The Mailstream as a Platform

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Abstract

This paper interprets the postal mailstream as a platform with two market sides in a theoretical model: On the one side of the market, advertisers (senders of direct mail) and senders of transactional mail are customers for mail services. On the other side of the market, there are the recipients. The value of direct mail for its sender depends on the quality of the mailmix, i.e. the number of transactional mail items in the mailstream. Hence, there is an interdependency between the two types of mail. This interdependency affects the equilibrium allocation, especially optimal prices. The paper analyzes these effects in two frameworks: A postal monopoly and (direct) postal competition within the mailstream as a platform. It also discusses their implications for (indirect) competition with other communication platforms.

A postal monopolist has a strong incentive to cross-subsidize transactional mail in order to increase the mail platform's attractiveness for direct mail. Electronic substitution of transactional mail thwarts these efforts. In addition, direct competition degrades the mailmix because new postal operators tend to focus on bulk and direct, rather than transactional mail. Thereby, direct competition indirectly contributes to the substitution of direct mail.

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1 Introduction

Letter mail services have come under pressure due to the emergence of electronic communication channels. Postal operators (POs) and regulators reconsider their pricing and policy behavior against the question what the value of mail still is. In this regard, several studies have examined demand for mail and its drivers, most of them from the perspective of senders of mail. However, in order to fully understand the mail's value and its demand it is not only important to consider the sender's but also the recipient's preferences and appreciation of mail because the latter also determine the mail's value for the sender. The recipient's perception of the mail he receives depends on the composition or the mix of mail. Consequently, various types of mail interact with each other: some types of mail are perceived positively and contribute to the attractiveness of the mail channel. They thereby also increase the value of other mail. Other types tend to annoy the recipients and degrade the quality of the channel as a means of communication.

Hence, the mailstream can be interpreted as a platform with various market sides: senders of two types of mail and recipients. This paper establishes analogies between the mailstream as a platform and other platforms like newspapers and TV channels. It discusses the relevance of an interdependency between various types of mail in optimal pricing strategies and the effect of selective market entry on the resulting mailmix in a stylized theoretical framework. The remainder of the paper is structured as follows: Section 2 discusses the recent literature on the development and the drivers of the demand for mail as well as the economics of platform markets. Section 3 characterizes the postal mailstream as a platform and compares it to other platform markets. It also discusses the various agents' roles and their interaction. Section 4 presents a stylized model of postal competition and its equilibria in various scenarios. Section 6 concludes.

2 Related literature

This paper builds on the literature on mail demand and platform markets. These two strands of the literature and their significance for this paper are shortly summarized in this section.

2.1 Demand for mail

Postal mail volumes have been continuously decreasing during the last decade due to the emergence of new communication possibilities. WIK-Consult (2013) finds that letter volumes in the European mail sector decreased from 97 billion to 82 billion items between 2007 and 2011. This corresponds to a decline of around 3% to 4% per year. Nevertheless, mail is still important: in 2011 it accounted for about 0.3% of the EU-28 GDP. Although the change of communication behavior is a main driver of demand, the authors identify pricing and economic activity as other key factors shaping demand for mail. However, not all types of mail are the same. The most general differentiation is between direct and transactional

mail where the latter may be sent from business or private customers.

Direct mail is a specific type of bulk mail that must fulfill certain criteria regarding contents. Bulk mail refers to mail composed of similar (though not necessarily identical) items sent in large volumes of which direct mail represents the majority. Directive 2008/6/EC defines direct mail as: "(...) consisting solely of advertising, marketing or publicity material and comprising an identical message, except for the addressee's name, address and identifying number (...)". Direct mail is therefore a typical form of advertisement and it competes with other advertising channels such as newspapers, the Internet, radio, etc. The market for advertisement can be structured by its content and by its target. In terms of the first dimension – content –, advertisement may contain hard facts, such as the price of a product, or other forms of information, so called image marketing. Typically, informative marketing is used to increase demand for the advertised product by boosting potential customers' awareness of it, while image marketing's aim is to differentiate the underlying product by building a reputation. The second dimension – target – describes how well the advertisement is targeted at a (sub)group. A case study in Denmark conducted by Okholm et al. (2015) shows that direct mail is mostly used for informative marketing. This is due to direct mail being not as restricted to time in comparison to other channels such as television advertisements. It is not clear where direct mail is located in the target dimension. Although the theoretical work of Bradley et al. (2015) shows that targeting is beneficial for the PO as well as for the sender, policy intervention regarding privacy such as described in Copenhagen Economics (2011) may hinder a too direct targeting. The senders' profit from direct mail is strongly linked with the probability that recipients are purchasing the advertised product. It is straightforward that this probability increases with higher attention of the recipients towards the advertisement. Hence, the recipients' attention is a crucial part of the value of direct mail for its senders. However, attention is not only driven by the degree of targeting but also by the mix of direct and transactional mail, as explained in section 3 below.

