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Market Opening, Downstream Access, and Competition in the Market for Mail

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1. Introduction

Postal market liberalization is a current issue in Switzerland as well as in the European Union (EU). In the EU, the market for addressed mail items has been liberalized down to a reserved (monopoly) area for letters weighing less than 50g at the beginning of 2006. Individual countries have already gone further, e.g. Sweden with full market opening in 1993. EU-wide full liberalization is envisaged in 2013. In Switzerland, the reserved area has been reduced to 100g in spring 2006 and a postal legislation revision is currently under way, potentially comprising further steps towards full liberalization.

The reserved area has been the traditional means to finance the provision of universal postal services at uniform prices. There is, therefore, a concern that reductions in the reserved area could undermine the ability of the incumbent postal operator to finance its universal service obligation (USO). We explore this issue for Switzerland in this paper.

Based on Jaag (2007a) we propose a simple calibrated model of the Swiss letter market offering theoretical insights into the mechanics of market opening and access regulation along with quantitative conclusions bearing direct policy relevance. The model allows for a continuum of market opening scenarios. Moreover, we are able to quantitatively compare equilibria with and without mandated or negotiated downstream access provided to entrants at regulated rates.

The impact of liberalization on the incumbent operator has been tackled before: Dietl et al. (2005) develop a model of the Swiss letter market with a focus on regulatory scenarios. Hill, Robinson, and Rodriguez (2001) examine the prospects for a graveyard spiral in the UK and focus on scenarios in which the USO remains unchanged. Key in their analysis are the extent and implications of entry. Based on a calibrated model, Crew and Kleindorfer (2001) find that entry is likely to reduce efficiency and financing problems for the incumbent operator are likely to become significant. In their prospective study on behalf of the European Commission, PriceWaterhouseCoopers (2006) find that under full market opening (FMO) the USO needs to be changed significantly ("adapted to market conditions") in order to be financially sustainable. The report prepared by Oxera (2007) discusses various mechanisms that could be used to fund USO provision. The existence of a receiver externality, the benefits enjoyed by the receiver of a postal item, implies that recipients also should or could contribute to the financing of delivery costs. This gives rise to the receiver-pays-principle. Felisberto et al. (2006) and Friedli et al. (2006) argue that the introduction of a delivery flat rate (DFR) allows to segment the receiver base into those who accept low service levels with delivery only to the nearest post office and those who are willing to pay for tailor-made delivery, typically to the doorstep. Compared to the high-level universal service obligation currently in place, this reduces the proportion of overserved receivers and hence gives rise to a more efficient postal delivery system.[1] In the following, we will confine our analysis to pure sender-pays scenarios.

[1] Jaag (2007b) and Jaag and Trinkner (2008) point to the opportunities and limits of charging receivers for postal services. They conclude that the actual collection of recipient fees (versus reducing the cost of delivery by changing

From the perspective of network economics, mail conveyance can be segmented into the complementary components collection, sorting, and delivery.[2] Among others, Knieps (2006) argues that in none of these components are there irreversible costs which would constitute a monopolistic bottleneck (essential facility) in those components that exhibit the property of a natural monopoly (i.e. a subadditive cost function). Hence, from a network economic point of view, there is no obstacle to effective competition and hence no need for access regulation in fully liberalized mail markets. However, some incumbent operators across Europe are granted considerable VAT (value added tax) advantages. This might result in asymmetric market equilibria which do not comply with the concept of potential competition. On the other side, binding USO obligations might distort the equilibrium in favor of new market entrants without such obligations. Note that market entry has been observed in liberalized mail markets despite the presence of significant economies of scale and scope (see Farsi, Filippini, and Trinkner (2006) for the case of Switzerland). Hence, mail markets seem not only to be contestable, but also readily contested (see Table 1). Consequently, apart from the United Kingdom, no country has introduced mandated access while allowing bypass, i.e. full market opening combined with regulated access. In contrast to the European countries, delivery of addressed mail in the USA remains a monopoly. However, the US does have an active access market, with regulated discounts based on avoided costs for upstream services (referred to as worksharing).

Table 1: Need for Regulation or Protection of the USO?

	Sunk Cost	No Sunk Cost	
		No USO	USO
Natural Monopoly	Monopolistic Bottleneck *Access Regulation*	Contestable Market *No Regulation*	Contested Market *USO Protection/Financing?*
No Natural Monopoly	Competition *No Regulation*	Competition *No Regulation*	Competition *USO Protection/Financing?*

The welfare effects of downstream access and bypass in a liberalized postal environment have received much attention in the past. In their seminal contributions, Baumol (1983) and Baumol and Sidak (1994) developed the so-called efficient component pricing rule (ECPR).[3] In their setting, the rents of the sector as a whole are predetermined (by an exogenously fixed end-to-end product price). The distribution of these rents within the sector is efficiently arranged by negotiations between the market parties. This results in the (downstream-) infrastructure provider charging its opportunity costs foregone due to new entry. Gautier (2006) and de Donder (2006) model postal markets with the entrant being a competitive fringe, setting its stamp price at marginal cost. They allow for the entrant's endogenous choice of delivery technology, much the same as in our model.

