Liberalization of the Swiss Letter Market and the Viability of Universal Service Obligations

Christian Jaag*

Forthcoming, Swiss Journal of Economics and Statistics

Abstract

We discuss the ongoing liberalization process in the market for addressed letter mail in Switzerland. The core of the paper is an assessment of the liberalization's impact on the financial viability of various universal service obligations with and without access to the incumbent's downstream delivery network for customers and competitors. We propose a simple calibrated model of the Swiss letter market offering theoretical insights into the mechanics of market opening along with quantitative conclusions bearing direct policy relevance. The extent of the entrants' market coverage and the equilibrium in the resulting price competition are endogenously determined. Our simulations suggest caution in introducing full market opening. For the scenarios considered, the model shows that either the burden of the USO must be reduced (e.g. with respect to the frequency and the coverage of delivery and / or through price differentiation). Alternatively, other means of assuring financial stability of Swiss Post must be sought, be it through external funds or demand stimulation through new producs, possibly in the worksharing domain.

JEL-Classification: H44, L52

Keywords: Liberalization, Mail, Universal Service Obligation

*University of St.Gallen and Swiss Post. The views expressed in this paper are those of the author and do not necessarily reflect the opinion of Swiss Post. Helpful comments and suggestions by Alex Gulde, Urs Trinkner, and two anonymous referees are gratefully acknowledged.

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 reserverd (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 2009. 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 as well.

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). Due to the lack of experience, there are currently no empirical studies available concerning the long-run market development after extensive liberalization.

In this paper we assess the impact of the liberalization of the Swiss letter market on the viability of USO on the basis of a market entry model. The paper aims at answering the question posed by Panzar (2001): "What levels of subsidy, rates, and reserved areas will allow the incumbent to cover its costs in the coming competitive area?" for the Swiss case.

The question has been tackled before: 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 (2006a) find that under full market opening (FMO) the USO needs to be changed significantly ("adapted to market conditions") in order to be financially sustainable.[1] The report prepared by Oxera (2007) discusses various mechanisms that could be used to fund USO provision.

The foremost motivation for market opening in the EU is the accomplishment of the postal internal market, while Switzerland primarily aims at finding an efficient means to provide a high level of universal service obligations. Dietl et al. (2005) develop a model of the Swiss letter market with a focus on regulatory scenarios. We propose a simple calibrated model of the Swiss letter market offering theoretical insights into the mechanics of market opening along with quantitative conclusions bearing direct policy relevance. The model allows for a continuum of market opening and -entry and USO scenarios. Moreover, we are able to quantitatively compare equilibria with and without mandated downstream access provided to entrants at regulated rates based on avoided cost.

[1] Cf. PriceWaterhouseCoopers (2006a), p.23: "We use the term 'adapting the USO to market conditions' to mean generally achieving a better alignment of price, cost and value for USO services. This might include, for example, using postal employees to provide services in rural areas as part of their routes rather than at fixed counters, increased use of franchised operations, increasing the stamp price, and eliminating uniformity requirements on business-originated mail. Adapting the USO could also mean changing the constraints on accessibility for counters and collection services as populations and demand for postal services change over time."

The paper proceeds as follows: Section 2 gives an outline of the model. Section 3 introduces technology, consumer preferences, and the USO in place. Section 4 discusses price competition and establishes the competitive equilibrium, while in section 5 we discuss the entrant's market coverage decision. We calibrate the model in section 6. In section 7 we quantitatively assess various scenarios with respect to market opening, USO and the access regime. Section 8 gives a sensitivity analysis with respect to crucial parameter; section 9 concludes.

2 Model Outline

The model addresses the entry game in the postal market. There is a regulatory authority setting the incumbent's USO and the degree of market openness. The incumbent faces prescribed behavior in her product choice and pricing behavior. Entrants 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.[2] Note that in our model we assume the discrete entry decision of operators other than the incumbent as exogenously given. We are therefore not interested in the absolute values of the entrant's profit, but only in the profit maximizing pricing and market coverage. It will be interesting, however, to compare the entrant's profit under various scenarios in order to assess her relative incentive to enter into the market in the first place.

The USO is exogenously defined, which currently amounts to full market coverage and daily delivery for the incumbent Swiss Post as well as uniform prices. The sequence of endogenous decisions by the involved actors 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. Second, there is price competition in the competitive market segments with consumers deciding on the quantity of letters to send with each provider.

