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## What is an Unfair Burden? Compensating the Net Cost of Universal Service Provision

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# What is an Unfair Burden? Compensating the Net Cost of Universal Service Provision

Christian Jaag

## Abstract

This paper discusses the net cost of universal service obligations and the potential burden they represent on the universal service provider. Specifically, it analyzes the situation in the postal sector after full liberalization. It considers various interpretations of what an unfair burden might be and discusses the competitive impact of corresponding compensation scenarios by means of a stylized theoretical model with endogenous entry and coverage decisions.

**KEYWORDS:** universal service, unfair burden, net cost, postal sector

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## 1. Introduction

The financing of universal service provision in network industries has traditionally relied on granting the provider a reserved area. The need for alternative funding sources after full liberalization has increased the interest of regulators and the public in knowing the cost of universal services because the universal service provider (USP) should be correctly compensated for its burden. This implies knowing the net cost of the universal service obligation (USO) as measured by the profitability cost approach pioneered by Panzar (2000) and Cremer et al. (2000). Calculating the net cost of the USO is currently an important topic in the European postal sector because markets have recently been fully opened to competition in many countries. The net cost of the USO according to profitability cost is the difference in the USP's profit with and without this obligation.<sup>1</sup> The profitability approach has been practically implemented in a number of countries.<sup>2</sup> In all of these cases, the costing of universal services has been treated separately from its financing.

Only recently it has been argued that the market structure and the burden of the USO are directly related to other regulations and the funding mechanism in place. Jaag et al. (2009) provide an outline of how changes in the USP's cost structure affect pricing, market equilibria and hence indirectly the net cost. They also show that individual elements or dimensions of the USO cannot be priced separately as this would either result in inconsistent or biased net cost estimates. Boldron et al. (2009) argue that the effective cost/burden of USO is endogenous to regulation and funding mechanisms. Similar points are raised in Borsenberger et al. (2010) and in Jaag and Trinkner (2011) who discuss the appropriate tax base for a sharing mechanism and the competitive impact of various cost sharing and compensation mechanisms on the competitive equilibrium, respectively. Jaag (2011) discusses the importance of a thorough definition of the counterfactual scenario – whether there is no USO at all or universal services are provided by an alternative operator – and its impact on the net cost of the USO.

Based on these considerations, it is apparent that merely calculating the net cost of a universal service obligation may not be adequate when devising fair

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<sup>1</sup> Annex I of the Third Postal Directive defines the net cost calculation as follows: “The net cost of universal service obligations is any cost related to and necessary for the operation of the universal service provision. The net cost of universal service obligations is to be calculated, as the difference between the net cost for a designated universal service provider of operating with the universal service obligations and the same postal service provider operating without the universal service obligations.”

<sup>2</sup> See Copenhagen Economics (2008), Bergum (2008), Frontier Economics (2008) and Cohen et al. (2010) for recent applications of the profitability cost approach in the postal sector. Jaag et al. (2011) discuss these approaches.

compensation for a universal service provider. Consequently, the Third Postal Directive 2008/6/EC in Article 7 states that:<sup>3</sup>

“Where a Member State determines that the universal service obligations [...] entail a net cost [...] and represent an unfair financial burden on the universal service provider(s), it may introduce:

- a mechanism to compensate the undertaking(s) concerned from public funds; or
- a mechanism for the sharing of the net cost of the universal service obligations between providers of services and/or users.”

Hence, a compensation for the USP may only be introduced if the USO entails a net cost and represents an unfair burden. While there is quite a comprehensive literature on the costing of the USO, there has been little discussion so far as to how exactly define an unfair burden. This paper aims at filling this gap. It provides hints at potential unintended consequences of implementing a compensation or cost sharing mechanism. Thereby, it adds to the foundations for an informed debate about the appropriate compensation for the provision of universal services. However, it does not weigh in on the current debate about the appropriate scope of the USO.<sup>4</sup>

Under what conditions the net cost of the USO represents an unfair burden on the USP is a debatable question. Boldron et al. (2009) argue that several criteria of unfairness may be relevant: When the burden exceeds a certain portion of the USP’s profit, when it prevents the USP from making a “reasonable profit” or when the USP’s profits are low compared to those of its competitors. In the literature, the criterion referring to a reasonable profit has often been used: According to this criterion, compensation should ensure that the USP collects a sufficient level of profit.<sup>5</sup>

As long as no other operator is involved in financing the burden of the USO, it makes indeed sense to focus on the effect of the USO on the USP’s profit only. However, if competitors have to contribute to the funding of the USO, also changes in their profit may have to be considered when determining whether a burden on the USP is unfair.<sup>6</sup> Such a comparative notion of fairness is supported

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<sup>3</sup> The same rules for compensating the net cost also apply in the telecommunications sector; see Directive 97/33/EC on interconnection in telecommunications with regard to ensuring universal service and interoperability through application of the principles of Open Network Provision (ONP) and Directive 2002/22/EC (Universal Service Directive).

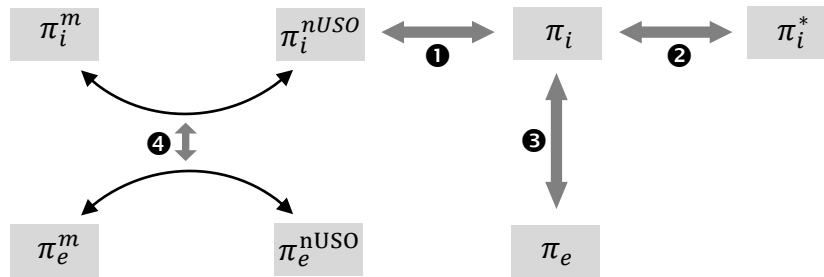
<sup>4</sup> See Jaag and Trinkner (2011) for a discussion of how the USO might be adapted in the future.

<sup>5</sup> See e.g. Crew and Kleindorfer (1998), De Donder (2006), Borsenberger et al. (2010), and Gautier and Paolini (2010).

<sup>6</sup> While the Third Postal Directive only refers to an unfair burden on the USP, also its competitors may be relevant due to the possibly comparative nature of the fairness concept.

by theories of other-regarding preferences which play a key role in the literature on the economics of fairness. E.g. Fehr and Schmidt (1999) and Bolton and Ockenfels (2000) find evidence suggesting that individuals value the payoff of reference individuals positively, hence exhibiting inequity aversion. For the notion of fairness, this implies that an individual's payoff (or a firm's profit) should be compared to an equitable benchmark, which may take into account also others' payoffs.

This paper adopts four different criteria to assess the (un-)fairness of a burden and hence the appropriateness and the level of compensation. The four criteria differ by the relevant equitable benchmark (see Figure 1): The first criterion (❶) sets the USP's profit in relation to its profit without universal service provision. Hence, the equitable benchmark is the USP's profit without USO. The second criterion (❷) considers the USP's absolute profit level, the equitable benchmark being an exogenously defined appropriate profit level. The third criterion (❸) compares the USP's profit to a competitor's, which serves as the equitable benchmark. The fourth criterion (❹) compares changes in the USP's and a competitor's profits due to the USO. Hence, in this case, the equitable benchmark for the change in the USP's profit is the change in a competitor's profit. The latter two criteria are more difficult to implement than the first two because they also depend on the competitor's profit. However, they are much closer to the notion of fairness in the economic literature on fairness, reciprocity and altruism (see Fehr and Schmidt, 2006).



**Figure 1: Approaches to the notion of unfair burden.**

We explore the effect of these criteria in the USP's compensation on the competitive outcome by allowing for three compensation means which are compliant with the Third Postal Directive:<sup>7</sup>

**State funding** – The USP's net cost of providing universal services is reimbursed with funds provided by the general government budget. In this scheme, no operator in the postal market contributes specifically to the funding of the USO.

<sup>7</sup> See Oxera (2007) for a comprehensive discussion of various funding mechanisms.

**Compensation fund** – All operators contribute to a compensation fund with a uniform tax. The USP’s net cost is reimbursed by the collected funds. In such a system, the USP has to partly compensate the net cost himself.