Compared to the previous literature, e.g. Armstrong, Doyle, and Vickers (1996), and Armstrong (2006), we explicitly model the extent of entry as a function of the access regime in place and the resulting asymmetric price competition. We extend the analysis of market opening on competition in Jaag (2007a) by considering various access regimes. While also being able to determine the welfare implications of

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delivery frequency) is not likely to be a solution to the USO financing problem, leading us to confine our analysis to the pure sender-pays scenario.

[2] Technical functions, such as the postal code system, are independent of the network characteristics of the postal sector; standardization and access to these can be dealt with separately.

[3] See Laffont and Tirole (1994) for a derivation of optimal access charges in a framework of asymmetric information.

access vs. bypass, we focus on the effect of access price setting on the incumbent's and the entrant's profit and market penetration.

The paper proceeds as follows: Section 2 gives an outline of the model. Section 3 introduces technology and consumer preferences. Section 4 discusses price competition and establishes the competitive equilibrium, while in section 5 we discuss the entrant's market coverage decision. Section 6 discusses welfare effects of access. In section 7 we quantitatively assess various scenarios with respect to market opening and access regimes. Section 8 concludes.

2. Model Outline

The model addresses the entry game in the postal market. There is a legislator setting the incumbent's USO and the degree of market openness. The incumbent (denoted I) faces prescribed behavior in its product choice and pricing behavior. Entrants (denoted E) choose the scope of their entry and their conduct in price competition. For simplicity, we pool all entrants in a single representative one who is – due to implicit or explicit collusion – able to charge a markup over marginal cost.[4]

Note that in our model we do not treat the discrete entry decision of operators. It will be interesting, however, to compare the operators' profits under various scenarios in order to assess E's relative incentive to enter into the market in the first place.

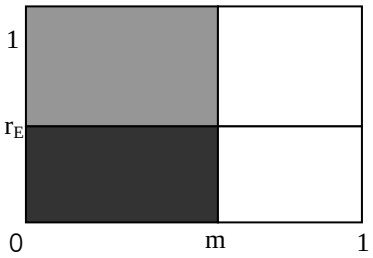

Figure 1: Market dimensions: geographical/consumer type (r) and letter type (m) dimension.

Figure 1 displays two relevant dimensions of the postal market: The horizontal dimension is the letter type dimension, while the vertical dimension has the two interpretations of the geographical location of delivery or sender type. While the first dimension is useful to define market opening, the second determines the structure of the cost function and area coverage of delivery if it is endogenously determined.[5] The figure shows market segmentation after (partial) market opening and with no bypass allowed. The USO currently in place implies full market coverage in both dimensions by the incumbent. The entrant's market coverage is pictured by the dark shaded area in the figure. The light shaded area depicts the part of the market in which the entrant hands over mail to the incumbent for delivery through downstream access. This is the market segment under competition (in the case of Figure 1, this competition is only for provision of upstream services). Such competition is limited by the degree of market opening m and E's own choice of coverage r_E. The rest is monopolistic, i.e. the entrant is either not able or not willing to serve that market.

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[4] This is counter to the "competitive fringe" assumption usually made in the literature. However, e.g. in the Swiss market for the conveyance of unaddressed mail, such behavior is common in practice. Moreover, allowing the entrant to make a profit in the model permits an assessment of market attractiveness to potential entrants when the market is being opened.

[5] Our approach is similar to the one employed by Valletti, Hoernig, and Barros (2002).

There are three potential paths (I-III) a mail item can take on its way from the sender to the receiver (see figure 2). In the monopolistic part of the market, only path (I) is possible. In the competitive market segment with bypass only (without access), also (III) becomes feasible. With access, all three paths are possible. With worksharing (see section 5.3) only paths (I) and (II) are feasible.

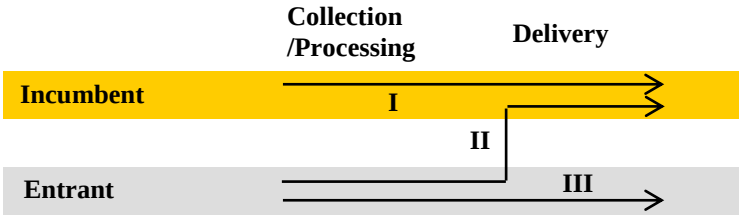


Figure 2: Possible paths of mail

The USO is exogenously defined, which currently amounts to full market coverage for the incumbent Swiss Post. The sequence of endogenous decisions by the actors I and E in the model is then as follows: Anticipating the equilibrium in the resulting price competition, first, entrants decide on their market coverage with either own delivery or – if available – downstream access to the incumbent's delivery network or a combination of both. Second, there is price competition in the competitive market segments with consumers deciding on the quantity of letters to send with each provider.