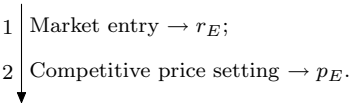


Figure 1: Timeline of the entrant's decisions in postal competition.

In the formal description of the model below, subscripts denote partial derivatives; capital subscript E indicates the association of a variable with the entrant. Subscript M is the incumbent acting as a monopolist, while subscript C denotes the incumbent in competition. Variables which are calibrated according to currrent values are denoted by a hat. In order to find a subgame perfect equilibrium, we solve the model backwards, starting with an analysis of postal production and consumer demand.

[2]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 attractivity to potential entrants when the market is being opened.

3 Technology, Consumer Preferences, and Universal Service Obligations

The single most important constraing facing the incumbent postal operator is the explicit USO it has to satisfy. Concerning the Swiss market for addressed mail, it currently consists of regulations in the following dimensions:

- **Product Range** List of services has to be approved by the ministry of transportation;
- **Covered Area** Distribution must be ubiquitous; the next postal counter network must be located within resonable distance;[3]
- **Frequency of Service** Collection and delivery must take place every working day, at least five times per week;
- **Prices** Prices must be uniform in reserved area and non-discriminatory for universal service;
- **Quality** At least 97% of all mail must be delivered in E+1 / E+3. This value has been surpassed regularly by Swiss Post.

When assessing liberalization scenarios we also discuss the financial impact of a slackening of these obligations. Technology and the USO determine the cost of mail conveyance. It is the sum of[4]
(a) quantity-dependent cost,
(b) coverage- and delivery-frequency-dependent cost and
(c) independent (fixed) cost.
In the model, we have cost consisting of a fixed amount f, variable cost κq which is linear in quantity q, and quantity-independent time cost gr^{β} which is a function of the served partial market as measured in the fraction r of served households. Delivery cost is convex in market coverage ($\beta > 1$) which reflects high time cost of delivery in rural areas with low population density. Total cost is thus given by

$$c(q, r) = \kappa q + g r^{\beta} + f. \tag{1}$$

Variable $g \equiv \alpha h^{\lambda}$ depends on the frequency of delivery h which is an important determinant of quality, where parameter $0 < \lambda < 1$ determines the convexity of the cost function with respect to the delivery frequency. Currently, the Swiss Post's USO requires delivery on five days per week which normalizes $\hat{h} = 1$. Senders gain utility from the quantity of letters sent q and a numéraire good z and dispose of a budget y. 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. Maximizing utility by

$$\max_{q,z} \; V(q, z) = \delta^{-\frac{1}{\gamma}} \frac{q^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}} + z \quad \text{s.t.} \quad pq + z \leq y \tag{2}$$

by means of the Lagrangean

$$\mathcal{L} = \delta^{-\frac{1}{\gamma}} \frac{q^{1+\frac{1}{\gamma}}}{1+\frac{1}{\gamma}} + z - \mu(pq + z - y) \tag{3}$$

[3] PostReg, the Swiss regulatory authority, considers this to mean that 90% of the population must be able to reach the next post office within 20 minutes.
[4] Cf. table 1 in section 6 below.

yields iso-elastic demand

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

with price elasticity γ.

Figure 2 displays the two 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. The USO currently in place implies full market coverage in both dimensions by the incumbent. The entrant's market coverage is pictured by the shaded area in the figure. This is the market segment under competition. It is limited by the degree of market opening m and her own choice of coverage r. The rest is monpolistic, i.e. the entrant is either not able or not willing to serve that market.

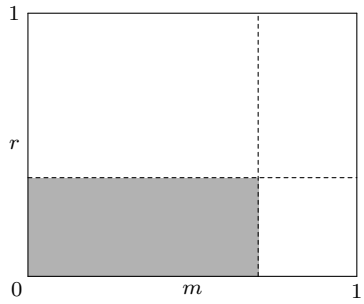


Figure 2: Market dimensions: geographical/consumer type (r) and letter type (m) dimension.

