Postal Quality and Price Regulation

Final report

Postal Regulatory Commission
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Preface

The Postal Regulatory Commission is currently conducting a ten-year review of the rate regulating system, mandated by the Postal Accountability and Enhancement Act (PAEA). In the context of this review, the Commission is assessing the functioning of the price cap system for market dominant products to determine whether any improvements might be needed. One of the aspects investigated by the Commission is whether quality of service could be included as a factor in the design of the price cap system.

Against this background, the Commission has asked Copenhagen Economics to investigate how quality of service could be included as a factor in the price regulation and what considerations should be taken into account in that process.

The structure of the report is the following:

Chapter 1 provides a theoretical background to how quality of service and price regulation relate to one another. It also presents the assignment and our approach to solving it.

Chapter 2 provides an overview of approaches to regulating quality of service and the related challenges.

Chapter 3 presents our research on how quality of service can be incorporated into a price cap regulation based on three types of sources: experiences from the postal sector, experiences from other network industries, and a review of academic literature.

Chapter 4 presents a framework for evaluating the methods analysed in chapter 3.

Chapter 5 provides a practical manual to guide the regulator in implementing quality regulation within the price cap regime.
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Executive summary

The Postal Regulatory Commission is currently conducting a ten-year review of the rate regulating system, mandated by the Postal Accountability and Enhancement Act (PAEA). In the context of this review, the Commission is assessing the functioning of the price cap system for market dominant products to determine whether any improvements might be needed. One of the aspects investigated by the Commission is whether and how quality of service could be included in the design of the price cap system in order to prevent indirect price increases through lower quality of service.

Against this background, the Commission has asked Copenhagen Economics to investigate how quality of service could be included as a factor in the price regulation and what considerations should be taken into account in that process.

Approaches to regulating quality of service

Quality of service can be regulated in different ways. In the context of the Commission’s ten-year review of the rate regulating system, we focus in this report on the option of regulating quality within the scope of the postal price cap regulation. There are two main approaches to how this can be done in practice:

1. The regulator can control quality via price signals in the price cap formula and let the operator adjust its level of quality accordingly.
2. The regulator can instruct the operator to achieve a predefined level of quality and adjust the allowed price increases under the price cap by a strong penalty (reward) if the operator fails to meet (meets) the predefined quality level.

When controlling quality via price signals, the price cap formula is designed such that the operator’s quality performance directly carries over to a higher (lower) allowed price. The postal operator will determine the level of quality by balancing the cost of additional quality against the additional price increase allowed when quality increases. To achieve an optimal outcome (a quality level that maximizes total social welfare), the change in the price cap triggered by a change in quality should mirror postal service users’ willingness to pay for higher/lower quality.

When controlling quality via instructions, the regulator sets a pre-defined level of quality that it wants the operator to comply with. Depending on the operator’s performance in relation to the standard, the regulator may impose financial penalties (rewards) by lowering (increasing) the price cap. Setting the regulatory standard at the socially optimal level requires information about postal service users’ willingness to pay for quality and the operator’s marginal cost of providing additional quality. This information is seldom available to the regulator. In practice, regulatory standards are therefore often based on political
considerations regarding appropriate minimum quality requirements or targets to increase quality from a low level.

In order to assess the two approaches (including their benefits and drawbacks and lessons learned in the process), we have analysed previous experiences with quality parameters in price cap regulations in the postal sector and in other network industries. We have also investigated the contributions from academic literature on the subject.

**Experience with quality parameters in postal price cap regulations**

While price caps are common in postal markets around the world, there is very limited experience with quality parameters the price caps. In fact, among Western jurisdictions, Belgium and Portugal are the only countries with a quality factor currently in place. In another two countries (Italy and the United Kingdom), the quality factor was abandoned and replaced by fine or compensation systems working outside the price cap.

