Welfare and pricing with single-piece and bulk mail access competition in the postal sector*

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1. INTRODUCTION

Following the full opening of the postal market to competition, the third European Directive makes a distinction between single piece (SP) mail and bulk mail (BM) to include the SP in the universal service and exclude BM from the universal service. SP mail comprises of social and business mail, and there is the option for BM market to include access to the incumbent operator's network.

This opens up to competition the upstream market in collection, outward sortation and transportation not only for BM, but also for all upstream mail if entrants can consolidate SP and BM upstream. While the fixed upstream costs for the social mail network may be prohibitively high for entry with respect to collection from post boxes, it may be less so for business mail where collection of larger mailings is made from businesses directly or from dedicated collection hubs. This form of market opening appears to leave the universal service provider (USP) exposed in its recovery of fixed upstream costs for business mail.

Furthermore, when direct ex ante regulation is withdrawn and replaced by ex post regulation as may be appropriate in a declining market, it can be accompanied by greater regulatory information requirements including accounting separation and transfer pricing. Transfer prices are implicit or explicit internal charges levied by one part of a vertically integrated business to another part of its business. This information can then be used by the business to inform pricing decisions, and by the regulatory authorities to inform assessments of whether behavior by a firm amounts to an abuse of dominance.

If the USP offers an access price for BM business mail, there is neither an explicit access price for SP business mail nor explicit internal transfer prices for SP or BM business mail. In general the transfer prices might be expected to have similar characteristics to the access prices offered to third parties, where those access prices exist, and to reflect what market access prices might be if they were to be offered to third parties but are not in fact offered. Indeed, within the postal sector if the incumbent operator is unable to distinguish between SP and BM from entrants for access pricing purposes, then the effective access price for these two markets may be the same.

This paper explores the impact of upstream competition on the USP, under different assumptions, through a model framework that is an extension of that developed by De Donder et al (2008). That paper explored cases where the incumbent Postal Operator (PO) or USP comprises a Mail Network Operator (MNO) with a single good for the SP market and an access good (for both urban and rural zones) in the BM market, and Retail Business (RB) selling a BM good (for both urban and rural zones) with a competitive fringe in BM. The paper assumed welfare maximization subject to break even for the USP and looked at the effect on welfare and pricing of different breakeven constraints and pricing rules on the PO, MNO and RB, including the effect on urban and rural access prices in the BM market.

In this paper, the MNO and RB introduce a market distinction between SP social and SP business mail in addition to BM business mail, with access and transfer prices in both business mail markets. Hence the MNO has one end-to-end service for SP social mail and two access services for SP business and BM, and the RB has two end-to-end business services. Imperfect competition in the upstream SP business and BM business mail markets is assumed. Geographic zones are excluded to focus on the impact of competition upstream on prices, welfare and finances of the USP. The model is calibrated to gain numerical results and provide further insight, including the effects of different levels of intensity of competition, switching to entrants and access pricing rules.

Section 2 sets out the details of the model and scenarios considered. The inputs to the model are calibrated in Section 3 with numerical examples then applied in Section 4. Section 5 concludes.

2. THE MODEL

There are three postal operators: a retail business (RB), a Mail Network Operator (MNO) and entrants. The MNO sells one final good to customers: SP social mail, while the RB sells two: SP business mail and BM business mail. For simplicity, we assume that the three types of goods have independent demands. The entrants sell SP and BM business mail, while there is no competition for SP social mail. The two goods sold by entrants are imperfect substitutes of the corresponding two goods offered by the RB, but the demands for entrants' SP business mail and BM business mail are independent from each other.

x denotes (generic) SP and y = BM, with a subscript S for social (SP) and B for business (SP), and with a superscript I for the RB (incumbent) and E for the entrants.

There is one representative sender of SP social mail, whose utility is

$$u(x_S) - qx_S + I_1,$$

where x_S denotes the quantity of SP social mail sold by the RB, q its final price and I_1 the sender's exogenous income. The demand function $x_s(q)$ is obtained by maximizing $u(x_s)$ with respect to x_S.