**“Pay or play”** – Operators that provide universal services (“play”) are exempt from contributing to the compensation fund (“pay”).

We discuss the implication of these funding mechanisms on the fairness of a USO burden in the postal sector. The topic strongly relates to EU state aid rules with which any compensation that involves some form of government funding needs to comply.<sup>8</sup>

The remainder of the paper is structured as follows: Section 2 discusses a stylized model of the postal sector which allows to discuss the USO, its net cost and its financing. In section 3, four criteria for assessing the (un-)fairness of a burden and their effect on the operators’ profits are presented and discussed. Section 4 explores the effect of price regulation on the compensation of the USO net cost. Section 5 concludes.

## **2. A Model of Competition in the Postal Sector**

Our model approach is similar to the one presented by Valletti et al. (2002): There are two firms  $p = i, e$ , each one offering postal services which are imperfect substitutes. There is a continuum  $[0, \bar{r}] \subset \mathbb{R}_+$  of different markets, where  $\bar{r}$  is the size of the total market. We use a geographical interpretation of a market, such that market  $r$  stands for a local delivery route. Hence, the market can be divided into segments by region of delivery. If firm  $p$  decides to enter a certain market  $r$  it has to pay the fixed cost associated to that market  $f(r)$ , where we assume that  $f'(r) > 0$ .<sup>9</sup> For the sake of simplicity, we make the following further assumptions:

**Assumption 1:** Markets are independent of each other. This implies that the competitive situation in one market does not affect the cost structure or demand in another market.

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<sup>8</sup> See e.g. Oxera (2007) or Holzleitner (2010). See also Case C-280/00 Altmark Trans GmbH und Regierungspräsidium Magdeburg gegen Nahverkehrsgesellschaft Altmark GmbH [2003] ECR I-7747.

<sup>9</sup> In the following we will refer to the fixed cost associated with serving a market as “incremental coverage cost” in the sense that it is the cost incurred when an operator extends its regional presence marginally.

**Assumption 2:** There are two symmetric operators. They possess the same technology (cost function) and compete in horizontally differentiated products.

**Assumption 3:** There is no reserved area; all markets are open to competition. The sequence of decisions is as follows: First, a profit-maximizing incumbent chooses its optimum market coverage (geographical area coverage). Second, an entrant (competitor) sets its optimum coverage. Third, both operators set a profit-maximizing price for each of the delivery markets.

Marginal cost is constant and by Assumption 2 the same for both operators. In every market  $r$  each operator makes a gross profit (or surplus) amounting to  $s(r)$ .<sup>10</sup> Because all markets share the same demand characteristics and variable costs, the equilibrium prices and therefore also gross profit  $s$  in each market depend only on the number of competitors.<sup>11</sup> Typically, in the postal sector,  $s(0) - f(0) > 0$  for at least two operators, while  $s(\bar{r}) - f(\bar{r}) < 0$  even for a single operator. This is what we assume for the following analysis. It implies that some regions are attractive to serve while others are not and market entry will generally occur, albeit not with full coverage. This is e.g. the case in Sweden where the incumbent's biggest rival Bring CityMail delivers only in the most densely populated areas.

From the perspective of operators, local delivery markets are ranked by increasing order of cost. Without USO, operators begin to cover the most densely populated areas and continue to cover less densely areas as long as it is profitable. Hence, each operator starts offering services from the market with the highest gross profit and leaves no gaps between served markets. If operator  $p$  serves all markets  $[0, r_p]$ , its total profit is

$$\pi_p = \int_0^{r_p} s(r) - f(r) dr. \quad (1)$$

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<sup>10</sup> Note that the surplus in each market results from selling a range of products in that market. It does not matter how many products are concerned (or e.g. whether or not they are in the product scope of the USO).

<sup>11</sup> There is no reason for price differentiation within markets with the same number of operator but different fixed costs because there is no differentiation of marginal cost and demand characteristics.

Solving the model backwards yields for the optimum market coverages of the entrant and the incumbent, respectively:

$$r^\# = \operatorname{argmax}_{r_e} \int_0^{r_e} s(r) - f(r) dr, \quad (2)$$

$$r^* = \operatorname{argmax}_{r_i} \int_0^{r_i} s(r) - f(r) dr. \quad (3)$$

Due to the assumptions made, total cost is convex. This implies that only one type of asymmetric equilibrium can arise in which one operator is bigger than the other. Here, given the sequence in Assumption 3, the entrant's coverage,  $r^\#$ , is lower than the incumbent's,  $r^*$ .<sup>12</sup> This is due to the incremental surplus in the monopolistic markets being larger than in the duopolistic markets:

There is a mutual business stealing (quantity effect) and competitive pressure on prices in the duopoly region (price effect) such that

$$s \equiv s(r|_{r < r^\#}) < s' \equiv s(r|_{r \geq r^\#}). \quad (4)$$

Hence, in the *absence of a universal service obligation*, the specific cost structure together with the market penetration decisions result in a natural segmentation of the entire market into three regions (see Figure 2):<sup>13</sup>

- (1) In attractive local delivery markets (e.g. densely populated delivery areas with low wage levels), it is feasible for both companies to operate in parallel ("competitive region",  $r < r^\#$ ).
- (2) In less attractive local delivery markets (e.g. semi-rural areas), an operator can make a profit only if there is no competitor. Hence, there will be a monopolistic operator in equilibrium ("monopolistic region",  $r^\# < r < r^*$ ).
- (3) In the least attractive local delivery markets (e.g. rural and / or high wage areas), incremental coverage costs are higher than incremental surplus, such that no operator serves these markets voluntarily ("unserved region",  $r > r^*$ ).

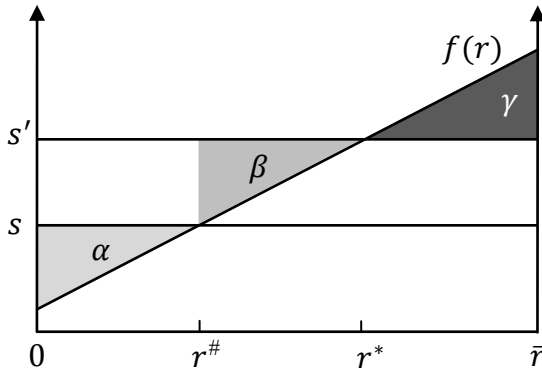
The horizontal lines at  $s$  and  $s'$  in Figure 2 represent the incremental gross surplus in each market with two and one operators, respectively. The straight line with

<sup>12</sup> In our model it is the sequence of decisions that results in the incumbent always serving at equilibrium a larger proportion of the market. This sequence reflects that the incumbent operator has traditionally been serving all markets due to the USO.

<sup>13</sup> See Jaag (2011) for an in-depth discussion of such market segmentation.



positive slope illustrates the incremental coverage cost associated with serving market  $r$ . In our model, we do not assume a concrete functional form of the cost function.



**Figure 2: The segmentation of the postal market.**

We define the USO in line with the Third Postal Directive to consist of the obligation to serve all regions up to  $\bar{r}$ .<sup>14</sup> However, there is no uniform tariff constraint.<sup>15</sup> Hence, the *introduction of a USO* forces the USP to also serve markets  $r > r^*$  in which the incremental cost exceeds the incremental surplus from extending market coverage.<sup>16</sup> This obligation replaces the operator's coverage decision in the sequence of decisions and potentially necessitates some kind of compensation. For the ease of analysis, we make a simplifying assumption on the financing of such compensation:

**Assumption 4:** If operators contribute to compensating the net cost of universal service provision, the necessary funds are collected through profit taxation.

Compared to other taxation schemes (e.g. based on turnover or per unit), profit taxation considerably simplifies our analysis because the operators' market coverage decisions are not distorted by their contributions to the USO fund.<sup>17</sup> Hence, by

<sup>14</sup> Art. 3 "Member States shall ensure that users enjoy the right to a universal service involving the permanent provision of a postal service of specified quality at all points in their territory [...]"

