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Should Publicly Funded Postal Services be Reduced? A Cost-Benefit Analysis of the Universal Service Obligation in Norway

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Abstract

We conduct, to our knowledge, the first cost-benefit analysis of the universal service obligation (USO) in the postal sector. Three alternatives are analysed that reduce delivery frequency and/or delivery speed, with particular emphasis on quantifying the potential loss of consumer benefits. Social cost savings are analysed for the service provider, for the environment and for the government through lower levels of distortionary taxes. Although there are challenges involved in measuring the net welfare change, especially loss in consumer benefits, our results suggest that only the largest reduction in the USO may be justified on social efficiency grounds.

KEYWORDS: post, universal service, cost-benefit analysis, contingent valuation

1. Introduction

Due to trends like urbanization, market liberalization and electronic communication, and the current urgency of fiscal austerity in Western countries, the desirability of maintaining the level of the universal service obligation (USO) in the postal sector is increasingly being questioned (Cremer et al., 2008). The USO involves an obligation to supply postal services at a determined delivery frequency and speed at an affordable price across the service area (usually a country). The universal service, traditionally provided by a monopolistic public or regulated operator, has been justified by network externalities, redistributive and regional policy objectives and the provision of an important public good (e.g. Cremer et al., 2001). While the need for monopoly protection has been criticized for many years, the rationale for the USO has until recently remained relatively unchallenged by regulators (Cremer et al., 2008).

It is likely that the USO still provides substantial social benefits in many countries (The Urban Institute, 2010), but are the benefits of the current level of the USO higher than its costs? What is the optimal social trade-off between service levels and costs? Several country governments and regulators are currently grappling with these questions. The literature has studied a range of issues of relevance to the postal market, especially optimal regulation, liberalization and competition, and estimation of cost and public financing of the USO (see e.g. Calzada, 2009, Crew and Kleindorfer, 1998, Panzar, 2000, Rodriguez and Storer, 2000 and the recent special issue of Review of Network Economics 10(3), 2011). However, comparatively little attention has been paid to estimating benefits and costs of universal postal services to their users to better evaluate the effectiveness and viability of current USO policies. In practice, the most relevant issue facing regulators and policy-makers is not to abandon the USO altogether but to consider gradual changes (reductions) in the level and quality of services. Recently, several papers point to the importance of more research related to this question, especially quantification of the (loss of) consumer benefits (see e.g. Cremer et al., 2008, Swinand and Jones, 2006, The Urban Institute, 2010).

The aim of this paper is to estimate and compare the changes in economic benefits and costs of three alternatives currently discussed to reduce the delivery frequency and/or delivery speed requirements of the USO in the postal sector in Norway. The analysis is based on a study commissioned by the Norwegian Post and Telecommunications Authority (NPTA) (Pöyry and Vista Analysis, 2011). To estimate the potential reduction in social benefits among households we use a large, nationally representative contingent valuation (CV) web survey utilizing a national probability-based web panel of willing respondents. A smaller telephone survey of small and medium sized enterprises is also included. The CV method

was originally developed to derive willingness to pay (WTP) estimates to determine the socially optimal provision of unpriced, non-market environmental public goods (Arrow et al., 1993, Mitchell and Carson, 1989). However, CV and its methodological cousin in the stated preference family, choice modeling (CM) (with its roots in market research and transport choice analysis), are increasingly being used to quantify the social benefits of other government-provided public and quasi-public goods and services, such as for example public service broadcasting (Delaney and O'Toole, 2004), public libraries (Aabo and Strand, 2004) and water services (Echenique and Seshagiri, 2009).

In the postal and network economics literature such stated preference applications are still rare. Marketing studies have looked at consumers' preferences for service quality and attributes, also in the postal sector, but these studies have rarely been designed to quantitatively measure service values to inform cost-benefit analysis (CBA). Reay (2002) reviews a few of the early marketing studies.[1] Four recent studies have qualitatively discussed or attempted to quantify the social benefits of postal services, in light of the current public debate about the claimed need to downscale the USO in several countries. In the UK, NERA (2009) investigates the social value of the post office network and NERA and RAND (2003) the value of the rural post office branches. In the US, the Urban Institute (2010) developed a framework for analyzing the social value of postal services, but does not actually conduct a stated preference study (though they recommend this as a next step).

Most recently, the European Commission funded a study investigating methodologies to better measure consumer preferences for postal services, where the main aim was to monetize consumer benefits (Rand Europe, 2011). Although stated preference methods may be a useful tool to quantify social benefits, there are also several challenges involved in their application. We discuss the most important ones of potential relevance beyond the postal sector to other publically provided network and related services.

For comparison with the economic benefits, we estimate the cost implications for the Norwegian postal service provider ("Norway Post" – NP) using their own cost model. Further, we explicitly quantify potentially lower transport-related environmental externality costs that are not already internalized (e.g. through levies on transport fuels paid by the NP). Finally, we quantify the costs of public funds from raising tax revenues for compensation of the USO. To our knowledge, this is the first CBA of changes in the postal USO in any country.

The paper is structured as follows. In the next section we briefly present the basic theory of costs and benefits of postal services and explain the components that will be quantified. Section two first gives a brief description of

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[1] Swinand and Jones (2006) use an alternative revealed preference (hedonic pricing) approach to estimate the WTP for quality of service in post.

the current USO requirements and the alternative service levels for analysis. The Norwegian postal market nicely illustrates typical postal market dilemmas: particularly high transport and distribution costs and high environmental impacts due to long travel distances and scarcely populated areas. Further, the methods used to quantify both costs and benefits and the underlying assumptions are explained in detail. Section four then goes through the results, compares costs and benefits and investigates the sensitivity of the results and the derived decision rule. Although there are challenges involved in measuring the net welfare change, especially the loss in consumer benefits, we find that just one of the proposed reductions in the USO may be justified on social efficiency grounds. Section 5 concludes.

2. Theoretical framework

2.1 Cost-benefit analysis and the decision rule

The cost-benefit framework implies ranking policy options from an economic point of view, taking account of both benefits and costs of the policy to society. In the case of postal services both the benefits and costs depend most importantly on the quality of the service (such as delivery frequency and speed etc.) and quantity consumed (see e.g. Crew and Kleindorfer, 2002). As pointed out by for example Boadway (2006) the decision rule in an intertemporal context is the present value criterion implying that the policy-maker should set a quality level of the USO that maximizes the present value of the future stream of net benefits of the obligation, as given in equation (1):

$$(1) \qquad Max_s \, W =: \left\{ \sum_{t=1}^{T} \left(\frac{B_t(s,q) - C_t(s,q)}{(1+r)^t} \right) \right\}$$

where r is the social discount rate, s is a vector of different quality parameters of the service obligation, q defines the quantity of postal services consumed and T the time period of the policy. Assuming that the social benefit function B_t is concave and the social cost function C_t is convex in both its arguments, the first-best optimal choice is the service level at which the marginal social benefits are equal to the marginal social costs. This assumes equal welfare weights across the population. In our case and in most practical policy contexts relatively small changes from the current (and usually sub-optimal) policy situation is the norm. The changes in the USO considered in the Norwegian case include three alternative small (but non-marginal) changes to the delivery frequency and/or delivery speed requirements of the USO. Hence, the welfare

change (ΔW_i) from the current situation for a given USO alternative *i*, can be expressed as (where the time dimension now is suppressed for convenience):

(2) $\qquad\qquad \Delta W_i = \Delta B_i - \Delta C_i$

Alternative *i* is preferred on economic efficiency grounds invoking the Kaldor-Hicks compensation principle, if and only if $\Delta W_i > 0$. Note that for the alternatives considered both costs and benefits are generally expected to be reduced. When evaluating the three alternative service levels *i, j* and *k*, they can be ranked in descending order by the size of welfare increase.

