swiss economics

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Swiss Economics Working Paper 0001

July 2005

Published as:

"Liberalization and Regulation of the Swiss Letter Market" (2005). In: Regulatory and Economic Challenges in the Postal and Delivery Sector. Crew, M. A. and Kleindorfer, P. R. (eds), pp. 53-72.

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1. INTRODUCTION

The European Union is gradually opening up its domestic letter markets for competition. Complete liberalization is planned for 2009. In contrast to the European developments, the United States developed worksharing as a means to introduce competition in the postal sector. However, despite the examples of the EU and the U.S., in most countries letter services are still national monopolies.

In Switzerland, the universal service provider (USP) is Swiss Post, which currently enjoys a monopoly on addressed letters up to a weight of 1 kilogram. The Swiss government has the power to open up the letter market if the provision of the universal service obligation (USO) remains guaranteed. Hence, prior to any further market opening, it is crucial to know how competition affects the financial viability of Swiss Post with or without a licensing system. Such a licensing system has been introduced in the recently liberalized parcels market. The regulatory authority PostReg is entitled to collect licensing fees that amount up to 3% on an entrant's turnover to compensate Swiss Post for its universal service provision if needed.

Our paper provides insights on the consequences of different kinds of liberalization or regulatory rules of the Swiss letter market. We examine welfare effects and financial consequences for both Swiss Post and potential market entrants. We start with an analysis of what would happen if the current regulation of the parcels market were applied to the letter market.

The paper proceeds as follows. In Section 2, we develop and tailor a game theoretic model to the Swiss postal system. In Section 3, we calibrate the model with Swiss data. Section 4 presents our results on end-to-end competition and compares them with an evaluation of the regulated monopoly of 2003. We show that end-to-end competition results in lower

[1] The views expressed in this paper are those of the authors

welfare and problems to finance the USO even if a licensing system is introduced. Building on these results, we expand the model in Section 5 and analyze alternative regulatory scenarios. We show that worksharing will increase economic welfare. The last section contains a discussion and our main conclusions.

2. BASIC MODEL AND FORMAL RESULTS

In order to analyze the effects of liberalization in the Swiss letter market, we use a standard game theoretic approach. On the supply side, we let Swiss Post as incumbent *I* compete with a representative entrant *E*. The demand side links the two operators. Customers value the available products with respect to quality and prices. Strategic interaction takes place, where one operator's behavior affects both operators' profits. For example, when the incumbent raises its prices, some consumers will switch to the entrant and boost the entrant's sales.

Technically speaking we use a Dixit-like approach to model price competition with product differentiation and assume that there are no information asymmetries.

2.1. Basic Model

On the *demand side,* we assume a representative sender with quasilinear preferences with respect to money[2]. The quasilinearity implies a cardinal utility measure that enables us to compute and compare overall welfare of different market structures. To obtain linear demand curves, we assume a quadratic utility function over every quantity of mail q_i^{rs} sent in segment *s* of region *r* through the network of operator *i*. Formally, we follow De Donder et al. (2001) and write total utility *U* as

$$U(q,m) = m + \sum_r \sum_s \left(a_I^{rs} q_I^{rs} - \frac{b^{rs}}{2} \left(q_I^{rs}\right)^2 + a_E^{rs} q_E^{rs} - \frac{b^{rs}}{2} \left(q_E^{rs}\right)^2 - e b^{rs} q_I^{rs} q_E^{rs} \right),$$

[2] Having in mind that most senders are businesses, quasilinearity is a reasonable assumption in the modeled riskless world. Businesses invest into mail as long as the NPV of an additional mailing is nonnegative, i.e. marginal utility of mail is greater than or equal to 1. Further, in an economy like Switzerland where postal consumption is small compared to total expenditure, postal consumption will be independent of the initial wealth endowment *Y*.

where a, b, $e > 0$ and m is the amount of money spent on other goods. The last term reflects the fact that the mail services offered by the two operators are not perfect substitutes but rather differentiated products. The higher the degree of differentiation, the closer to zero is parameter e. Parameters a and b determine the market size and the slope of the demand curve.

A consequence of this utility specification is that demand in one market does not affect demand in another one. That is, cross-price elasticities between the market segments are zero and operators cannot increase demand in one market segment by serving an additional segment, i.e. no network externalities are directly included.

Utility maximization implies that our representative consumer satisfies with equality the budget constraint $\Sigma\Sigma(p_I^{rs} q_I^{rs} + p_E^{rs} q_E^{rs}) + m \leq Y$, where p_i^{rs} is the price the consumer has to pay to operator i for the mail product s delivered to region r. Y represents the initial wealth endowment of the economy. By computing the first-order conditions of the Lagrange function and solving the resulting equation system, we obtain the demand functions for the incumbent and the competitor as

$$q_i^{rs}(p_i^{rs}, p_j^{rs}) = \frac{1}{b^{rs}(1-e^2)}\left(a_i^{rs} - ea_j^{rs} - p_i^{rs} + ep_j^{rs}\right). \quad (1)$$

The slope of the demand curve in a given market is equal for both operators. Quantities are negatively related to the own price and positively to the price of the competitor ($\partial q_i/\partial p_i < 0$; $\partial q_i/\partial p_j > 0$). Furthermore, quantities increase with a higher degree of product differentiation (i.e., a smaller e).

On the *supply side*, pricing possibilities and cost structures determine profit functions. In the case of unregulated competition, where the incumbent and the entrant face no regulatory restrictions on pricing and production decisions, the operators are able to differentiate prices for every market segment and hence take into account demand properties specified in (1). We assume that there are no economies of scope between products, segments or regions. This assumption allows us to treat the production decision in each market segment independently.