<sup>15</sup> This implies that we employ only a partial definition of the USO. Of course, in reality the USO may comprise several other dimensions, such as a minimum delivery frequency or the definition of certain services to be offered at regulated terms. See e.g. Panzar (2008) who discusses the role of postal rates on the costing of the USO.

<sup>16</sup> Other interpretations of the USO are conceivable, e.g. that the USO only applies to regions which would be unserved without regulation. See Jaag (2011) for a discussion of such a USO definition.

<sup>17</sup> A downside of the profit tax approach is that compared to other funding approaches, as e.g. unit taxes or turnover taxes, it may lead to more difficulties in allocating the contributions across oper-

restricting our analysis to profit taxation, we exclude potential strategic behavior by firms reacting to the financing mechanism. Such behavior is analyzed in detail by Jaag and Trinkner (2011).

Assumptions 1–4 allow us to define the profits in each of the three markets separately: The two operators' economic profit in the competitive markets is equal to

$$\alpha \equiv \int_0^{r^\#} s(r) - f(r) dr > 0. \quad (5)$$

The economic profit in the markets which are served by only one operator in equilibrium is equal to

$$\beta \equiv \int_{r^\#}^{r^*} s(r) - f(r) dr > 0. \quad (6)$$

The USP's economic profit in the markets which would not be served in the absence of a USO is

$$\gamma \equiv \int_{r^*}^{\bar{r}} s(r) - f(r) dr < 0. \quad (7)$$

Hence, the entrant's total economic profit without USO is equal to area  $\alpha$  in Figure 2,

$$\pi_e = \alpha. \quad (8)$$

The incumbent's economic profit without USO is equal to the areas  $\alpha + \beta$  in Figure 2,

$$\pi_i^{nUSO} = \alpha + \beta. \quad (9)$$

Assuming that the incumbent will be the USP, its economic profit with USO but without compensation is equal to

$$\pi_i = \alpha + \beta + \gamma. \quad (10)$$

Profit levels with and without USO very much depend on the regulatory environment of the two scenarios, which affects the operators' surplus and cost functions,

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ators due to the risk of inconsistent accounting policies being adopted. See Borsenberger et al. (2010) and Jaag and Trinkner (2011) for a discussion of the effect of various taxation schemes on the costing and financing of the USO.

$s(r)$  and  $f(r)$ , respectively. We assume that the only difference between the two scenarios with and without USO is that in the former the USP is forced to cover all markets. Specifically, we make the following assumption:

**Assumption 5:** There is no profit-oriented regulation of the USP's pricing other than the one implied in the compensation criteria used below.<sup>18</sup>

Assumption 5 implies that prices contribute toward the funding of the USO but are not used as a regulatory dimension. We will discuss the implications of this assumption in more detail in Section 4. As discussed above, we consider three potential financing mechanisms in case there is a net cost which constitutes an unfair burden:<sup>19</sup>

- (1) External financing (“ext”): The burden is financed by state funding; hence, there are no specific taxes imposed on postal operators,  $\tau_e^{ext} = \tau_i^{ext} = 0$ .
- (2) Everyone pays (“fund”): Both operators contribute equally to a universal services fund  $\tau_e^{fund} = \tau_i^{fund}$ . The total tax base equals the two operators' joint profits before compensation:  $2\alpha + \beta + \gamma$ .
- (3) Pay or play (“pop”): Only the competitor contributes to the funding of the USO,  $\tau_e^{pop} \neq \tau_i^{pop} = 0$ , the total tax base is equal to its profit  $\alpha$ .

Hence, after compensation, the two operators' profits are respectively equal to

$$\pi_e^m \equiv (1 - \tau_e^m)\alpha, m \in \{ext, fund, pop\}; \quad (11)$$

$$\pi_i^m \equiv (1 - \tau_i^m)[\alpha + \beta + \gamma] + \underbrace{\tau_e^m \alpha + \tau_i^m [\alpha + \beta + \gamma]}_{T^m}. \quad (12)$$

$T^m$  is the gross transfer the USP receives as compensation. According to the definition in Annex I of the Third Postal Directive, the net cost of USO is equal to

$$\pi_i^{nUSO} - \pi_i = \alpha + \beta - (\alpha + \beta + \gamma) = -\gamma. \quad (13)$$

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<sup>18</sup> Imposing a general breakeven constraint on the USP's but not on the competitor's pricing would intervene with the compensation criteria and the employed notion of fairness such that the problem of determining the level of compensation would be over-specified. Moreover, after full market opening and with the development of competition, there is a priori no reason for price regulation other than as part of the USO (see e.g. Panzar, 2002).

<sup>19</sup> Traditionally, reserved areas have been used to finance the USO. We do not consider them here, because they are no longer allowed in the framework of the Third Postal Directive.

The Third Postal Directive also imposes rules on accounting separation as a basis for the calculation of the USO net cost (Art. 14, Para. 2):

“The universal service provider(s) shall keep separate accounts within their internal accounting systems in order to clearly distinguish between each of the services and products which are part of the universal service and those which are not. This accounting separation shall be used as an input when Member States calculate the net cost of the universal service. Such internal accounting systems shall operate on the basis of consistently applied and objectively justifiable cost accounting principles.”

In the calculation of the USO net cost, according to Annex I of the Third Postal Directive, the profit level of the entire operator is relevant, not the profit of individual services. Our model shows that in general, in order to calculate the USO net cost, there may not be a necessity to distinguish between the services and products which are part of the universal service and those which are not. However, there is a need for another separation, namely between products or services which are affected by the USO and those which are not. There are two ways by which a non-USO product or service are potentially affected by the USO: First, there may be economies of scope between USO and non-USO products, such that e.g. with a USO, non-USO products are voluntarily offered in all markets  $r > r^*$ , which would not be profitable in the absence of the USO. Second, if there is a tax on all products, also non-USO products have to contribute to the funding of the USO.

It is apparent that there is an inherent difficulty in the calculation of the USO net cost due to non-observability: The competitor's profit  $\alpha$  is an “existing number” which is observable (at least by itself and its shareholders). The USP's profit  $\alpha + \beta + \gamma$  “exists” as well. Therefore, the difference between the two,  $\beta + \gamma$ , in principle can be calculated. However,  $\beta$  and  $\gamma$  are not observable separately and cannot be computed directly because they exist only in the counterfactual scenario without USO. We will return to this issue in the context of the approaches to the definition of an unfair burden discussed in the next section.

### **3. Approaches to the Notion of Unfair Burden**

With respect to the notion of an unfair burden, there are two fundamental but distinct questions to be answered:

**When** is there a burden? What is the criterion for implementing a compensation or cost sharing mechanism?

**What** is the appropriate compensation such that there is no remaining unfair burden?

The net transfer to compensate the USP is

$$C^m = \pi_i^m - \pi_i. \quad (14)$$

If the USO net cost and its financing are calculated sequentially, this net transfer does not take into account the financing mechanism. Hence, the relevant criterion for compensation is met ex ante (but not necessarily ex post), which helps answering the first question. If there is an integrated calculation of the net cost of the USO and its financing, the net transfer meets the relevant criterion ex post (but not necessarily ex ante), which answers the second question.

In the following, we discuss the four notions of unfairness outlined in the introduction. Both questions raised above will be considered separately. We will also discuss the necessity to have separated accounts between USO products and non-USP products as well as the incentives resulting from compensating the USP according to each of these criteria and the appropriate scope of appraisal, i.e. the definition of the operations which need to be taken into account in determining whether there is an unfair burden and its compensation.

Note that we apply the notions of (un-)fairness symmetrically. This implies that a situation with a net cost may represent an unfair burden, but that it may just as well represent an unfair advantage. In such a case, the resulting compensation may – in the case of a USO fund – debit the USP and credit its competitor. Such a result may seem unrealistic. However, the establishment of a USO fund can be interpreted as an insurance device: If a net cost represents an unfair burden, the USP is compensated; but if the USP's situation before compensation is considered to represent an unfair advantage over the competitor, the latter is compensated by the same rationale. Jaag (2011) discusses in detail why and under what circumstances the USO may constitute an unfair competitive advantage.