2.2 Reduced benefits and willingness to pay (WTP)

The USO in the postal sector is generally seen as an important public good for many reasons. The existence of a functioning postal network that "binds the nation together" is important for a working democracy and it is by many considered unethical to exclude anyone from essential communication services (Cremer et al., 1998). A recent study from the US divides the types of benefits into eight categories: consumer, business, safety and security, environmental, delivery of other governmental services, information exchange, social linkage and civil pride and patriotism (The Urban Institute, 2010). A significant share of the likely benefits may stem from the mere existence of a functioning network, independently e.g. of the extent of use of the service level itself. The positive preferences people may hold for public goods they do not themselves intend to use is sometimes termed non-use or existence value in the literature (Freeman, 2003). There is also the option value related to potential future use.

The social value of the total stream of benefits can be defined and captured by the beneficiaries' willingness to pay (WTP) for the USO services. Building on Reay (2002) and Crew and Kleindorfer (1992), let *q(P,s)* be the demand for the service at a price *P* and service quality level *s*. *q(P,s)* is the solution to the optimization problem *[V(q, s) – Pq]*, where *V(.)* is assumed concave or linear in both *q* and *s*. For a constant posted volume, *q*, the function *V(q,s)* represents the WTP for different levels of service quality. Expanding this framework slightly and applying it to a change in the service level *s* from the reference state-of-the-world *(R)* to some target state *(T)* with an alternative (lower) USO level, WTP may be defined by:[2]

(3) $\qquad V_j\left(P_j^R, Y_j - WTP; q_j^R, s_j^R, SUB_j^R, H_j, I_j\right) = V_j\left(P_j^T, Y_j; q_j^T, s_j^T, SUB_j^T, H_j, I_j\right)$

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[2] Adapted from Bergstrom and Taylor (2006).

Y_j is household income of individual j, SUB_j is a measure of substitutes for the postal services, H_j is non-income characteristics of individual j's household, I_j a measure of information available to individual j[3], and q, s and P as defined above. Solving this equation for WTP (which is identical to the change in benefits from equation (1), ΔB_i) yields:

$$(4) \qquad \Delta B_i \equiv WTP \quad = f(P_j^T - P_j^R, q_j^T - q_j^R, s_j^T - s_j^R, SUB_j^T - SUB_j^R, H_j, I_j)$$

WTP is increasing in s. When assuming constant prices, quantity levels and measures of available substitutes[4], (3) and (4) define WTP, the amount that can be subtracted from the individual's income so that he is indifferent between the current USO level and a reduced alternative service quality level. As stated by Reay (2002), WTP for postal service quality changes can be estimated by "consumer surveys", in our case the CV method. Note that we are interested in service quality reductions, where the theoretically correct measure would arguably be the consumers' willingness to accept compensation (WTA) to forego the current service level and remain at the same utility level as before the change (Freeman, 2003). This welfare measure is the compensating variation. However, since the WTA is not bounded by the consumer's income constraint, typically yielding disproportionally high statements of WTA, this measure is normally not used in practical CV applications (Bateman et al., 2002).[5]

Although individual consumers are likely the most important when considering the value of the USO as a public good, they are of course not the only beneficiaries. Private firms and public sector institutions at various levels use and rely on postal services. In principle, firms may be asked to assess and state their WTP to avoid service reductions in a similar way to private individuals – reflecting the value of the service levels to their businesses. Alternatively, their benefits of sending could be measured more conventionally, e.g. using areas under mailer demand curves. In contrast to small and medium sized enterprises (SMEs), larger companies often have separate, dedicated mail systems for internal communication.

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[3] The information available to consumers is rarely perfect, and hence it is important to consider the amount and type of information available to individuals when valuing public goods (e.g. information given in a questionnaire as discussed subsequently).

[4] We return to a discussion of some of these assumptions.

[5] Respondents also tend more often to protest against the concept of compensation for reduction in a public good. For these reasons, WTP to avoid reductions in service quality levels (the so-called equivalent variation) is used instead, though this measure may also, as we shall see, not go free of protesting behaviour among respondents. As discussed by Hanemann (1991) the difference between WTA and WTP depends importantly on available substitutes (the fewer substitutes available for the public good, the greater the disparity).

In a similar way to larger businesses, public sector entities to some extent also have dedicated mail systems for internal communication. Household WTP should in principle capture at least a part of the service loss related to public external communication. Further, to a larger extent than for the private sector, some of the USO service reductions considered would perhaps not result in substantial changes to normal mail delivery from public sector institutions to households.[6]

Our main emphasis here is on the potential reduction in welfare benefits to the public at large. Hence, our main effort has been put on quantification of the WTP of households. In addition, we try to approximate the WTP for SMEs. It is methodologically complex to estimate implications for large companies and public sector institutions, hence we simplify by excluding these from further analysis. This approach measures the sending and receiving benefits of individual and SME mailing, but not the sending benefits of large mailers.[7] These are the same main beneficiary groups also considered by NERA (2009), while Rand Europe (2011) also includes a small sample of large businesses. This approach can be seen as conservative, as a full CBA in principle should also include sending benefits for large mailers.

2.3 Cost savings from reductions in the USO

The aim is to identify the changes in social costs for different USO quality levels. In principle the potential welfare gains induced by the reduction in costs from downscaling the USO level consists of three elements. First, a reduction in the service level will free up input factors, the most important of which are labor and capital. The release of these resources only represents welfare gains as long as they have an alternative value in the economy.

Second, the postal sector affects the environment through for example CO_2- and other emissions due to road and air transport. A reduction in the USO burden therefore has the potential to reduce such environmental externalities, as an alternative to Pigouvian pricing, which is difficult under expectations of uniform prices (see e.g. Boldron et al., 2011).[8]

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[6] One of the changes we examine is excluding mail delivery on Saturdays, which is not very relevant to many public sector institutions. In addition, public sector may be bound by certain response time requirements that would not change.

[7] In our study for NPTA, we did include a small sample of larger mailers that were investigated more qualatively through telephone interviewing. However, we did not end up trying to quantify their loss from service changes, due to the small sample and methodological challenge in eliciting meaningful WTP estimates from large firms (see Pöyry and Vista Analysis 2010).

[8] To the extent that such externalities are not already internalized through taxes on energy, transport fuels and other input factors.