Total costs per segment consist of a fixed and variable part. Entry occurs if entrant E's earnings exceed variable costs cq and fixed costs F. In contrast, the incumbent's fixed costs are sunk and cannot be avoided. The introduction of fixed costs is equivalent to increasing economies of scale, so the market has the property of a natural monopoly especially in those segments where fixed costs are high.

2.2. Regulated Competition with Swiss Licensing System

So far, there was no political or regulatory authority captured in the model. When such authorities set market rules, they usually change the

underlying cost structures of the various operators. In Switzerland, the incumbent Swiss Post must provide universal service. This USO contains uniform tariffs across regions and service provision in every market segment. Additionally, the mail section of Swiss Post has to pay a transfer T to cover the deficit in the postal offices. If the incumbent does not break even due to cherry-picking entrants, the regulatory authority is entitled to charge licensing fees. Such fees are collected as a fixed fraction μ of the entrant's turnover. We treat μ as an exogenous parameter. Under such a regulatory regime, the profit functions in a given market segment are

$$\begin{aligned} \pi_I(p_I) &= \sum_r \left[\left(p_I - c_I^r\right) q_I^r(p_I, p_E^r) + \mu \cdot p_E^r q_E^r(p_I, p_E^r) - F_I^r \right] - T, \\ \pi_E(p_E^r) &= \sum_r \max\left\{0, \left(p_E^r(1-\mu) - c_E^r\right) q_E^r(p_I, p_E^r) - F_E^r\right\}. \end{aligned} \tag{2}$$

Profit maximization yields $s(r+1)$ first-order conditions (FOC). Substituting the demand functions (1) into these first-order conditions, we obtain the reaction functions for the two operators. For the case of two regions *D* (dense) and *R* (rural), the two reaction functions in a given market segment *s* are

$$\begin{aligned} p_I(p_E^D, p_E^R) &= \frac{b^R\left[a_I^D - ea_E^D + ep_E^D(1+\mu) + c_I^D\right] + b^D\left[a_I^R - ea_E^R + ep_E^R(1+\mu) + c_I^R\right]}{2(b^D + b^R)}, \\ p_E^r(p_I) &= \tfrac{1}{2}\left(a_E^r - ea_I^r + \tfrac{c_E^r}{(1-\mu)} + ep_I^r\right) \quad r \in \{D, R\}. \end{aligned} \tag{3}$$

The incumbent's reaction function is much more complicated because it must average its price over the two regions. By solving this equation system, we obtain the equilibrium prices for each operator *given that entry occurs*, (i.e. the entrant's revenues exceed variable *and* fixed costs):

$$p_I = \frac{b^R\left[c_I^D + a_I^D - ea_E^D + \frac{e(1+\mu)}{2}\left(a_E^D - ea_I^D + \frac{c_E^D}{1-\mu}\right)\right] + b^D\left[c_I^R + a_I^R - ea_E^R + \frac{e(1+\mu)}{2}\left(a_E^R - ea_I^R + \frac{c_E^R}{1-\mu}\right)\right]}{(b^D + b^R)\left(2 - \frac{e^2(1+\mu)}{2}\right)}. \tag{4}$$

Once this price is calculated, we obtain the price of the entrant by appropriately substituting this result into (3). If the entry condition is satisfied, the corresponding quantities can be calculated with the demand functions in (1).

If entry is not profitable at the incumbent's price in (4), the above formulae no longer hold. For example, if the entrant fails to break even in the dense area, the incumbent can improve its profits by increasing the price

up to the limit at which the entrant just breaks even[3]. This 'opponent break even price' is limited by the monopoly price p^M. However, because of uniform pricing, any increase in the incumbent's price affects both regions and it is not clear how to balance the two different 'opponent break even prices' in every situation. In our simulation, we solve this problem numerically through appropriate use of the entrant's reaction and profit functions. With the resulting equilibrium prices, quantities and profits we can compute overall welfare by subtracting industry expenses from gross utility. Doing so is equivalent to summing consumer net utility and the operators' profits.

2.3. Licensing fees lead to higher prices

Expressions (3) and (4) yield a first interesting result. Because the first derivative with respect to the licensing rate μ is positive under reasonable calibration, the incumbent will *increase* prices the more the regulator tries to finance the incumbent's USO through the licensing system. Intuitively, one would expect exactly the opposite. To see the intuition behind this result, we first study the impact of an increase in μ on the price of the entrant. To offset the negative effect of higher unit costs, the entrant must respond with an increase in prices; a higher licensing fee reduces the competitiveness of the entrant in equilibrium. Now the incumbent can charge a slightly higher price without losing any volume and thus further increases profits.

The financial effects to the incumbent can be identified by analyzing the marginal effect of μ on its profit function:

$$\frac{d\pi_I(p_I^*, p_E^*, \mu)}{d\mu} = \frac{\partial \pi_I}{\partial \mu} + \frac{\partial \pi_I}{\partial p_I}\frac{dp_I^*}{d\mu} + \frac{\partial \pi_I}{\partial p_E}\frac{dp_E^*}{d\mu} > 0.$$

The first term is the direct effect and represents the positive impact of the collected licensing fees. This direct effect equals $p_E q_E$ and is positive. The second and third terms represent indirect effects arising from price responses of both operators. The second term is zero at the optimum (because of the FOC). The third term is positive because both parts are positive (prices are strategic complements and both optimal prices increase with the license fee). We can therefore conclude that the incumbent's profits increase with a higher licensing fee. Thus, the licensing fee will help to sustain the USO, but will lead to a higher overall price level.