## **CRITERION 1: ABSOLUTE NET COST LEVEL**

**According to criterion 1, universal service provision imposes an unfair burden if it reduces the USP's profit compared to a situation without USO.**

This criterion matches the view taken by CERP (2008). However, in their view there is only an unfair burden if the net cost exceeds a certain threshold. Hence, if the net cost is negligible, its calculation and compensation should be avoided.<sup>20</sup>

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<sup>20</sup> CERP (2008) states: „If the reference scenario does not vary fundamentally from the scenario with USO the difference can be ignored. Then the cost of administrating a compensation mechanism probably would cost more than it would help the USP” (p. 20). It further argues that “If the

This criterion allows for a compensation of the net cost irrespective of the actual or hypothesized competitive situation in the postal sector.

### Criterion 1 - Ex ante perspective

Assuming that the USO net cost exceeds a certain threshold, from an ex ante perspective, the USP should receive a transfer such that its resulting profit is equal to its profit without USO. Hence, the necessary gross transfer  $T^m$  is to be set such that

$$\pi_i + T^m = \pi_i^{nUSO} \leftrightarrow T^m = -\gamma. \quad (15)$$

Superscript  $m$  indicates the source of the USO financing and whether the compensation is devised ex ante (*ea*) or ex post (*ep*).<sup>21</sup> If this transfer is financed by state funds, the USP's loss in the least attractive region is just offset by the transfer; the competitor's profit remains unchanged. If there is a pay or play mechanism, the transfer must be collected from the competitor with its profit as the relevant tax base:

$$\tau^{pop,ea} \alpha = -\gamma. \quad (16)$$

Hence, the tax rate in that scenario is

$$\tau^{pop,ea} = -\frac{\gamma}{\alpha}. \quad (17)$$

If there is a fund to which all operators contribute, the tax base is the sum of both operators' profits. Hence, the tax rate is determined by

$$\tau^{fund,ea} [2\alpha + \beta + \gamma] = -\gamma, \quad (18)$$

which results in

$$\tau^{fund,ea} = -\frac{\gamma}{2\alpha + \beta + \gamma}. \quad (19)$$

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current universal service provision exceeds the requirements of the USO, the designated USO doesn't carry a burden" (p. 20). This is certainly true, but in that case there is no net cost in the first place.

<sup>21</sup> In order to keep notation simple, in the following we suppress indices referring to the scenarios we discuss. These differ in two dimensions: The criterion by which the unfairness of a burden is assessed and whether that assessment is ex ante or ex post.

Of course, if the USP contributes to financing its own net cost, the criterion by which the unfairness of its burden is assessed may not be met from an ex post perspective.

### Criterion 1 - Ex post perspective

In order for the criterion to be met ex post, the USP's profit with and without universal service provision must be equal independently of the financing mechanism in place. Hence,

$$\pi_i^m = \pi_i^{nUSO}. \quad (20)$$

In the case of external financing, the resulting equilibrium matches the result obtained by setting the transfer ex ante. With a pay or play mechanism the tax rate is now determined as

$$\alpha + \beta + \gamma + \tau^{pop,ep} \alpha = \alpha + \beta \rightarrow \tau^{pop,ep} = -\frac{\gamma}{\alpha}. \quad (21)$$

Similarly, with a compensation fund in place the tax rate is calculated by

$$\begin{aligned} (1 - \tau^{fund,ep})[\alpha + \beta + \gamma] + \tau^{fund,ep}[2\alpha + \beta + \gamma] &= \alpha + \beta \\ \rightarrow \tau^{fund,ep} &= -\frac{\gamma}{\alpha}. \end{aligned} \quad (22)$$

### Discussion

Table 1 shows the operators' profit levels resulting from a compensation of the USO net cost according to criterion 1 with external financing, a pay or play mechanism and a USO fund with tax rates set ex ante and ex post, respectively. Note that with external funding, the joint profit of both operators equals  $2\alpha + \beta$ , which is also the joint profit without USO. If the USO net cost is financed within the sector, the joint profit is  $2\alpha + \beta + \gamma$ , irrespective of whether a fund or pay or play mechanism is in place. With a fund and from an ex ante perspective, the net cost  $-\gamma$  is shared among the operators according to their profit levels: the USP bears a fraction  $(\alpha + \beta + \gamma)/(2\alpha + \beta + \gamma)$  and the competitor bears a fraction  $\alpha/(2\alpha + \beta + \gamma)$ . From an ex post perspective, the "pay or play" and fund-based financing mechanisms are equivalent, as the net compensations received by the USP are the same by definition. Of course, as soon as the competitor's profit turns negative, the financing mechanism breaks down, as the competitor will not remain active in the market.<sup>22</sup>

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<sup>22</sup> Correctly, the profit levels reported in Tables 1 to 4 would have to have a lower bound at zero.

$m$	USP profit $\pi_i^m$	Competitor profit $\pi_e^m$
ext	$\alpha + \beta$	$\alpha$
pop ex ante	$\alpha + \beta$	$\alpha + \gamma$
fund ex ante	$\alpha + \beta + \frac{\gamma(\alpha + \beta + \gamma)}{2\alpha + \beta + \gamma}$	$\alpha + \frac{\gamma\alpha}{2\alpha + \beta + \gamma}$
pop ex post	$\alpha + \beta$	$\alpha + \gamma$
fund ex post	$\alpha + \beta$	$\alpha + \gamma$

**Table 1: Results for criterion 1 – absolute net cost level.**

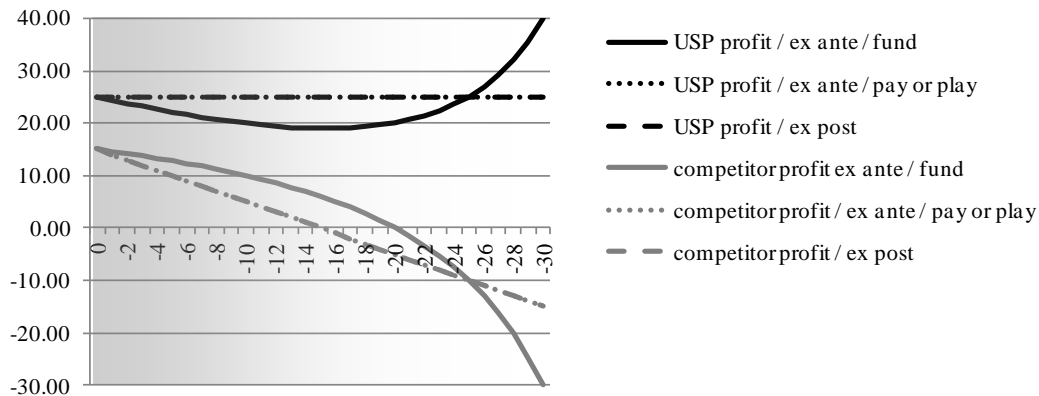
Figure 3 displays the distribution of profits between the USP and its competitor resulting from a compensation of the USO net cost according to criterion 1.<sup>23</sup> The horizontal axis shows the net cost ( $-\gamma$ ) ranging from 0 to 30.  $\alpha$  and  $\beta$  are kept constant such that overall profits in the market are decreasing in the net cost. Compensation by state funding is not displayed because it has a trivial effect on the operators' profits. If the net cost is compensated with a pay or play mechanism and correctly from an ex ante perspective, the resulting burden on the USP is always equal to zero. It is also fair ex post. If the USP is compensated by a fund to which both operators contribute such that the criterion is met ex ante, there are two effects involved. Firstly, The USP contributes according to its profit, which is declining in the USO net cost. Secondly, the competitor's profit and therefore also its contribution increases relative to the USP's. As the total tax base is decreasing in the net cost, this implies that the net transfer the USP receives from the competitor increases if the net cost is high.<sup>24</sup>

The shaded area in Figure 3 shows the range of net cost which represents an unfair burden from an ex ante perspective without compensation. Concretely, in the displayed example, the net cost is considered to represent an unfair burden for values of  $\gamma < 0$ , i.e. whenever there is a net cost.