Third, lower USO requirements could reduce the extent of unprofitable postal services in the reserved, monopoly area of the operator. In the Norwegian case the USP burden of the USO is meant to be (partly) offset by the surplus from the reserved area and if this surplus is insufficient, by a compensation from the state (see Bergum, 2008). Given that taxes are distortional to the economy, i.e. it is costly in efficiency terms to collect them (see Kleven and Kreiner, 2006, Sandmo, 1998), a reduction in the USO burden has the potential to lower the marginal costs of public funds required to compensate the postal operator for unprofitable services. The reduction in cost from introducing service level alternative i, ΔC_i, introduced in equation (1) can now be broken down in the following way;

$$(5) \quad \Delta C_i = \Delta c_i^I + \Delta c_i^E + \Delta c_i^T$$

where c^I denotes the labor and capital costs, c^E is the value of the environmental externalities, and c^T defines the total value of the tax distortions. All components can be assumed to increase with the service level s (and quantity q) though relationships may not be smooth due to the well-known logistical complexities of mail sorting, distribution and delivery.

3 Measuring welfare effects of reducing the USO: Methods and assumptions

3.1 The Norwegian postal market and proposed changes in the USO

The USO in Norway

In Norway, the USO license is granted NP by government and determined by the EU Postal Directive, which Norway is obliged to comply with through its European Economic Area (EEA) agreement. In addition, NP has a license issued by the Norwegian Ministry of Transport and Communications, which requires NP to preserve a level of USO that exceeds the requirements of the Directive in a number of respects. According to NP's license, the main elements of the USO are as follows: (i) each municipality must have at least one post office or contract post office offering basic postal and financial services; (ii) postal services must meet specified quality of service standards; (iii) delivery is required to all addressees six days per week; (iv) rates for universal postal services must be cost oriented, transparent and non-discriminatory; and (v) rates for reserved services must be geographically uniform throughout the country. One of the most important quality requirements (linked to ii) is that at least 85 percent of domestic priority letter mail should arrive within one day after delivery ("D+1"), while at least 97 percent

shall be delivered within D+3. For non-priority mail, the requirements are D+4 and D+6, respectively.

NP is granted the exclusive right by the Postal Act to provide closed, addressed domestic letters within a certain weight (< 50 grams) and price limits. NP's license also states that the burden of the USO shall be offset by the surplus from the reserved area and, if the surplus from the reserved area is insufficient, by compensation from the state. Norway has a total area of 385,252 square km (148,747 sq mi) and a population of about 5 million. The rugged and long coastline broken by long and deep fjords and thousands of islands combined with the widely accepted policy goal of maintaining settlements in rural and remote areas makes Norway the second least densely populated country in Europe (behind Russia). Due to this settlement pattern and long travel distances the surplus of the reserved area traditionally has been insufficient. In 2010, the government compensated NP approximately 500 million NOK (USD 83.3 million[9]).

Three alternative service levels compared to the current USO

Three alternatives to the current USO were chosen that were thought to represent relevant and realistic alternatives for NP, the NPTA and NP's business and residential customers. Changes were suggested for priority letters and postcards only, the largest bulk of normal post. Further, the alternative service levels make changes in the delivery speed and/or delivery frequency. The three alternative service levels, and the current USO (Alternative 0, the reference level), are listed in Table 1.

Table 1   Overview of the delivery speed and frequency of letters and postcards for the current USO and three alternative service levels

	Delivery speed	**Delivery frequency**
Today´s USO (Alternative 0)	At least 85 percent of prioritized domestic mail arrive the next day (D+1)	Six days a week – Monday to Saturday
Alternative 1:	At least 85 percent of prioritized domestic mail arrive within three days (D+3)	Six days a week (as today)
Alternative 2:	At least 85 percent of prioritized domestic mail arrive the next day (as today)	Five days a week – without Saturdays
Alternative 3:	At least 95 percent of prioritized domestic mail arrive within three days within southern and northern Norway, respectively, within 5 days between the regions	Three fixed days a week

Source: Pöyry and Vista Analysis (2011) in cooperation with NP and NPTA.

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[9] Average exchange rate for 2010 was 6.0453 NOK/USD.

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Alternative is 1 motivated by the hypothesis that for the lion's share of normal post it is not very important that it arrives overnight. Since only 85 percent can be ensured within this time, it is likely that important letters are sent using guaranteed services if timing is essential. Hence, a suggested three days is suggested instead, leaving the 85 percent requirement and the delivery frequency the same. Alternative 2, which removes Saturday as a delivery day, is a publicly much debated option in Norway. It is controversial since some remote areas get newspapers and magazines delivered by NP, and there may not always be alternative providers at reasonable cost. However, abstracting from this issue, we hypothesized that most people would not mind not getting post on Saturdays.

Finally, Alternative 3, changes both delivery time and frequency. This option was designed by NP to save substantial costs, as delivery requirements long distance between regions, the major driver of its costs, are loosened compared to Alternative 2. In addition, the delivery security can be upped to 95 percent without substantial increase in costs. A delivery frequency of three fixed days is also suggested based on the hypothesis that it may be more important for consumers to know which days of the week they will receive letters for sure, than post spread over the whole week.

3.2   Contingent valuation survey and benefit estimation approach

Survey design

To measure the WTP of households and SMEs to remain at the current service level compared to the three USO alternatives, a fairly standard CV survey was designed following recent best-practice guidelines in the field (e.g. Bateman et al., 2002, SEPA, 2006). We explain the most comprehensive household version of the survey first. This survey first included questions about how often respondents receive and send various types of post before explaining, in a non-technical way, the current USO requirements. The survey then continued through a series of Likert scale and open questions about the importance to the household of the various USO requirements and potential changes to those. These questions served to make respondents think about the USO and their own use and prepared the ground for the WTP questions.

The second part of the questionnaire first contained information about the rational for considering reduction in the service levels (gradual switch to electronic communication, increasing costs). This is important to make respondents believe in the potential policy changes, to justify why it may be important for society to consider and for them to expend the effort necessary to make the trade-off for their household. It then presented the three alternative

levels in a simple table (similar in appearance to Table 1 above, though simplified). The respondents were first asked to rank the alternatives in accordance with which service level best match the needs of their household. As this choice is cheap in the sense that it does not carry any costs to the respondent's household, it was no surprise that the large majority of the respondents ranked the current USO as the best. This was followed by alternatives 2, 1 and finally 3. This indicates at least that most respondents understood the relative scope of the service changes they faced.

After this warm-up a short text explained the cost implications of maintaining the current service level and that the respondents now should consider how much Alternative 0 (status quo) was worth for their household compared to the alternatives. The respondents were notified that changes would only affect normal priority letters and postcards (not newspaper or magazine delivery, or parcels and non-priority mail, which would remain unchanged) and that they should consider the changes both as private[10] senders and recipients of post. In addition, it was specified that the USO is meant to satisfy the most important postal needs of the population, and that many other services would still be provided on a commercial basis in most parts of the country.[11] It was also specified that a potential continuation of the current level of the USO would be funded by an extra, annual tax per household earmarked to funding NP costs from the USO provision (in addition to normal postage).

Respondents were first confronted with Alternative 1 compared to Alternative 0 in a table, and asked their household's maximum WTP to maintain status quo (see Appendix 6.1 for a graphic illustration from the web survey for this question). A standard household budget reminder, asking for a realistic annual amount, was added before respondents could indicate their "highest amount, if anything, your household would pay" in a payment card in the form of two vertical columns of radio buttons with a non-linear scale containing 24 amounts (ranging from 0 first to NOK 15,000[12]), including "don't know" (at the end). The amounts were chosen on the basis of previous CV studies and payment card chosen as response format over dichotomous choice ("Yes" or "No" to a specific amount), to avoid so-called yea saying and to preserve data efficiency (Boyle, 2003). No time limit was indicated for the tax payment, indicating that the tax hike would be permanent (as tax hikes most often are).