1 Market entry $\rightarrow r_E$;

2 Competitive price setting $\rightarrow p_E$.

Figure 3: Timeline of the entrant's decisions in postal competition.

In the formal description of the model below, capital subscript E indicates the association of a variable with the entrant. Without access, it is complemented by subscript D, with access by subscript A. Subscript M is the incumbent acting as a monopolist, while subscript C denotes the incumbent in competition. To increase readability, we suppress subscripts where no distinction is necessary.

In order to find a subgame-perfect equilibrium, we solve the model backwards, starting with an analysis of postal production and consumer demand.

3. Technology and Consumer Preferences

Technology and the USO determine the cost of mail conveyance. It is the sum of

(a) quantity-dependent (variable) cost,
(b) independent (fixed) cost.

In the model, the incumbent's cost consists of a fixed amount f_I and variable cost from end-to-end services $\kappa_I q_I$ and from downstream access services $\kappa_I^D q_A$, where q_I and q_A are end-to-end and downstream volumes, respectively. κ_I is the incumbent's's marginal end-to-end cost and κ_I^D marginal delivery cost. Total incumbent cost is thus given by

$$c_I(q_I) = \kappa_I q_I + \kappa_I^D q_A + f_I. \qquad (1)$$

The entrant has costs

$$c_E\left(q_{E,D}, q_A, r_E\right) = \kappa_E q_{E,D} + \kappa_{E,A} q_A + \omega r_E^{\beta} + f_E \tag{2}$$

which also consists of a quantity-dependent part and fixed cost. $\kappa_{E,A} = p_A + \kappa_E - \kappa_E^D$ is the entrant's marginal cost for all items handed over to the incumbent with κ_E being the entrant's marginal end-to-end cost with respect to quantity, κ_E^D marginal delivery cost and p_A the access price. Mail which is delivered by the incumbent through an access agreement costs the entrant p_A plus the marginal cost of collection and processing $\kappa_E - \kappa_E^D$. ω is a parameter weighing fixed costs.

Delivery cost, which depends on the number of households served, is not fixed – as in the incumbent's case – but convex in market coverage r_E with parameter $\beta > 1$. This reflects high time cost of delivery in rural areas with low population density.

Senders gain utility

$$V(q) = \delta^{-\frac{1}{\gamma}} \frac{q^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}} \tag{3}$$

from the quantity of letters sent q. For simplicity, we assume that mail demand treats letters of different weight and size as homogeneous. When discussing market opening by letter category below, we simply assume that different portions of a homogeneous market are being opened. Demand is given by

$$q(p) = \delta p^{\gamma} \tag{4}$$

with price elasticity γ.

End-to-end demand to the incumbent consists of quantity demanded in the monopolized part of the market plus the demand in the competitive segment

$$q\left(p_M, p_C, p_E\right) = q_M\left(p_M\right) + q_C\left(p_C, p_E\right). \tag{5}$$

In the monopoly segment, the incumbent faces demand

$$q_M\left(p_M\right) = \left(1 - m r_E\right) \delta p_M^{\gamma} \tag{6}$$

The monopoly segment's borders are defined by the degree of market opening m and the entrant's choice of market coverage r_E. This formulation implies that total market demand depends on the incumbent's price only. This is a justifiable simplification as long as the incumbent remains the dominant player in the market.[6] In the simulations below, the incumbent's price is set constant, such that total mail volume is constant as well.

In the complementary part of the entire market, the incumbent faces end-to-end demand

[6] This simplifying assumption implies that competition does not stimulate total demand. It ignores the empirically established fact that the products of the universal service provider and the entrants are imperfect substitutes, and that competition indeed increases total demand (see Pearsall, 2005).

$$q_C(p_C, p_E) = mr_E s\delta p_C^{\gamma} \tag{7}$$

where I's market share s is given by

$$s = \begin{cases} 0 & if \quad p_E < 0, \\ \left(\frac{p_E}{p_C}\right)^{\chi} & if \quad 0 \le p_E \le p_{C,} \\ 1 & if \quad p_E > p_C. \end{cases} \tag{8}$$

The constant switching elasticity in the competitive market segments is $\varepsilon_{s:p_E} = -\varepsilon_{s:p_C} = \chi > 0$. Note that this formulation of the switching function yields iso-elastic individual demand functions. It gives the incumbent the advantage of serving the whole market if prices are equal; the entrant is able to gain market share only by undercutting the incumbent's price.[7] Hence, the price elasticity of the incumbent's demand is $\varepsilon_{q_C:p_C} = \gamma - \chi > 0$ c.p. Figure 3 illustrates the incumbent's market share as a function of the entrant's relative price.