<sup>23</sup> Parameter values are:  $\alpha = 15$ ,  $\beta = 10$ ,  $\gamma \in [0, -30]$ . The profit levels with external funding are not displayed as they are obviously constant in changes of  $\gamma$  (see Table 1). The range of  $\gamma$  allows for two outcomes in the USO case before compensation: If  $\gamma < -(\alpha + \beta)$ , the USP is able to make a positive economic profit without compensation. If  $\gamma \geq -(\alpha + \beta)$ , this is not the case. Our assumption on the regulatory framework in place allows for both cases.

<sup>24</sup> The effect that the USP's profit may be increasing in the USO net cost is due to the operators' profits (which decrease in the USO net cost) being the tax base for the USO fund. With a per-unit or turnover based tax, results may be different.





**Figure 3: Profits resulting from a net cost compensation according to criterion 1.**

With respect to the necessary data to determine a fair compensation, in our model, there is no need to separate between universal services (which are offered in all markets) and others, but between the unserved markets and the others in order to know the net cost  $-\gamma$ .

If compensated according to this criterion, the USP faces no incentives to minimize its net cost, i.e. to maximize efficiency in the provision of services only offered in the USO scenario. If there is a fund with ex ante defined contributions, the USP is even incentivized to increase the net cost, because it is overcompensated by its competitor.<sup>25</sup>

The relevant business units to consider are all operations which are affected by the USO: All processes and infrastructures which would be organized more efficiently without USO and all products which would be sold at a different price or at a different volume without USO. This scope of appraisal has to be defined for the calculation of the net cost of the USO. However, it is not needed to determine whether the net cost constitutes an unfair burden.

## CRITERION 2: ABSOLUTE PROFIT LEVEL

**According to criterion 2, universal service provision imposes an unfair burden if the USP's economic profit is negative.<sup>26</sup>**

Hence, universal services should not be offered at a loss. The implicit normative reference behind this criterion could be the assumption that competition in fully

<sup>25</sup> If contributions were not on a profit basis but per piece or by turnover, this effect would be even stronger, as it would also degrade the entrant's optimum market coverage.

<sup>26</sup> The zero-profit criterion does not represent a loss of generality. The USP's targeted profit could be set to any amount.

liberalized postal markets results in zero profits of all operators in the absence of a universal service obligation. In this context Boldron et al. (2009) rely on the concept of “inequity” and argue: “The burden is unfair if the USP’s market power is not sufficient to counterbalance the weight of the USO to maintain a reasonable profit” (p. 68). This approach is close to the interpretation of an unfair burden by De Donder et al. (2010) who define it as the inability to support the USO financially. Criterion 2 is also related to the mentioning of a “reasonable profit” in Annex I of the Third Postal Directive:

“The calculation shall take into account all other relevant elements, including any intangible and market benefits which accrue to a postal service provider designated to provide universal service, the entitlement to a reasonable profit and incentives for cost efficiency.”

Criterion 2 has already been applied in the telecommunications sector: In a recent judgment the EU Court of Justice defines an unfair burden as

“(..) a burden which, for each undertaking concerned, is excessive in view of the undertaking’s ability to bear it, account being taken of all the undertaking’s own characteristics, in particular the quality of its equipment, its economic and financial situation and its market share.”<sup>27,28</sup>

## **Criterion 2 – Ex ante perspective<sup>29</sup>**

From an ex ante perspective, the gross transfer  $T^m$ , which is necessary for the USP to break even, is calculated as:

$$\pi_i + T^m = 0 \leftrightarrow T^m = -(\alpha + \beta + \gamma). \quad (23)$$

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<sup>27</sup> Judgment of the EU Court of Justice of 6 October 2010 on case C-222/08.

<sup>28</sup> In the telecommunications sector, many countries consider the net cost not to be an unfair burden as long as the USP’s market share remains above 80%, possibly in addition to other criteria. These countries include Austria, Bulgaria, Croatia, Lithuania and Portugal (see Anacom, 2011).

<sup>29</sup> In order to simplify notation, we again suppress indices for the relevant criterion and the (ex post or ex ante) perspective.

If this transfer is financed by state funds, the USP's overall loss or profit is just offset by the transfer (which may well be negative).<sup>30</sup> If there is a pay or play mechanism, the transfer must be collected from the competitor with its profit representing the relevant tax base:

$$\tau^{pop,ea} \alpha = -(\alpha + \beta + \gamma) \rightarrow \tau^{pop,ea} = -\frac{\alpha + \beta + \gamma}{\alpha}. \quad (24)$$

If everyone contributes to the fund, the tax base is enlarged by the USO's own profit, such that:

$$\tau^{fund,ea} [2\alpha + \beta + \gamma] = -(\alpha + \beta + \gamma) \rightarrow \tau^{fund,ea} = -\frac{\alpha + \beta + \gamma}{2\alpha + \beta + \gamma}. \quad (25)$$

## Criterion 2 – Ex post perspective

From an ex post perspective, the USP is supposed to just break even,

$$\pi_i^m = 0. \quad (26)$$

In the case of external financing, the resulting equilibrium matches the result obtained by setting the transfer ex ante. With a pay or play mechanism the tax rate is determined as

$$\alpha + \beta + \gamma + \tau^{pop,ep} \alpha = 0 \rightarrow \tau^{pop,ep} = -\frac{\alpha + \beta + \gamma}{\alpha}. \quad (27)$$

With a compensation fund it is

$$\begin{aligned} (1 - \tau^{fund,ep})[\alpha + \beta + \gamma] + \tau^{fund,ep} [2\alpha + \beta + \gamma] &= 0 \\ \rightarrow \tau^{fund,ep} &= -\frac{\alpha + \beta + \gamma}{\alpha}. \end{aligned} \quad (28)$$

Note that as long as  $\alpha + \beta + \gamma > 0$ , tax rates are negative which implies that the competitor's profit increases by “financing” the USO.

## Discussion

Table 2 shows the operators' profit levels resulting from a compensation of the USO net cost according to criterion 2.

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<sup>30</sup> Note that in our model context, this implies that there may not only be an unfair burden, but possibly also an unfair profit which is treated symmetrically.

$m$	USP profit $\pi_i^m$	Competitor profit $\pi_e^m$
ext	0	$\alpha$
pop ex ante	0	$2\alpha + \beta + \gamma$
fund ex ante	$\frac{(\alpha + \beta + \gamma)^2}{2\alpha + \beta + \gamma}$	$\alpha + \frac{\alpha(\alpha + \beta + \gamma)}{2\alpha + \beta + \gamma}$
pop ex post	0	$2\alpha + \beta + \gamma$
fund ex post	0	$2\alpha + \beta + \gamma$

**Table 2: Results for criterion 2 – absolute profit level.**

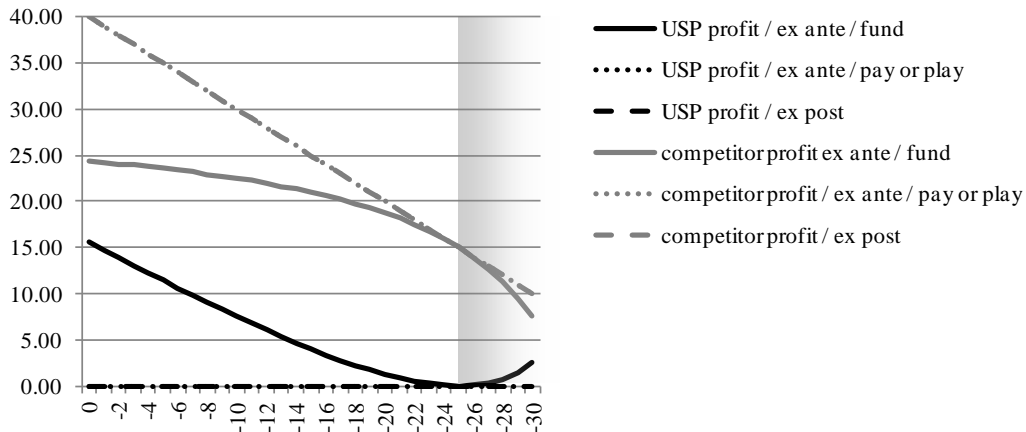
Figure 4 shows the distribution of profits between the USP and its competitor resulting from a compensation of the USO net cost according to criterion 2.<sup>31</sup> Because the USP's profit is set to zero from an ex ante perspective, the entire industry profit accrues to the competitor. It is declining in the level of the USO net cost. In the case that the USP is compensated by a fund to which both operators contribute such that the criterion is met ex ante, the tax rate is negative if  $\alpha + \beta + \gamma > 0$ . Then, ex post, the USP retains part of its profit from the competitive and the monopolistic regions. If the net cost exceeds the profit in these two regions, the tax rate becomes positive which implies that the USP is a net receiver of transfers and that it profits from an increase in the net cost.