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[10] They were asked not to consider the mail sent and received in connection with their work.

[11] As it would vary what sort of services would be viable in different parts of the country, we could not go into detail on this question but only emphasise that all services would not disappear. This is the question of available substitutes (variable SUB in equation (3)) in case the current postal service level is reduced. It is not a completely satisfactory approach, but the simplest given the difficulty of predicting and explaining which services would be viable in different areas.

[12] There was also an option to choose "more than 15000", in which case the exact amount could be specified in a separate space.

Following the first WTP question, the respondent got two identical questions in turn, with the only difference that Alternative 1 now was replaced with Alternative 2 and Alternative 3, respectively (displayed in the same table containing only the two alternatives for comparison at a time). The respondents were informed before the WTP questions that they would be asked about all three alternatives, a type of advance disclosure to help respondents think, improve consistency and avoid "surprise" effects (see e.g. Bateman et al., 2004).[13] The rest of the CV survey followed standard procedure, probing into why people answered zero or positive. Particular emphasis was made to identify responses that could indicate protesting against the proposed reductions in service levels rather than a "true" zero WTP, as this was expected to be a potential issue. The final part collected socio-economic background information, which was merged with existing Internet panel information about the respondents and their households. The survey instrument went through pilot testing before administering to the full sample, through which no major problems with the survey were identified.[14]

Sampling and administration

The questionnaire was adopted to be administered to households in an Internet context, following advice e.g. given by Dillman (2008). Although personal interviews have been recommended for CV in the past (Arrow et al., 1993; Mitchell and Carson, 1989), this mode also has drawbacks of very high cost and potential social desirability bias. Recently Internet CV surveys have been shown to give reasonable response quality and potentially lower social desirability bias leading to more conservative WTP estimates (Lindhjem and Navrud, 2011a, b). A randomly recruited panel of ca. 50,000 willing respondents, maintained by the professional survey firm TNS Gallup was used for the survey.[15] Norway has one of the highest Internet broadband penetration rates in the world, and around 95 per cent of the population is well covered at reasonable speeds (at least 4 Mbit/s). The survey was conducted on a representative sample of the Norwegian adult (>15 years of age) population in June-July 2010. To be sure to cover the older part of the population who normally are less computer literate, an additional small sample recruited from the same panel of respondents was administered through a normal mail survey. The net sample was 2,013 completed responses.

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[13] For simplicity, the order of the alternatives were not randomized between respondents, though this could have been a strategy to reduce potential order effects. However, the advance disclosure procedure is an alternative procedure to alleviate this problem.

[14] The full survey questionnaire is available in English from the author upon request.

[15] TNS Gallup uses no form of self recruitment (such as website advertisements etc), which is a common form of Internet survey recruitment, including in panels such as Harris Interactive in the US (see e.g. Baker et al., 2010).

Small and medium sized enterprises

A simplified version of the household questionnaire was adopted for computer-assisted telephone interviewing and administered to a sample of SMEs by the same polling company. It was not considered possible to conduct this kind of survey through e-mail due to potential problems of response rate and getting hold of the right person within the firm, and there was no web panel available for SMEs. The sample frame was a national register maintained by the polling company of 390,000 SMEs with less than 50 employees, covering all main sector and geographical areas, i.e. representative of the Norwegian population of SMEs. The survey was targeted to a person responsible for accounts and/or postal services and the WTP questions were framed in terms of "how much, if anything, would your company pay per year to maintain the current level of services compared to…". Based on a pilot of 30 SMEs, the questionnaire was simplified, i.e. information shortened compared to the web survey. The net sample was 375 SMEs.

Econometric estimation of mean WTP

Answers to the WTP questions using payment card return interval data. If respondents indicate that their maximum WTP is NOK 1,100 per year, their true WTP will lie somewhere between this amount and the next one up, NOK 1,400. 23 amounts were used on the payment card giving fairly narrow intervals. For simplicity, respondents' true WTP was approximated using interval mid-points as proxies and simple mean of the distribution estimated, following procedures described in e.g. Cameron and Huppert (1989). For the purpose of our analysis, this estimation procedure is accurate enough and follows the true WTP distribution fairly closely (see e.g. Table III in Cameron and Huppert *ibid*).

3.3 Methods to estimate cost savings

We discuss the methods to estimate the three social cost components in turn below.

Estimation of input cost savings

Out of a total cost of NOK 8.7 billion in 2010 (Pöyry and Vista Analysis 2010), sorting and distribution of post to customers accounts for more than half. A reduction in the USO service level implies that there is less need to sort, transport

and/or deliver mail around the country. But the relationship between costs and delivery frequency and speed is far from smooth. As anyone involved in the production of postal services would know, the logistics are highly complex and cost implications best assessed by the NP itself. NP and Norwegian Ministry of Transportation and Communication have over time developed a USO Cost Model called the ACS-model (see Bergum, 2008).[16] The main objective of the ACS-model is to estimate the USO burden depending on certain services levels and service standards. The model is the basis for any annual government transfers to cover the USO burden, and is independently verified. The model is based on a plausible definition of NP's strategy without the USO (and reserved, monopoly area) consistent with main elements of NP's current commercial strategies. The reference scenario (in absence of the USO) is characterized by local reductions in the service quality, similar to the service reductions considered in our analysis. The ACS-model, together with current costs of the relevant parts of the postal network, is therefore a good framework to calculate the cost reduction for each of the three alternative service levels.

As pointed out by Dieke and Niederpruem (2008) the ACS-model is based on the assumption that cutbacks in service have a negligible effect on sales. This assumption is a convenient simplification, but due to the specific type of cost structure of NP, any demand reductions may not have large impacts on total costs. The postal network in general is characterized by economies of scale, requiring large fixed costs to maintain the network and justifying only one supplier in rural areas where volumes are (already) small and distances long. The main driver of costs can be argued to be the USO service specifications. For this project, the potential labor and capital cost savings were calculated by the research department of NP using the ACS model, overseen by the NPTA.[17] The lion's share of the cost savings are due to freed-up labor resources. Due to almost no unemployment in the Norwegian economy, even during international financial crises, it is reasonable to assume that labor resources can relatively easily be reallocated to other uses. The Norwegian Ministry of Finance (2005) recommends ignoring search and friction costs of people seeking new employment in CBA. Hence, it represents a cost saving to society counted in full to reduce labor input for NP.

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[16] "Alternative Commercial Strategy"-model.

[17] The detailed structure of the cost model is confidential for commercial reasons. For our purpose, it suffices to present the main assumptions and general structure of the model and the main cost changes for each of the alternative USO levels. Since the cost modelling task was part of an official government project and could in principle be checked by the Norwegian Post and Telecommunications Authority and its auditors, we believe it unlikely that NP deliberately exaggerated its cost estimations for strategic reasons.