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[3] This limit price p^{Limit} could be calculated as follows:

$$\pi_E(p_I^{\text{Limit}}, p_E^r(p_I^{\text{Limit}})) = 0 \quad \Leftrightarrow p_I^{\text{Limit}} = a_I^r - \tfrac{1}{e}a_E^r + \tfrac{c_E^r}{e(1-\mu)} \pm \tfrac{2}{e}\sqrt{b^r \tfrac{1-e^2}{1-\mu} F_E^r}.$$

3. CALIBRATION WITH SWISS DATA

In order to predict price and welfare effects more precisely, we simulate the model using Swiss data. In Switzerland, geographic characteristics have a major impact on the cost structure of services. Differences in delivery time per household between dense and rural areas are significant and vary between delivery offices as much as 1:6. Accordingly, we divide the market into a dense region *D* and a rural region *R*.

To reflect the market structure we segment the market into five basic market segments *s*. The two basic sender groups, "businesses" and "households," can choose between two products "slow mail" and "fast mail." In addition, businesses have the option of mass mail. Crossing regions and segments yields ten submarkets.

To estimate the demand functions (1) for each operator in each submarket, we must calibrate the parameters *a* and *b* with market data from 2003, when Swiss Post was still the only operator in the letter market and charged regulated prices. Rewriting (1) for the case of this regulated monopoly (RM) we get in every segment

$$q_{2003}(p_{2003}) = \frac{a_{RM} - p_{2003}}{b_{RM}} \quad \text{with price elasticity} \qquad \varepsilon_{2003} = -\frac{1}{b_{RM}} \frac{p_{2003}}{q_{2003}}. \quad (5)$$

After rearranging (5), we can directly calibrate parameter *b* with prices, quantities and elasticities from 2003.

Parameter a_i influences the size of the market of the two operator's services. By setting $a_I > a_E$, we can include effects like customer inertia, reputation effects, switching costs, or even quality differences like universal service provision that work in favor of the USP. Formally, we define *x* as the percentage of total demand the incumbent receives if the entrant were to offer the same price for its services. In the remainder of the paper, we will refer to *x* as "incumbent advantage." For calibration we evaluate demand given in (1) at 2003 prices for both operators and solve the resulting equation system. We obtain

$$a_I = a_{RM}; \quad x = \frac{q_I}{q_I + q_E}; \quad p_I = p_E = p_{2003}$$
$$a_E = \frac{1}{1 - e + \frac{e}{x}} \left(a_I \left(e - 1 + \frac{1}{x}\right) + p(1-e)\left(2 - \frac{1}{x}\right) \right).$$

Table 1 summarizes the major demand characteristics of the model. According to its 2003 annual report, Swiss Post delivered about 2.8 billion pieces of addressed mail, of which we assume 25% was destined to rural areas. The price elasticities are a delicate issue for two reasons. First, there is

considerable divergence of opinion on the level. See Cazals (2002) for an overview and discussion. Second, price elasticities determine the steepness of the demand curves; competition is more effective and leads to higher welfare results if price elasticities are greater, *ceteris paribus*. The most recent data of Swiss Post 2004 suggests that the values in Table 1 are overestimated. These reflect our assumptions based on estimations from former Swiss data, studies from other countries, and industry experts. However, we expect mail elasticity to grow over time due to an increase of substitutes. Therefore, we stay on the safe side with the overestimation. The main intuition behind the differences between segments is a substantially higher value per sent item for households (so businesses are more price sensitive), and an increasing variety of urgent communication possibilities such as e-mail resulting in a higher elasticity of fast mail compared to slow mail[4].

The incumbent advantage x is assumed to be higher for households than for businesses because of higher relative switching and information costs. The experiences from other liberalized postal, telecommunications or electricity markets support our assumptions; recent examples in Switzerland include Swiss Post in the parcels market.

Table 1: Major Demand Characteristics

	Market size 2003	Prices 2003 (in €)	Price elasticity	Incumbent advantage
Fast Mail B	21 %	0.56	-0.5	70 %
Fast Mail HH	6 %	0.60	-0.4	75 %
Slow Mail B	26 %	0.43	-0.4	65 %
Slow Mail HH	6 %	0.47	-0.3	70 %
Mass Mail B	39 %	0.33	-0.4	60 %

For the production side of the economy we estimate variable and fixed costs for collection, processing, delivery and overhead. This detailed attribution is somewhat artificial, as some economies of scale and scope get lost. Such effects could be included numerically, but then we could not compute unique equilibrium formulae anymore.

Table 2 shows how costs differ in the various market segments. In a first step, we map total costs based on data from Swiss Post's 2003 annual report onto processes. Thereby we first corrected total cost by subtracting the € 234 million contribution that the addressed letter products paid last year to finance the postal outlet network's deficit. In line with empirical and technical estimations from comparable countries in Europe, Table 2 shows that delivery accounts for the largest portion of total costs.

[4] This assumption is consistent with recent observations that customers are willing to switch to slow mail products after price increases.

In a second step, we attribute these process costs to market segments and regions. The figures are estimates and cannot reflect the economies of scope between the various segments and processes. Implicitly, we assume that collection costs are much higher for households and slightly higher for fast mail segments. Processing is slightly more expensive for fast mail but cheaper for mass mail because of extended presorting possibilities. Delivery costs are mainly determined by the quantity per segment and are slightly more expensive for fast mail and household segments. Overhead spreads equally over all segments.

