmix 2} = \frac{\text{Private mail}}{\text{Total mail}} \tag{2}$$

$$\text{Mailmix 3} = \frac{\text{Good mail}}{\text{Total mail}} \tag{3}$$

Table 2 gives an overview of the different mail categories and how they are assigned to the three chosen mail mix proxies of eq. (1) to eq. (3). The real mail mix is unknown, since the participants could understand the categories in different ways. "Total mail" consists of the sum of all mail items. Descriptive statistics of the mail mix proxies are given in Table 3. The table reveals that the average weekly share of received non-advertisement items per recipient in the sample amounts to roughly 50 percent, while the share of private and good mail is 13 percent and 18 percent, respectively. The entry for "mail mix 2 – daily" represents daily averages (instead of weekly averages), with a correspondingly higher standard deviation. Table 3 also provides descriptive statistics of further variables, such as age, gender, whether the recipient receives also unaddressed letters (in Switzerland, about 50% of households have their mailboxes tagged with "no advertisement", and hence are not receiving unaddressed mail), and whether the recipient received newspapers in the respective week (or on the respective day in case of daily mail mix definitions). Advertisement stems from different branches, as shown in Table 4. Most mail stems from trade businesses, followed by mail-order firms and other branches.

Table 2: *Assignment of mail types to mail mix proxies.*

	Mail type	Non-advertisement mail	Private mail	"Good" mail
1	Bill/admonition/credit card statement	X		
2	Advertising mail			
3	Catalog			
4	Notification/contingent	X		
5	Bank statement	X		
6	Appeal for funds			
7	Forms/documents (e.g. for voting or tax)	X		
8	Customer magazine	X		
9	Invitation/reply to invitations	X	X	X
10	Spontaneous writing	X	X	X
11	Mail of clubs or associations	X	X	X
12	Periodic regular mail contact	X	X	X
13	Replies to requests/applications	X	X	X
14	Payrolls	X		X
15	Offers/quotes	X		X
16	Gifts/vouchers			X
17	Greeting cards	X	X	X
18	Picture postcards/holiday greetings	X	X	X
19	Public holiday/season's greetings	X	X	X
20	Announcement of special events (e.g., marriage etc.)	X	X	X
21	Confirmation (e.g. of course enrolment)	X		X
22	Competitions/lotteries etc.			
23	Forwarding of forgotten items	X	X	X
24	Condolences	X	X	X
25	Others			

Table 3: *Descriptive statistics of the variables.*

	Mean	Std.dev.	Min.	Max.
Mail mix 1 – Overall	0.494	0.231	0	1
Mail mix 2 – Overall	0.104	0.117	0	0.667
Mail mix 3 – Overall	0.172	0.154	0	1
Mail mix 2 – Daily	0.080	0.185	0	1
Age	51.38	14.92	16	88
Gender (1 = female)	0.518	0.500	0	1
No ads sticker fixed effect (1 = no-ads sticker)	0.445	0.497	0	1
Also received newspaper fixed effect	0.951	0.215	0	1

Note: This table presents descriptive statistics of the mailmix variables given in eq. (1) to (3).

Statistics are based on a total of 760 observations of 306 individuals.

Table 4: *Branches advertisement originated from.*

Branches advertisment originated from	Frequency	Percent	Cumulative
Trade (retailers, e.g. Migros/Coop)	169	22.24	22.24
Other	117	15.39	37.63
Mail order businesses	110	14.47	52.1
Consumer goods (producers)	94	12.37	64.47
Automotive	58	7.63	72.1
Tourism, travel agencies, hotels, etc.	34	4.47	76.57
Telecommunication companies	33	4.34	80.91
Banks	29	3.82	84.73
Insurance companies	29	3.82	88.55
Energy (electricity/gas)	19	2.5	91.05
Non-profit-org. (e.g., WWF, Caritas, etc.)	18	2.37	93.42
Health insurance companies	17	2.24	95.66
Media	15	1.97	97.63
Physicians/hospitals/labs	12	1.58	99.21
Die Post	6	0.79	100
Total	760	100	

Note: This table presents descriptive statistics of branches where the advertisement

originated from. Branches are ordered according to their percentage share.