The quantity of SP business mail sold by the RB is denoted by x_B^I, and its price by q_B^I. Similarly, x_B^E denotes the quantity of SP business mail sold by the entrants, and q_B^E its price. There is one representative sender of SP business mail, whose utility is

$$v(x_B^I, x_B^E) - q_B^I x_B^I - q_B^E x_B^E + I_2,$$

where I_2 is the sender's exogenous income. The demand functions $x_B^I(q_B^I, q_B^E)$ and $x_B^E(q_B^I, q_B^E)$ are obtained by maximizing this utility with respect to quantities (x_B^I and x_B^E).

Similarly, for BM: y^I (resp., y^E) denotes the quantity of BM sold by the RB (resp., entrants), and p^I (resp., p^E) its price. There is one representative sender of BM, whose utility is

$$w(y^I, y^E) - p^I y^I - p^E y^E + I_3,$$

where I_3 is the sender's exogenous income. The demand functions $y^I(p^I, p^E)$ and $y^E(p^I, p^E)$. are obtained by maximizing this utility with respect to quantities (y^I and y^E).

There are two types of activities in the postal sector: upstream (collection, sorting and transportation) and downstream (delivery). The MNO performs the downstream (delivery) activities for all five goods (x_S, x_B^I, x_B^E, y^I and y^E), and also the upstream activities for SP social mail (x_S). The RB takes care of the upstream activities for BM (y^I) and SP business (x_B^I). The RB then has to buy access to the MNO's delivery network and to pay the MNO an access charge for both x_B^I and y^I. For each unit of mail delivered requiring access to the MNO delivery network, the RB pays an access charge of a_B^I for SP business mail and of a_y^I for BM.

The entrants sell SP business mail and BM business mail, but they only perform the upstream activities and buy access to the MNO delivery network, for which they pay a unit access charge of a_B^E for SP business mail and a_y^E for BM. Bypass is not allowed.

The cost structure of the industry is as follows.

The MNO faces one large fixed cost for all its downstream activities, denoted by F_D (subscript D stands for downstream). Downstream marginal costs are assumed to be the same for all five goods (SP social mail, SP business mail by RB and by E, and BM by I and E) and denoted by c_D. The MNO also faces an upstream fixed cost for SP social mail, denoted by F_{US}. The upstream marginal cost for SP social mail is denoted by c_{US}.

The RB faces fixed costs in its upstream activities for both SP business mail (denoted by F_B^I) and for BM (denoted by F_y^I). The (constant) upstream marginal cost of the RB is denoted by c_B^I for SP business mail and by c_y^I for BM.

The (constant) upstream marginal costs of the entrants are the same across entrants and are denoted by c_B^E for SP business mail and by c_y^E for BM. For simplicity the entrants are assumed to face no fixed costs.

The RB's profit function is given by

$$\begin{aligned}\Pi^I = &(q_B^I - a_B^I - c_B^I)x_B^I(q_B^I, q_B^E) - F_B^I \\ &+(p^I - a_y^I - c_y^I)y^I(p^I, p^E) - F_y^I,\end{aligned}$$

where the RB controls the two final prices q_B^I and p^I.

The MNO's profit function is given by

$$\begin{aligned}\Pi^N = &(q - c_{US} - c_D)x_S(q) - F_{US} \\ &+(a_B^I - c_D)x_B^I(q_B^I, q_B^E) + (a_B^E - c_D)x_B^E(q_B^I, q_B^E) \\ &+(a_y^I - c_D)y^I(p^I, p^E) + (a_y^E - c_D)y^E(p^I, p^E) - F_D,\end{aligned}$$

where the MNO controls the final price q and four downstream access charges (a_B^I, a_B^E, a_y^I and a_y^E).

The entrants' profits are given by

$$\begin{aligned}\Pi^E = &(q_B^E - a_B^E - c_B^E)x_B^E(q_B^I, q_B^E)\\ &+(p^E - a_y^E - c_y^E)y^E(p^I, p^E),\end{aligned}$$

where the entrants control two final goods' prices: q_B^E and p^E.