For the implemented scale effects, the fraction of fixed costs is important. In Switzerland, the number of letters per capita is the second largest in the world. Hence, the total time the mail carriers need to reach the various delivery points is almost fixed and the economies of scale in delivery are large. In accordance with most of the literature, we assume that processing costs are much more elastic. In total, about 50% of the incumbent's total costs are fixed. Compared to the incumbent, whose infrastructure is historically grown, designed for private customers and more capital intensive (postal outlets, sorting centers, delivery offices), the entrant's percentage of variable costs is higher.

Table 2: Major cost characteristics

	Collection	Processing	Delivery	Overhead
	10 %	30 %	55 %	5 %
Cost attribution to market segments				
Fast Mail B	15 %	20 %	24 %	20 %
Fast Mail HH	38 %	17 %	8 %	20 %
Slow Mail B	10 %	18 %	26 %	20 %
Slow Mail HH	30 %	16 %	6 %	20 %
Mass Mail B	7 %	29 %	36 %	20 %
	100 %	100 %	100 %	100 %
Fraction of variable costs				
Incumbent	50 %	80 %	40 %	10 %
Entrant	75 %	85 %	50 %	50 %

So far, the main difference between the two operators was the entrant's lower fraction of fixed costs. According to current observations in the Swiss parcel market, competitors pay lower wages. As stated by the labor unions, the wage premium is currently around 16% and hits the incumbent especially hard because about 80% of total costs are labor costs. The network design tailored to business customers further reduces the entrant's cost. We assume the upstream efficiency advantage (collection and presorting) of about 30% to reflect the savings realized by computerized sorting in the printing stage. In delivery, this advantage is much smaller (5%). Most business mailings are business-to-consumer. Consequently, one large customer causes a great deal of delivery points. Hence, a delivery network similar to that of the

incumbent is needed with limited ways of cost innovation (the work is mainly physical).

4. RESULTS & DISCUSSION

With the calibrated model, we are now able to give some insight into the overall welfare consequences of various regulatory frameworks. In addition, we can perform sensitivity analysis and derive recommendations for postal operators on the strategies they should pursue under specific market rules. We focus on the first question and carry out sensitivity analysis only to judge the robustness of the results. In a first step, we evaluate the regulated monopoly of Swiss Post of 2003. Next, we analyze different forms of end-to-end competition (complete liberalization without access possibilities) and change the introduced model slightly where needed. The monopoly scenarios serve primarily as a benchmark.

The quantitative results presented in this section serve as rough guidelines in which directions the examined regulatory regimes influence the market equilibrium in terms of prices, quantities, surpluses, and profits.

4.1. Monopoly: Positive effects of a price freeze

It is straightforward to evaluate the *regulated monopoly (RM)* of 2003, since the model was calibrated with data of 2003. Swiss post charged uniform prices at an average of 44 cents. With the underlying cost structure, the resulting loss was € 54 million, thus Swiss Post was close to break even despite of the USO. From now on, we will use this scenario as a benchmark reflecting the status quo[5].

As a second benchmark, we examine the case of an *unregulated monopoly (UM)*. What would happen, if the incumbent charged profit maximizing uniform prices? The results are interesting. The monopolist almost doubles its prices to 82 cents on average and thereby boosts its profit up to € 349 million. Profits are positive in all market segments except fast mail for households in rural areas. However, the higher price level reduces consumer welfare dramatically: despite the high profit, a net welfare decrease of € -497 million results. Table 3 presents the details.

We conclude that Swiss Post did not charge monopoly prices in 2003[6]. For that reason, one could view the legal framework of 2003 as an effective price cap combined with a break-even constraint. However, one does not know whether the regulated monopolist produced efficient.

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[5] At this point, we note that there was a price increase in Switzerland in the beginning of 2004 due to the deficit in the postal network.

[6] Only if elasticities were assumed to be 3.5 times larger than the values in table 1, the model would predict monopoly pricing for Swiss Post in 2003

Table 3: Results monopoly cases

Legal Monopoly	Regulated	Unregulated
Average Price	0.44	0.82
Quantities (in Mio)	2836	1'787
Consumer Surplus	1491	591
Profit after transfer	-54	349
Welfare	1'437	940
Welfare change		-497

4.2. End-to-end Competition: Universal service at risk

In theory, competition leads to positive welfare effects mainly due to marginal cost pricing, improved efficiency, and product innovation. To reflect these potential benefits, we equipped the entrant with a substantial efficiency advantage. Additionally, we assume that the entrant improves product diversification, technically we set $e = 0.75$[7]. However, it is not clear for two main reasons, whether these positive effects lead to an increase in overall welfare. First, positive economies of scale diminish when entry occurs, so the market ends up with larger industry wide production costs. Second, the combination of a relatively inelastic demand with product differentiation possibilities could lead to oligopolistic pricing rather than marginal cost pricing. It will be interesting to see whether the model predicts prices above or below the ones from 2003.

In our first end-to-end competition case, hereafter referred to "Regulated Competition (RC)", there are no restrictions on market entry. The incumbent must fulfill the universal service obligation as presented in Section 2. In return, the entrant must pay a licensing fee of 3% of its turnover.

The model predicts an overall welfare decrease with universal service at risk. Despite an 18% increase in the overall price level, the incumbent's loss rises to about € 189 million. Entry occurs in all three dense business segments. Both operators make substantial profits with single-piece business mail. The incumbent reaches its best margins in rural business segments where no economies of scale are lost. The main losses occur in the household segments. The results are straightforward and support similar findings from Panzar (2001, 2002), Crew/Kleindorfer (2002), De Donder (2004) and Dietl/Waller (2002).