Estimation of environmental externalities avoided

All three service alternatives will reduce transport needs, both air and road transport, which in turn will reduce emissions of greenhouse gases (mostly CO_2) and other harmful substances and reduce other transport related externalities, such as noise, accidents and traffic jams. Reductions from road transport are for CO_2 calculated based on fuel use and emissions per liter fuel, from the NP's ACS model. Emissions, sulphur dioxide, nitrogen oxides (NOx), non-methane volatile organic compounds (NM/VOC) and particles, are calculated based on average emissions per km multiplied by given distances, using standard emission factors for Norwegian transport modes (Statistics Norway, 2008).

The next step is to assess whether and to what extent existing taxes and levies in the transport sector are set at levels which can be considered already to internalize the externalities. If so, it would be double counting to include these. This assessment depends both on the type of tax (i.e. if it can be considered externality-motivated) and the level of the tax compared to the assumed marginal WTP for emission reductions. The CO_2 tax per liter fuel for air transport of NOK 0.68/liter (or around NOK 267/tonne CO_2) tax is higher than the general domestic CO_2 tax for mineral oil (ca. NOK 218 per tonne). The tax is also somewhat higher than the long-term expected carbon price in the European emission trading scheme, at the time, at around NOK 240 (Euro 30) (Point Carbon, 2010). For our conservative estimate, we assume that the CO_2 effect for air transport is internalized through taxes paid by NP.

In addition to the global CO_2 externality, air and road transport cause other emissions and noise. Given the dispersed population pattern in Norway, not many people are generally affected. Based on among others the costs of reaching the targets for NOx emissions of the Gothenburg Protocol and previous studies valuing noise reductions, ECON (2003) estimates the total external costs of air transport at NOK 1.85/tonne-km. Subtracting the CO_2 assumed to be internalized, we arrive at a cost estimate of NOK 1.75/tonne-km. For CO_2 from road transport, the taxes are considered by ECON (2003) to be slightly too low for heavy duty vehicles (that use diesel) and slightly too high for automobiles. Including CO_2 and other externalities from road transport ECON (2003) calculates that the taxes paid by NP for diesel and petrol currently only internalize around half of the externalities from road transport caused by the current USO level. For our main alternative, we use these assumptions.

Since Norway has an ambitious climate policy, it may be argued that a higher carbon price than NOK 240/tonne should be used. Norwegian Climate and Pollution Authority (2010) has calculated that to reach climate neutrality in 2030 and cut 2/3 of emissions domestically, the average cost per tonne CO_2 would be NOK 1,500. For sensitivity, we also estimate externality cost savings for this

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alternative. Assuming constant postal volumes for the three service alternatives potential externalities related to paper use and disposal, an environmental impact considered by Boldron et al. (2011), can therefore be ignored in the analysis.

Estimation of reduced tax distortions

Raising funds for public projects and policies through taxation is costly in efficiency terms, since taxes create wedges between the prices for supply and demand. The guideline by Norwegian Ministry of Finance (2005) recommends assuming that 1 NOK for a public project or policy in tax costs 0.2 NOK to raise. The USO in Norway has traditionally been partly financed by taxes and partly by profits from the reserved area. The profits from the reserved monopoly area have, however, been falling in recent years and is for 2010 estimated at zero. For simplicity we therefore assume that 1 NOK saved by NP represents 1 NOK reduction in the need for government transfers. This means in practice adding 20 percent to the labor and capital cost savings. The exception, only relevant for alternative 3, is where the cost savings are so large that they outweigh the government transfer for 2010 of NOK 497 million. In this case, this figure is used as a ceiling to calculate the reduced tax distortions.

4   Results

4.1   Reduction in consumer benefits

Household willingness to pay

Starting with the survey of households, 1,762 of the 2,011 web respondents who received the survey completed the questionnaire in full. This yielded a final stage response rate of 88 per cent, which is high for this type of survey.[18] The postal version sent to older respondents yielded 251 completed questionnaires out of 467, a response rate of 53 per cent. Except for some slight underrepresentation in the age group below 39 years of age, the net combined postal and web sample was largely representative of the Norwegian adult population in terms of age, gender and geography.

In all CV surveys a large share of respondents typically indicate zero WTP for proposed increases in the supply of a public or quasi-public good or to avoid a reduction. In our case the share was somewhat higher than normally observed at

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[18] This rate does not include the unknown response rate related to the polling company's random recruitment to the websurvey panel.

around 51 per cent. Of these respondents around 41 per cent stated as one of two reasons that "I think I have a right to the current level of postal services". This may be considered a protest reaction to the scenarios they were confronted with[19], rather than a zero utility effect for these households. Following the most common procedure in our base case, these respondents and other zero respondents indicating reasons not reflecting real wealth-utility trade-offs, were removed from the sample (Bateman et al., 2002). Around 10-11 per cent of the respondents indicated "don't know" in the payment card, and were also removed. Further, the data were inspected for very high responses, typically above 2-3 per cent of annual income (and blank income responses removed). No such unreasonably high responses relative to income were identified. Mean WTP per household per year was then estimated for each service alternative in turn, following the procedure described in section 3.2 above. Results are displayed in column two of Table 2 (and net sample size in column three).

Table 2   *Mean annual household WTP and total WTP for the Norwegian population (with confidence intervals – CI) to maintain the current level of the USO compared to given alternative, NOK 2010*

Alternative	Mean WTP (95% CI)	n	Total loss (NOK million)* (95% CI)
1	383 (294, 471)	1261	831 million (638, 1022)
2	345 (246, 443)	1264	749 million (534, 962)
3	454 (357, 550)	1254	986 million (775, 1 194)

*Notes: * In 2010 the number of households was 2 170 893 in Norway according to SSB (2010), which multiplied with mean household WTP yields the figures here.*

Mean WTP to remain at the current USO level was found to be NOK 383, NOK 345 and NOK 454, for the three alternatives. These differences are statistically different using paired t-tests, indicating that respondents consider it (slightly) better to lose Saturday (alt. 2) as delivery day than to reduce delivery speed from one to three days (alt.1).[20] However, alternative 3 is considered

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[19] As mentioned in section 2.2, the share of protesters tend to be higher if the scenario descriptions are cast in terms of willingness to accept compensation for foregoing the current service level.

[20] T-values for pairwise t-tests where 4.52 for hyopthesis WTP3=WTP2, 2.8 for WTP3=WTP1, and 3.01 for WTP1=WTP2. N was 1220 for all three tests, as a few more observations were removed in pairing the data.

considerably worse than the first two. The stated WTP amounts mimic the results of the ranking exercise conducted before the WTP questions, as mentioned in section 3.2. A priori, it was fairly clear that respondents would consider alternative 3 the worst option, though this alternative is not entirely negative. Hence, the mean WTP shows that there is some internal consistency in how respondents consider the alternatives. The most common reason people stated for their positive WTP was that they "think it is important to have a postal network of the same quality as we have today". The second most frequent reasons included the importance of having the option to use the network, that it is important to maintain the network even if the respondent did not personally use it much, and the potential problems rural areas may experience if service levels are reduced. Such responses indicate a considerable positive utility of maintaining the postal network for altruistic and option-value reasons.