4 Price Competition

After market entry, the entrant and the incumbent compete in linear and uniform tariffs.[6] The incumbent's cost function is given as in (1), while the entrant has costs

$$c_E(q_E, r_E) = \upsilon q_E + \omega r_E^{\beta} + f_E. \tag{5}$$

In analogy to g, $\omega < g$ depends on chosen delivery frequency. υ ist the entrant's marginal cost with respect to quantity. Individual demand to the incumbent consists of quantity demanded in the monopolized part of the market plus her demand in the competitive segment

$$q(p_M, p_C, p_E, r_E) = q_M(p_M) + q_C(p_C, p_E). \tag{6}$$

In the monopoly segment, the incumbent faces demand

$$q_M(p_M, r_E) = (1 - m r_E)\, \delta p_M^{\gamma}. \tag{7}$$

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

[6] The distinction of a monopolistic and a competitive market segment below allows the incumbent to discriminate prices between these segments in principle. In parts of the simulations, however, we will assume a regulatory freeze of all prices, such that price uniformity is maintained.

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.[7]

In the complementary part of the entire market, the incumbent faces demand

$$q_C(p_C, p_E, r_E) = m r_E s \delta p_C^{\gamma}, \tag{8}$$

where market share s is given by

$$s = \begin{cases} 0 & p_E \leq 0, \\ \left(\frac{p_E}{p_C}\right)^{\chi} & 0 \leq p_E \leq p_C, \\ 1 & p_E \geq p_C. \end{cases} \tag{9}$$

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 isoelastic individual demand functions. It gives the incumbent the advantage that she serves the whole market if prices are equal; the entrant is able to gain market share only by undercutting the incumbent's price.[8] Hence, the price elasticity of the incumbent's demand is $\varepsilon_{q:p_C} = \gamma - \chi$ c.p. Figure 3 illustrates the incumbent's market share as a function of the entrant's relative price.

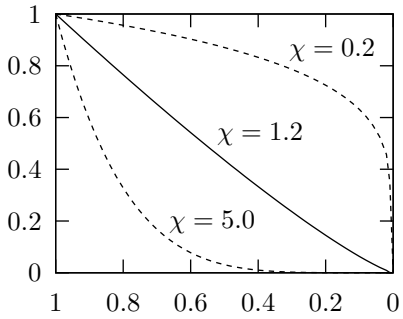


Figure 3: Incumbent market share as a function of the entrant's relative price.

In the served market, the entrant faces demand

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

In the simulations below, we will assume tight incumbent price regulation, such that in fact only the entrant is able to freely choose her price: The incumbent's monopoly and competitive prices p_M and p_C are exogenously set by the regulation authority. Given these prices, the entrant sets her optimum price p_E. Arguing backwards, the entrant's program is regular and

$$\max_{p_E} \ \pi_E = p_E q_E(p_C, p_E, r_E) - c_E(q_E(p_C, p_E, r_E), r_E) \tag{11}$$

[7] This 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, such that competition indeed affects total demand (cf. Pearsall, 2005).

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

with the first-order condition being

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

There is no closed-form solution to (12). Note, however, that in the case $p_C = \upsilon$ it yields $p_E = p_C$. Total differentiation then yields

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

such that

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

Hence, the first-order condition satisfies the entrant's non-negative profit condition whenever she serves a positive market share. Figure 4 illustrates numerical solutions for different values of the entrant's marginal cost υ.

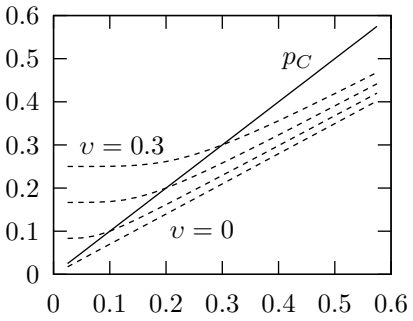


Figure 4: Entrant's price (dashed lines) given the incumbent's ($\upsilon \in \{0, 0.1, 0.2, 0.3\}$).

Hence, whatever the incumbent's price, the entrant will almost linearly underprice it as long as her price exceeds marginal cost.[9] 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.

[9] In the special case of $\upsilon = 0$, 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. Cf. WIK Consult (2006) for a discussion of postal business models in various countries of the European Union.