A closer look at the price cap regimes applied in Belgium, Italy, Portugal, and United Kingdom reveals that they are very different, but also have some common features. In particular, we find that the regimes differ with respect to three main aspects:

- The use of rewards, punishments, and combinations of the two
- The number and type of quality dimensions included and the weighting of the quality dimensions into a single quality index
- The inclusion of safeguards to reduce the risk of extreme effects

We also find that all four regimes have two important features in common:

- All regimes have implemented the quality parameter in the price cap by means of a separate quality factor (i.e. although efficiency factors are common in many of the regimes, there are no examples of quality-adjusted efficiency factors)
- All regimes have defined a quality target and introduced a 'sufficiently large' penalty or reward to incentivise the postal operator to comply with the defined target. In other words, it seems like no postal regulator to date has applied the price signal approach where the link between changes in quality and changes in prices allowed under the price cap is based on users’ willingness to pay for changes in quality

**Examples from other network industries and academic literature**

A review of price regulation in other network industries reveals that quality factors in these sectors resemble those in the postal sector by (i) relying on a (weighted) measure of easily quantifiable indices and (ii) employing a bonus and/or penalty system. In contrast to the postal sector examples, quantitative links between service quality and price changes in other network industries are often based on assessments of the regulated operator’s costs of providing certain levels of quality or evaluations of users’ willingness to pay for certain levels of quality.

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2 Electricity distribution and transmission, airport, telecom, water, and motorway sectors.  
3 E.g. motorways in Italy  
4 E.g. electricity in the Netherlands
Our review of academic contributions on the incorporation of quality into price regulation regimes confirms that, in order to obtain an optimal level of quality, the link between quality and price should be based on users' willingness to pay for quality. Alternative approaches (e.g. benchmarking of quality levels and costs) could potentially be used to link changes in quality to changes in allowed price increases. However, the specific implementation of these methods in the context of the postal sector is not well researched.

**Evaluation of regulatory approaches and selection of a preferred approach**

When choosing the approach to regulate quality within the price cap, and how to design the regulation in practice, regulators should pay attention to at least three considerations.

*Firstly,* the regulation of quality within the price cap includes important trade-offs:

- A trade-off between capturing several quality dimensions versus maintaining a relatively simple model with low administrative and regulatory burden
- A trade-off between allowing for the maximisation of total social welfare versus having a model with low administrative burden
- A trade-off between maintaining stable price/quality relationships versus providing sufficient commercial flexibility in times of changing postal market dynamics.5

*Secondly,* in the light of the latter trade-off, regulators should apply a cautious regulatory approach. If there is uncertainty about whether service quality is a real concern or not, regulators should opt for ‘soft’ measures, such as monitoring of service quality, in order to avoid over-regulation. This is particularly important in dynamic markets, such as the postal market, where user needs are changing over time and where the regulated operator’s cost of providing a high quality of service is highly dependent on market developments.

*Thirdly,* the regulator’s broader goals can be a useful guidance for regulatory design:

1. If the goal is to maximise total social welfare, the quality factor must capture users’ willingness to pay.
2. If the regulatory goal is to ensure satisfied users of postal services, the quality factor should account for changing user needs and preferences.
3. If the goal is to guarantee a minimum or target level of quality for all postal users, a quality standard approach with defined minimum/target standard(s) would be appropriate.

While it would be optimal to base the link between quality and prices on postal users’ incremental willingness to pay for quality, this is often very difficult in practice. A more pragmatic approach is one where allowed price increases are set at a level that provides ‘sufficient’ incentives, but without a link to willingness to pay. In fact, we find that many regulators already apply this more pragmatic approach.