Direct mail prices increased both in nominal and real terms between 2004 and 2011. On average for all EU Member States, nominal price increased by 20.9% while the real price increase amounted to 4.5% (see Copenhagen Economics, 2012). The price increases occurred before 2009; prices stopped to grow in the aftermath of the financial crisis. Average annual movement in nominal prices after 2009 was about half that before 2009, while the average movement in real prices turned negative.

Figure 1 shows the development of transactional mail and direct mail items per capita for various postal universal service providers (USPs). Although many countries faced a decline of direct mail between 2007 and 2010, volumes stabilized between 2010 and 2011. WIK (2013) therefore argues that the decline is mainly driven by the economic recession and not by electronic substitution. The stabilization may indicate that direct mail is not as exposed to electronic substitution as transactional mail and has not lost relevance in comparison to other forms of advertising (see also Bradley et al., 2015). This is in line with the results from Central Mailing Services (2014), Royal Mail (2013) and The Boston Consulting Group (2010), who conclude that direct mail keeps a strong position in the market for advertisements as it often benefits from a higher return on

investment compared to other marketing channels. Even though direct mail volumes remain strong, we will argue below that there might be a long-term adverse indirect effect of declining transactional mail on direct mail, too.

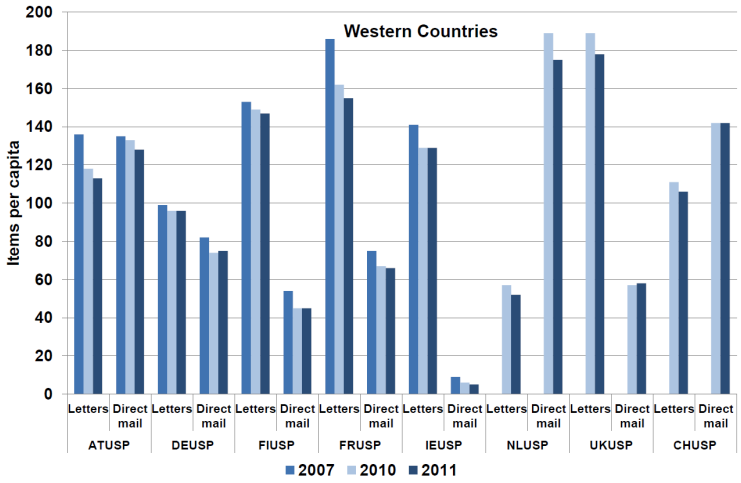

Figure 1: Comparison of direct and transactional mail volume per capita (source: Wik survey and WIK research; presented in WIK, 2013).

Transactional mail can be grouped according to the sender's and the recipient's position in the market. The most common forms are business to consumers (B2B), business to business (B2C) and consumer to consumer (C2C) mail. Transactional mail may be either sent in bulk or as single-piece items.

In European postal markets, nominal prices for bulk mail increased by 15.9% on average between 2004 and 2011, while real prices have remained almost constant over the period (see Copenhagen Economics, 2012). In the period after 2009 the annual nominal increase appears to have halved. The explanation for this could be that the financial crisis made customers more price sensitive, especially regarding transactional mail, e.g. invoices. Prices for domestic priority single-piece items have been steadily increasing in 26 European countries from 2004 to 2011. Between 2004 and 2011, prices increased nominally by 35% and 11% in real terms. Again, nominal prices increased slower after 2009, at 3.0% per year. Non-priority mail is a lower-cost alternative to priority letters. It is not offered in all countries, but in a substantial number of countries it is the most commonly used service. Between 2004 and 2011, nominal prices have increased by 50%. The total increase in real prices of non-priority mail for the period was about 20%. Both nominal and real annual increases were lower after 2009.

All of the transactional mail volumes have in common that they are under pressure from electronic means of communication such as email and social media. As a result, their volumes are declining steadily (see Figure 1). However, as Figure 2 demonstrates, mail activity has been different between these channels: Whereas the volume of B2C mail sent has been increasing during the last decades (at least up to 2008), demand for B2B and C2C has declined. According

to the literature, there are two possible reasons for the B2C market's strength: on the one hand, it has benefited from the "explosion" of invoices and statements from banks, mobile operators, Internet providers, etc. (see Martin et al., 2013). On the other hand, the lower acceptance of electronic solutions by recipients and their lower access to technology may have lead to a weaker electronic substitution compared to the B2B and C2C markets (see Nikali, 2011). Nevertheless, the Copenhagen Institute for Future Studies (2011) forecasts declining volumes (CAGR between -1.1% and -1.7%) in the European marketing communication market. Elkelä and Nikali (2009) have studied how senders select their communication channel and have ranked five different factors according to their relevance: (1) reliable arrival of message, (2) ease of use, (3) data security, (4) price and (5) speed of communication. The reliability of the arrival of the message is the most important factor and should therefore also have a major impact on the profit of transactional mail senders. It is important to note that a message has not actually arrived until the receiver pays attention to it, i.e. until he reads it. The same holds for other communication channels: if the receiver is not interested in a certain communication channel then he will give no or little attention to the messages he receives.