5.1 Downstream Bypass

Without access, the entrant has the choice of market coverage

$$\max_{r_E \in [0,1]} \pi_E = p_E q_E(p_C, p_E, r_E) - c_E(q_E(p_C, p_E, r_E), r_E). \quad (16)$$

Exploiting the first-order condition yields

$$\begin{aligned} r_E &= \left[\frac{m\delta p_C^{\gamma} p_E \left(1 - \left(\frac{p_E}{p_C}\right)^{\chi}\right)}{\beta\omega} \right]^{\frac{1}{\beta-1}} \quad (17) \\ &= \left[\frac{m\delta \left(\frac{\gamma-\chi}{1+\gamma-\chi}\kappa\right)^{1+\gamma} \left(\frac{1}{1+\chi}\right)^{\frac{1}{\chi}} \left(1 - \frac{1}{1+\chi}\right)}{\beta\omega} \right]^{\frac{1}{\beta-1}}. \end{aligned}$$

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 Worksharing

Under worksharing, 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 her offer with respect to delivery coverage while at the same time waiving the cost of establishing a parallel delivery network. She hence bears only the upstream marginal cost $\kappa - \kappa^D$ and zero coverage- and delivery-frequency-dependent cost.

5.3 Welfare

Total welfare is computed as the sum of all operator profits plus the consumers' net utility

$$W = \pi + \pi_E + V(q_M + q_C + q_E) - q_M p_M - q_C q_M - q_E p_E - T, \quad (18)$$

where T is a lump-sum transfer from consumers to the incumbent postal operator (cf. the receiver-pays-principle scenario below). In the simulations we assume for simplicity that reductions in the USO are welfare neutral, i.e. that the cost saving by the incumbent is just offset by the increased costs on the receivers' side.[10]

6 Calibration

In Switzerland, total cost of addressed mail conveyance amonts to 1950m CHF. With a total revenue of 2150m CHF, the resulting profit is roughly

[10] In the RPP case, the incumbent's profit function becomes $\pi = p_M q_M + p_C q_C - c + T$.

200m CHF.[11] Swiss Post's total cost of addressed mail conveyance consists of (a) quantity-dependent cost, (b) coverage- and delivery-frequency-dependent cost and (c) independent (fixed) cost. Table 1 gives the cost structure in two dimensions: supply chain and cost type.

Table 1: Cost structure of addressed mail conveyance in Switzerland.

Supply chain		Cost type	
Collection	15%	(a)	40%
Processing	24%	(b)	16%
Delivery	55%	(c)	44%
Overhead	6%		
Total	100%		100%

Note: Data from 2005 in CHF.

A calibration for Switzerland with data from 2005 yields parameter values as stated in table 2.[12] Parameter $\hat{\delta}$ is computed from (4); $\hat{\kappa}$ follows from table 1 and $\hat{q}$. The chosen value of $\gamma = -0.3$ is in line with existing literature.[13] We consciously choose a value from the low end in the range proposed by the empirical literature. In the simulations below, this will lead to conservative results concerning the effect of market opening on the necessary price increase in order for Swiss Post to break even. Parameters β and γ determine the convexity of the cost function and are calibrated to fit with data from Swiss Post. Due to the existing USO, the Swiss Post's coverage is exogenously set to its maximum level which is normalized to unity, $r = 1$. Note that due to current price regulation in Switzerland, the actual price $\hat{p} = 0.766$ is well below its profit maximizing level: Inelastic demand is not compatible with monopoly pricing, since a monopolist would optimally increase price beyond the point where demand becomes elastic. Hence, our choice of isoelastic demand is not well suited to describe the current monopoly, but in competition, demand may well be price elastic.

Table 2: Status quo calibration with Swiss data from 2005.

Input data	Calibrated value
$\hat{q} = 2810$m	$\beta = 6$
$\hat{p} = 0.766$ CHF	γ = -0.3
$\hat{\delta} = 2594$m	$\lambda = 0.5$
$\hat{\kappa} = 0.27$ CHF	

[11] Current legislation imposes the burden of the USO on addressed mail. The data given correspond to a suppositional more balanced allocation of costs in which all products take an adequate share.

[12] Considered mail categories are addressed proirity and economy mail (corresponding to A, B1, and B2 mail in Switzerland).

[13] In an empirical study for Switzerland, Trinkner and Grossmann (2006) find a long-run price elasticity between -0.22 and -0.27. From his survey of studies, Robinson (2007) concludes that price elasticity measures for mail products typically range between -0.2 and -0.8 (Cf. also Fève et al., 2006, for a recent study on mail price elasticities). In a similar exercise as ours, D'Alcantara and Amerlynck (2006) choose a value of -0.3; Dietl et al. (2005) use values between -0.3 and -0.4.