Table 5: *Descriptive statistics of the variables conditional on reaction.*

	Mean	Std.dev.	Min.	Max.
Positive reaction to addressed advertisement				
Age	51.83	14.92	23	75
Gender (1 = female)	0.300	0.462	0	1
No ads sticker fixed effect (1 = no-ads sticker)	0.300	0.462	0	1
Also received newspaper fixed effect	0.917	0.279	0	1
Neutral reaction to addressed advertisement				
Age	53.12	15.66	18	88
Gender (1 = female)	0.496***	0.501	0	1
No ads sticker fixed effect (1 = no-ads sticker)	0.484***	0.500	0	1
Also received newspaper fixed effect	0.965**	0.184	0	1
Negative reaction to addressed advertisement				
Age	49.64	14.01	16	88
Gender (1 = female)	0.577^{+++}	0.495	0	1
No ads sticker fixed effect (1 = no-ads sticker)	0.431^{++}	0.496	0	1
Also received newspaper fixed effect	0.944	0.230	0	1

Note: Statistics for positive reaction are based on 60 observations and 44 individuals. Statistics for neutral reaction are based on 343 observations and 191 individuals. Statistics for negative reaction are based on 357 observations and 203 individuals. Asterisks *** indicate significance at 1 percent level, ** at 5 percent level and * at 10 percent level of the one-sided unpaired t-test of the comparison of the respective variables of sub-samples of a positive and neutral reaction. Analogously, pluses (+) represent significance levels of the one-sided t-test of the comparison of the respective variables of sub-samples of a positive and negative reaction.

Table 5 describes the characteristics of the participants conditional on their form of reaction to addressed advertisement. A reaction to addressed advertisement is treated as positive if the recipient asked for products or services of the sender, contacted the sender or searched the Internet for further information. A reaction is considered to be neutral if the recipient put the mail aside for later action or for other behavior. A reaction is considered to be negative if the recipient discarded the mail immediately. The share of positive reaction in total observed reactions is 8.96 percent. As it can be seen in Table 5, the sample of recipients who, for example, reacted positively to addressed mail on average are significantly (at a level of 1 percent) more likely to be male and less likely to have a no-ads sticker on their letterbox. Furthermore, they less likely (at a significance level of 5 percent) also receive newspapers. Similar observations hold for the comparison of the sample with a positive reaction with the sample showing a negative reaction.

5   Empirical Specification

In what follows, we describe the methodologies to empirically measure the effect of the mail mix on the recipients' reaction to direct mail. The effect of different mail mixes on the reaction of recipient i to addressed advertisement mail is estimated by means of an unordered multinomial logit model. The model differentiates between the three reactions R of type j which are "positive", "neutral", and "negative". The probability for one of the three reactions j is given in eq. (4) and depends on a vector of covariates $\mathbf{x}_i$, e.g. age and gender of the recipient or the mail mix. It is important to include personal characteristics of the recipient to ensure that a possible positive reaction to mails is not driven by personal characteristics rather than the mail mix. For example, older recipients could receive more transactional mail while generally reacting more positively to advertisement. The disturbances are assumed to be of i.i.d. logit distribution. The log-odd ratios of a positive or negative reaction against the base case of a neutral reaction n then can be given as shown in eq. (5), with the intercept being set to zero. The coefficients of vector $\boldsymbol{\beta}$ are obtained by maximum likelihood technique (Greene, 2002).