The shaded area in Figure 4 shows the range of net cost which represents an unfair burden from an ex ante perspective. Concretely, the net cost is considered to represent an unfair burden if  $\alpha + \beta + \gamma < 0$ , i.e. if the USP is not able to break even without compensation.<sup>32</sup>

If the USP's compensation equals the burden calculated according to this approach, there is no need to compute the USO net cost in the first place: Note that in Table 2 it suffices to know  $\alpha$  and  $(\alpha + \beta + \gamma)$ . The net cost  $-\gamma$  needs not to be known separately.

<sup>31</sup> Again, parameter values are:  $\alpha = 15$ ,  $\beta = 10$ , and on the horizontal axis  $\gamma \in [0, -30]$ . The profit levels with external funding are not displayed as they are obviously constant in changes of  $\gamma$  (see Table 2).

<sup>32</sup> By symmetric application of our fairness criterion, a situation in which  $\alpha + \beta + \gamma > 0$  is considered to be unfair, too, because the USP is able to make a positive economic profit. Then, as an alternative to transferring the total market profit to the competitor, the USP's prices may be regulated in order to reduce profits to zero.



**Figure 4: Profits resulting from a net cost compensation according to criterion 2.**

Even though the USP is supposed to break even, it makes a profit in the scenario in which it contributes to a fund and the contribution is determined ex ante. The reason is that the USP's contribution to the fund is not considered when the tax rate is determined. For low values of the USO net cost, the USP's profit before contributing to the fund is positive, and consequently the tax rate – which is set ex ante such that the USP just breaks even – is negative. For high values of the USO net cost, the USP's profit before contributing to the fund is negative, while the tax rate is positive. Hence, the USP is overcompensated because, again, because its (negative) contribution is not taken into account in the determination of the tax rate.

We have so far assumed that the entire operator's profit is regulated to zero profit. Alternative scopes of the USP's operations that are regulated to just break even may be the provision of individual products within the scope of universal services; the provision of universal services as a whole; or the business unit providing universal services.

Similarly to the situation with criterion 1, there is no need to have separated accounts between USO and non-USO products in this setting. There is not even a need to know the net cost because it is just the profit of the relevant business unit which is the basis for the evaluation whether the USO creates (or perpetuates) an unfair situation.

As to the incentives resulting from this notion of fairness, the choice of the relevant business unit very much affects the USP's incentives to minimize cost associated with the operations relevant in the zero-profit regulation resulting from this criterion: The broader the scope of the relevant business unit is, the more widespread are the disincentives resulting from the implicit rate of return regulation.

### CRITERION 3: ABSOLUTE DIFFERENCE TO THE COMPETITOR'S PROFIT LEVEL

**According to criterion 3, universal service provision imposes an unfair burden if the USP's profit is lower than its competitor's.**

Hence, the USP should not be worse off than its competitor. Compared to the two first criteria, criterion 3 takes into account the relative position of both operators against each other. Compensation then results in a leveling of profit differences between operators.

#### Criterion 3 – Ex ante perspective

From an ex ante perspective, the gross transfer  $T^m$  which is necessary for the USP's profit to equal its competitor's is calculated as:

$$\pi_i + T^m = \pi_e \leftrightarrow T^m = -(\beta + \gamma). \quad (29)$$

If this transfer is financed by state funds, the difference in the operators' profits is just offset by the transfer; again, the competitor's profit remains unchanged. In case there is a pay or play mechanism, the transfer must be collected from the competitor with its profit being the relevant tax base:

$$\tau^{pop,ea} \alpha = -(\beta + \gamma) \rightarrow \tau^{pop,ea} = -\frac{\beta + \gamma}{\alpha}. \quad (30)$$

If everyone contributes to the fund, the tax base is the total of the two operators' profits, such that:

$$\tau^{fund,ea} [2\alpha + \beta + \gamma] = -(\beta + \gamma) \rightarrow \tau^{fund,ea} = -\frac{\beta + \gamma}{2\alpha + \beta + \gamma}. \quad (31)$$

#### Criterion 3 – Ex post perspective

From an ex post perspective, the USP's profit is supposed to equal its competitor's,

$$\pi_i^m = \pi_e^m. \quad (32)$$

In the case of external financing, the resulting equilibrium matches the result obtained by setting the transfer ex ante. With a pay or play mechanism the tax rate is determined as

$$\alpha + \beta + \gamma + \tau^{pop,ep} \alpha = (1 - \tau^{pop,ep}) \alpha \rightarrow \tau^{pop,ep} = -\frac{\beta + \gamma}{2\alpha}. \quad (33)$$

With a compensation fund it is

$$(1 - \tau^{fund,ep})[\alpha + \beta + \gamma] + \tau^{fund,ep}[2\alpha + \beta + \gamma] = (1 - \tau^{pop,ep})\alpha$$

$$\rightarrow \tau^{fund,ep} = -\frac{\beta + \gamma}{2\alpha}. \quad (34)$$

## Discussion

Table 3 shows the operators' profit levels resulting from a compensation of the USO net cost according to criterion 3.

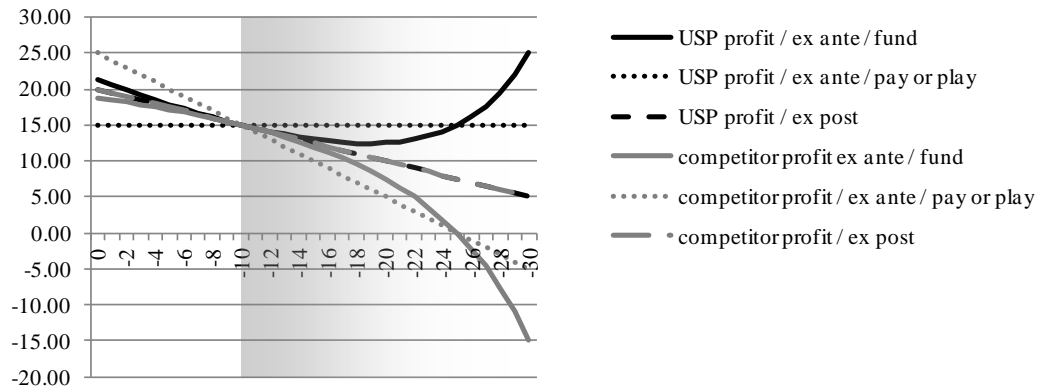
$m$	USP profit $\pi_i^m$	Competitor profit $\pi_e^m$
ext	$\alpha$	$\alpha$
pop ex ante	$\alpha$	$\alpha + \beta + \gamma$
fund ex ante	$\alpha + \frac{(\beta + \gamma)(\alpha + \beta + \gamma)}{2\alpha + \beta + \gamma}$	$\alpha + \frac{\alpha(\beta + \gamma)}{2\alpha + \beta + \gamma}$
pop ex post	$\alpha + 0.5(\beta + \gamma)$	$\alpha + 0.5(\beta + \gamma)$
fund ex post	$\alpha + 0.5(\beta + \gamma)$	$\alpha + 0.5(\beta + \gamma)$

**Table 3: Results for criterion 3 – absolute difference in profit levels.**

Figure 5 shows the distribution of profits between the USP and its competitor resulting from a compensation of the USO net cost according to criterion 3.<sup>33</sup> From an ex ante perspective with a pay or play mechanism, as the USP's profit is fixed, increases in the net cost are fully borne by the competitor. The effects of a fund are the same as discussed under criterion 1. If the compensation is calculated from an ex post perspective, the burden resulting from the net cost of the USO is evenly distributed among the two operators.