Table 3 summarizes the chosen calibration of the consumers' switching function and the incumbent's and entrant's cost parameters. By setting $\upsilon = 0.18$ we assume the entrant's marginal cost advantage to amount to roughly 33%. This corresponds to the actual wage differential between Swiss Post and private competitors in the already liberalized markets for delivery of unaddressed mail and newspapers. The choice of ω amounts to assuming that with an optimal delivery frequency choice, the entrant incurs 50% of the incumbent's time cost, c.p. Note that the chosen value of the entrant's fixed cost is independent of her choice of market penetration. This is of course unrealisitic, but it nevertheless allows for a comparison of scenarios with the same degree of market openness. The calibration of the switching elasticity is decisive for the simulation outcomes. The choice of $\chi = 1.2$ corresponds to the model calibrations in PriceWaterhouseCoopers (2006a) and D'Alcantara and Amerlynck (2006).

Table 3: Calibration of switching and cost parameters in competition.

Incumbent	Competitor
$\hat{g} = 300$m CHF	$\omega = 150$m CHF
$\kappa = 0.27$	$\upsilon = 0.18$
$\kappa^D = 0.19$	$\upsilon^D = 0.13$
$f = 1$'000m CHF	$f_E = 200$m CHF
$\chi = 1.20$	

According to table 3, we set the incumbent's marginal delivery cost to $\kappa^D = 0.19$.[14] This is the cost the incumbent bears per unit in the downstream access channel. In the simulations with downstream access, we set the access price $p_A = 0.64$ CHF which corresponds to a worksharing discount equal to avoided cost. In order to assess the sensitivity of our results with respect to the implied marginal delivery cost, we ran a number of scenarios on alternative cost structures (cf. section 8 below).

7 Scenario Analysis

In this section we discuss various market opening scenarios with respect to their effect 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 liberalization.[15] Before actually calculating the effect of various liberalization scenarios on the financing of the USO, we have to define relevant scenarios in terms of the market opening parameters in our model. The values given in table 4 correspond to the actual composition of total addressed mail in Switzerland in 2005 (e.g. 56% of total addressed mail volume weighs less than 20g).

In the following we simulate five market opening scenarios. The basis is the status quo in the Swiss market for addressed mail: A monopoly ($m = 0$) with full market coverage obligation ($r = 1$) and a uniform price.

[14] This value corresponds to the result by Farsi, Filippini, and Trinkner (2006) who estimate the determinants of delivery cost in the Swiss mail market.

[15] WIK Consult (2006) show that the rate of market share loss of the incument postal operators in Europe is approximately 1% p.a. of the opened market segment.

Table 4: Parametrization of market opening scenarios.

monopoly level	market opening
100g	$m = 0.15$
50g	$m = 0.30$
20g	$m = 0.56$
0g	$m = 1.00$

1. Partial market opening with a monopoly level at 50g and a freeze of the incumbent's prices;
2. Full market opening (FMO) with a monopoly level at 0g and a freeze of the incumbent's prices;
3. As scenario 2 with a reduction in the USO in the form of 5 delivery days, and 90% area coverage;
4. Full market opening with a break-even constraint on the incumbent and differentiated but uniform prices within the monopolistic and competitive market segments;
5. As scenario 4 with the possibility to raise a flat delivery rate (receiver-pays-principle, RPP);
6. Worksharing with a monopoly, mandated downstream access, and a freeze of the incumbent's prices.

Table 5 summarizes the simulation results of market opening with respect to market entry, the resulting equilibrium prices, and the impact on profits and employment; a discussion follows below.

7.1 Price Freeze

This section considers scenarios in which the incumbent's prices in monopoly and the competitive sectors are kept constant. The answered question is thus: "How is the incumbent's profit affected under various USO and market opening scenarios?" Column 2 in table 5 summarizes the effect of full market opening to the incumbent's delivery network. With the current USO in place, the incumbent Swiss Post would end up with a total market share of 0.6, incurring a loss of almost 550m CHF compared to the result with full monopoly. If the market is only partially opened (e.g. only for letters weighing more than 50g), the effects remain the same with the only difference that now the incumbent operator is able to make a profit, while market entry is unlikely due to the entrant's expected loss in equilibrium. Column 1 in table 5 shows these results.

Considering total welfare as defined in (18), there are two effects related to market opening: Lower prices increase welfare, while the duplication of fixed costs is detrimental.

As to the financial viability of the USO, column 3 in table 5 shows the effect of a reduction in its burden: A decrease from 6 to 5 delivery days and only 90% area coverage may limit Swiss Post's loss, while not greatly affecting the market outcome otherwise.