Finally, social welfare is given by

$$\begin{aligned}W = &u(x_S) - qx_S + I_1 + v(x_B^I, x_B^E) - q_B^I x_B^I - q_B^E x_B^E + I_2\\ &+w(y^I, y^E) - p^I y^I - p^E y^E + I_3 + \Pi^I + \Pi^E + \Pi^N\\ &=u(x_S) + v(x_B^I, x_B^E) + w(y^I, y^E)\\ &-(c_{US} + c_D)x_S(q)\\ &-(c_B^I + c_D)x_B^I(q_B^I, q_B^E) - (c_B^E + c_D)x_B^E(q_B^I, q_B^E)\\ &-(c_y^I + c_D)y^I(p^I, p^E) - (c_y^E + c_D)y^E(p^I, p^E)\\ &+I_1 + I_2 + I_3 - F_{US} - F_D - F_B^I - F_y^I.\end{aligned}$$

The pricing behavior of the postal operators is studied assuming that the MNO and the RB maximize welfare subject to a profit constraint and concentrate on Ramsey prices to consider several sets of constraints, in addition to the profit constraint. The objective is to focus on numerical examples, in order to shed light on the impact of these different sets of constraints on prices, volumes, contribution to profits, consumer surplus and welfare. Numerical simulations also make it possible to check whether there exists a vector of prices that satisfies all the constraints. The various optimization problems solved for are described briefly before moving to the sections devoted to the calibration and numerical results.

Initially a hypothetical monopoly situation is examined. The Appendix derives demand functions $x_B^{IM}(q_B^I)$ and $y^{IM}(p^I)$ and profit functions Π^{IM} and Π^{NM}. Initially also the profit constraint is assumed to be global,

$$\Pi^{IM} + \Pi^{NM} \geq 0,$$

which would be the case for instance if both the RB and the MNO were part of the same postal operator.

The Ramsey problem with one global profit constraint is then

$$\begin{aligned}\max_{q,q_B^I,p^I} W^M &= u(x_S) + v(x_B^I, 0) + w(y^I, 0) \\ &-(c_{US} + c_D)x_S(q) - (c_B^I + c_D)x_B^{IM}(q) - (c_y^I + c_D)y^{IM}(p^I) \\ &+I_1 + I_2 + I_3 - F_{US} - F_D - F_B^I - F_y^I,\end{aligned}$$

$$\begin{aligned}&\text{subject to } \Pi^{IM} + \Pi^{NM} \geq 0 \\ &\Leftrightarrow (q - c_{US} - c_D)x_S(q) + (q_B^I - c_B^I - c_D)x_B^{IM}(q_B^I) + (p^I - c_y^I - c_D)y^{IM}(p^I) \\ &\geq F_{US} + F_D + F_B^I + F_y^I.\end{aligned}$$

The following Ramsey prices are obtained:

$$\begin{aligned}\frac{q - c_{US} - c_D}{q} &= \frac{\lambda}{1+\lambda}\frac{1}{\left|\varepsilon_S(q)\right|}, \\ \frac{q_B^I - c_B^I - c_D}{q_B^I} &= \frac{\lambda}{1+\lambda}\frac{1}{\left|\varepsilon_B^{IM}(q_B^I)\right|}, \\ \frac{p^I - c_y^I - c_D}{p^I} &= \frac{\lambda}{1+\lambda}\frac{1}{\left|\varepsilon_y^{IM}(p^I)\right|},\end{aligned}$$

where λ is the Lagrange multiplier of the budget constraint $\Pi^{IM} + \Pi^{NM} \geq 0$ and where $\varepsilon_S(q)$, $\varepsilon_B^{IM}(q_B^I)$ and $\varepsilon_y^{IM}(p^I)$ represent, respectively, the direct price elasticity of the demand for SP business mail , SP business mail and BM in a monopoly situation.

It is easy to show analytically that the same retail prices would obtain if one were to look at the same problem with two separate profit constraints: $\Pi^{IM} \geq 0$ and $\Pi^{NM} \geq 0$. The intuition is that the two access prices a_B^I and a_y^I are used so that both the RB and the MNO break even. This result was already underlined in De Donder et al. (2008).