The total number of households in Norway in 2010 was 2,170,893 according to Statistics Norway (2010), which multiplied with the mean WTP amounts yield estimates of the consumer welfare loss for each service alternative (column four in Table 2). The confidence intervals are carried over in the estimates of the total welfare loss. For sensitivity, we also calculate mean WTP if none of the zero respondents are removed, i.e. yielding a conservative welfare estimate. In the base case the removed respondents are implicitly assumed to have a WTP equal to the mean of the remaining sample when scaling up to the whole population. Including them in the sample instead, yields mean WTP of NOK 279 (CI: 214, 343) for Alternative 1 (n=1,779), NOK 249 (CI: 179, 320) for Alternative 2 (n=1,790), and NOK 326 (CI: 256, 395) for Alternative 3 (n=1,782).[21] These conservative WTP estimates in turn yield population estimates of NOK 605 million for alternative 1, NOK 541 million for alternative 2 and NOK 708 million for alternative 3.

The mean WTP per household estimated here may be considered fairly low, but within the range of what households spend on other goods during a year. At least, they may not be considered unrealistically high for a public service as the postal network. In addition to the consistency checks of responses mentioned above, it is also common in the CV literature to investigate construct validity, i.e. whether WTP vary in expected ways with a number of common variables. This is because true WTP cannot be observed from hypothetical market responses, and therefore validity must be investigated in other ways. For sake of brevity, a full analysis of this sort is not included here. However, a simple regression analysis of (the log of) WTP for the three alternatives is included in Appendix 6.2. This

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[21] Following the procedure of Cameron and Huppert (1989) zeros are assigned the mid point in the 0-25 category of the payment card, i.e. 12.5. Interpreting instead the responses as zeros would have a minor impact on the mean WTP, e.g. NOK 271 instead of NOK 279 for alternative 1 when all zero responses are included and NOK 377 instead of NOK 383 for the base estimate.

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analysis shows, for example, that those who stated that the current level of the service is "more than needed for their household", reflect this opinion through also stating lower WTP. Those who in the early parts of the survey say it is very important for their household that most mail arrives within one day and to keep Saturday, state significantly higher WTP to keep the current service level, also as expected.

Interestingly, and perhaps in tune with the responses mentioned above about the importance of the network rather independently of own use, there seem to be a relatively weak relationship between stated frequency of sending and receiving letters and cards, and WTP (though two of three models indicate that people who frequently receive tend to have somewhat higher WTP). Interestingly, there seem to be no relationship between WTP and whether respondents live in rural areas or their frequency of Internet use (proxy for electronic communication as an alternative to normal post). Overall, the regression results are not implausible, giving some trust in the responses.

Small and medium sized enterprises

A fairly high share of the sampled telephone numbers from the database of SMEs was inactive. From the 954 SMEs where contact by phone was established, 375 full interviews were conducted, i.e. a final stage response rate of 39 percent. A similar procedure for judging protest response as for the households was conducted. Overall, a higher share of SMEs answered between 0 and 25 NOK, than for the households. In addition, a few businesses that had a fairly large WTP and reported annual sales of zero the year before, were excluded. This left from 166-189 responses for the three WTP questions (see Table 3). The mean WTP for the three alternatives were NOK 410, 281 and 264, respectively.

Table 3   *Mean annual SME WTP and total WTP (with confidence intervals – CI) to maintain the current level of the USO compared to given alternative, NOK 2010.*

Alternative	Mean WTP (95% CI)	n	Total loss (NOK million) (95% CI)*
1	410 (169, 651)	166	156 million (64, 247)
2	281 (70, 491)	189	107 million (27, 187)
3	264 (108, 420)	167	100 million (41, 160)

* According to TNS Gallup there were around 475,000 SMEs with 50 or fewer employees.

Naturally, the confidence intervals are broader than for household WTP. It is not surprising that SMEs consider it more valuable to avoid alternative 1, with slower sending times, than to lose Saturday as delivery day in alternative 2. Most SMEs do not collect or send mail during weekends (though some of them may consider it important that consumers receive post sent on Fridays). SMEs consider alternative 3 similar to alternative 2, which is perhaps somewhat puzzling. We cannot rule out that the last alternative may have been too complicated to communicate on the phone.

The WTP estimates for SMEs should be considered more uncertain than household WTP, and we have not conducted validity analysis of the types conducted for households. The total number of SMEs in Norway is around 475,000 according to Statistics Norway (2010). Out of these we estimate that around 20 percent are "sleeping", based on the number of businesses with "dead" phone numbers, leaving a total population of around 380,000 SMEs. Conservatively, we estimate the loss to these businesses of between NOK 100-156 million, depending on the alternative considered (column 4, Table 3).

4.2   Social cost savings

Input cost savings

Applying the ASC model described in section 3.3, removing the requirement that prioritized mail must arrive overnight (alternative 1) would save NP, and society, around NOK 238 million annually. This reduction is primarily related to lower use of air transport (between north and south of Norway especially), less need for relatively expensive night time labor and rationalization of the terminal structure for incoming and outgoing post. Removing the Saturday delivery requirement in alternative 2 would reduce costs by NOK 468 million annually. The primary component here is reduction in distribution costs, around 378 of which are labor costs. There would also be some reductions in air freight and general transport costs, though lower than for alternative 1. Finally, in alternative 3, substantial costs can be saved as NP can optimize transport and sorting between the southern and northern regions of Norway. Both delivery days and speed are cut. The total cost savings were estimated at NOK 1.128 billion annually. Current distribution costs can be more than halved if this alternative is chosen.

Environmental externalities avoided

Table 4 shows the percentage reductions in different types of emissions from transport for the three alternatives compared to the current USO. In relative terms compared to the current USO level the reductions are fairly substantial. However,

relative to the total Norwegian emissions, the reductions are marginal. The emissions of CO_2 from transport to fulfill the current USO level, for example, amount to 0.1 percent of total Norwegian emissions. This would be reduced to 0.02 percent in alternative 3.

Table 4   Selected transport-related emission reductions for the three alternatives compared to the current USO, CO_2 in tonnes, other emissions in kilograms

Alternative	CO_2	SO_2	NO_x	NMVOC	Particles
	Tonne	**Kg**	**Kg**	**Kg**	**Kg**
1	14,785	1,408	52,426	3,567	66
2	7,428	450	21,231	3,009	1,575
3	30,400	2,124	92,469	10,984	4,761

Pricing these emission reductions applying the assumptions discussed in section 3.3 yields changes in the non-internalized environmental costs as given in Table 5.

Table 5   Reductions in (non-internalized) environmental costs from transport. Million NOK 2010.