7.2 Profit (Break-Even) Regulation

In contrast to the above section, we now simulate scenarios keeping the incumbent's profit constant. We thus answer the question: "What price

Table 5: The impact of market opening on the incumbent operator.

Scenario	1	2	3	4	5	6
Monopoly price	0.77	0.77	0.77	0.77	0.77	–
Competitive price	0.77	0.77	0.77	1.16	0.66	0.77
Entrant Price	0.48	0.48	0.48	0.68	0.43	0.70
Access Price	–	–	–	–	–	0.58
Entrant coverage	0.72	0.92	0.92	0.98	0.89	–
Entrant profit	-142.70	43.00	43.00	243.32	-10.24	-178.63
Inc. quantity	2549.95	1707.18	1707.18	1352.71	1844.66	2506.21
Inc. market share^a	0.57	0.57	0.57	0.53	0.59	0.89
Inc. market share^b	0.91	0.61	0.61	0.54	0.63	0.89
Δ inc. profit	-128.98	-547.00	-392.02	-200.00	-200.00	-33.42
Inc. employment‡	-0.04	-0.15	-0.23	-0.20	-0.13	-0.01
Mail volume‡	0.00	0.00	0.00	-0.11	0.04	0.00
Welfare‡	-0.07	-0.07	-0.07	-0.15	-0.05	-0.06

Notes: Labor cost is a constant fraction of total cost; quantity and profits is in m units; ‡ means changes relative to status quo. Incumbent upstream market share is ^{a} in competitive market segment and ^{b} overall. Scenarios are:
Column 1: partial market opening (monopoly level at 50g) with price freeze;
Column 2: full market opening (FMO, monopoly level at 0g) with price freeze;
Column 3: FMO with price freeze, 5 delivery days, and 90% coverage;
Column 4: FMO with break-even constraint;
Column 5: FMO with break-even constraint and RPP;
Column 6: monopoly with mandated downstream access and price freeze.

increase is needed to let the incumbent attain a certain profit under various USO and market opening scenarios?" We confine our scenario simulations to equilibiria in which the incumbent just breaks even.

Column 4 in table 5 summarizes the effect of FMO and a break-even constraint on the incumbent's side. Compared to the according scenario without break-even, prices are now significantly higher, leading also to an increased market coverage and profit by the entrant.

Recent steps in the liberalization of the postal sector force policy makers to find a broader financial basis for postal services. The existence of a receiver externality, the benefits enjoyed by the receiver of a postal item, implies that also they should or could contribute to the financing of delivery costs. This gives rise to the receiver-pays-principle (RPP). 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 taylor-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.[16] In our simulations, we confine ourselves to the same system as public TV and radio broadcasting are financed in many countries: The introduction of

[16] Jaag (2007) and Jaag and Trinkner (2008) point at the opportunities and limits of charging receivers for postal services.

a compulsory flat postal licence on all households receiving postal mail items. If receivers are to pay a fixed fee for doorstep delivery this constitutes a lump sum transfer to the postal operator. With 3.5m receiving households and firms, a monthly fee of 10 CHF would – in the case of full delivery coverage – amount to 420m CHF per year which could be passed on the sending customers. The results of the corresponding simulations are given in column 5 of table 5. Even with full liberalization, average price could be lowered to 0.66 CHF in the competitive market segments. The reduction in the overall price level would squeeze down the entrant's profit, rendering market entry considerably less attractive.

7.3 Worksharing

Under worksharing, the market for upstream services and consolidation are open completely to competitors, but final delivery is reserved to the incumbent Swiss Post. This regulatory framework is essentially the one currently in place in the USA.[17] Column 6 in table 5 summarizes the equilibrium effects of the worksharing scenarios under price regulation with a freeze of the incumbent's prices. Due to mandatory access, the entrant faces higher marginal costs than with a proprietary delivery network. This results in a higher price and lower market share and profit. However, the retention of the downstream monopoly allows the incument to cover her fixed costs du to large volumes.

From a welfare point of view, among FMO scenarios, worksharing performs well since it avoids the multiplication of fixed costs. Being an ideal regulatory scheme for the letter market in Switzerland, it bears the risk of serving as a mere stage in the process to full liberalization: Complete market opening along with regulated access would challenge the financing of universal service even more than liberalization without bypass access. This is due to the ample cherry picking opportunities entrants would have in such a system.