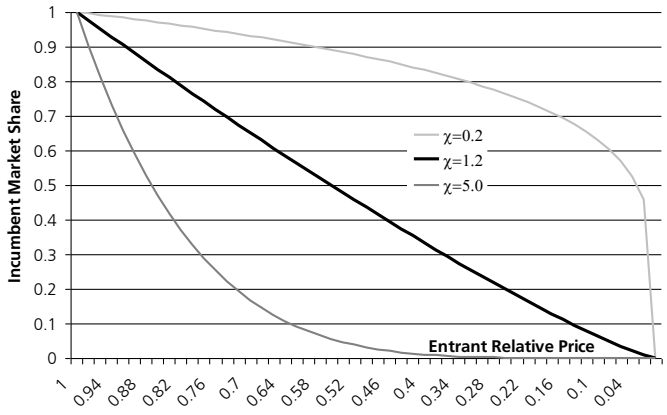


Figure 4: Incumbent market share as a function of the entrant's relative price.

In the served market, the entrant faces end-to-end demand

$$q_{E,D}(p_C, p_E, r_E) = mr_E(1-s)\delta p_C^{\gamma} \tag{9}$$

while the quantity handed over to the incumbent for delivery – if access is available – amounts to

$$q_A(p_C, p_E, r_E) = m(1-r_E)(1-s)\delta p_C^{\gamma} \tag{10}$$

4. Price Competition

[7] This is a common assumption in the literature, see e.g. the prospective EU study by PriceWaterhouseCoopers (2006).

The entrant and the incumbent compete in linear tariffs. The distinction of a monopolistic and a competitive market segment below allows the incumbent to discriminate prices between these segments. The entrant is assumed to be able to discriminate between mail delivered by herself and mail delivered by the incumbent via downstream access. We assume tight incumbent price regulation, such that only the entrant is able to freely choose its price: The incumbent's monopoly and competitive prices p_M and p_C are exogenously set by the regulation authority. If access is available, given these prices and the optimum extent of market coverage $r_{E,A}$, the entrant then determines optimum prices $p_{E,D}, p_{E,A}$ by solving the following :

$$\begin{aligned}\max_{p_E} \pi_E = {} & p_{E,D} q_{E,D}\left(p_C, p_{E,D}, r_{E,A}\right) \\ & + p_{E,A} q_A\left(p_C, p_{E,A}, r_{E,A}\right) \\ & - c_E\left(q_{E,D}\left(p_C, p_{E,D}, r_{E,A}\right), q_A\left(p_C, p_{E,A}, r_{E,A}\right), r_{E,A}\right)\end{aligned} \tag{11}$$

with the first-order conditions being

$$1 = (\chi + 1) p_E^{\chi} p_C^{-\chi} - \kappa_E \chi p_E^{\chi-1} p_C^{-\chi} \tag{12}$$

The entrant's marginal cost with respect to quantity for $\kappa_E \in \{\kappa_{E,A}, \kappa_{E,D}\}$ with and without access is $\kappa_{E,A}$ and $\kappa_{E,D}$, respectively. There is no closed-form solution to (12). Note, however, that in the case $p_C = \kappa_E$ it yields $p_E = p_C$. Total differentiation then yields

$$\frac{dp_E}{dp_C} = \frac{(\chi+1)\chi \frac{p_E}{p_C} - \chi^2 \frac{\kappa_E}{p_C}}{(\chi+1)\chi - (\chi-1)\chi \frac{\kappa_E}{p_E}} \tag{13}$$

such that

$$0 \le \left.\frac{dp_E}{dp_C}\right|_{p_E \ge p_C} \le 1. \tag{14}$$

Hence, the first-order condition satisfies the entrant's non-negative profit condition whenever E serves a positive market share. Figure 5 illustrates numerical solutions for different values of the E's marginal cost κ_E.

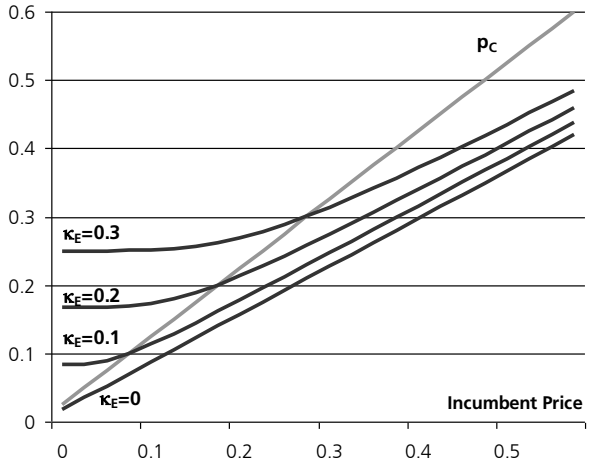


Figure 5: Entrant's price (dashed lines) given the incumbent's price for $\left(\kappa_E \in \{0,0.1,0.2,0.3\}\right)$.

Hence, whatever the incumbent's price, the entrant will almost linearly underprice it as long as her price exceeds marginal cost.[8] These considerations complete the characterization of the second step in the decision timeline. The equilibrium in price competition is the basis for the entrant's entry decision.

5. Market Entry

In this section, we study market entry first without and then with the availability of downstream access to delivery.