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5 See discussion in chapter 2
6 In order to provide sufficient incentives to increase/maintain quality levels, the change in allowed prices associated with a change in quality must be larger than the change in cost associate with the same quality change.
Introducing a Q-factor in the postal price cap – a practical approach
The implementation of a quality factor (Q-factor) in the price cap according to the price
signal approach or quality standard approach consists of seven steps:

1. Selecting quality dimension(s) in the Q-factor
2. Measuring quality
3. Weighting quality dimensions to construct a quality index
4. Setting targets and a reward and/or punishment mechanism
5. Defining the quantitative link between quality and price
6. Identifying data needs to quantify the link between quality and price
7. Constructing the Q-factor in the price cap

1. Selecting quality dimension(s) in the Q-factor
Regulators can choose between two main approaches regarding the number of quality di-
dimensions in the Q-factor:

• One-dimensional Q-factor
• Multi-dimensional Q-factor

One-dimensional Q-factors have been applied in Belgium and Italy with the share of on-
time deliveries as the sole quality indicator. Multi-dimensional Q-factors were applied in
Portugal and the United Kingdom. These models included additional quality dimensions,
such as the share of completed collections and waiting time at post offices. Irrespective of
the model chosen, the selection of quality dimension(s) to include should follow a few
guiding principles:

• The quality dimension(s) should reflect aspects important to postal service users;
• The quality dimension(s) should be measurable;
• The quality dimension(s) should be limited to a small number to avoid high complex-
ity and heavy regulatory burden;
• The choice should be future-oriented and account for possible changes in user needs
in the near future; and
• Quality dimensions can be selected to reflect specific problem areas (identified in the
past or assumed to become relevant in the near future)

2. Measuring quality
In order to measure the quality dimensions chosen, the regulator first has to define a
measurement unit for each quality dimension and identify a way to measure it. As a sec-
odent step, the regulator can decide to measure certain quality dimensions at different lev-
els: (i) at product or aggregate level, (ii) at national or lower level, (iii) at route level. The
measuring can be done by the Postal Service itself or by an independent body.

3. Weighting quality dimensions to construct a quality index
To construct a quality index, the regulator has to find weights between:

• The different quality dimensions, e.g., between on-time delivery and customer
satisfaction at touchpoints

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7 This is only relevant for the quality standard approach
• The different **types of products** within a single quality dimension, e.g., between first class and standard mail
• The **different geographical dimensions**, e.g., national versus regional measurement of quality dimensions

The weights that feed into the quality index should reflect the importance of products in the overall mail mix, i.e. they should reflect the share of the volume of each product in the overall mail volume subject to the price cap.

4. **Setting targets and a reward and/or punishment mechanism**
If the regulator chooses to apply the quality standard approach, this requires the setting of appropriate target levels. The regulator further has to choose whether to punish failure to meet targets or to give a reward for meeting or beating the set targets. Broadly seen, the regulator can choose from three alternatives:

(i) Minimum standard with penalty for underperformance
(ii) Standard, maximum target and reward
(iii) Standard and reward and/or punishment

These choices will depend on the Postal Service’s initial level of quality as well as the regulator’s level of ambition for the improvement or maintenance of service quality.

5. **Defining the quantitative link between quality and price**
When the regulator has chosen to regulate quality via price signals, the quality performance should be measured as a percentage change in quality level (i.e. the quality index constructed in step 3) and the link to price should reflect postal service users’ willingness to pay for the additional/lower quality.

When applying the quality standard approach, quality performance is measured as a deviation from the standard and the link to price should be based on a trade-off between giving sufficient financial incentives to the Postal Service and the risk of putting the Postal Service under financial stress or imposing excessive quality provisions. In order to provide sufficient financial incentives, the change in revenues from a change in quality has to exceed the change in costs of the same quality change. At the same time, the penalty cannot be so large that it puts the financial sustainability of the operator at risk.

6. **Identifying data needs to quantify the link between quality and price**
Measuring users’ willingness to pay (price signal approach) requires information on:

• how much users would consider paying for receiving additional quality for a given product and;
• how much users would need to get compensated for a reduction in quality of a given product to be equally well off
Two main survey methods for estimating willingness to pay are contingent valuation\(^8\) and conjoint analysis\(^9\).