Entrants are then introduced into the model. Imperfect competition is assumed between entrants and the RB and, further, to simplify matters, entrants are assumed to post an exogenous mark-up over marginal costs for the two goods they sell. The mark-up for SP business mail is denoted by m_B^E, and the mark-up for BM by m_y^E. Then:

$$q_B^E = (1+m_B^E)\left(a_B^E + c_B^E\right),$$
$$p^E = (1+m_y^E)\left(a_y^E + c_y^E\right),$$

and the MNO and RB's Ramsey prices are solved for given these entrant's prices. The two mark-ups m_B^E and m_y^E can be considered to reflect the intensity of the competition between entrants, so that the numerical section reports how Ramsey prices are affected when the entrants' mark-ups are exogenously changed. In addition, this formulation encompasses the case of a competitive fringe, where the entrant's mark-ups are both zero. Note that whether the profit constraint imposed is global or imposed separately on the MNO and the RB is immaterial, because the planner can use the access charges a_y^I and a_B^I to transfer income from one operator to the other so that both break even.

Finally, the case is considered where access charges follow the equi-proportional mark-up (EPMU) rule and are set according to

$$a_B^E = a_B^I = a_y^E = a_y^I = (1+m)c_D.$$

Observe that, since the downstream marginal costs are by assumption the same for the four goods, the EPMU rule results in the same access charge level being set for the four goods. Section 4 provides numerical illustrations of final prices and reports how the EPMU setting of

the access charges impacts Ramsey prices when separate profit constraints for the RB and the MNO are imposed.

3 CALIBRATION

The calibration assumptions are based on De Donder et al. (2008) modified to take account of the fact that SP mail is split between social and business. The assumptions are not estimates from a particular postal operator, but they are intended to reflect the general nature of postal markets and cost structures given published empirical studies.

The initial situation is a hypothetical one where the RB faces no competition. The USP sets a price of 0.50 for SP social mail and a price of 0.40 for SP business mail and for BM. Total quantities sold at those prices are 2bn, 3bn and 5bn items, respectively. The direct price elasticities are -0.2 for SP social mail, -0.25 for SP business mail and -0.5 for BM. Linear demands are calibrated based on these quantities, prices and elasticities.

Further information is required to calibrate the (linear) demand functions for SP business mail and for BM in the presence of competition by entrants. With regard to the extent of entry, it is assumed for both SP business mail and for BM that the entrants' total market share is 10% if their price is the same as the RB's and 50% if they are 20% cheaper.[1] On substitution, the displacement ratio of both SP business mail and BM offered by the entrants is assumed to be 0.9.[2]

The MNO's marginal downstream cost c_D is set at 0.12. The marginal upstream cost of SP social mail c_{US} is set at 0.18 so that the total marginal cost of social SP is 0.3. The marginal upstream cost of SP business mail is 0.15 for both the RB and the entrant ($c_B^E = c_B^I$, so that its total marginal cost is 0.27 for both operators), while the marginal upstream cost of BM is 0.102 for both the RB and the entrants ($c_y^E = c_y^I$, for a total marginal cost of 0.222). The USP faces a total fixed cost of 1.680 billion which is assumed to include the normal remuneration of

capital. There is no need for the analysis or calibrations to segment this, though in Section 4 the contribution to total upstream fixed cost of the RB ($F_B^I + F_y^I$) is examined on the assumption that this could be separately imposed in the budget constraint. The reader can check that, with these demand and cost calibrations, the sum of the profits of the RB and of the MNO is zero (i.e., revenues exactly cover the sum of variable and fixed costs).

4. NUMERICAL ILLUSTRATIONS

For ease of reference the results of the monopoly case are reported under the same assumptions as De Donder et al (2008) in the first column of Table 1. The comparative welfare maximizing results subject to the USP (MNO+RB) breaking even are shown, where there are two access services and two entrants' services and the MNO can distinguish SP business mail from BM. The results are for two scenarios where the entrants firstly have ($m_B^E = m_y^E$) 20% mark ups on their marginal costs (in the second column of figures) and secondly have greater competition intensity and a competitive fringe with 0% mark up on their marginal costs (in the third column of figures). The consequences of the MNO being unable to distinguish the access prices are then reported, with the same EPMU mark up on downstream marginal costs, for the two scenarios (in the fourth and fifth columns respectively).