$$\text{Prob}\left(R_i = j \middle| \mathbf{x}_i\right) \equiv P_{ij} = \frac{e^{\boldsymbol{\beta}_j^T \mathbf{x}_i}}{1 + \sum_{s=1}^{3} e^{\boldsymbol{\beta}_s^T \mathbf{x}_i}}, \quad j = 0,1,2 \tag{4}$$

$$\ln\left(\frac{P_{ij}}{P_{in}}\right) = \mathbf{x}_i^T \beta_j \tag{5}$$

6   Results

The recipients' behavior is analyzed in terms of the reaction to addressed advertisement conditional on mail mix characteristics using the data described above. Table 6 summarizes the results of model 1 [M1]. The table lists the corresponding effects of different mail mixes on the reaction to addressed advertisement, with the reference outcome being

a neutral reaction (which is, putting the mail aside). The upper part of the table (i.e., model M1-1) shows the complete regression results using mail mix 2 and including a fixed effect of whether or not the recipient also received newspapers. It might be important to control for the reception of newspapers as newspapers are not counted towards mail but nevertheless may absorb attention. In the middle part of the table (i.e., models M1-2 to M1-4) only the estimated coefficient of the mail mix proxy is presented. Models M1-2 to M1-4 include the same coefficients as model M1-1, except of the fixed effect of also having received newspapers during the period observed. The lower part of the table (i.e., model M1-5) presents the estimated coefficient of the mail mix 2 evaluated daily rather than weekly.

Table 6: *Effect of mail mix on the reaction to addressed advertisement [M1].*

Multinomial logit model	Positive reaction	
Basis: neutral reaction	Odds ratio	Std.dev.
[M1-1] Mail mix 2 – Overall	2.763**	(1.100)
30 < Age ≤ 45	0.421	(0.567)
45 < Age ≤ 60	–0.344	(0.591)
Age > 60	0.073	(0.558)
Gender (female)	–0.962***	(0.325)
No ads sticker fixed effects	0.906***	(0.311)
Newspaper fixed effects	–1.066*	(0.598)
Constant	–2.202**	(0.871)
[M1-2] Mail mix 1 – Overall	1.635***	(0.617)
[M1-3] Mail mix 2 – Overall	2.889***	(1.095)
[M1-4] Mail mix 3 – Overall	1.269	(0.873)
[M1-5] Mail mix 2 – Daily	1.284**	(0.619)

Note: Coefficients other than the estimates of the correlation of mail mix quality with reaction type are shown for M1-1 only. Models M1-2 to M1-4 include all variables of M1-1 except the fixed effect of also having received newspapers during the period observed. M1-5 contains the same explanatory variables as models M1-2 to M1-4. The reference age category is age ≤ 30. The total number of observations is 760, with 60 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

The effects of mail mixes 1 and 2 on the patterns of recipients' reactions are highly significant and positive. For example, a 10 percent increase in mail mix is associated with a 0.276 increase in the relative log odds of showing a positive reaction towards addressed mail vs. showing a neutral reaction. For the control variables, the relative log odds of

showing a positive reaction vs. a neutral reaction will increase by 0.073 if moving from the youngest age category (age of 30 years or less) to the oldest age category (older than 60 years). However, these effects are statistically insignificant. Females and newspaper subscriber appear to react less positively to addressed advertisement. An underlying factor for such finding might be a limited attention span of consumers, which already may have spent their attention on newspapers instead of advertisement. Interestingly, "no ads" stickers affect the reaction towards addressed advertisement positively. Postal services are not allowed to deliver unaddressed advertisement to mailboxes with this sticker. Hence, this effect may be related to an increase in attention time for addressed advertisement, assumed that total attention time is constant for addressed and unaddressed mail. However, such hypothesis remains to be tested.