The shaded area in Figure 5 shows the range of net cost which represents an unfair burden from an ex ante perspective without compensation. Concretely, the net cost is considered an unfair burden if  $\alpha + \beta + \gamma < \alpha$  because in this situation the USP's profit is lower than the competitor's. Consequently and by symmetry, also all situations  $\alpha + \beta + \gamma > \alpha$  have to be considered unfair ("unfair advantage"), because in these cases the USP's profit is higher than the competitor's. In Figure 5, this is the case for  $\gamma \in [0, -10[$ .

<sup>33</sup> Again, parameter values are:  $\alpha = 15$ ,  $\beta = 10$ , and on the horizontal axis  $\gamma \in [0, -30]$ . The profit levels with external funding are not displayed as they are obviously constant in changes of  $\gamma$  (see Table 3).



**Figure 5: Profits resulting from a net cost compensation according to criterion 3.**

In analogy to criterion 1, this criterion necessitates the calculation of the net cost of the USO, but there is no need to keep separate accounts for USO products.

If the compensation of the USO net cost is implemented according to this criterion, the incentive problem associated with the first two criteria discussed is now extended to the USP's competitor because the compensation is contingent on its profit as well.

In real postal markets, profit differences between operators are possibly due to asymmetric competition as a result of differences in reputation or asymmetric cost structures, asymmetric strategic behavior related to the dynamics of their entry decisions or asymmetric management capabilities. Hence, applying this criterion potentially extends far beyond compensation for a burden resulting from universal service provision.

Under this criterion, the definition of the relevant business unit is especially important, but also very difficult because the USP's profit needs to be compared to the competitor's which may be organized differently. Therefore, a sensible application of this criterion necessitates detailed knowledge of USP's and the competitor's organization and processes.

#### **CRITERION 4: RELATIVE DIFFERENCE TO THE COMPETITOR'S PROFIT LEVEL**

**According to criterion 4, universal service provision imposes an unfair burden if it reduces the USP's profit compared to a situation without USO by more than the competitor's profit is reduced due to its contribution to USO funding.**

Hence, the USP should not be worse off by more than its competitors due to its universal service provision.



#### Criterion 4 – Ex ante perspective

From an ex ante perspective, the competitor's profit is unaffected by the USO. Hence, the gross transfer  $T^m$ , which is necessary for the USP's profit difference compared to a situation without USO to be zero, is calculated as:

$$\pi_i + T^m = \pi_i^{nUSO}. \quad (35)$$

Note that this is the same condition as under criterion 1.

#### Criterion 4 – Ex post perspective

From an ex post perspective, the USP's profit without and with USO (including compensation) is supposed to equal the difference in its competitor's profit.

**Criterion 4a:** The absolute difference in profit levels is supposed to be the same:

$$\pi_i^{nUSO} - \pi_i^m = \pi_e^{nUSO} - \pi_e^m \quad (36)$$

With a pay or play mechanism the tax rate is determined as:

$$\begin{aligned} [\alpha + \beta] - [\alpha + \beta + \gamma + \tau^{pop,ep} \alpha] &= [\alpha] - [(1 - \tau^{pop,ep}) \alpha] \\ \rightarrow \tau^{pop,ep} &= -\frac{\gamma}{2\alpha}. \end{aligned} \quad (37)$$

With a compensation fund it is

$$\begin{aligned} [\alpha + \beta] - [(1 - \tau^{fund,ep})(\alpha + \beta + \gamma) + \tau^{fund,ep}(2\alpha + \beta + \gamma)] \\ = [\alpha] - [(1 - \tau^{fund,ep}) \alpha] \\ \rightarrow \tau^{fund,ep} &= -\frac{\gamma}{2\alpha}. \end{aligned} \quad (38)$$

**Criterion 4b:** The percentage difference in profit levels is to be the same:

$$\frac{\pi_i^{nUSO}}{\pi_i^m} = \frac{\pi_e^{nUSO}}{\pi_e^m}. \quad (39)$$

With a pay or play mechanism the tax rate is determined as:

$$\frac{\alpha + \beta}{\alpha + \beta + \gamma + \tau^{pop,ep} \alpha} = \frac{\alpha}{(1 - \tau^{pop,ep}) \alpha} \rightarrow \tau^{pop,ep} = -\frac{\gamma}{2\alpha + \beta}. \quad (40)$$

With a compensation fund it is

$$\frac{\alpha + \beta}{(1 - \tau^{fund,ep})(\alpha + \beta + \gamma) + \tau^{fund,ep}(2\alpha + \beta + \gamma)} = \frac{\alpha}{(1 - \tau^{fund,ep})\alpha}$$

$$\rightarrow \tau^{fund,ep} = -\frac{\gamma}{2\alpha + \beta}. \quad (41)$$

## Discussion

Table 4 shows the operators' profit levels resulting from a compensation of the USO net cost according to criteria 4a and 4b.

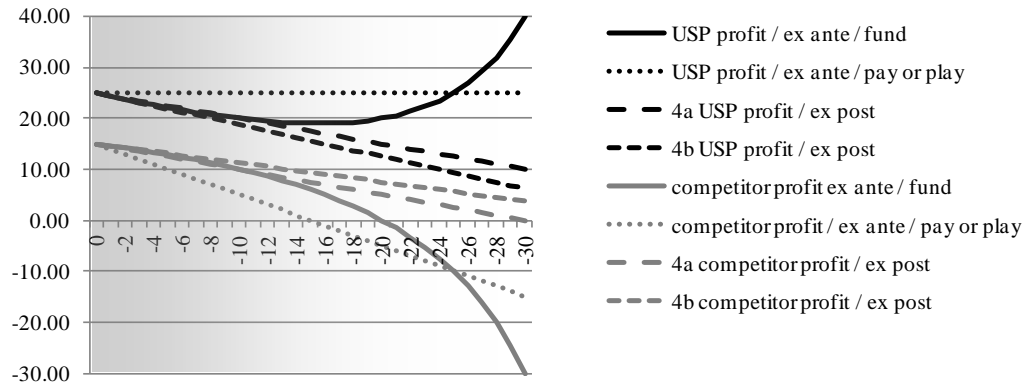
<i>m</i>	USP profit $\pi_i^m$	Competitor profit $\pi_e^m$
ext	$\alpha + \beta$	$\alpha$
pop ex ante	$\alpha + \beta$	$\alpha + \gamma$
fund ex ante	$\alpha + \beta + \frac{\gamma(\alpha + \beta + \gamma)}{2\alpha + \beta + \gamma}$	$\alpha + \frac{\gamma\alpha}{2\alpha + \beta + \gamma}$
a) pop ex post	$\alpha + \beta + 0.5\gamma$	$\alpha + 0.5\gamma$
a) fund ex post	$\alpha + \beta + 0.5\gamma$	$\alpha + 0.5\gamma$
b) pop ex post	$\alpha + \beta + \gamma - \frac{\alpha\gamma}{2\alpha + \beta}$	$\alpha + \frac{\alpha\gamma}{2\alpha + \beta}$
b) fund ex post	$\alpha + \beta + \gamma - \frac{\alpha\gamma}{2\alpha + \beta}$	$\alpha + \frac{\alpha\gamma}{2\alpha + \beta}$

**Table 4: Results for criterion 4 – relative difference in profit levels.**

Figure 6 shows the distribution of profits between the USP and its competitor resulting from a compensation of the USO net cost according to criterion 4.<sup>34</sup> From an ex ante perspective and with a pay or play mechanism, the USO net cost is fully borne by the competitor. With a compensation fund designed from an ex post perspective, the USP shares the burden and it bears more if the percentage difference in profits is the relevant measure due to its profits being higher than the competitor's in a range of low net cost. The higher the net cost is, the closer the two profit levels become after compensation.