5.1 Downstream Bypass without Access

Without access, the entrant has the choice of market coverage

$$\max_{r_{E,D}\in[0,1]} \pi_E = p_{E,D} q_{E,D}\left(p_C, p_{E,D}, r_{E,D}\right) - c_E\left(q_{E,D}\left(p_C, p_{E,D}, r_{E,D}\right), r_{E,D}\right) \tag{16}$$

[8] In the special case of $\kappa_E = 0$, i.e. if the entrant has zero quantity-dependent marginal cost, we have

$$p_E = p_C\left(\frac{1}{\chi+1}\right)^{\frac{1}{\chi}}. \tag{15}$$

The assumption of zero quantity-dependent marginal cost is reasonable as long as the entrant does not operate at her capacity limit. The business case of CityMail in Sweden, who conveys only electronically processed mail, suggests that, indeed, an entrant bears very little quantity-dependent cost which then mainly consists of the delivery cost related to the number of served households. See WIK Consult (2006) for a discussion of postal business models in various countries of the European Union.

The marginal cost of extending market coverage consists of the (progressive) fixed costs due to delivery to ever more remote places. The marginal benefit is the per-piece profit of additional items. Exploiting the first-order condition yields

$$r_{E,D} = \left[\frac{m\delta p_C^{\gamma} \left(p_{E,D} - \kappa_E \right) \left(1 - s_D \right)}{\beta\omega} \right]^{\frac{1}{\beta - 1}} \tag{17}$$

where

$$s_D = \left(\frac{p_{E,D}}{p_C} \right)^{\chi}. \tag{18}$$

Comparative statics yield that the covered area by the entrant increases in the degree of market opening, $\partial r_E / \partial m > 0$, while its reaction to the degree of substitutability between the incumbent's and the entrant's postal service is ambiguous, $\partial r_E / \partial \chi <> 0$.

5.2 Downstream Bypass with Access

In order to sensibly analyze access in our model setting, we have to restrict the interpretation of the r-dimension to geographical coverage. p_A denotes the area-independent per-piece access charge the entrant pays to the incumbent, the amount of which is part of the regulatory setting. Since access is assumed to be area-independent, the entrant chooses full coverage access and offers full coverage to its customers (by own delivery or access), consequently iff $p_A \leq p_E$, which we assume to hold. Given this, the entrant's problem is to choose the degree of market coverage (own delivery) that maximizes profit:

$$\begin{aligned} \max_{r_{E,A} \in [0,1]} \pi_E = {} & p_{E,D} q_{E,D} \left(p_C, p_{E,D}, r_{E,A} \right) \\ & + p_{E,A} q_A \left(p_C, p_{E,A}, r_{E,A} \right) \\ & - c_E \left(q_{E,D} \left(p_C, p_{E,D}, r_{E,A} \right), q_A \left(p_C, p_{E,A}, r_{E,A} \right), r_{E,A}, p_A \right) \end{aligned} \tag{19}$$

in which $r_{E,A}$ denotes own coverage where no access is used. With access, the marginal cost of extending market coverage also entails (progressive) fixed costs. The marginal benefit is the difference between the access price and the entrant's marginal cost of her own delivery network. This effect is enhanced by the larger market share $s_D > s_A$ in the competitive segment due to a lower optimum price. Hence, from the first-order condition we get

$$r_{E,A} = \left[\frac{m\delta p_C^{\gamma} \left[\left(p_{E,D} - \kappa_E \right) \left(1 - s_D \right) - \left(p_{E,A} - \kappa_{E,A} \right) \left(1 - s_A \right) \right]}{\beta\omega} \right]^{\frac{1}{\beta - 1}} \tag{20}$$

where s_D is as in (18) and

$$s_A = \left(\frac{p_{E,A}}{p_C} \right)^{\chi}. \tag{21}$$

Since we assumed that $p_A \leq p_E$, comparing (20) to (17) yields $r_{E,A} \leq r_{E,D}$. So, access induces the entrant to reduce her own delivery coverage.

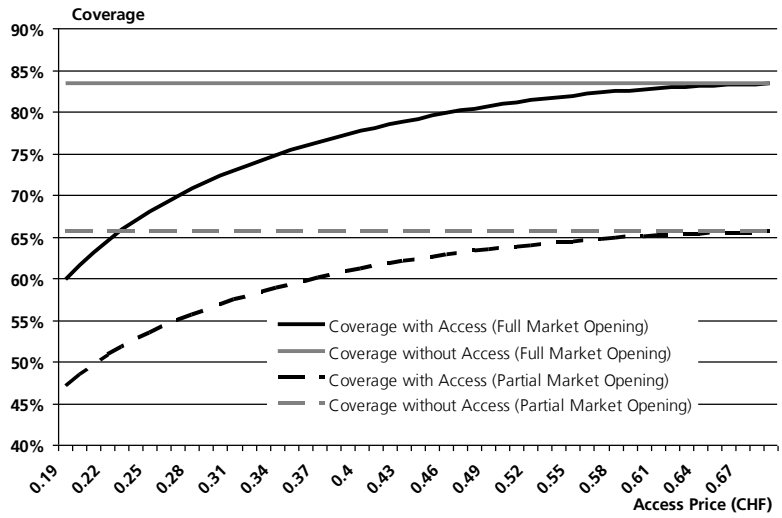


Figure 6: Market entry decision

Figure 6 shows the entrant's market entry decision as a function of the access price. Market coverage is generally lower with access than without as in this case fixed delivery cost can be saved. As the access price increases, also own market coverage increases as the entrant's own delivery channel becomes relatively more attractive.