8 Sensitivity Analysis

In this section we report the sensitivity of our simulation results with respect to crucial parameter choices. Table 6 shows the impact of the senders' switching elasticitiy and the entrant's marginal cost of mail processing on the incumbent USP's market share in the competitive market segment. As one would expect, a high switching elasticity reduces the incumbent's market share considerably. Low marginal cost allows the entrant to underprice the incumbent, also resulting in a low incumbent market share. This second effect is due to the asymptotically linear underpricing discussed in the context of figure 4.

Table 7 reports simulation results with different marginal delivery costs and hence access prices which are computed based on avoided cost. We assume that total marginal cost stays constant and freeze of the incumbent USP's competitive price. High delivery cost directly translates into a high worksharing discount. This allows the entrant to set a low price. Accordingly, the incumbent's market share is the lower, the higher her marginal delivery cost. Social welfare is not directly affected by higher marginal delivery cost since total marginal cost is assumed constant. However, since the entrant bears lower cost than the incumbent, a high entrant market

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

Table 6: Sensitivity of the incumbent's market share in the competitive market segment with respect to the switching elasticity and the entrant's marginal cost in scenario 1.

$\chi \rightarrow$ $\upsilon \downarrow$	0.600	0.800	1.000	1.200	1.400	1.600
0.09	0.682	0.165	0.559	0.512	0.472	0.438
0.12	0.700	0.634	0.578	0.531	0.491	0.456
0.15	0.717	0.652	0.598	0.551	0.511	0.476
0.18	0.733	0.671	0.617	0.571	0.531	0.496
0.21	0.750	0.689	0.637	0.592	0.552	0.516

share means that a large mail volume is more efficiently processed. Hence, welfare increases in the incumbent's marginal delivery cost.

Table 7: Sensitivity of the worksharing scenario 6 with respect to the incumbent's marginal delivery cost κ^D. The worksharing discount is based on avoided cost.

Scenario	6A	6B	6C	6D	6E	6F
κ^D	0.160	0.170	0.180	0.190	0.200	0.210
Competitive price	0.766	0.766	0.766	0.766	0.766	0.766
Entrant Price	0.711	0.706	0.701	0.696	0.691	0.686
Access Price	0.606	0.596	0.586	0.576	0.566	0.556
Inc. market share	0.915	0.907	0.900	0.892	0.884	0.877
Welfare‡	-0.065	-0.063	-0.061	-0.059	-0.057	-0.055

Note: ‡ indicates change relative to the status quo.

Our sensitivity analysis indicates that the choice of crucial parameters significantly influences the simulation outcomes. Hence, quantitiave results have to be taken with a pinch of salt. When discussing scenarios concerning further liberalization in the market for addressed mail, it is crucial to understand its various effects on competition and its outcome.

9 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. It turns out that market opening indeed invites competition, but challenges the USO currently in place. Its financing is questioned by the loss of revenues and scale economies in combination with the uniformity and affordability constraints on pricing.

Concerning overall welfare implications of liberalization, the simulations reported here yield robustly negative results. Cost differentials in the delivery function between the incumbent operator and entrants, and the associated efficency gains, are captured in our model. The model

does not reflect, however, welfare gains that might result from entrants' products being imprefect substitutes for the incumbent's product. These effects of product innovation are primarily in the worksharing domain: Changes in product mix and welfare related to delivery options under full liberalization are generally considered less important than upstream benefits of worksharing.[18]

Competition could certainly stimulate restructuring and internal efficiency gains, as discussed in PriceWaterhouseCoopers (2006a). It is evidently a strong belief in this possibility by policy makers which is at the core of the motivation for current postal liberalization. These effects are not accounted for in our model. However, PriceWaterhouseCoopers (2006b) point out that in international comparison, there is a very high level of implicit and explicit requirements of the existing USO in Switzerland. Moreover, there is a strong public support for continuing the USO at its current level. This represents a significant barrier in adapting Swiss Post and the USO to competitive market conditions. Therefore, there are significant risks associated with liberalization. Caution in the speed and scope of lieralization seems to be the prudent approach, at least for Switzerland.