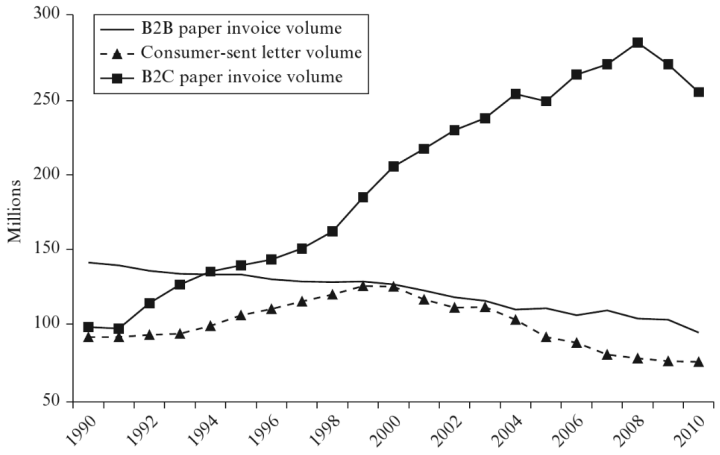

Figure 2: Depevelopment of different transactional mail types in the Finnish market (source: Itella, 2012; presented in Martin et al., 2013).

The development of mail prices and its volumes shows that various types of mail evolve quite differently. So far, transactional mail seems to have suffered more from electronic substitution than direct mail. However, there may be an indirect effect through the degradation of the mailmix which will affect direct mail in the long-term (and might have started to do so already, see Figure 1). Competition has also evolved differently in the various segments of mail: New postal operators often focus on bulk mail (see e.g. WIK, 2013) while transactional mail originating from private customers remains mostly uncontested. While e.g. Bradley et al. (2015) discuss the role of the recipients' attention for mail as an important driver for senders' demand, to our knowledge, there is no research yet on the effect of the postal mailmix on the recipients' attention and

the value of the mail channel for advertisers. For other platforms, e.g. newspapers, the interaction between the various types of content and their role in the competition for readers has been studied extensively. This literature will be shortly reviewed in the next section.

2.2 Platform markets

A platform serves two or multiple distinct groups of agents, where the utilities of the agents in one group depend on the presence of the others. A particularly interesting case is asymmeric interaction of the utilities between the groups on the platform, i.e. one group exerts a negative effect on the other group, while the latter exerts a positive effect on the former. This dissimilar interaction between the groups' utilities complicates the profit-maximizing price setting for the platform provider. Only recently, 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 notable starting points. A standard example for platforms with asymmetric external effects is the media sector, i.e. newspapers, radio, and television channels, where one group consists of the consumers of editorial content and the other group by advertising firms.

The economics of media platforms have been studied extensively. Common to all models is the division of the platform's users in two sides, advertising firms and content consumers. For instance, Anderson and Gabszewicz (2005) model the media sector as a two-sided market in which they take into account the influence of advertising on media usage. The model is applied in the specific context of television by Anderson and Coate (2005). Furthermore, Gode et al. (2009), Crampes et al. (2009), as well as Reisinger (2012) investigate the competition between media companies using a platform model, which also integrates external effects of advertising on the media content consumers. Peitz and Valletti (2008) consider different platform designs for television – with subscription fees and for free – and compare the resulting advertising intensity and content differentiation. 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).

The mailstream of POs can also be viewed as a platform. In fact, the mailstream can be described as carrying two types of mail – transactional and direct mail – while three groups interact on it: recipients of mail, senders of transactional mail, and advertisers, i.e. senders of direct mail (see Section 3.2). There is an interdependency between one group's mail volume and the others' profit. Both types of senders are interested in the recipients' attention to their items. In particular, the attention for direct mail is affected by the mailmix the recipient receives in his letterbox. It is conjectured that transactional mail exerts a positive effect on the recipients 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.