In each case all prices are above marginal costs, including the access prices charged to the entrant. The implicit transfer prices paid by the RB to the MNO play no role in the formulation of results shown in Table 1 because of the combined RB+MNO break even constraint, but observe that in each case both prices of the RB exceed their corresponding access price plus upstream marginal cost. For the scenarios shown, when the MNO can set distinct access prices the RB's prices exceed those of the entrants, but when the MNO cannot the relative prices of the RB and entrants depend on the level of mark-up applied and competitive intensity of the

entrants. Observe also that the end-to-end price for SP business mail is higher than that for the end-to-end price for BM business mail, and this is the case even when the access prices are set to be the same.

With distinct access prices and a low competitive intensity (in the second column) the MNO sets a higher access price for SP business than for BM to reflect the more inelastic demand for the SP business market and the same marginal downstream cost. The overall level of the access prices are set sufficiently low to avoid the SP business and BM prices rising sharply from those under the monopoly case. The contributions toward the recovery of fixed costs of business (SP and bulk) mail for the MNO and the RB are reported based on the assumption that internal prices are equal to access charges paid by the entrant. Compared to the monopoly situation,[3] the MNO loses some contribution from the introduction of upstream competition and the USP raises all its end-to-end prices as it becomes more difficult for it to break even.

In contrast, when the competitive intensity increases upstream (in the third column of figures) so that entrants' profit is zero, the USP has the opportunity to raise its access prices more without introducing higher end-to-end prices. In fact, the RB lowers its end-to-end prices (compared to the second column), which further reduces the differences between its prices and the access prices. In fact, the end-to-end prices are remarkably similar to the monopoly case.

Table 1: Illustrative results for the USP (MNO and RB)

		With distinct access prices			With same access prices	
		Monopoly	**Low competitive intensity with Entrant mark up of 20%**	**High competitive intensity with Entrant mark up of 0%**	**Low competitive intensity with Entrant mark up of 20%**	**High competitive intensity with Entrant mark up of 0%**
Prices (€):						
Single piece social – MNO	p^x	0.592	0.606	0.591	0.618	0.604
Single piece business – RB	q_B^I	0.457	0.463	0.456	0.420	0.410
Single piece business - Entrant	q_B^E	-	0.456	0.441	0.410	0.393
Bulk mail business – RB	p^I	0.328	0.331	0.327	0.350	0.349
Bulk mail business - Entrant	p^E	-	0.330	0.321	0.352	0.345
Access single piece business - MNO	a_B^E	-	0.230	0.291	0.192	0.243
Access bulk mail business - MNO	a_y^E	-	0.173	0.219	0.192	0.243
Quantities (bn):						
Single piece social - MNO	x^S	1.926	1.915	1.927	1.905	1.916
Single piece business – RB	x_B^I	2.893	2.593	2.484	2.572	2.470
Single piece business - Entrant , MNO	x_B^E	-	0.322	0.455	0.434	0.567
Bulk mail business – RB	y_I	5.452	4.789	4.668	4.781	4.642
Bulk mail business – Entrant, MNO	y_E	-	0.715	0.873	0.587	0.753
Total		10.271	10.333	10.408	10.279	10.348
Contribution to fixed cost – USP (€bn):						
Single piece social - MNO		0.562	0.586	0.561	0.606	0.582
Single piece business – MNO		0.541	0.319	0.503	0.215	0.374
Bulk mail business – MNO		0.576	0.291	0.548	0.385	0.664
Subtotal – MNO		1.680	1.196	1.612	1.206	1.620
Single piece business – RB			0.216	0.038	0.202	0.042
Bulk mail business – RB			0.268	0.031	0.272	0.019
Subtotal (upstream) – RB			0.484	0.068	0.474	0.061
Profit subtotal – MNO+RB		0.000	0.000	0.000	0.000	0.000
Profit subtotal – Entrant		-	0.064	0.000	0.064	0.000
Consumer surplus (€bn)						
Single piece social		2.320	2.293	2.321	2.269	2.295
Single piece business		2.218	2.218	2.240	2.346	2.380
Bulk mail business		2.371	2.371	2.394	2.262	2.275
Total		6.929	6.882	6.956	6.877	6.950
Welfare (€bn)		6.929	6.945	6.956	6.941	6.950
Lagrange multiplier		0.138	0.146	0.137	0.154	0.146

The higher access prices enhance the contribution to the fixed network costs from the business mail, and the contribution from RB upstream reduces from €0.484bn to €0.068bn, but this is more than offset by the increase in contribution from the MNO prices which increases from €1.196bn to €1.612bn (as the entrants profit reduces to zero), The lower mark up by the entrants both grows the market (marginally) and their market share (from 12% to 16%), which has the effect of making it easier for the USP to break even (as reflected by the lower Lagrange multiplier) and marginally increasing consumer surplus in all three markets as well as welfare.