Linking quality and price changes under the quality standard approach necessitates information on (i) the Postal Service’s costs, (ii) the Postal Service’s financial situation, and (iii) user preferences. In order to set the quality standard at the socially optimal level, the regulator would need information about users’ willingness to pay for quality (same as in the price signal approach). If a more pragmatic approach is applied, however, information from the Postal Service from previous reviews and reports, or from own analyses, could guide the design of the quality factor.

6. Constructing the Q-factor in the price cap
The functional form of the Q-factor will depend on the approach chosen to regulate quality within the price cap.

A Q-factor based on the price signal approach should take the functional form:

\[
\% \Delta \text{price} \leq CPI + Q
\]

where

\[
Q = \% \Delta \text{quality} \times WTP
\]

The allowable increase in price is smaller or equal to inflation augmented by the quality factor. The quality factor is equal to the change in quality, times postal users’ willingness to pay for that change in quality.

A Q-factor based on a quality standard should take the functional form:

\[
\% \Delta \text{price} \leq CPI - Q
\]

where the design of Q will depend on whether a minimum standard, maximum target, or medium level target is applied.

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\(^8\) Contingent valuation estimates the value that users place on quality of service for different products by asking the users to report either their willingness to pay (WTP) to obtain a specified quality and/or their willingness to accept (WTA) a quality reduction.

\(^9\) Conjoint analysis (also called contingent choice method) infers users’ valuation of different products from the hypothetical choices or tradeoffs that respondents make in a survey.
Chapter 1

Introduction

In this introductory chapter, we start by presenting the theoretical background to quality provision and price regulation. We thereafter discuss quality of service in the specific context of a dynamic postal market. We conclude by outlining the question to be answered in this report, our approach to answering it, and the content of the coming chapters.

1.1 Theoretical background: Quality and price regulation

Deciding which level of quality to provide is an important decision for most firms. The reason for this is that the level of quality affects the firm’s costs and revenues, and thereby its profits. Mathematically, firm’s profit function can be expressed as:

\[ \text{Profit} = [p - c(x, q)] x(p, q) \]

where \( p \) is price of the product, \( c(x, q) \) is the unit cost depending on the quantity of units sold and the quality of the product, and \( x(p, q) \) is the quantity of units sold depending on the price and the quality of the product. When deciding on the level of quality, a firm thus considers the impact on cost of increasing or reducing quality in relation to the impact on revenues.

When quality can be observed by customers prior to its purchase\(^{10}\), higher quality can increase the customers’ willingness to pay, thereby increasing the firm’s revenues directly. However, when quality cannot be observed directly\(^{11}\), higher quality will lead to higher revenues through increased reputation, which will benefit the firm only in the medium to long term.

From an economic perspective, the socially optimal level of quality is the level of quality that maximizes not only the profit of the firm (so-called producer surplus), but the sum of producer surplus and the excess value to consumers (so-called consumer surplus)\(^{12}\). The socially optimal level of quality occurs when the marginal benefit (i.e. the marginal increase in consumers’ willingness to pay) is equal to the marginal cost of providing the additional quality\(^{13}\), see Figure 1.1. This socially optimal level of quality is not necessarily the same as the profit-maximizing quality level, especially not in situations when the level of competition is weak.

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\(^{10}\) This type of product is often referred to as “search goods” by economists.

\(^{11}\) This type of product is often referred to as “experience goods” by economists.

\(^{12}\) The consumer surplus is the difference between the customers’ willingness to pay for a specific product and the price that they pay for the product in question, aggregated over all customers buying the product.

\(^{13}\) Spence (1975) Monopoly, Quality and Regulation
Figure 1.1 Socially optimal quality level

Source: Copenhagen Economics based on Spence (1975) Monopoly, Quality, and Regulation

When market conditions change, the socially optimal level of quality changes as well. This may be due to changes in the costs of providing quality or changes in the benefit to customers of increased quality. In the context of postal markets, substitution to electronic communication might lead to a lower willingness to pay for a high quality of service (e.g. next day delivery of transactional mail) on the letter market. At the same time, declining letter volumes might make quality more costly to provide due to higher unit costs in delivery\(^\text{14}\). These types of developments will shift the marginal benefit and the marginal cost of providing quality and may thus imply a lower socially optimal level of quality, see Figure 1.2.