5.3 Worksharing Only

Under worksharing, the market for upstream services and consolidation are open completely to competitors, but final delivery is reserved to the incumbent. This regulatory framework is essentially the one currently in place in the USA.[9] The regulatory setting comprises the area-independent per-piece worksharing discount the entrant pays to the incumbent. This defines the access charge p_A. Since access is assumed to be area-independent, the entrant chooses full coverage access and offers full coverage to her customer. Compared to downstream bypass, worksharing with access induces the entrant to increase delivery coverage while at the same time waiving the cost of establishing a parallel delivery network. The entrant hence bears only the upstream marginal cost $\kappa_E - \kappa_E^D$ and fixed cost:

$$c_E = \kappa_{E,A} q_A + f_E = \left(p_A + \kappa_E - \kappa_E^D \right) q_A + f_E. \tag{22}$$

5.4 Welfare

[9] See Haldi and Olson (2003) for a description of the US worksharing system.

In this section we discuss the effect of market opening and access regulation on overall welfare. Welfare is computed as the sum of all operator profits plus the consumers' net utility from mail consumption

$$\begin{aligned} W &= \pi_I + \pi_E + V\left(q_M + q_C + q_{E,D} + q_A\right) \\ &\quad - p_M q_M - p_C q_C - p_{E,D} q_{E,D} - p_{E,A} q_A \\ &= V\left(q_M + q_C + q_{E,D} + q_A\right) - c_I - c_E + p_A q_A \end{aligned} \tag{23}$$

There are two differences between the incumbent and and the entrant: First, the incumbent has to fulfill a USO (with full area coverage), while the entrant is free to choose the optimum degree of market entry. Second – and based on the first difference – the entrant has lower fixed and variable costs due to its higher entrepreneurial flexibility.

Consider the first-order necessary condition for internal solutions to the welfare-optimal access price p_A:

$$\frac{dW}{dp_A} = \underbrace{\frac{d\left(\omega r_E^{\beta}\right)}{dp_A}}_{\leq 0} - \underbrace{\kappa_I \frac{dq_I}{dp_A}}_{<0} - \underbrace{\kappa_E \frac{dq_{E,D}}{dp_A}}_{\leq \geq 0} - \underbrace{\left[\kappa_E - \kappa_E^D + \kappa_I^D\right]\frac{dq_A}{dp_A}}_{>0} = 0. \tag{24}$$

From a welfare point of view, with bypass, the access price has three direct effects on welfare:

- A high access price induces the entrant to extend her own delivery network and reduce the use of downstream access, resulting in higher overall delivery cost due to network duplication. This is the effect described by the first part on the right-hand side of (24).
- It also shifts demand for end-to-end services from the entrant to the less efficient incumbent (Second expression on the right-hand side of (24)).
- Due to a high access price, the remaining (lower) mail volume collected by the entrant is rather self delivered than handed over to the incumbent for delivery, hence using the entrant's (marginally) more efficient technology. This is reflected in the third and fourth part on the right-hand side of (24).

Hence, our result assures that the efficient degree of market entry is chosen, which corresponds to the logic behind the ECPR. In the worksharing scenario (without bypass) the first and the third term on the right-hand side of (24) are zero: The scope of the entrant's delivery network and hence also the volume she delivery herself are fixed to zero. Then, once market entry has taken place and because $\frac{dq_I}{dp_A} = -\frac{dq_A}{dp_A}$, the optimal access price is not defined in general: As long as $\kappa_I - \kappa_I^D > \kappa_E - \kappa_E^D$, the access price must be indefinitely low in order to assure that no volume is processed by the inefficient incumbent.

Based on the above considerations, a very low access price seems optimal with and without bypass. However, lowering the access price increases the entrant's profit relatively more than overall welfare and therefore encourages inefficient market entry in the first place, as we will show in the simulations below. It also questions the financial stability of the incumbent and hence the financial viability of the USO in the long term.