The incumbent's main problem arises from the combination of universal service provision and uniform pricing. The entrant is able to undercut the incumbent in the dense segments and "picks the cherries," offered by the incumbent's tariff balancing act between the dense and rural region. This cherry-picking effect is much stronger than the cure for it, the licensing system. The entrant has to pay no more than € 15 million in licensing fees, a sum that represents less than 10% of its profits (and the incumbent's loss).

[7] in line with De Donder (2001) and Dietl/Waller (2002)

We observe a lot of price differentiation between the various market segments. Prices for households rise about 50%, whereas the average price in business segments rises about 10%, despite the entrant's cheaper prices.

Table 4: Results End-to-End Competition

	Regulated (uniform pricing for I)			**Unregulated (non uniform pricing)**		
Licensing Rate	**μ = 0%**	**μ = 3%**	**μ = 20%**	**μ = 0%**	**μ = 3%**	**μ = 20%**
Average Price (€)						
Incumbent	0.56	0.57	0.48	0.43	0.45	0.50
Entrant*	0.39	0.39	0.43	0.38	0.39	
Average	0.49	0.50	0.48	0.43	0.44	0.50
Quantities (Mio #)						
Incumbent	1'652	1'631	2'408	2'540	2'503	2'571
Entrant	1'176	1'177	350	322	323	-
Total	2'828	2'808	2'759	2'863	2'826	2'571
Welfare (Mio €)						
Consumer Surplus	1'351	1'331	1'356	1'481	1'444	1'246
Profit I after transfer	-217	-196	-27	-124	-97	82
Profit Entrant	168	159	36	41	39	-
Welfare	1'302	1'294	1'365	1'398	1'386	1'328
Welfare change**	-135	-143	-72	-39	-51	-109
Other						
Licensing Fees (€)	-	14	30	-	4	-
Entry in # segments	3	3	1	1	1	-

* The values in this row represent weighted averages in active market segments.
** Values compared to the regulated monopoly case

One promising strategy for the USP against this kind of cherry picking is to abolish the uniform price. In such an Unregulated Competition (UC) the incumbent can differentiate its prices between regions. To implement this regulatory framework into the model, we make appropriate changes to expressions (2), (3) and (4). Doing so results in major change. The USP can now prevent entry in all segments except slow mail business. In the three market segments in which the entrant cannot enter anymore, we observe predatory behavior. The incumbent sets prices below the optimal prices in (4) to turn the entrant's profit into a deficit; the entrant cannot break even anymore and no entry occurs. The incumbent is better off because he defends 100% of the market. From this combination of predatory pricing and price discrimination between regions, consumers gain a € 100 million net surplus; the incumbent's prices are much lower on average, e.g. mass mailers gain about € 70 million net surplus (on the cost of rural regions). Nevertheless, there are also losers, namely the entrant and the less price elastic households in rural areas where tariffs explode by more than 100%.

Compared to the regulated competition, the model predicts an overall welfare gain of € 92 million and a better financial situation for the incumbent. Still, the results are worse than in the case of the regulated monopoly of 2003. However, the welfare effects of this unregulated

competition may be overestimated. There are several justifications for uniform pricing the model does not include. Examples are political reasons, menu and transaction costs, network externalities, and unwanted redistribution from rural regions and households to businesses, etc. We leave these extensions for further research. Table 4 summarizes the results.

4.3. Ambiguous effects of the licensing rate μ

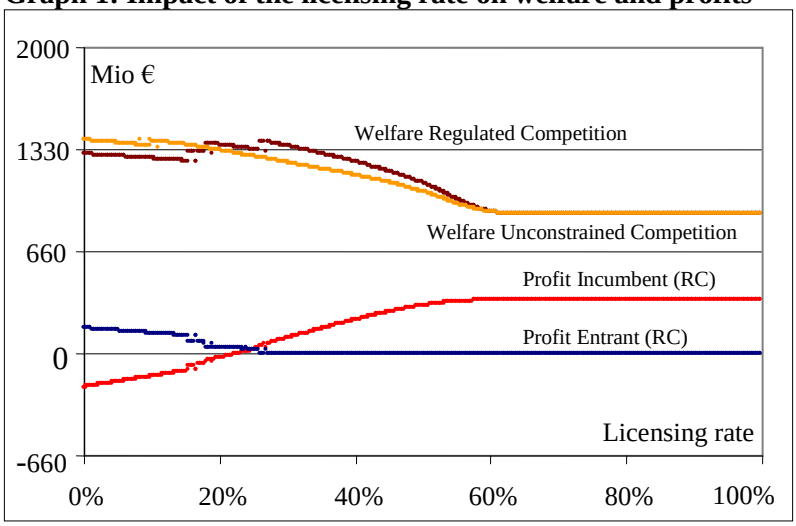
For the above results, we assumed a licensing rate of 3%. If no licensing fee were collected (μ = 0%), the results would change only slightly. As predicted in section 2.3, both operators offer lower prices. Consequently, the incumbent's loss rises by an additional € 21 million, which is more than the foregone licensing fees (€ 14 million). Thus, the indirect effect of the licensing system is in this case € 7 million (caused by price changes). The lower rate increases the entrant's potential profit margin, weakens the entry barrier function of the licensing system and leads to higher losses for the incumbent.

If the licensing rate is set to 20%, we observe a further important aspect of the licensing system. In the case of RC, we observe now only one market entry instead of three. The licensing system turns into a barrier to entry. In this special case, the entry barrier is desirable because the threat of entry forces the incumbent to charge low prices. As a result, overall welfare increases and the incumbent almost beaks even due to the indirect effect worth € 156 million (direct effect = additional 16 million). These good results are only one side of the coin, as we can see for the case of UC, where the incumbent's prices rise and welfare decreases. If the licensing rate is too high, the threat of entry is too low and the incumbent improves profits at the cost of overall welfare.