Alternative	Environmental costs – base case*	Environmental costs – ambitious climate policy**
1	11.5 million	34.6 million
2	9.9 million	20.9 million
3	35.8 million	81.7 million

* CO_2 price of NOK 240, **Abatement cost per tonne CO_2 of NOK 1500.
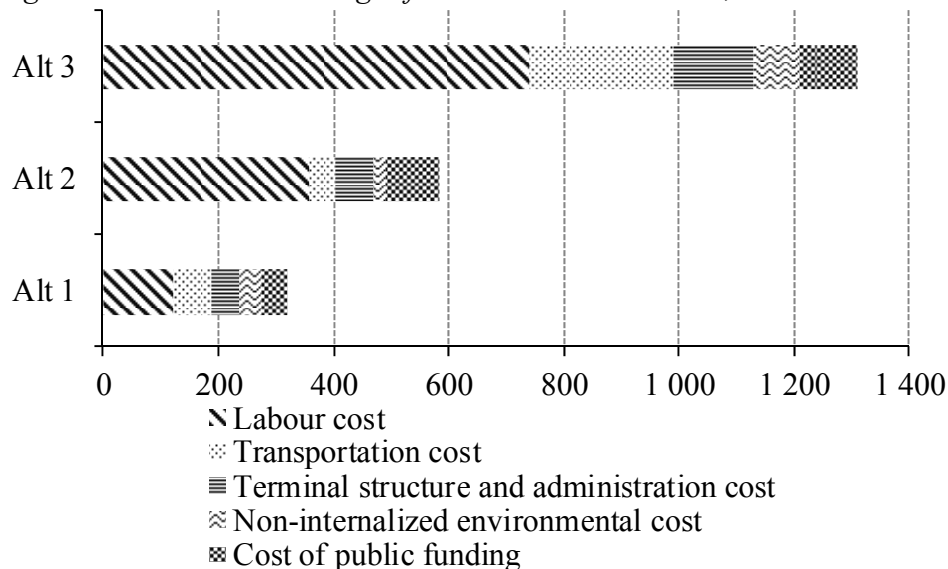
For alternative 1 in the base case the whole change (11.5) is related to reduced air transport, as the road transport is assumed constant between the two alternatives in the ASC model. Alternative 2 consists of NOK 3.2 million from air transport and 6.7 million from road transport. For alternative 3 the total change in environmental costs are divided into NOK 15.8 million from air transport and 20 million from road transport. In the case where we assume a more ambitious climate policy, the change in environmental costs range from NOK 20.9 to 81.7 million, depending on the alternatives.

Reduced tax distortions

The reduced tax distortions constitute 20 per cent of NPs cost savings going from the current level of the USO and the alternatives. The only exception is in alternative 3, where the cost savings of NP is so large that the government support (for 2010 estimated at NOK 497 million) would we reduced to zero. Hence, the saved tax distortion is calculated from NOK 497 million. The savings are therefore NOK 48 million, 94 million and 99 million, for the three alternatives, respectively.

The overall social cost savings are given in Figure 1, split into transportation, labor and terminal structure and administration costs, non-internalized environmental costs, and costs of public funding.

Figure 1   Social cost changes for the three alternatives, NOK million 2010.

\\ Labour cost
⸬ Transportation cost
≡ Terminal structure and administration cost
≋ Non-internalized environmental cost
▩ Cost of public funding

4.3   Cost-benefit comparison and sensitivity considerations

Costs and benefits in the base case

The changes in costs and benefits are summarized in Table 6. Reducing delivery speed to D+3 in alternative 1 would give an estimated overall welfare loss of NOK 749 million. Keeping the delivery speed constant and instead removing Saturday as delivery day, would give a lower welfare loss of NOK 283 million. As consumers seem to consider delivery speed only slightly more troubling than losing Saturday as a delivery day, the higher cost savings in alternative 2 eats up

almost all the utility loss. Finally, the only alternative that would give a net welfare gain in our analysis is reducing both delivery speed and number of delivery days in alternative 3, as this entails substantial cost savings that are not outweighed by the loss of consumer benefits.

Table 6   Cost and benefit components, annual changes in NOK million 2010.

Alternative	Alt. 1: D+3 delivery	Alt. 2: Remove Saturday	Alt. 3: (note*)
Social cost savings:			
Cost savings for Norway Post	238	468	1,128
Environmental externalities	12	10	36
Tax distortions	48	94	99
Total quantified cost savings	*298*	*573*	*1,263*
Consumer loss:			
Households	831	749	986
Small and medium sized enterprises	156	107	100
Total quantified utility loss	*987*	*856*	*1,086*
Net benefits	***-749***	***-283***	***177***
Net benefits (excluding SMEs)	***-533***	***-176***	***277***

*Alternative 3: 3 regular days delivery frequency and 3 days delivery speed within Southern and Northern Norway and 5 days between the regions.

Sensitivity of results

The cost and benefit estimates are uncertain, and we consider the SME estimates more so than the household estimates (as is only partly reflected in the wider confidence intervals for the SME estimates in Table 3). Removing the SME estimates altogether, do not change the overall ranking of alternatives or the sign of the net welfare change (last line of Table 6), but makes alternative 3 more beneficial. Treating the household estimates even more conservatively by not removing any zero responses in the final sample, as discussed in section 4.1, would reduce consumer loss in alternative 2 by NOK 208 million, bringing this alternative almost to break even, while the net-benefits of the other two alternatives remain firmly below and above zero, respectively. Finally, considering a more ambitious climate policy as discussed in section 4.2 would pull results in the other direction, but only by around NOK 11 million for

alternative 2. In any case, lower environmental impacts are dwarfed by other costs and benefits in the overall comparison. Note that the potential loss of benefits to large mailers (large companies) have not been included. Including this would make alternatives 1 and 2 more negative, while alternative would be left undetermined.

5 Discussion and conclusions

This paper has conducted a cost-benefit analysis of three alternative policy proposals for reductions in the current USO in the Norwegian postal sector, with particular emphasis on the loss to consumers and small and medium sized enterprises. Despite our (and the Norwegian regulator's) original hypothesis that reduction in delivery speed and frequency may not matter that much to household consumers, their stated preferences for the current USO level tells a slightly different story. Consumers are willing to pay to keep up the current service standards, and seem to care more about speedy delivery (D+1 rather than D+3) than losing Saturday as one of six delivery days. Analysis of the total cost savings shows that neither of these two alternative service levels gives net welfare gains. Only in the third alternative, where both delivery times and frequency are reduced, the cost savings are so large that they outweigh loss of consumer benefits. Based on our analysis, this is the preferred option on social efficiency grounds. Note that we have not been able to include potential loss to large mailers, which would leave alternatives 1 and 2 even less desirable.

The only other studies we are aware of that has attempted to estimate benefits to households and SMEs of a full postal network and/or individual services of the network are NERA (2009) and Rand Europe (2011). Using a similar stated preference survey to ours and disaggregating a total household WTP estimate for the entire postal network into services of general economic interest from the post office network[22], NERA (2009) find that mean WTP for households for only the postal services ranges from UK£ 1.3 – 6.3 per month, or approximately NOK 140 – 680 per household annually. Our estimates are comparable to this range. NERA (2009) also confirms our finding that consumers (both households and SMEs) seem to value the existing postal network highly and that many of the derived benefits are unlikely to be reflected in their direct use of the network. Rand Europe (2011) is not directly comparable to our study, as they use a choice modelling (CM) approach that price service individual attributes relative to the stamp prices in the respective countries surveyed (Sweden, Poland

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[22] This disaggregation is not without problems and typically suffer from issues of part-whole bias, related to the scope insensitivity problem discussed below. Our approach did not, like NERA (2009), attempt to value the whole postal network, but rather some specific changes directly.

and Italy). Both these studies and ours show that stated preference surveys are a potential route to get to the unpriced benefits of postal networks.