Reductions in quality levels do therefore not necessarily have to reflect a deviation from the optimal level, but may simply signal that the optimal quality level has changed.

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\(^{14}\) The postal sector is characterized by economies of scale, meaning that the average cost of delivering a letter will decline as the volume of letters increase. A specific example of this is the situation where a mail carrier walks his route every day, irrespective of the number of letters he needs to deliver. Since the cost of the mail carrier is the same, irrespective of the number of letters, a higher volume of letters in his mail bag will lead to a lower unit cost per letter delivered.
Figure 1.2 Changing market conditions lead to a lower optimal quality level

![Graph showing changing market conditions and optimal quality level](image)

Note: WTP = Users’ willingness to pay for an increase in quality, MC = Marginal cost of providing an increase in quality

Source: Copenhagen Economics

A price cap regulation may incentivise the regulated firm to reduce quality levels or refrain from increasing quality in two ways.

**Firstly**, by incentivising the firm to reduce its costs in order to increase its profit given the pricing constraint, the price cap may incentivise the firm to *reduce quality in order to reduce costs*. Since costs depend on the level of quality, when the firm has a strong incentive to reduce costs, it also has an incentive to reduce quality.\(^{15}\)

**Secondly**, the price cap reduces the marginal benefit of supplying a higher quality of service compared to a situation without the regulation. For the price cap to be effective, the capped price has to be lower than the price that the firm would otherwise set. For each new customer that the firm can attract with higher quality it will therefore receive a lower price under the price cap regulation than it would without the cap. While the firm still has to bear the full cost of providing additional quality, it will not be able to reap the full benefit of the increased quality, to the extent that the increase in demand is multiplied by a lower margin. This reduces the firm’s incentives to provide a high level of quality under a price cap regulation.\(^{16}\)

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\(^{15}\) Laffont & Tirole (1993) A Theory of Incentives in Procurement and Regulation, p. 213


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If customers cannot observe the quality of the product prior to purchase, the link between quality and quantity is less tangible and direct. The firm can nevertheless affect the quantity of future sales, for example by developing a reputation of quality, which will influence future demand. If the link between quality and quantity is weak or only very long-term, then the benefit to the firm of providing higher quality is low.  

1.2 Quality of service in a dynamic postal market

Across postal sectors in many countries, changing user needs have led to significant e-substitution, i.e. consumers moving from physical mail to electronic mail and other online services. The stark drop in mail volumes related to e-substitution implies that postal operators no longer benefit from the same economies of scale in mail delivery. As a result, the unit cost of providing high quality postal services increases.

As explained in the previous section, changes in mail demand composition also mean that the marginal value of quality has changed. For example, since most time-critical mail nowadays can be handled electronically through e-mail or online platforms, consumers’ willingness to pay for next day delivery of physical mail is lower. In other words, the marginal benefit to consumers of improving certain aspects of service quality (e.g., speedy delivery of letter mail) might be lower today. For other aspects, though, (e.g., reliability of parcel delivery) it might be higher.

In order to ensure financial sustainability, postal operators respond to these market developments by implementing a number of cost-saving measures that also have implications on the quality of service in the postal sector, such as:

- *Extending delivery routes per mailman:* If a mailman has to serve longer delivery routes within the same time frame, the resulting time pressure might increase the share of items that are incorrectly delivered or not delivered on time.
- *Hiring subcontractors for (part of) the delivery:* While the hiring of subcontractors with cheaper labour might reduce costs, the postal operator foregoes part of the control over quality in delivery and therefore risks quality reductions. This might for instance be the case if the subcontractor’s workforce is insufficiently trained, or does not have experience in the delivery sector.
- *Introducing products with longer delivery time or a reduced delivery frequency:* Another way for postal operators to reduce costs is through the introduction of products with longer delivery time or reduced delivery frequency. The introduction of such products at unchanged prices could be seen as a reduction in the overall service quality, because recipients have to wait longer for their mail to arrive.