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 considers sender and recipients as the two sides of the market. They argue that the subsidization of recipients by senders through the sender-pays-principle is a natural outcome of the two-sidedness of the market. The present paper is also somewhat related to Bradley et al. (2015) who analyze the demand for saturation advertising mail and targeting advertising mail in competition for the recipients' attention. De Donder et al. (2011) study welfare and pricing for bulk mail which comprises two distinct markets, of transactional and advertising mail, for which the price elasticities are different but the cost of providing those services is the same. However, they assume that demands in these markets are independent of each other.

3 The mailstream as a platform

3.1 Comparison of different platform markets

A comparison of the mailstream as a platform to the standard examples from the media sector shows that there are significant similarities. Most importantly, all platforms face consumers of content – mail and editorial content – in a first market and firms (in a second market) directing advertising to the consumers as two distinct groups on the platform. The most apparent analogies between the television, print media, and mail platforms are presented in Figure 3.

		Television	Print Media	Mail
Platform		Channel	Newspaper	Mailstream / Mailbox
Market 1	Demand side	Advertisers	Advertisers	Senders
	Good	Time slot	Page space	Transactional / Direct mail
	Price	Price per advert	Price per advert	Postage fee
Market 2	Demand side	Viewers	Readers	Recipients
	Good	Televised content	Editorial content	Transactional / Direct mail
	Price	Subscription or zero fee	Subscription or zero fee	Zero fee

Figure 3: Analogies between television, newspaper and postal mail platforms.

There are also an important differences between the mailstream and media platforms. In the case of the postal mail platform, there are two distinct sender groups in the first market: senders of transactional mail and senders of direct mail. Furthermore, while senders pay a postage fee to the platform provider, the recipients are not charged any price for the use of the mailstream platform. Media platforms may be free for content consumers, but in many cases they charge a subscription or a price per unit. Naturally, the question arises whether such differences have an effect on the optimal pricing strategy of POs to the two groups of senders. In fact, note that the media sector could also be modelled with three groups: the third group would then consist of content providers in the form of editorial staff or external content sources. The structures of the postal platform and the media platforms are illustrated in Figure 4.

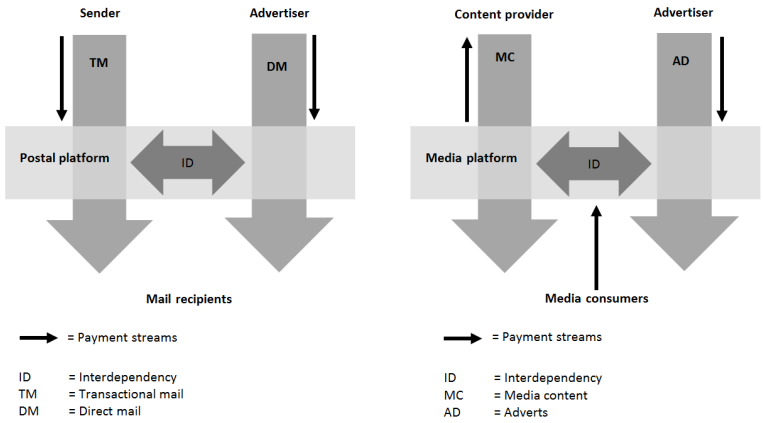

Figure 4: Illustration of the structure of the mailstream and media platforms.

In the model discussed below, the mailstream is formalized as a platform, where the focus is on agent heterogeneity across one side of the platform.[1] Consequences for optimal pricing are analyzed within both monopolistic as well as duopolistic market structures. Finally, implications for POs with regards to the optimal mailmix and its pricing are drawn from the results in the monopolistic and duopolistic frameworks. More generally, the model also contributes to the literature on platforms from a conceptual viewpoint. The (editorial) platform content is not assumed to be externally given – as in the standard models of platforms for the media sector – but created by the platform itself via a group of its users (the senders of transactional mail) and thus also explicitly modelled. Such a more general model could be applied to the media sector, too, by introducing editorial staff as a third group on a media platform.

3.2 Characteristics of the platform agents

The set-up of our model includes four types of agents: the PO as a platform provider, recipients of mail, senders of transactional mail and senders of direct mail.

The *PO* provides the mail platform and maximizes his profits in two different markets by offering transactional mail and direct mail. The PO thus sets prices for the two types of mail, and faces the ensuing demand in these two markets.

The *recipient (R)* has access to a mailbox in which they find transactional mail and direct mail. The recipient's attention to the direct mail he receives is increasing in the volume of transactional mail he receives. Hence, there is an interdependency between the two types of mail. Potential extensions to this paper involve preferences for certain subsets of transactional mail and of direct

[1] In a companion paper (Jaag et al., 2016), the direction and the extent of the interdependencies between various types of mail are investigated empirically with data from the Swiss mail market.

mail. Intuitively, a recipient prefers a love letter to an invoice, and relevant advertising, e.g. linked to his interests, to irrelevant advertising, e.g. about products he is indifferent about or dislikes.