Table 7: *Effect of mail mix on the reaction to addressed advertisement including total mail [M2].*

Multinomial logit model	Positive reaction	
Basis: neutral reaction	Odds ratio	Std.dev.
[M2-1] Mail mix 2 – Overall	2.985***	(1.120)
30 < Age ≤ 45	0.502	(0.573)
45 < Age ≤ 60	–0.321	(0.595)
Age > 60	0.130	(0.565)
Gender (female)	–1.019***	(0.330)
No ads sticker fixed effects	0.961***	(0.318)
Newspaper fixed effects	–1.023*	(0.601)
Total mail	–0.016	(0.023)
Constant	–2.189**	(0.872)
[M2-2] Mail mix 1 – Overall	1.614***	(0.619)
[M2-3] Mail mix 2 – Overall	3.132***	(1.113)
[M2-4] Mail mix 3 – Overall	1.306	(0.869)
[M2-5] Mail mix 2 – Daily	1.275**	(0.618)

Note: Coefficients other than the estimates of the correlation of mail mix quality with reaction type are shown for M2-1 only. The variables included in models M2-2 to M2-5 are those of models M1-2 to M1-5 described in Table 6 plus the additional control variable "total mail". The total number of observations is 760, with 60 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

Table 7 probes the results of models M1-1 to M1-5 of Table 6 with respect to the number of mail items received by the recipients. By doing this, we test whether our results

are being driven by the number of total mail items received, a hypothesis we would like to see rejected. The results of Table 6 are robust in terms of the inclusion of total mail as explanatory variable, i.e. the number of total mail items received does not significantly explain differences in our observed behavioral patterns. Furthermore, the covariates still are in the range of the specification of Table 6 in terms of magnitude and significance. In what follows, the analyses will keep controlling for the total number of mail received.

Table 8: *Effect of mail mix on the reaction to addressed advertisement by mail mix 2 stratum [M3].*

Stratum:	Obs. ≤ Median mail mix 2		Obs. > Median mail mix 2	
Multinomial logit model	Positive reaction		Positive reaction	
Basis: neutral reaction	Odds ratio	Std.dev.	Odds ratio	Std.dev.
[M3-1] Mail mix 2 – Overall	−5.883	(7.805)	3.600 *	(1.920)
30 < Age ≤ 45	0.464	(0.844)	0.673	(0.817)
45 < Age ≤ 60	−0.234	(0.898)	−0.435	(0.821)
Age > 60	0.152	(0.864)	0.162	(0.786)
Gender (female)	−0.471	(0.461)	−1.679 ***	(0.525)
No ads sticker fixed effects	−4.437	(0.545)	−0.550	(0.417)
Newspaper fixed effects	−1.207	(0.895)	−1.083	(0.845)
Total mail	0.012	(0.037)	−0.032	(0.031)
Constant	−0.383	(1.207)	−0.193	(1.062)
[M3-2] Mail mix 1 – Overall	2.102**	(0.884)	0.712	(0.964)
[M3-3] Mail mix 2 – Overall	−4.567	(7.683)	3.741 **	(1.905)
[M3-4] Mail mix 3 – Overall	−3.663	(2.339)	3.018 **	(1.500)
[M3-5] Mail mix 2 – Daily	0.983	(3.014)	0.830	(0.710)

Note: As for model specifications M3-1 to M3-5, the analogue description applies as given in Table 7. The lower stratum contains all observations with a mail mix 2 smaller or equal to the median mail mix. The upper stratum contains all observations with a mail mix 2 larger than the median mail mix. The total number of observations in the lower stratum is 421, with 26 positive observations. The total number of observations in the upper stratum is 339, with 34 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

Table 8 shows the reaction of the—with respect to mail mix 2—stratified sample to addressed advertisement. While the sample with a low mail mix 2, i.e. with a mail mix smaller or equal to the median mix, shows no significant increase in the odds for a positive reaction, the upper stratum does so at a level of 10 percent. It therefore seems that our main findings from before with a significant effect of a mailmix on the odds of a positive

reaction might be driven primarily by recipients with a mailmix quality better than aver-age. Nevertheless, the significance is lower than the benchmark results of Table 7, what might stem from the loss in between variation.