6. Scenario Analysis

The calibration of the model is exactly the same as in Jaag (2007a). In this section we discuss various market opening scenarios with respect to their effects on the incumbent's market share and profitability. Note that the model presented in the previous section discusses equilibrium effects only. Hence, the

analysis does not permit statements on the short-term effects of policy changes. We focus on two market opening scenario classes: Full market opening with no reserved area and partial market opening ($m = 1$) with a reserved area for letters weighing less than 50g ($m = 0.3$). Due to the affordability constraint on prices imposed by the USO, in all scenarios we keep the incumbent's prices constant: $p_M = p_C = 0.77$. The following scenarios are simulated:

1. Market opening without access;
2. Market opening with access; access price based on the retail price minus the avoided cost of collection and processing;
3. Market opening with access; access price based on the marginal cost of delivery;
4. Worksharing with a monopoly, mandated downstream access; access price based on the retail price minus the avoided cost of collection and processing.
5. Worksharing with a monopoly, mandated downstream access; access price based on the marginal cost of delivery.
6. As a reference (REF), the status quo with a reserved area below 100g and no access.

Table 2 summarizes the simulation results of partial market opening with respect to market entry, the resulting equilibrium prices, and the impact on profits and employment; a discussion follows below.

Scenario	**PMO1**	**PMO2**	**PMO3**	**PMO4**	**PMO5**	**REF**
p_A	–	0.69	0.19	0.69	0.19	–
$p_{E,D}$	0.48	0.48	0.48	–	–	–
$p_{E,A}$	–	0.75	0.51	0.75	0.51	–
$r_{E,D}$	0.66	–	–	–	–	–
$r_{E,A}$	–	0.65	0.47	–	–	–
$q_M^{\dagger}$	2257.77	1967.00	1967.00	1967.00	1967.00	2810.00
$q_C^{\dagger}$	315.49	599.57	499.80	823.25	515.93	–
$q_A^{\dagger}$	–	6.82	160.00	19.75	327.07	–
$q_{E,D}^{\dagger}$	236.74	236.61	183.20	–	–	–
$\Delta\pi_I^{\dagger,\ddagger}$	-117.42	-117.36	-170.23	0.00	-162.23	–
$\Delta\pi_E^{\dagger,\ddagger}$	-140.73	-140.63	-103.58	-199.70	-112.09	–
$\Delta W_I^{\dagger,\ddagger}$	-190.55	-190.32	-180.33	-199.41	-190.19	–
$\Delta W_I^{\dagger,\ddagger} - \Delta\pi_I^{\dagger,\ddagger}$	-49.81	-49.68	-76.75	0.30	-78.10	–

Notes: in chf; †in millions; ‡relative to scenario REF.

Table 2: Partial market opening: Simulation results

Table 3 reports the simulation results of full market opening. In the scenarios where the mail market is only partially opened (e.g. only for letters weighing more than 50g, as reported in table 2), without access, entrants cover 66% of the market in equilibrium. The corresponding number with full market opening is 83%. Note that the overall mail volume is constant due to the assumed freezing of the incumbent's price.

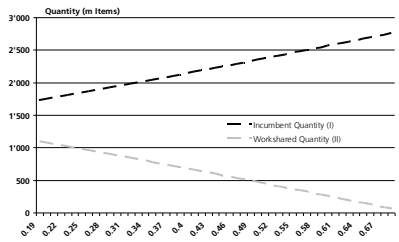
With the possibility of access, the entrant's scope of delivery is expected to decline. In our simulations (comparing scenarios PMO1 to PMO2 and PMO3), this is only the case if the access price p_A is sufficiently low. Otherwise, access is an unattractive choice for the entrant which is hardly drawn upon: The entrant's optimum price in the market segment handed over to the incumbent for delivery is just not competitive.

Scenario	FMO1	FMO2	FMO3	FMO4	FMO5	REF
p_A	–	0.69	0.19	0.69	0.19	–
$p_{E,D}$	0.48	0.48	0.48	–	–	–
$p_{E,A}$	–	0.75	0.51	0.75	0.51	–
$r_{E,D}$	0.83	–	–	–	–	–
$r_{E,A}$	–	0.83	0.60	–	–	–
$q_M^{\dagger}$	468.07	0.00	0.00	0.00	0.00	2810.00
$q_C^{\dagger}$	1337.95	1795.57	1651.34	2744.16	1719.77	–
$q_A^{\dagger}$	–	11.00	438.21	65.84	1090.23	–
$q_{E,D}^{\dagger}$	1003.98	1003.43	720.44	–	–	–
$\Delta\pi_I^{\dagger,\ddagger}$	-497.97	-497.70	-574.69	0.00	-540.76	–
$\Delta\pi_E^{\dagger,\ddagger}$	51.34	51.51	127.35	-199.01	93.03	–
$\Delta W_I^{\dagger,\ddagger}$	-159.91	-159.47	-128.88	-198.02	-167.29	–
$\Delta W_I^{\dagger,\ddagger} - \Delta\pi_I^{\dagger,\ddagger}$	-211.25	-210.97	-256.23	0.99	-260.33	–

Notes: in chf; †in millions; ‡relative to scenario REF.