The shaded area in Figure 6 shows the range of net cost which represents an unfair burden from an ex ante perspective without compensation. Concretely, the net cost is considered an unfair burden for all values of  $\gamma < 0$  because it is only the USP that bears the net cost, while the competitor's profit is unaffected as long as it does not contribute to the financing of the USO. Hence, from an ex ante perspective, any positive net cost represents an unfair burden.

<sup>34</sup> Again, parameter values are:  $\alpha = 15$ ,  $\beta = 10$ , and on the horizontal axis  $\gamma \in [0, -30]$ . The profit levels with external funding are not displayed as they are obviously constant in changes of  $\gamma$  (see Table 4).



**Figure 6: Profits resulting from a net cost compensation according to criterion 4.**

Applying criterion 4 to determine whether the USO net cost constitutes an unfair burden is especially challenging because not only the USP's profit change needs to be assessed, but also the competitor's. Again, there is no need to have separate accounts between those products which are affected by the USO and those which are not. Because it is the changes in profits (not absolute profit levels) which determine whether there is an unfair burden, disincentives are similar to the application of criterion 1. With respect to the relevant business units, this criterion is similar to criterion 3: If operators are organized differently, it is difficult to assess and compare changes in their profit levels.

#### 4. Price Regulation

So far, we have assumed that there is no profit regulation other than the one implied in the compensation criteria (Assumption 5). We now abandon this assumption by allowing for regulated prices. Specifically, price regulation is not part of the USO but applies also in the non-USO scenario, e.g. based on competition law or sector-specific regulation. For simplicity, we assume that price regulation is such that both operators just break even. This breakeven constraint on the operators' pricing is applied before other compensation mechanisms may be employed.<sup>35</sup>

In the following we discuss the implications of such an assumption on the regulatory environment for the results derived in the previous section. With price

<sup>35</sup> Alternatively, price regulation could be assumed to be part of the USO. The implications would be straightforward: The ex ante net cost of the USO would then also consist of profit changes in the competitive and monopolistic regions. The discussion in section 3 would apply with the limitation that  $\pi_i = 0$  if according prices are supported by the market. All four criteria are independent and the condition in criterion 2 is met automatically.

regulation, economic profits in the three regions are no longer constant. Depending on the market conditions, the net cost may be zero or positive:

If the market supports prices such that the USP's and the competitor's profits are zero in both scenarios with and without USO, the resulting ex ante net cost is zero by definition. This implies that all four criteria coincide and neither of the two operators makes a profit. If the competitor's price is not regulated, criterion 1 (absolute net cost level) and criterion 2 (absolute profit level) coincide and there is no compensation because these criteria are independent of the competitor's profit. Additional compensation in excess of allowed price adjustments is needed according to criterion 3 (absolute difference to competitor's profit level). The condition in Criterion 4 (relative difference to competitor's profit level) is trivially met because neither of the two operators bear a burden.<sup>36</sup>

If the market supports regulated prices such that the operators break even without USO but the USP incurs a loss with USO, criteria 1 and 2 coincide again. If there is a competitor in both scenarios, from an ex ante perspective, criterion 3 also coincides with criteria 1 and 2 because all three equitable benchmarks are equal to zero. From an ex post perspective, criterion 3 can be applied as discussed in Section 3. Applying criterion 4, the sub-cases 4a and 4b coincide because both the USP's and the competitor's profits are equal to zero without USO. If the competitor's price is not regulated, criteria 3, 4a and 4b can be applied as discussed in Section 3. The according results do not coincide because the two operators' profits are different in the non-USO scenario.

## **5. Conclusion**

In this paper we have discussed four different criteria by which the (un-)fairness of a burden could be assessed and by which the appropriateness and the level of compensation may be determined. The four criteria differ by the relevant equitable benchmark: The first criterion sets the USP's profit in relation to its profit without universal service provision. The second criterion considers the USP's absolute profit level. The third criterion compares the USP's profit to its competitor's. The fourth criterion compares changes in the USP's and a competitor's profits due to the USO.

Based on a stylized theoretical model with endogenous market entry and coverage, we have demonstrated the impact of these four criteria concerning the "unfairness" of the burden represented by the USO net cost on the distribution of

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<sup>36</sup> If the market did not support prices such that the USP's profit is zero in either of the scenarios with and without USO, no competitor would enter the market and criteria 3 and 4 become meaningless. Since also the USP would not be active in the market without USO, criteria 1 and 2 coincide and can be applied as discussed in Section 3 with the limitation that only external funds are available.

profits among the operators. This analysis hints at potential unintended consequences of implementing a compensation or cost sharing mechanism.

Table 5 summarizes the information requirements, i.e. whether it is necessary to have separated accounts between USO products and non-USP products, the incentives resulting from compensating the USP and aspects of the definition of the operations which need to be taken into account in determining whether there is an unfair burden and the appropriate compensation.

Criterion	Information Requirement	Effect on Incentives	Definition of Relevant Business Units
1	Need to have separate accounts between those products which are affected by the USO and those which are not	Disincentives limited to products which are affected by the USO	Only necessary for calculation of the net cost; not to determine whether there is an unfair burden
2	No need to calculate the net cost; no accounting separation needed	Implicit rate of return regulation for all products; strong disincentives to realize efficiency gains	Determines scope of rate of return regulation
3	Need to have separate accounts between those products which are affected by the USO and those which are not	Disincentives are aggravated because implicit rate of return regulation is extended to the competitor	Potential asymmetries between operators make application of fairness criterion extremely difficult
4	Need to have separate accounts between those products which are affected by the USO and those which are not	Disincentives limited to products which are affected by the USO	Potential asymmetries between operators make application of fairness criterion extremely difficult

**Table 5: Comparison of fairness criteria.**

The choice of a criterion is to be based on equity rather than on efficiency considerations.<sup>37</sup> In general, each of the criteria results in a different distribution of profits. The choice of one among the others is therefore to be oriented on the goals to be reached by the compensation. It also depends on the available financing mechanism: If the net cost is compensated with external funds, criterion 2 is probably the most realistic one because tax payers would not accept financing a profitable USP. If competitors have to contribute to the funding of the USO, changes in their profit should be considered, too. Therefore, criterion 4 should be applied: It

<sup>37</sup> In general, the choice of the fairness criterion also yields efficiency effects (see e.g. Jaag et al., 2009). However, in the model used in this paper, there are no allocative effects of the compensation mechanism and hence efficiency is not an issue.

is closest to the concept of reciprocity which empirical evidence shows to be an important motive in social behavior.

Sequentially calculating the net cost of the USO, determining whether there is an unfair burden and then finding a financing mechanism generally (and from an ex post perspective) does not result in the distribution of profits sought after. Specifically, the implementation of a compensation fund results in a systematic undercompensation of the USP in almost all regimes. Hence, an integrated approach is necessary to cope with this issue. This implies that distributive outcomes are assessed ex post. Our analysis also suggests that price regulation strongly interacts with the compensation of the USO net cost: With price regulation some of the criteria discussed reduce to a single criterion.

There are important incentive issues associated with the compensation problem. In principle, they can be dealt with the same way as in incentive-compatible price-cap regulation: By determining the amount of compensation ex ante for a number of years and thereby restoring the operators as residual claimants of their efforts to be efficient.

Our analysis is based on a very stylized model. Multiple USO dimensions, asymmetries in the operators' technology or specific customer preferences towards one of the operators are not considered. Neither are alternative bases for contributions of operators to a USO fund. These would not only yield distributional effects but also affect the equilibrium allocation in the postal sector. The consideration of such issues as well as an implementation of such models when determining the appropriate compensation of unfair burdens in real markets is left to future research.

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