With the access prices set the same by applying an EPMU rule to the same marginal costs for the two business segments (in the fourth and fifth columns of figures), the access prices increase for BM business mail and reduce for SP business mail. There are corresponding prices movements for RB's prices and an increase in the contribution from the BM business market. However, this reduces overall market volumes and welfare, and it becomes more difficult for the USP to break even. It would then be in the interests of the USP to have distinct access prices between the two markets of business mail if they could be applied.

Overall, the effects of changing assumptions are all rather small. for the calibrations used in the numerical illustrations. The difference in welfare between having distinct access prices and the same access prices for the two business segments is just €4-6m and the difference in welfare between having low and high competitive intensity is just €8-9m. Indeed, the potential welfare enhancement of high competitive intensity within these illustrations is based on a market growth of less than 1% from greater entrants' market share, which may be overshadowed, in practice, by other movements in the market from digital competition. Hence, perhaps the most significant result here is that the BM access price would be higher and therefore the contribution from BM greater, if the MNO cannot distinguish SP business and BM items for pricing.

The relatively small effects of changing assumptions may be due in part to the low propensity to switch to entrants services assumed and so the case is considered where the USP can set distinct access prices for SP business mail and BM but faces a greater propensity to switch to the entrants. More specifically, for both the SP business and BM markets, it is assumed that the entrants would obtain 50% of the market for equal prices and 90% if they were 25% cheaper than the USP.

Table 2 considers the case where the entrants' services are more attractive and the entrants have a greater market share of the business mail. This is done for the two scenarios of Ramsey pricing with 20% and 0% mark ups on their marginal costs by the entrants (in the first and third columns of figures respectively), with the difference relative to the corresponding case from Table 1 (from the second and fourth columns of figures respectively) also shown. As this change has the effect of reducing the RB's upstream contribution to just €7m for the high competitive intensity case, the directional change to the results is also shown when a higher contribution is imposed on the RB in Table 2 (final column).

The RB's share of business mail reduces to 46%-51% under the two scenarios presented and the higher entrants' shares leads to an increase in the access prices. When the entrants apply a high (20%) mark-up in Table 2 (in the first column of figures), the entrants and USP both raise their end-to-end prices, but the USP increases them to a lesser degree, and sets a BM price below the entrant price (as compared to equivalent case in Table 1 where the RB sets its prices above those of the entrant). The RB's prices remain above the sum of the access price and marginal upstream cost. The lower market share for the USP reduces its contribution from business mail as well as its contribution from RB while the MNO's contribution increases (including from the SP social market). Total volume, consumer surplus and welfare all

Table 2: Illustrative results for the USP (MNO and RB) with lower market share conditions