The *transactional mail sender (TMS)* uses the mail platform to send transactional mail items and incurs a postage fee per item. His profit depends on the quantity of his transactional and the mail postage fee.

The *direct mail sender (DMS)* uses the mail platform for direct advertising purposes. He sends physical adverts with the intention to raise awareness of his products among the recipients. His ultimate objective is to subsequently increase demand for his products. His profit hence depends not only on the quantity of his direct mail and the postage fee, but also on how effective the advertising is for his sales. This effectiveness of direct mail depends on the attention the recipient pays to his mail which is positively affected by the number of transactional mail items in the mailstream.

4 The model

In the following, we model demand for transactional and direct mail both in a monopoly context and with competition by an entrant. The POs first set their prices; the customers then choose the quantity they demand. The model is solved backwards. Throughout the model, we assume that there are two representative senders, a direct mail sender and a transactional mail sender, and a representative recipient. Both sender types only send one – "their" – type of mail.

4.1 Postal monopoly

The benchmark model is a postal monopoly serving the two sender types with direct and transactional mail. In a first case we assume that the two mail types do not interact with each other (model without interdependency between mail types); in a second case we allow the direct mail sender's profit to depend not only on his own mail volume and the price, but also on the number of transactional mail items in the recipient's mailbox.

4.1.1 Model without interdependency between mail types

The two senders' profit maximization problems are

$$\max_{x_d} \pi_{dms} = ux_d - \frac{1}{2}x_d^2 - p_d x_d$$

and

$$\max_{x_t} \pi_{tms} = ux_t - \frac{1}{2}x_t^2 - p_t x_t,$$

respectively, where π is the senders' profit, u is a demand parameter, x is their mail quantity per receiver and p is the price per mail item. Subscript d denotes direct mail while t stands for transactional mail. The ensuing optimal choices of mail volumes are:

$$x_d^* = u - p_d$$

and

$$x_t^* = u - p_t.$$

Anticipating these optimal quantities demanded, the postal monopolist (incumbent PO) faces the following optimization problem:

$$\max_{p_d, p_t} \pi_{inc} = p_d x_d^* + p_t x_t^* - c_d x_d^* - c_t x_t^* - f,$$

where c is the marginal cost of a mail item and f denotes fixed cost (per recipient). This profit maximization problem can also be written as

$$\max_{p_d, p_t} \pi_{inc} = (p_d - c_d)(u - p_d) + (p_t - c_t)(u - p_t) - f.$$

We assume that $c_t > c_d$, i.e. that the marginal cost of processing and delivering a direct mail item is lower than for a transactional mail item. In order to have positive volumes, we assume further that $u > c_t$. The PO's profit-maximizing prices in the monopoly scenario with no interdependency are

$$p_d^{M,nI} = \frac{u + c_d}{2}$$

and

$$p_t^{M,nI} = \frac{u + c_t}{2}.$$

Observe that with these prices, the following optimal demand ensues:

$$x_d^{M,nI} = \frac{u - c_d}{2},$$

$$x_t^{M,nI} = \frac{u - c_t}{2}.$$

Since the cost for direct mail is lower than for transactional mail ($c_t > c_d$), it follows that $p_d^{M,nI} < p_t^{M,nI}$. Hence, a profit-maximizing PO prices transactional mail more expensively than direct mail. This is often observed in postal pricing where e.g. single-piece mail (which is often transactional mail) is sold at a higher price than bulk mail (which is often direct mail).

4.1.2 Model with interdependency between mail categories

In this subsection we analyze the effect of interdependency between the two mail categories. This means that the direct mail sender's profit not only depends on his own mail volume per receiver but also on the other sender's volume. In line with the analogies discussed in 3, we assume that transactional mail increases the value of direct mail by creating a positive environment for it. Hence, the senders' profit maximization problems are respectively

$$\max_{x_d} \pi_{dms} = (u + ax_t)x_d - \frac{1}{2}x_d^2 - p_d x_d$$

and

$$\max_{x_t} \pi_{tms} = ux_t - \frac{1}{2}x_t^2 - p_t x_t,$$

where $0 \leq a < 2$ captures the positive effect of transactional mail on demand for direct mail. The ensuing optimal quantities are given by

$$x_d^* = (1 + a)u - p_d - ap_t$$

and

$$x_t^* = u - p_t.$$

Anticipating these optimal quantities of the two senders, the incumbent PO faces the following profit maximization problem:

$$\max_{p_d, p_t} \pi_{inc} = p_d x_d^* + p_t x_t^* - c_d x_d^* - c_t x_t^* - f.$$

The profit-maximizing prices for the two mail types are then

$$p_d^{M,I} = \frac{(2 + a)u + (2 - a^2)c_d - ac_t}{4 - a^2}$$

and

$$p_t^{M,I} = \frac{(2 - a - a^2)u + ac_d + 2c_t}{4 - a^2}.$$

Hence, compared to the equilibrium prices without interdependency, direct mail is priced more expensively while transactional mail is sold at a lower price. The higher price of direct mail results from the PO exploiting the direct mail senders' higher willingness to pay. The lower price of transactional mail reflects the positive effect of transactional mail on demand for direct mail.