Table 9: *Effect of mail mix on the reaction to addressed advertisement conditional on gender [M4].*

Multinomial logit model	Positive reaction	
Basis: neutral reaction	Odds ratio	Std.dev.
[M4-1] Mail mix 2 – Overall	4.001***	(1.339)
[M4-1] Mail mix 2 – Overall × Gender	–4.932*	(2.904)
30 < Age ≤ 45	0.480	(0.577)
45 < Age ≤ 60	–0.314	(0.594)
Age > 60	0.172	(0.567)
Gender (female)	–0.475	(0.434)
No ads sticker fixed effects	–0.953***	(0.321)
Newspaper fixed effects	–1.178**	(0.602)
Total mail	–0.019	(0.023)
Constant	–0.268**	(0.770)
[M4-2] Mail mix 1 – Overall	1.732**	(0.735)
[M4-2] Mail mix 1 – Overall × Gender	–0.746	(1.402)
[M4-3] Mail mix 2 – Overall	4.048***	(1.338)
[M4-3] Mail mix 2 – Overall × Gender	–4.376	(2.866)
[M4-4] Mail mix 3 – Overall	2.421**	(1.040)
[M4-4] Mail mix 3 – Overall × Gender	–4.714**	(2.242)
[M4-5] Mail mix 2 – Daily	1.497**	(0.729)
[M4-5] Mail mix 2 – Daily × Gender	–0.734	(1.423)

Note: As for model specifications M4-1 to M4-5, the analogue description applies as given in Table 7. The total number of observations is 760, with 60 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

Given our findings in Table 7, gender might have an effect on the odds for a pos-itive reaction not only on its own, but also conditional on the mail mix. Such hypothesis is tested in Table 9, were it becomes evident that—ceteris paribus—females throughout show a significantly lower odd of showing a positive reaction vs. a neutral reaction con-ditional on the mail mix than men do. In case of model M4-1, for example, females are associated with an overall 0.931 decrease in the relative log odds of showing a positive reaction towards vs. showing a neutral reaction. Given the strong significance of gender on its own in Table 7, such finding was to be expected.

Table 10 to Table 12 show the tests to what extent a mail mix defines the odds of the recipients asking for a product or service. Asking for a product or service includes the three actions of the purchase of a product or service (42 positive observations, out of 760), contacting a firm (12 observations) or searching the internet for further information (24 observations). 6 observations simultaneously performed two actions and 1 observation performed all three actions. While the results so far by and large indicate a significantly positive correlation between a mail mix and the odds for a positive reaction, the specific odds of asking for a product or service seem to remain unaffected by the mail mix. Such finding, however, does not hold for the odds of contacting a firm. As shown by Table 11, the odds of a firm being contacted are significantly higher by a striking magnitude for recipients with a positive mail mix 2. A similar finding holds for the odds of searching the internet (cf. Table 12), with mail mix 3 additionally contributing in a significant way as well.

Table 10: *Effect of mail mix on purchase of product or service to addressed advertisement [M5].*

Multinomial logit model	Asked for product/service	
Basis: neutral reaction	Odds ratio	Std.dev.
[M5-1] Mail mix 2 – Overall	1.173	(1.313)
30 < Age ≤ 45	–0.556	(0.585)
45 < Age ≤ 60	–0.717	(0.595)
Age > 60	–0.079	(0.541)
Gender (female)	–0.323	(0.341)
No ads sticker fixed effects	0.415	(0.336)
Newspaper fixed effects	13.291	(517.8)
Total mail	–0.036	(0.027)
Constant	–15.923	(517.8)
[M5-2] Mail mix 1 – Overall	0.381	(0.674)
[M5-3] Mail mix 2 – Overall	1.005	(1.313)
[M5-4] Mail mix 3 – Overall	–0.697	(1.087)
[M5-5] Mail mix 2 – Daily	–0.457	(0.951)