		Distinct access prices				
		Low competitive intensity with Entrant mark up of 20%	**Change relative to lower entrant share from 2nd column of Table 1**	**High competitive intensity with Entrant mark up of 0%**	**Change relative to lower entrant share from 3rd column of Table 1**	**Direction of change when RB required to increase contribution relative to 3rd column of this table**
Prices (€):						
Single piece social – MNO	p^x	0.643	+0.037	0.582	-0.009	+
Single piece business – RB	q_B^I	0.476	+0.013	0.451	-0.005	+
Single piece business - Entrant	q_B^E	0.477	+0.021	0.444	+0.003	-
Bulk mail business – RB	p^I	0.338	+0.007	0.324	-0.003	+
Bulk mail business - Entrant	p^E	0.346	+0.016	0.325	+0.004	-
Access single piece business - MNO	a_B^E	0.247	+0.017	0.294	+0.003	-
Access bulk mail business - MNO	a_y^E	0.186	+0.013	0.223	+0.004	-
Quantities (bn):						
Single piece social - MNO	x^S	1.885	-0.030	1.934	+0.007	-
Single piece business – RB	x_B^I	1.571	-1.022	1.450	-1.034	-
Single piece business - Entrant , MNO	x_B^E	1.430	+1.108	1.616	+1.161	+
Bulk mail business – RB	y_I	3.054	-1.735	2.938	-1.730	-
Bulk mail business – Entrant, MNO	y_E	2.589	+1.874	2.818	+1.945	+
Total		10.530	+0.197	10.756	+0.348	+
Contribution to fixed cost – USP (€bn):						
Single piece social - MNO		0.647	+0.061	0.546	-0.015	+
Single piece business – MNO		0.382	+0.063	0.532	+0.029	-
Bulk mail business – MNO		0.375	+0.084	0.595	+0.047	-
Subtotal – MNO		**1.404**	**+0.208**	**1.673**	**+0.061**	**-**
Single piece business – RB		0.123	-0.093	0.010	-0.028	+
Bulk mail business – RB		0.153	-0.115	-0.003	-0.034	+
Subtotal (upstream) – RB		**0.276**	**-0.208**	**0.007**	**-0.061**	**+**
Profit subtotal – MNO+RB		0.000	0.000	0.000	0.000	0
Profit subtotal – Entrant		0.263	+0.199	0.000	0.000	0
Consumer surplus (€bn)						
Single piece social		2.221	-0.072	2.338	+0.017	-
Single piece business		2.238	+0.020	2.325	+0.085	-
Bulk mail business		2.435	+0.064	2.534	+0.140	+
Total		6.894	+0.012	7.198	+0.243	-
Welfare (€bn)		7.157	+0.212	7.198	+0.243	-
Lagrange multiplier		0.171	+0.025	0.132	-0.005	+

increase. The SP social price increase lowers its consumer surplus but this is more than offset by the increase in consumer surplus for business mail.

When there is a high competitive intensity and a competitive fringe (with entrants mark ups of zero), the levels of RB contribution were already low when the entrants' market share was low in Table 1 (in the second column of figures), and is even lower with a greater propensity to switch to the entrants in Table 2 (in the third column of figures). Something different happens when the USP has a lower market share and sets higher access prices. The entrants increase their prices, but the USP lowers all of its end-to-end prices to the point where the RB price is above the entrants' prices in SP business and below the entrants' prices in BM business, such that RB's contribution from BM is negative. This illustrates where the RB prices below access price plus marginal cost and enhances welfare, with the entrants retaining a high market share. The RB makes a negative contribution to fixed network costs in the BM market and a low overall contribution from business mail of just €7m. The welfare gain from raising the access price is greater than that from raising the SP social price, because of the greater entrants' market share and the consumer surplus increases in each of the three customer segments to raise welfare.

With the RB's upstream contribution only just positive for the higher propensity to switch and high competitive intensity case, the effect of imposing the constraint of a higher contribution on the RB is explored. This might be internally or externally imposed as a requirement for RB to make a greater contribution to its fixed network upstream costs.

The directional changes arising from the introduction of this additional constraint are shown in Table 2 (in the final column). While welfare maximizing subject to the revised budget constraint and overall break even, the USP increases its end-to-end prices (RB prices and MNO's SP social price) and reduces its access prices. The contribution from SP social and business increases and welfare reduces. It becomes more difficult for the USP to break even as reflected in the increase in the Lagrange multiplier of the USP's profit constraint. For the

calibrations assumed, the RB is limited in the contribution it can make. Consequently imposing additional constraints upon the RB is neither beneficial to the USP, nor to overall welfare and is unnecessary for competition to have a high market share.

5. CONCLUSIONS

This paper has explored the development of upstream competition and its impact on prices, the financing of the USP and welfare where the USP maximizes welfare. The numerical illustrations indicate the relative scale and direction of movement arising from changes in market assumptions, which for the USP as a whole are often relatively small but for the RB and MNO are more material.

Transfer prices were confirmed to play no direct role in the analysis and do not affect the behavior of the USP, as was shown in De Donder (2008). They are therefore not necessarily informative for pricing decisions by the USP or its regulatory authorities.