The above examples all show how the current characteristics of the postal market can lead to reduced quality of service. All examples, however, represent quality reductions that come as a natural development due to changes in user needs. Such reductions are not necessarily bad for consumers, as their marginal benefit from quality has also changed. If the cost of providing quality increases, or if the demand for high quality decreases, it is

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natural that the socially optimal quality level would decrease as well. Any regulation of
quality in the postal sector should take into account these developments.

1.3 The assignment and our approach to solving it

Since 2006, the US Postal Service has been subject to an inflation-based price cap on its
market dominant products. In the same period, the Postal Service has also conducted a
number of substantial operational changes, which have led to changes in the level of ser-
vice provided. One example of this is the elimination of overnight delivery for a large
share of the population. While these changes have influenced service quality substantially
(e.g., many recipients no longer receive their letters within one day), they have not had
any impact on the prices that the US Postal Service may charge for its market dominant
products under the price cap regulation.

It should be kept in mind, that these changes in service quality are not necessarily an ad-
verse effect of the price cap regulation itself. Nevertheless, they make it important for the
Commission to understand whether postal rates reflect the service levels provided by the
postal operator.

In market segments with limited competition, the Postal Service may have less incentive
to maintain a high level of service quality because the risk of losing volumes to competi-
tors is limited. This may lead to a quality level that is below what is socially optimal. In or-
der to ensure that the quality of market dominant postal services in the US does not dete-
riorate to sub-optimal levels, the Commission is reviewing the Postal Service’s quality of
service for all market dominant products by examining factors such as speed of delivery,
reliability, and the level of customer satisfaction. There is, however, no direct re-
ward/penalty for the Postal Service if quality exceeds/falls short of certain quality stan-
dards.

The Commission’s ten-year review of the rate regulating system, mandated by the Postal
Accountability and Enhancement Act (PAEA) provides a good opportunity for the Com-
mission to assess the functioning of the price cap system and to determine whether any
improvements might be needed. In particular, it provides the Commission with the op-
portunity to investigate if and how quality of service could be included in the design of the
price cap system in order to prevent indirect price increases through lower quality of ser-
vice.

Within the context of the current ten-year review, the Commission would like to investi-
gate if and how quality of service could be included in the design of the price cap system.
In particular, the Commission would like to investigate the possibility of including a re-
ward/penalty mechanism for service quality performance in the current price cap system
for market dominant products, by way of installing a quantifiable link between service
quality changes and postal rate changes.
Against this background, the Commission has asked Copenhagen Economics to investigate **how quality of service could be included as a factor in the price regulation and what considerations should be taken into account in that process.**

The remainder of this report is structured in the following way.

In **Chapter 2**, we present the main options available to a regulator who would like to regulate quality levels and explain the benefits and drawbacks of the different options.

In **Chapter 3**, we analyse the methods available to link service quality to postal prices in the framework of a price cap regulation. We therefore draw upon international experience of quality regulation in the postal sector as well as experience from other network industries. We also review the academic literature on the subject.

In **Chapter 4**, we design a framework for evaluating the methods analysed in chapter 3. We then apply this framework to the methods identified in chapter 3 and use it to highlight the main benefits and disadvantages of each method and the key trade-offs to consider when deciding if and how to include a quality dimension in the price cap formula.

Finally, in **Chapter 5**, we provide a practical manual to implement a quality factor in the price cap regulation.
Chapter 2
Regulating quality of service

In this chapter, we start by examining how quality of service can be regulated and the pros and cons of different regulatory approaches. Following this, we conduct a more in-depth analysis of the option of incorporating quality regulation into a price cap. Finally, we review some of the key challenges that need to be considered, especially for the postal industry, in designing a quality regulation scheme.