Observe that the following optimal quantities demanded ensue:

$$x_d^{M,I} = \frac{(2+a)u - 2c_d - ac_t}{4-a^2}$$

$$x_t^{M,I} = \frac{(2+a)u - ac_d - 2c_t}{4-a^2}$$

Comparing these quantities to those in the monopoly scenario without interdependency yields $x_d^{M,I} > x_d^{M,nI}$ and $x_t^{M,I} > x_t^{M,nI}$, i.e. the positive effect of transactional mail results in higher quantities of both mail types in equilibrium. The positive effect of transactional mail on direct mail implies that an exogenous decrease in transactional mail (e.g. as a result of electronic substitution) decreases the senders' willingness to pay for direct mail which results in a decrease in the PO's optimal price for direct mail.

4.1.3 Postal competition in direct mail

In this section we study the effect of postal competition on the optimal pricing for the two mail types. We assume that there is an entrant postal operator focusing on direct mail and competing directly with the incumbent PO. Hence, there exist two types of services for the direct mail sender while there is still only one service for transactional mail. For the sender of direct mail, the profit maximization problem with postal competition can then be formulated as follows:

$$\max_{x_d, \hat{x}_d} \pi_{dms} = (u + ax_t)x_d + (u + ax_t)\hat{x}_d - \frac{1}{2}x_d^2 - \frac{1}{2}\hat{x}_d^2 - \varepsilon x_d\hat{x}_d - p_d x_d - \hat{p}_d\hat{x}_d,$$

where variables marked with a hat ($\hat{}$) are associated with the competitor and $\varepsilon > 0$ denotes the degree of differentiation between the two direct mail services: The closer it is to zero, the higher is the degree of differentiation. The profit maximization problem for the sender of transactional mail remains the same:

$$\max_{x_t} \pi_{tms} = ux_t - \frac{1}{2}x_t^2 - p_t x_t.$$

Profit-maximizing quantities are now given as

$$x_d = u + ax_t - \varepsilon\hat{x}_d - p_d,$$

$$\hat{x}_d = u + ax_t - \varepsilon x_d - \hat{p}_d$$

and

$$x_t = u - p_t.$$

Substituting the different quantities yields

$$x_d^* = \frac{(1+a-\varepsilon-\varepsilon a)u - p_d + \varepsilon\hat{p}_d + (\varepsilon a - a)p_t}{1-\varepsilon^2},$$

$$\hat{x}_d^* = \frac{(1+a-\varepsilon-\varepsilon a)u + \varepsilon p_d - \hat{p}_d + (\varepsilon a - a)p_t}{1-\varepsilon^2}$$

and

$$x_t^* = u - p_t.$$

Anticipating this demand, the incumbent and the entrant POs maximize their profits as

$$\max_{p_d,p_t} \pi_{inc} = p_d x_d^* + p_t x_t^* - c_d x_d^* - c_t x_t^* - f$$

and

$$\max_{\hat{p}_d} \pi_{ent} = \hat{p}_d \hat{x}_d^* - \hat{c}_d \hat{x}_d^* - f,$$

respectively. We assume that $\hat{c}_d < c_d$, i.e. that the entrant has lower marginal cost of processing direct mail than the incumbent. Optimal prices are

$$p_d = \frac{(1+a-\varepsilon-\varepsilon a)u + c_d + \varepsilon\hat{p}_d + (\varepsilon a - a)p_t}{2},$$

$$\hat{p}_d = \frac{(1+a-\varepsilon-\varepsilon a)u + \hat{c}_d + \varepsilon p_d + (\varepsilon a - a)p_t}{2}$$

and

$$p_t = \frac{(1-\varepsilon^2)u - (\varepsilon a - a)c_d + (1-\varepsilon^2)c_t + (\varepsilon a - a)p_d}{2(1-\varepsilon^2)}.$$

To make the calculations more tractable, various cases concerning the relationship between the incumbent's and the entrant's direct mail are considered in the following: Maximum differentiation, a case in which the entrant fully displaces the incumbent in the market for direct mail and intermediate degrees of substitutability between the incumbent's and the entrant's direct mail service.