Notes: As for model specifications M5-1 to M5-5, the analogue description applies as given in Table 7. The total number of observations is 760, with 42 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

Table 11: *Effect of mail mix on contacting a firm to addressed advertisement [M6].*

Multinomial logit model	Contacted firm	
Basis: neutral reaction	Odds ratio	Std.dev.
[M6-1] Mail mix 2 – Overall	5.729***	(2.169)
30 < Age ≤ 45	15.862	(12.592)
45 < Age ≤ 60	14.447	(13.473)
Age > 60	13.217	(14.644)
Gender (female)	−1.494**	(0.678)
No ads sticker fixed effects	0.352	(0.647)
Newspaper fixed effects	−1.030	(0.861)
Total mail	−0.092*	(0.049)
Constant	−17.680	(20.358)
[M6-2] Mail mix 1 – Overall	1.451	(1.456)
[M6-3] Mail mix 2 – Overall	5.882***	(2.146)
[M6-4] Mail mix 3 – Overall	5.854***	(1.799)
[M6-5] Mail mix 2 – Daily	2.479***	(0.935)

Notes: As for model specifications M6-1 to M6-5, the analogue description applies as given in Table 7. The total number of observations is 760, with 12 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

Table 12: *Effect of mail mix on searching the internet for further information to addressed advertisement including total mail or unaddressed mail fixed effect [M7].*

Multinomial logit model	Search in internet	
Basis: neutral reaction	Odds ratio	Std.dev.
[M7-1] Mail mix 2 – Overall	3.336**	(1.639)
30 < Age ≤ 45	17.114	(17.679)
45 < Age ≤ 60	15.949	(18.877)
Age > 60	16.342	(17.579)
Gender (female)	−2.453***	(0.632)
No ads sticker fixed effects	1.043**	(0.488)
Newspaper fixed effects	−2.014***	(0.743)
Total mail	−0.062*	(0.034)
Constant	−18.600	(18.332)
[M7-2] Mail mix 1 – Overall	1.234	(0.951)
[M7-3] Mail mix 2 – Overall	3.607**	(1.618)
[M7-4] Mail mix 3 – Overall	3.958***	(1.313)
[M7-5] Mail mix 2 – Daily	2.058	(0.736)

Notes: As for model specifications M7-1 to M7-5, the analogue description applies as given in Table 7. The total number of observations is 760, with 24 positive observations. Asterisks *** indicate significance at 1 percent level, ** at 0.05 percent level and * at 10 percent level.

7 Conclusion

While letter mail services have come under pressure due to the emergence of electronic communication channels, not all mail types are being substituted equally but the mail mix seems to degrade over time. This paper interprets the postal mail stream as a platform with two market sides carrying various types of mail of different value to the recipients which may interact with each other. Jaag and Bach (2016) argue that it would be beneficial for POs to take into account the positive effect of "good" mail by reducing its price and thereby increasing the attractiveness of the mail stream as a platform.

To provide first empirical support for this result, this paper hypothesizes that the value of direct mail to advertisers depends on the composition of mail. This hypothesis is tested by analyzing data from the Swiss mail market collected in the first quarter of 2016. Three mail mix proxies are defined to investigate the interdependencies between mail types. For all three mail mixes, results suggest that a good mail mix is significantly correlated with an increase in the recipients' propensity of reacting positively to addressed advertisement mail. This study therefore provides first empirical evidence that a differentiated pricing of mail based on its content might benefit the mail platform as a whole.

Following these findings, there is a range of follow-up questions to be addressed: What is the relevance of the recipients' reaction for senders? What is their willingness to pay for various types of recipient reaction? How can postal operators use these findings in their product development and pricing strategies? Are there trends in the recipients' reaction patterns, e.g. is there a surge in internet searches in wake of an increasing penetration of online shopping? What is the effect of seasonalities on the reaction pattern, e.g. does it differ in summers and winters, or during Christmas time? These questions are left to further research.

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