Table 3: Full market opening: Simulation results

The entrant profits from the optional opportunity of access to the incumbent's network at any rate. Also, the incumbent can profit from such an agreement, but only if the access price allows her to retain the margin of her end-to-end product. In the access and worksharing scenarios, the entrant faces higher marginal costs than with a proprietary delivery network. This results in a higher price, but lower fixed costs. In the worksharing case, the retention of the downstream monopoly allows the incumbent to cover her fixed costs due to large volumes. From a welfare point of view, among all scenarios, access and worksharing perform well with low access prices since they avoid the multiplication of fixed costs. However, complete market opening along with regulated access and high worksharing discounts would challenge the incumbent even more than liberalization without bypass access. This is due to the ample cherry picking opportunities entrants would have in such a system. A low access price also bears the risk of inefficient entry into the market. This can be seen from the last row in tables 2 and 2. A large negative value of the difference in welfare and the entrant's profit shows that entry is much more attractive for the entrant than for society.



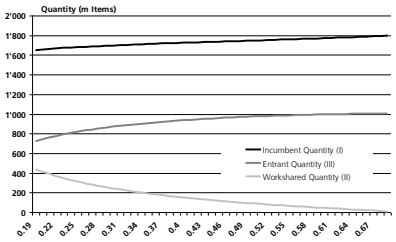


Figure 7: Quantities without Bypass **Figure 8:** Quantities with Bypass

Figure 7 shows the incumbent's and the entrant's quantities as a function of the access charge. A high charge induces the entrant to set a high price (see figure 5) which decreases his volume. As total volume depends only on the incumbent's price, it is unaffected by a change in the access price. Also with bypass (Figure 8), the workshared volume decreases in the access price. However, as the entrant is now allowed to (partially) redirect volumes to her own network, the loss in market share is much lower than without the possibility to bypass.

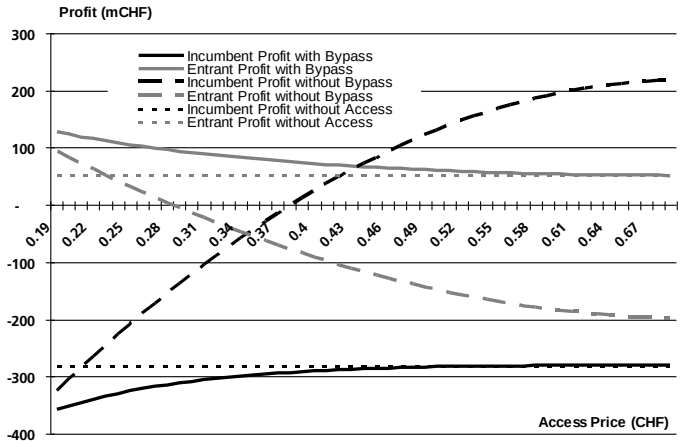


Figure 9: Profits in different scenarios

Based on the market shares as shown in Figures 7 and 8, figure 9 shows the corresponding profit levels in different scenarios. The incumbent's profit increases in the access price. Without the entrant's possibility to bypass, it profits the most from an access price increase. If bypass is allowed, with a high access price, it is attractive for the incumbent to offer access to its delivery network with resulting profits from higher downstream volumes. The entrant always loses if the access charge is increased as this reduces E's delivery options. However, even with a high access price, the entrant is never worse off than without access: If it is too expensive, it is just not used.

7. Conclusion

Following the postal liberalization process in the European Union, Switzerland intends to further open its postal markets in the years to come, albeit for different reasons. While one of the main reasons for liberalization in the EU is the accomplishment of the postal internal market, Switzerland aims at finding an efficient means to provide a high level of universal service obligations. Market opening indeed invites competition, but it may also present challenge to financing the USO currently in place. USO financing under entry is challenged both by the loss of revenues and scale economies in combination with the affordability constraints on pricing. The incumbent and the entrants would benefit from downstream

access as compared to end-to-end competition if the access price is set according to avoided cost. This is due to a better cost allocation between operators. At lower access prices, the incumbent loses margin and therefore incurs losses. Concerning overall welfare implications of downstream access, the simulations reported here yield robustly negative results with bypass. Positive effects can be expected with a worksharing regime and access prices oriented at avoided cost. Cost differentials in the delivery function between the incumbent operator and entrants, and the associated efficiency gains, are captured in our model. The model does not reflect, however, welfare gains that might result from entrants' products being imperfect substitutes for the incumbent's product. These effects of product innovation may be primarily in the worksharing domain: Changes in product mix and welfare related to delivery options under full liberalization probably less important than upstream benefits of worksharing.[10]

Our simulations show that regulated access might spur competition in the upstream market while reducing competitive pressure downstream. Positive welfare effects of downstream access can only be expected if the multiplication of cost due to entry is overcompensated by a better overall cost allocation among operators. However, in these situations, inefficient entry into the market by cherry picking is most likely. Granting the universal service provider flexibility in her pricing and product range decisions reduces this threat.

We find that downstream access is an attractive means of entry for new competitors as it helps to avoid delivery fixed cost. However, it may also be attractive for incumbents as it helps covering the fixed costs already incurred and could well add to total volumes by stimulating demand through upstream cost savings and product innovation.

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[10] See Pearsall (2005).

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