Maximum differentiation

Maximum differentiation is characterized by $\varepsilon = 0$. Then, the direct mail volumes demanded from the incumbent and the entrant are independent from each other. It follows that demand for the three mail types is given by

$$x_d^* = (1+a)u - p_d - ap_t,$$

$$\hat{x}_d^* = (1+a)u - \hat{p}_d - ap_t,$$

and

$$x_t^* = u - p_t.$$

The POs' profit-maximizing prices are then

$$p_{d,\varepsilon=0} = \frac{(1+a)u + c_d - ap_t}{2},$$

$$\hat{p}_{d,\varepsilon=0} = \frac{(1+a)u + \hat{c}_d - ap_t}{2}$$

and

$$p_{t,\varepsilon=0} = \frac{u + ac_d + c_t - ap_d}{2}.$$

Hence,

$$p_{d,\varepsilon=0}^C = \frac{(2+a)u + (2-a^2)c_d - ac_t}{4-a^2},$$

$$\hat{p}_{d,\varepsilon=0}^C = \frac{(4+2a)u - a^2c_d + (4-a^2)\hat{c}_d - 2ac_t}{2(4-a^2)}$$

and

$$p_{t,\varepsilon=0}^C = \frac{(2-a-a^2)u + ac_d + 2c_t}{4-a^2}.$$

Compared to the monopoly situation, we observe that the incumbent's prices for direct and transactional mail are the same. This is due to the assumption of maximum differentiation ($\varepsilon = 0$) which leaves the incumbent's direct mail unaffected by the entrant. The entrant benefits from the incumbent's transactional mail which is reflected in its price $\hat{p}_{d,\varepsilon=0}^*$. Since the entrant's marginal cost is assumed to be lower than the incumbent's, it follows that $\hat{p}_{d,\varepsilon=0}^* < p_{d,\varepsilon=0}^*$. As a result, with maximum differentiation of the two direct mail services, the following demand ensues:

$$x_{d,\varepsilon=0}^C = \frac{(2+a)u - 2c_d - ac_t}{4-a^2},$$

$$\hat{x}_{d,\varepsilon=0}^C = \frac{(4+2a)u - a^2c_d - (4-a^2)\hat{c}_d - 2ac_t}{2(4-a^2)}$$

and

$$x^C_{t,\varepsilon=0} = \frac{(2+a)u - ac_d - 2c_t}{4-a^2}.$$

The optimal demand for direct and transactional mail, respectively, can also be compared with the postal monopoly scenario. First, note that the optimal demand for transactional and direct mail services by the incumbent is the same under competition with maximum differentiation as under a postal monopoly. Second, due to the presence of the entrant, total direct mail demand is now higher.

The entrant takes it all

In the most extreme competitive scenario the entrant (who has a cost advantage over the incumbent) takes over the direct mail market from the incumbent PO. The two senders' optimization problems are given as follows:

$$\max_{\hat{x}_d} \pi_{dms} = (u + ax_t)\hat{x}_d - \frac{1}{2}\hat{x}_d^2 - \hat{p}_d\hat{x}_d,$$

$$\max_{x_t} \pi_{tms} = ux_t - \frac{1}{2}x_t^2 - p_t x_t.$$

The profit-maximizing demand functions are:

$$\hat{x}_d = u - \hat{p}_d + ax_t \quad \text{i.e.} \quad \hat{x}^*_d = (1+a)u - \hat{p}_d - ap_t$$

and

$$x^*_t = u - p_t.$$

Anticipating the senders' optimal demand behavior, the two POs set their prices according to

$$\max_{\hat{p}_d} \pi_{ent} = \hat{x}^*_d\hat{p}_d - \hat{c}_d\hat{x}^*_d - f,$$

$$\max_{p_t} \pi_{inc} = x^*_t p_t - c_t x^*_t - f.$$

Optimal prices and resulting quantities are

$$\hat{p}_d = \frac{(1+a)u + \hat{c}_d - ap_t}{2} \quad \text{i.e.} \quad \hat{p}^E_d = \frac{(2+a)u + 2\hat{c}_d - ac_t}{4},$$

$$p^E_t = \frac{u + c_t}{2},$$

$$\hat{x}_d^E = \frac{(2+a)u - 2\hat{c}_d - ac_t}{4},$$

$$x_t^E = \frac{u - c_t}{2}.$$

Hence, $p_t^E = p_t^{M,nI}$, i.e. the incumbent's price for transactional mail is equal to the monopoly outcome without interdependency since the incumbent does not take into account the positive effect of its transactional mail on the entrant's direct mail demand. It is higher than in all the other competitive scenarios for the same reason. Also the equilibrium quantity of transactional mail is the same as in the monopoly case without interdependency. The entrant's price for direct mail is lower than in the competitive case with $\varepsilon = 0$, i.e. $\hat{p}_d^E < \hat{p}_{d,\varepsilon=0}^C$ since the price and quantity of transactional mail do not reflect its effect on direct mail.