Graph 1 gives further insight into the mechanism of the licensing system. Under Regulated Competition, the incumbent breaks even with a licensing rate of 23%. Welfare is maximized at 26%. This is the point at which the entrant has to give up service even in the last segment (slow mail businesses). Still the threat of entry persists and sets the upper bound for the incumbent's prices. Any further rate increase would decrease the threat of entry and the incumbent (now a monopolist) can adjust his prices towards the profit maximizing unregulated monopoly solution.

In the case of Unconstrained Competition, the optimal licensing rate is 0% where entry occurs in only one market segment. Up to a rate of 10%, the entrant stays in. At 10%, the incumbent is able to push the entrant out of the market by profitable predatory pricing. This discrete drop in prices yields the welfare jump that can be seen in the graph. From now on, any increase of the licensing rate reduces welfare.

Graph 1: Impact of the licensing rate on welfare and profits



4.4. Comparison of the four regulatory regimes and first conclusions

Having calculated overall price levels as well as the welfare of the different market rules, we are now able to make normative statements about which of the four scenarios a welfare-maximizing regulator should prefer. None of the competitive scenarios described above could reach the welfare of the Regulated Monopoly of 2003, even if a regulator maximized welfare with an optimal licensing rate. The model gives the following ordering in terms of welfare[8]: $RM \succ RC_{\mu^*=26\%} \succ UC_{\mu^*=0\%} \succ UM$.

If we apply these results to Switzerland, neither of the discussed competition scenarios is efficient. End-to-end competition does not necessarily lead to lower prices because of strategic interaction and the natural monopoly in delivery. Welfare is likely to decrease, and Swiss Post's ability to fund its universal service obligation is heavily reduced. These conclusions include positive effects of competition, such as higher product choice and a highly more efficient entrant.

In a dynamic context, Regulated "Competition" with a licensing rate between 20% and 25% might still be best because a profit-maximizing incumbent has direct incentives to reduce costs further. Suppose a regime in which the regulator reduces the licensing rate yearly by 1% for ten years. If the incumbent is able to reduce his costs appropriately, it can lower prices further to prevent a competitor's entry and thereby secure a 100% market

[8] Only if elasticities are assumed at least 50% higher than the ones in Table 1, both competition scenarios turn out to be better than RM. As pointed out in section 3, the most recent market data rejects such high elasticity values.

share for exploiting the scale effects in distribution. From this point of view, a regulatory system similar to the one in Finland is reasonable.

4.5. Other ways for competition

There are various other ways to introduce competition in the letter market. One could relax universal service restrictions further, find other mechanisms for financing the USO (taxes, fixed licensing rates, etc), introduce various forms of access regimes, copy U.S. Worksharing, or combine the discussed competition designs with price cap regulation.

Combining end-to-end competition with some form of downstream access, where entrants can hand over mail to the incumbent's delivery network if wanted, will provide entrants with additional possibilities of cherry picking by focusing on processes (in addition to customers and regions). Crew/Kleindorfer (2004), De Donder (2004) and Panzar (2003) show that these "bypass possibilities" will have negative effects on welfare and USO provision. We let the Swiss access issue for further research and focus directly on worksharing as a means to introduce competition in the letter market.

5. WORKSHARING AND PRICE CAP COMPETITION

Worksharing aims to minimize the costs of industry-wide service provision in the U.S. letter market. The incumbent United States Postal Service (USPS) is granted a monopoly in delivery ("downstream monopoly"), whereas competitors can perform upstream services like collection and presorting just as well. For these upstream services, USPS gives "worksharing discounts" on the official retail prices, depending on the value of the competitor's services for USPS. The system makes sense in economic terms if delivery has the property of a natural monopoly and its innovation potential is limited in contrast to upstream services. Worksharing evolved over the last 30 years. Today, about 70% of total U.S. mail volume is workshared and the sum of all worksharing discounts is about US$ 14.

5.1. Modeling Worksharing

To compare Worksharing (WS) with the regulatory frameworks discussed above, some small changes of the model are needed. We change the demand side only to the extent that two calibration values are slightly changed. First, we reduce the incumbent advantage x in all segments by 50% (i.e. $x_{new} = ½x_{old} + ¼$) because the entrant takes some advantage of the incumbent's downstream reputation and quality. Customers will switch faster to the entrant. Second, product differentiation possibilities are smaller because the entrant cannot deliver anymore. Therefore, we assume the

product differentiation factor e to rise to 0.85. In other words, the two services of the two operators are still considered as two different products and demand is still described by (1).

The major changes are on the cost side, as the entrant is legally obliged to buy the downstream services from the incumbent. In return, the entrant receives a discount of δ^s (the "worksharing discount") for his collection and presorting efforts in market segment s[9]. In other words, the entrant pays the access price $A = p_I - \delta$ to the incumbent for final processing and delivery. The entrant's variable costs for its upstream activities are c_{Eu}, whereas the incumbent's variable costs split up in an upstream and downstream part, i.e. $c_I = c_{Iu} + c_{Id}$.