Even if promising, contingent valuation surveys also have their challenges worth noting here (see e.g. Carson et al., 2001) for a general overview). We will mention the three, in our opinion, most important ones, one of which is a specific problem in situations where service provision is reduced. The first challenge is that of scope insensitivity, i.e. that people's WTP is found not to vary sufficiently with the scope or quality of a good. It is not clear from theory how WTP should vary with scope in given situations, but WTP should be higher to avoid large than small service reductions. Further, a small reduction from a relatively high service level should also be worth less than a reduction from an already low level. In our case, reductions may be considered to be from an already high service level. We do find internal scope sensitivity in our survey, i.e. that respondents state significantly higher WTP to avoid alternative 3, clearly the worst option. Even if the amounts respondents state are plausible, we are not entirely convinced that all respondents understood the implications of the more complex alternative 3. A topic for further research would be to try to display service changes in alternative ways, randomize order of alternatives and administer different service alternatives to subsamples to conduct clean tests of scope sensitivity between respondents (so-called external scope tests). This would be particularly important as alternative 3 is the only option that imply positive welfare change if implemented. This is also the potentially most politically controversial alternative, as politicians are unlikely to accept the use of equal welfare weights between consumers in urban areas vs. rural areas (which in effect are cross-subsidized by the former).

The second challenge is that of hypothetical bias, i.e. that respondents state higher WTP than they would actually pay if faced with a real trade-off in the marketplace. This is generally a valid criticism. Some studies find hypothetical to actual WTP ratios of around 1.35 (Murphy et al., 2005) while others find higher ratios of around 3 (List and Gallet, 2001). Even so, we are not overly concerned that the WTP estimates are highly inflated in our case. First, a large share of respondents stated zero and mean WTP is relatively low compared to other household expenditures. Second, Internet surveys often give lower WTP estimates than other survey modes involving an interviewer, possibly due to reduction in social desirability bias (Lindhjem and Navrud, 2011b). Third, we included all zero respondents for sensitivity, which did not tip the balance. Finally, Norwegians are generally honest survey respondents, and hypothetical bias has been shown to vary between cultures (Ehmke et al., 2008). If CV is expected to be problematic in this sense, an alternative approach recommended by some is to use CM method where people's WTP is derived indirectly. However, it is well-known by practitioners that these surveys when compared tend to give higher mean WTP estimates than standard CV (for unknown reasons).

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The final CV challenge, of specific importance to researchers assessing reductions in publically provided services is the potential protest reactions shown by respondents. People feel entitled to the status quo situation and are reluctant to accept the trade-off they are asked to do. There is also the potential endowment effect, status quo bias and loss aversion, documented in the behavioural economics literature (see e.g. Kahneman et al., 1991). There is no quick fix for these related problems. Framing the questions as a matter of compensation using WTA, is likely, as argued in section 2.2, to make matters worse. Our approach tried to alleviate the protesting problem by carefully explaining the underlying need to consider the USO and to alert respondents to the public choice that had to be made on behalf of everybody. Based on the responses we got, we cannot say that this approach was entirely successful. It seems that the use of CM may not avoid the problem either (Barrio and Loureiro, 2010). Further research is clearly needed to quantify welfare losses, as the current financial turmoil would require prioritisation among cuts in a number of publicly provided services across much of the Western world.

Finally, one remaining caveat and assumption should be discussed. In our analysis constant postal volumes are assumed and the analysis is static in the sense that the cost savings and losses in consumer benefits are assumed to extend into the future. This is a simplification, as the postal volumes are likely to continue to drop and would also be affected somewhat negatively by the service level reductions. Some of the consumer benefits are linked to the direct use of the postal services, and the loss in these would be smaller for the three alternatives than in our base case. This could push alternative 2 into positive welfare territory in a few years' time. A more dynamic analysis of cost savings, taking reduced postal volumes and efficiency effects over time into account, could also imply higher cost savings for NP over time. This would pull in the same direction for alternative 2. However, it should be noted that we have not aimed to quantify potential welfare losses from the sending side for public entities (to the extent that those losses are not captured by household WTP) and to larger companies. More research is required to pin these down.

6   Appendix

6.1   Appendix A

Figure A   Web dump illustration from the web survey of the first WTP question (Alternative 1) and the use of payment card (In Norwegian).

6.2 Appendix B

Table A   Regression analysis of log of WTP for Alt. 1-3 (Models I-III)

	Model I	Model II	Model III
Annual income below 200'	0.720***	0.276	0.400
	(0.253)	(0.289)	(0.305)
Annual income between 200'-400'	-0.0461	-0.218	-0.265
	(0.198)	(0.195)	(0.201)
Annual income betwene 600'-800'	-0.151	-0.0652	-0.259
	(0.164)	(0.165)	(0.169)
Annual income above 800'	0.186	-0.0757	-0.178
	(0.234)	(0.229)	(0.253)
Male	0.0913	0.0171	0.0999
	(0.128)	(0.131)	(0.139)
University education or more	0.550***	0.260	0.792***
	(0.175)	(0.182)	(0.191)
Basic schooling or less	-0.0274	0.0546	-0.0585
	(0.148)	(0.146)	(0.154)
Medium Internet usage	0.134	-0.0824	-0.0576
	(0.203)	(0.200)	(0.214)
Low Internet usage	-0.132	0.0707	0.104
	(0.192)	(0.184)	(0.203)
Important that 85% rule is kept	0.574***	0.325**	0.344**
	(0.161)	(0.154)	(0.164)
Important that Saturday is kept	0.377**	0.522***	0.339**
	(0.157)	(0.162)	(0.170)
Today's service level is more than needed	-0.637***	-0.595***	-0.591***
	(0.167)	(0.154)	(0.165)
Respondent resides in large city	0.0154	-0.153	0.0425
	(0.163)	(0.167)	(0.169)
Respondent resides in very rural area	-0.688**	-0.520	-0.626*
	(0.314)	(0.325)	(0.334)
Offical index of degree of centralness	-0.0364	-0.0142	0.0405
	(0.0546)	(0.0544)	(0.0573)
Children below age 15 present in the household	-0.157	-0.125	-0.0410
	(0.225)	(0.217)	(0.243)
Number of household members	0.000438	-0.0218	0.0308
	(0.0872)	(0.0819)	(0.0945)
Age	-0.0288	-0.0422*	-0.0929***
	(0.0250)	(0.0249)	(0.0262)
Age squared	0.000279	0.000428	0.000868***
	(0.000260)	(0.000262)	(0.000273)
Respondent aware of 85% rule	0.122	0.0783	0.0392
	(0.145)	(0.145)	(0.152)
Respondent sends letters almost every day	-0.464	-0.368	-0.0998
	(0.705)	(0.754)	(0.748)
Respondent sends letters very rarely	-0.183	-0.0853	-0.169
	(0.141)	(0.142)	(0.149)
Respondent receives letters almost every day	0.319*	0.537***	0.0979
	(0.185)	(0.192)	(0.198)
Respondent receives letters very rarely	-0.0922	0.0301	0.0442
	(0.177)	(0.181)	(0.197)
Constant	4.718***	4.836***	6.123***
	(0.642)	(0.647)	(0.667)
Observations	1,137	1,137	1,137
R-squared	0.123	0.095	0.105

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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