The model presented is only a stylized representation of the Swiss Market and its opening. However, it does seem to represent sufficient detail on the interaction between the incumbent postal operator and entrants to support the following conclusions. For the scenarios considered, it shows that either the burden of the USO must be reduced (e.g. with respect to the frequency and the coverage of delivery or as a last resort through price differentiation). Alternatively, other means of assuring financial stability of Swiss Post must be sought, be it through external funds or demand stimulation through new producs, possibly in the worksharing domain. Worksharing, i.e a downstream monopoly with an open market for upstream services and consolidation, could be an efficient means of promoting competition and stimulating demand while at the same time ensuring the financial viability of the high level of Swiss universal service obligations currently in place.

References

Crew, Michael A., and Paul R. Kleindorfer (2001): "Whither the USO under Competitive Entry: A Microstructure Approach," in *Future Directions in Postal Reform*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Boston.

D'Alcantara, Gonzales, and Bernard Amerlynck (2006): "Profitability of the Universal Service Postal Operator under Entry with Economies of Scale in Collection and Delivery," in *Progress Toward Liberalization of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, New York.

Dietl, Helmut M., Urs Trinkner, and Reto Bleisch (2005): "Liberalization and Regulation of the Swiss Letter Market," in *Regulatory and Economic Challenges in the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Boston.

Farsi, Mehdi, Massimo Filippini, and Urs Trinkner (2006): "Economies of Scale, Density and Scope in Swiss Post's Mail Delivery,"

[18] Cf. Pearsall (2005).

in *Liberalization of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Northampton.

Felisberto, Cátia, Beat Friedli, Matthias Finger, Daniel Krähenbühl, and Urs Trinkner (2006): "Pricing the last mile in the postal sector," in *Progress Toward Liberalization of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, New York.

Fève, Frédérique, Jean-Pierre Florens, and Sophie Richard (2006): "Microeconomic Demand Modelling for Price Elasticities," in *Liberalization of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul. R. Kleindorfer, Northampton.

Friedli, Beat, Christian Jaag, Daniel Krähenbühl, Ole Bach Nielsen, Søren Michael Pihl, and Urs Trinkner (2006): "Consumer Preferences and Last Mile Pricing in the Postal Sector," in *Liberalization of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Northampton.

Haldi, John, and William J. Olson (2003): "An Evaluation of U.S. Postal Service Worksharing," in *Competitive Transformation of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul. R. Kleindorfer, Boston.

Hill, Roger, Richard Robinson, and Frank Rodriguez (2001): "The Financial Equilibrium of Universal Service Providers in a Liberalized Postal Market," in *Regulatory and Economic Challenges in the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Boston.

Jaag, Christian (2007): "Who Should Pay for Postal Services? Tax Payers vs. Senders vs. Receivers," *Paper presented at the 1st* gpren *Postal Research Conference*.

Jaag, Christian, and Urs Trinkner (2008): "Pricing in Competitive Two-sided Mail Markets," in *Competition and Regulation in the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Northampton.

Oxera (2007): "Funding Universal Service Obligations in the Postal Sector," *Prepared for La Poste, De Post-La Poste, Hellenic Post, Poste Italiane, P&T Luxembourg, Correos, Magyar Posta, Cyprus Post, Poczta Polska*.

Panzar, John (2001): "Funding Universal Service Obligations: The Costs of Liberalization," in *Future Directions in Postal Reform*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Boston.

Pearsall, Edward S. (2005): "The Effects of Worksharing and Other Product Innovations on U.S. Postal Volumes and Revenues," in *Regulatory and Economic Challenges in the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, Boston.

PriceWaterhouseCoopers (2006a): "The Impact on Universal Service of the Full Market Accomplishment of the Postal Internal Market in 2009," *Study for the European Commission*.

PriceWaterhouseCoopers (2006b): "Evaluating the Impact of a Full Market Opening on Swiss Post," *Report for Swiss Post*.

Robinson, A. (2007): "A Review of Price Elasticity Models for Postal Products," *Pitney Bowes Background Paper 2007-01*.

WIK CONSULT (2006): "Main Developments in the Postal Sector (2004-2006)," *Study for the European Commission*.

TRINKNER, URS, AND MARTIN GROSSMANN (2006): "Forecasting Swiss Mail Demand," in *Progress Toward Liberalization of the Postal and Delivery Sector*, ed. by Michael A. Crew, and Paul R. Kleindorfer, New York.

VALLETTI, TOMMASO, STEFFEN HOERNIG, AND PEDRO P. BARROS (2002): "Universal Service and Entry: The Role of Uniform Pricing and Coverage Constraints," *Journal of Regulatory Economics*, 21(1).