Since the universal service obligation can now be financed by the downstream monopoly, there is no reason for a licensing fee anymore, i.e. $\mu=0$. We thus rewrite the profit functions (2) as follows (for any given market segment):

$$\begin{aligned}\pi_I(p_I,\delta) &= \sum_r \underbrace{\left(p_I - c_{Iu}^r - c_{Id}^r\right)q_I^r(p_I,p_E^r)}_{\text{IncumentMail}} + \underbrace{\left(p_I - \delta - c_{Id}^r\right)q_E^r(p_I,p_E^r)}_{\text{WorksharedMail}} - F_I^r - T,\\ \pi_E(p_E^r) &= \sum_r \max\left\{0,\left(p_E^r - c_{Eu}^r - p_I + \delta\right)q_E^r(p_I,p_E^r) - F_{Eu}^r\right\}.\end{aligned} \tag{6}$$

5.2. U.S. Worksharing

In the U.S., both retail prices and worksharing discounts are regulated. The Postal Rate Commission (PRC) is entitled to give its recommendations about pricing issues raised by the USPS. Worksharing discounts are calculated using ECPR, where discounts equal USPS' cost savings for the respective worksharing activity ("avoided costs").

In the model, the incumbent's savings are exactly the upstream variable costs c_{Iu}. We rewrite (6) accordingly and set $c_{Iu} = \delta$ for the worksharing discount and $p_I = p_{2003}$ for the retail prices (i.e. again a price freeze to compare with the other price freeze scenarios). To obtain the profit-maximizing price for the entrant, we compute its first order condition. In equilibrium, optimal prices are

$$\begin{aligned}p_I^* &= p_{2003},\\ p_E^{r\,*} &= \tfrac{1}{2}\left(a_E^r - e a_I^r + e p_{2003} + c_{Eu}^r + p_{2003} - c_{Iu}^r\right) \quad r \in \{D,R\}.\end{aligned} \tag{7}$$

[9] I.e. the modeled worksharing system is very stylized. In the U.S., there are various classes of worksharing discounts, and private operators need not to do all the upstream work as one block. They can specialize in any single discount.

The results are straightforward. If entry occurs, there is a Pareto improvement compared to the Regulated Monopoly. The incumbent is indifferent whether to workshare or not and is better off if the entrant generates additional volume. Consumers only buy the products of the entrant if they gain net utility. The entrant can only enter if it charges lower prices due to more efficient production and/or it generates additional demand through product differentiation. In both cases, volumes increase when demand is downward sloping as assumed. Empirical findings from Cohen et al. (2002) support this argument.

In line with the theory, the model predicts an increase in overall volume of 2.2%. In total 640 million letters are workshared. The welfare improvement is € 77 million and the sum of worksharing discount totals € 97 million. Entry occurs in 5 segments (all business segments but rural fast mail). We note that these nice results do not hold anymore if worksharing discounts were set above avoided costs.

It is interesting to observe that the entrant charges a higher price than the incumbent does. Parameter analysis with different values for *e* shows that only for high values of *e* are the entrant's prices lower. I.e., only if the entrant cannot differentiate its products relative to the incumbent's ones, it must charge a lower price. If the entrant reaches to do product innovation, it might benefit from higher prices. In this case, consumers also benefit (their needs are better served) and, of course, so does the incumbent, who gets the additional volume for downstream delivery.

Table 5: Results Worksharing and Price Cap Competition

	U.S. Worksharing		**Price Cap Competition**		
	***e* = 0,85**	***e* = 0,75**	**μ = 0%**	**μ = 3%**	**μ = 20%**
Average Price (€)					
Incumbent	0.44	0.44	0.44	0.44	0.43
Entrant	0.46	0.51	0.35	0.36	0.41
Average	0.45	0.46	0.41	0.41	0.42
Quantities (Mio #)					
Incumbent (*upstream)	2'291*	2'307*	2'073	2'079	2'432
Entrant	640	705	1'016	1'008	538
Total	2'932	3'012	3'090	3'088	2'970
Welfare (Mio €)					
Consumer surplus	1'515	1'533	1'612	1'610	1'560
Profit I after transfer	-22	-1	-300	-287	-165
Profit Entrant	21	48	90	79	21
Welfare	1'514	1'580	1'402	1'402	1'416
Welfare change (RM)	+77	+143	-35	-35	-21
Welfare change (RC)			+100	+108	+51
Other					
Discounts/Fees (Mio €)	97	118	0	10	44
Entry in # segments	5	7	3	3	2

Table 5 presents detailed model results and illustrates the positive welfare and profit effects of a further increase in product differentiation.

The model supports the experience from the U.S.: Successful entry occurs in business segments, the USP gains and can better sustain the USO at low prices. There is only one group, which is worse off, namely the workforce who represents the avoided upstream variable costs. However, they lose much less than in the case of regulated competition.

5.3. Price Cap Competition

The two end-to-end competition cases from section 4 yield much lower overall welfare than worksharing. One reason is the price-driving effect of the licensing system. To offset this price-driving effect, we supplement the RC case with a price freeze.

Table 5 reports the results of such a "Price Cap Competition." The price freeze has a positive effect on overall welfare compared to the Regulated Competition case (but not compared with the Regulated Monopoly) because the overall price level drops. The incumbent is worse off. He has no further possibility of responding competitively and its deficit increases up to € 287 million – the USO burden is not covered at all. Once again, this regulatory regime is not feasible for Switzerland from a legal point of view. Similar to the findings in section 4, only a sufficient high licensing rate can stabilize the financial situation of the USP. It prevents entry, and if the rate is set accordingly, it gives the incumbent incentives to reduce costs and to avoid potential entry.

5.4. Discussion

Both the regulatory regimes presented in this section did help to improve overall welfare compared to the competition cases examined in section 4. However, Price Cap Competition is desirable for consumers (higher net utility), but not for the ones who must pay the higher burden of the universal service obligation. If this burden would have to be paid by the consumers through a special postal tax, they are again worse off compared to the Regulated Monopoly of Swiss Post in 2003.