Intermediate substitutability

The closed-form solution to the model with competition between an incumbent and an entrant PO with $\varepsilon \neq 0$ is very involved. Table 1 shows the results of a numerical simulation with $\varepsilon \in \{0; 0,4; 0,8\}$.[2]

	M, nI	M, I	$C, \varepsilon = 0$	$C, \varepsilon = 0.4$	$C, \varepsilon = 0.8$	E
p_t	1,25	0,47	0,47	0,89	1,14	1,25
p_d	1,20	1,97	1,97	1,41	0,79	
$\hat{p}_d$			1,92	1,36	0,75	1,53
x_t	0,75	1,53	1,53	1,11	0,86	0,75
x_d	0,80	1,57	1,57	1,20	1,07	
$\hat{x}_d$			1,62	1,27	1,25	1,23
π_{dms}	0,32	1,23	2,53	2,12	2,43	0,75
π_{tms}	0,28	1,18	1,18	0,62	0,37	0,28
π_{inc}	1,20	2,40	2,40	1,64	0,96	0,56
π_{ent}			2,61	1,35	0,56	1,50

Table 1: Simulation results

A comparison of the four competitive scenarios reveals that the higher the substitutability the two PO's direct mail, the more intense is the competition between the two POs. Intense competition means for the incumbent that his benefits from the positive effect of his transactional mail and hence his incentives to cross-subsidize it are low. Intense competition reduces the two POs' and the transactional mail sender's profits. The effect on the direct mail sender is ambiguous: On the one hand, he benefits from low prices; on the other hand, he is negatively affected by the reduction of transactional mail and therefore the degradation of the mail channel.

[2]For the simulation we assume $u = 2$, $a = 1$, $c_t = 0,5$, $c_d = 0,4$, $\hat{c}_d = 0,3$, $f = 0$.

5 Platform competition

Competition in mail is not restricted to direct competition between POs. Especially transactional mail also competes with alternative means of communication and tends to be increasingly substituted, which is reflected in decreasing volumes. Direct mail, however has so far experienced lower rates of decrease, which indicates a lower degree of substitutability with other forms of advertising. The results of the previous Section 4.1.3 suggest that there is an indirect effect of the substitution of transactional mail on direct mail through the degradation of the mailmix. This makes the mail channel less attractive for advertising, too. As a result, incumbent POs and their direct competitors may lose market share to other advertizing platforms as a (possibly lagged) consequence of the electronic substitution of transactional mail.

6 Conclusion

This paper interprets the postal mailstream as a platform with two market sides in a theoretical model: On the one side of the market, advertisers (senders of direct mail) and senders of transactional mail are customers for mail services. On the other side of the market, there are the recipients. The value of direct mail for its sender depends the number of transactional mail items in the mailstream, i.e. there is an interdependency between the two types of mail. Hence, there are significant similarities between the mailstream as a platform and the standard examples from the media sector. Most importantly, all platforms face consumers of content – mail and editorial content – in a first market and firms (in a second market) directing advertising to the consumers as two distinct groups on the platform.

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 case of the postal mail platform, there are two distinct sender groups in one market: senders of transactional mail and senders of direct mail. Both sender types typically pay a postage fee to the platform provider. Direct mail is often less expensive than transactional mail, which reflects differences in their direct cost and the competitive environments. Our considerations show that it would be beneficial for POs to take into account the positive effect of transactional mail on direct mail by cross-subsidizing the former and thereby increasing the attractiveness of the mailstream as a platform.

An example for an active improvement of the mailmix by a PO is the PostCard creator offered by Swiss Post. It is an application for Android an iOS platforms which allows its users to send physical postcards to any Swiss address. The postcards may contain a written text and a picture provided by the user. Every user is offered one free postcard per day. The service is very popular in Switzerland and it contributes to the attractiveness of the consumers' mailstream.

A cross-subsidization of transactional mail to improve the mailmix is well possible for a monopolistic PO who can thereby fully internalize the interdependency between the mail categories. However, these efforts are thwarted by the decrease

of transactional mail due to electronic substitution which has a long-term adverse indirect effect on direct mail through the degradation of the mailmix. With open postal markets, entrant POs typically focus on bulk and direct mail. Hence, they can freeride on the mailmix provided by the incumbent PO. This reduces the incumbent's incentives to cross-subsidize transactional mail in an effort to make the mailstream an attractive platform for advertising. Hence, besides the adverse effect of electronic substitution, the mailmix also tends to degrade as a result of postal market opening which might indirectly contribute to the substitution of direct mail, too.

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