The paper has shown that the access prices charged by the MNO to entrants rise as competition intensifies (and the markup on entrants' marginal costs falls). As the contribution to fixed network costs made by the RB reduces, the USP also relies more heavily on recovering its fixed costs from both SP and BM business markets. Greater market share loss upstream by the RB further reduces its contribution to the recovery of fixed costs and further increases the access prices and the MNO's contribution.

When the USP charges the same access price for both SP and BM business markets or the BM market alone, the RB's end-to-end price was shown to not always be above that of the entrants, but can be below (depending on the level of competitive intensity). Furthermore, when there is a greater propensity to switch to the entrants, it can lead to the RB reducing its business prices

and a situation where its prices are below the access price plus upstream marginal cost and entrants' prices, with the entrants still holding a high share of the market. Hence the RB prices that maximize welfare may be above or below the entrants' prices access prices plus marginal upstream costs, with competition still having a high market share.

The paper has also demonstrated that if higher contributions to the fixed upstream costs are imposed on the RB (either internally or externally), the USP finds it more difficult to break even and further there is a limit to the contribution that the RB can make. The imposition of additional constraints upon the RB is neither beneficial to the USP nor to overall welfare and is also unnecessary for competition to have a high market share.

If the MNO can apply distinct access prices to business mail with different market elasticities (in this case SP and BM business mail), this can improve the USP's financial position (by making it relatively easier to break even). This reduces the burden on the business market with the higher price elasticity (in BM). Furthermore, the RB distinguishes between the two business markets even when the downstream access charges are the same. Hence, more distinct pricing by USP can improve its financial position and increase welfare in the presence of upstream competition.

The analysis did not include bypass competition, competition from digital media, and the potential relationships between upstream and bypass competition, so as to focus on the impact of upstream competition alone. The development of upstream competition not only reduces the contribution to fixed network costs and raises access prices as has been shown, but also increases drop density of the mail volume held upstream by entrants, which would both increase the likelihood of bypass competition. Hence the development of competition in the postal sector as a whole may be informed by the development of upstream competition and

remain a subject for further research under full market opening and alongside competition from digital media.

References

De Donder Philippe, Helmuth Cremer, Paul Dudley and Frank Rodriguez (2008), 'Pricing, welfare and organizational constraints for postal operators' in M.A. Crew and P. R. Kleindorfer (eds), *Competition and Regulation in the Postal and Delivery Sector*, Cheltenham, UK and Northampton, MA, USA: Edward Elgar

Appendix

The demand functions for SP business mail and BM in case the RB has a monopoly over these two goods can be obtained easily:

$$x_B^{IM}(q_B^I) \text{ is obtained from } \max_{x_B^I} v(x_B^I, 0) - q_B^I x_B^I + I_2,$$
$$y^{IM}(p^I) \text{ is obtained from } \max_{y^I} w(y^I, 0) - p^I y^I + I_3.$$

The profit functions of the operators are also easy to adapt to the monopoly situation:

$$\Pi^{IM} = (q_B^I - a_B^I - c_B^I) x_B^{IM}(q_B^I) - F_B^I + (p^I - a_y^I - c_y^I) y^{IM}(p^I) - F_y^I,$$

$$\Pi^{NM} = (q - c_{US} - c_D) x_S(q) - F_{US} + (a_B^I - c_D) x_B^{IM}(q_B^I) + (a_y^I - c_D) y^{IM}(p^I) - F_D.$$

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* The analysis contained in this chapter reflects the view of the authors and may not necessarily be those of Royal Mail Group.

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[1]The sensitivity of the results to this assumption is checked by also looking at results obtained when the entrants' market share of both SP business mail and BM is 50% for equal prices and 90% if the entrants are 20% cheaper than the RB.

[2]With linear demands, this means that for any 10 items sold by the entrants, 9 are displaced from the RB and 1 is net volume creation. A higher displacement ratio would have the effect of reducing the market growth arising from the transfer of mail to the entrants, and therefore reduce the welfare benefit of entry. The figure of 0.9 is used from illustrative purposes. The growth in that market from the switching of mail to entrants is not easily discerned and may be even lower in a declining market.

[3] For the monopoly case, in the absence of access charges and thus of a benchmark for internal prices, it is assumed that all contributions accrue to the MNO.