In contrast, Worksharing seems to be the only system that can improve economic efficiency in the sector. Worksharing realizes the benefits of competition without sacrificing the economies of scale in delivery and putting universal service at risk.

Empirically, one could try to find out how tariffs and volumes do vary between the different regulatory regimes applied in practice today. The model predicts that the United States should have large volumes per capita ceteris paribus. In liberalized markets, postal operators should have problems sustaining the USO due to smaller volumes. In regulated monopolies (or licensing regimes with very high rates) tariffs and volumes should lie

somewhere in between. However, such a comparison is difficult, because demand and supply factors vary heavily across nations.

6. CONCLUSIONS

Like the member states of the European Community, Switzerland is in the process of liberalizing its domestic postal markets. In 2004, a new postal ordinance fully opened the parcels market by introducing end-to-end competition using a licensing system to help the incumbent fund its universal service obligation.

We asked, what would happen if the letter market were liberalized in the same way? To gain deeper insight on this issue, we adapted a price competition framework from De Donder et al. (2001), tailored it to Swiss circumstances and extended it further to include worksharing. The model enables quantitative comparisons between monopoly, competition and worksharing scenarios. Despite the limits of such a quantitative model, we believe that the main results are robust and straightforward.

We identify U.S. Worksharing[10] as a Pareto improvement compared to monopoly regulation. Moreover, our model predicts higher welfare and much better USP stability than various ways of end-to-end competition with different levels of licensing rates. End-to-end competition with its full liberalization of the postal value chain is leading to serious difficulties for the incumbent to sustain the Universal Service requirements. The more restrictions are imposed on the incumbent's pricing flexibility (uniform price, price freeze), the worse becomes the financial situation of the incumbent.

We conclude that Switzerland should be very cautious when copying European plans of end-to-end competition. We believe caution is especially indicated when the assumption of high economies of scale in delivery truly reflects the industry. Our model predicts that complete letter market liberalization will lead to higher prices, to much more price differentiation between regions and customers (in favor of business customers and cities), to an erosion of Universal Service due to Swiss Post's attempts to adapt its business model to the underlying market forces and to continuous financial problems of the incumbent. Some of these problems could be mitigated by combining liberalization with a mandatory access regime under which competitors could use the incumbent's delivery network when needed. However, the financial consequences to the USP will remain serious because

[10] The Pareto improvement is only achieved if retail prices stay regulated *and* worksharing discounts are equal or less to avoided costs.

the entrant's competitive advantage gets even larger. We leave an evaluation within our model for further research.

The model cannot cope with some dynamic advantages of competition. For example, there were no possibilities for Swiss Post for dynamic efficiency gains over time. If one believes those efficiency potentials to be large, end-to-end competition could still be a desirable solution. However, postal services already face increasing indirect competition through digital means of written communication. The overall volume in single-piece mail is shrinking in most highly developed countries, including Switzerland despite growing written communication markets. This rapidly evolving "e-competition" threatens the postal services as end-to-end competition does. Regulated "monopolists" and worksharers are "hit" only once, whereas incumbents competing in fully liberalized letter markets are "hit" twice.

REFERENCES

Cazals, Catherine, and Jean-Pierre Florens. 2002. "Econometrics of Mail Demand" In *Postal and Delivery Services: Delivering on Competition*, edited by Michael A. Crew and Paul R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

Cohen, Robert H., William W. Ferguson, John D. Waller and Spyros S. Xenakis. 2002. "The Impact of Using Worksharing to Liberalize a Postal Market." In *Liberalisation of Postal Markets*, edited by Gabriele Kulenkampff and Hilke Smit. Rheinbreitbach: Druckerei Plump KG.

Crew, Michael A., and Paul R. Kleindorfer. 2004. "Access and the USO for Letters and Parcels": In *Competitive Transformation of the Postal and Delivery Sector*, edited by Michael A. Crew and Paul R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

Crew, Michael A., and Paul R. Kleindorfer. 2002. "Putty-Putty, Putty-Clay or Humpty-Dumpty? Universal Service Under Entry." In *Postal and Delivery Services: Pricing, Productivity, Regulation and Strategy*, edited by Michael A. Crew and Paul R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

Dietl, Helmut M. and Peter Waller. 2002. "Competing with Mr. Postman: Business Strategies, Industry Structure, and Competitive Prices in Liberalized Letter Markets." In *Schmalenbach Business Review*, Vol. 54, pp 148 – 170, zfbf, Verlagsgruppe Handelsblatt.

De Donder, Philippe, Helmuth Cremer and Frank Rodriguez. 2004. "Access Pricing and Uniform Tariff in the Postal Sector." In *Competitive Transformation of the Postal and Delivery Sector*, edited by Michael A. Crew and Paul R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

De Donder, Philippe, Helmuth Cremer, Jean-Pierre Florens, André Grimaud and Frank Rodriguez. 2001. "Uniform Pricing and Postal Market Liberalization." In *Future Directions in Postal Reform*, edited by M. A. Crew and Paul R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

Panzar, John C. 2003. *The Economic Effects of Combining Liberalization and Unbundling Policies in Postal Markets*. Third Conference on Regulation, Competition and Universal Service in the Postal Sector, Toulouse.

Panzar, John C. 2002. "Reconciling Competition, Downstream Access, and Universal Service in Postal Markets." In *Postal and Delivery Services: Delivering on Competition*, edited by M.A. Crew and P.R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.

Panzar, John C. 2001. "Funding Universal Service Obligations: The Costs of Liberalization." In *Future Directions in Postal Reform*, edited by Michael A. Crew and Paul R. Kleindorfer. Boston, MA: Kluwer Academic Publishers.