2.1 Approaches to regulating quality of service

Quality of service can be regulated in different ways. Our review of quality regulation in the postal sector and other network industries reveals four main approaches that regulators can use to incentivise high postal service quality:

- Monitor quality levels and publish performance results
- Define regulatory standards, review performance and impose fines
- Require customer compensation if quality is too low
- Incorporate quality parameter(s) into the price cap – via an X-factor or an explicit Q-factor

Monitoring and publishing of quality performance can be considered a rather soft regulatory approach where the regulator collects information about quality performance from the regulated operator and makes the findings available to customers and other stakeholders. In this way, reactions from customers and other stakeholders can provide the operator with incentives not to lower the quality of service. There is a risk, however, that this approach does not provide sufficiently strong incentives. This is especially true in markets with low or no competition.

Defining regulatory standards and taking action when the regulated operator deviates from the predefined level of quality is another way of regulating quality. The regulator can decide to make further reviews and possibly fine the operator if it does not comply with the established standards.

Requirements for customer compensation imply that customers are reimbursed if they suffer from a too low quality of service. Although the direct reimbursement may have some desirable features, such as the direct link between low quality and financial compensation, the approach also entails some challenges. One such challenge is the difficulty associated with capturing quality dimensions shared by many users, i.e. where the harm of low quality is shared by many users without a clear link to a specific transaction with the operator. When this is the case, establishing a system that guarantees incentives for customers to seek compensation when quality is too low may become a complex task.

This has also been previously summarized by e.g. Swindand and Scully (2006) Incorporating Quality of Service Measures Into Price-caps for Post
The incorporation of quality parameters into the price cap mechanism implies that the level of quality provided by the regulated operator is directly linked to the price (or revenue) allowed under a price cap. More specifically, changes in the quality of service will lead to changes in the allowed price changes under the price cap\(^{19}\). While this mechanism can be very good at aligning the incentives of quality provision to financial incentives, this report reveals that there are many considerations to take into account in order to get the most out of this regulatory approach.

Regulators can evaluate the different approaches based on a number of criteria. Examples of such criteria are:

- The incentives provided to the regulated operator
- The transparency and simplicity of the regulation
- Data availability
- The regulatory burden for the regulated operator
- The administrative burden for the regulator
- Allowance for financial sustainability for the provision of postal services

Table 2.1 summarises the main benefits and disadvantages of the four approaches listed above based on these criteria.

<table>
<thead>
<tr>
<th>Approach</th>
<th>Pros</th>
<th>Cons</th>
<th>Conclusion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring</td>
<td>Low regulatory burden for the operator.</td>
<td>Reduces information problems but often does not provide sufficient incentives to provide quality due to lacking link with financial impact.</td>
<td>Low burden on operator, but low incentives.</td>
</tr>
<tr>
<td>Standards, reviews and fines</td>
<td>Low complexity, can give “flexibility” for the regulator.</td>
<td>Potential regulatory uncertainty for the operator. Higher discretionary power for the regulator. Higher risk of regulatory failure if the regulator does not know the true costs of providing quality of service.</td>
<td>Trade-off between flexibility and regulatory certainty.</td>
</tr>
<tr>
<td>Requirements for customer compensation</td>
<td>Reimburses customers directly for lower quality.</td>
<td>Potential difficulties to capture various dimensions of quality. The fact that not all customers might request compensation decreases incentives to maintain/increase quality.</td>
<td>Directly compensates the customers but may fail to include all dimensions of quality and may provide lower quality incentives.</td>
</tr>
<tr>
<td>Quality parameter in price cap</td>
<td>Directly aligns quality provision to financial incentives.</td>
<td>Complex; Potentially large burden on both operator and regulator.</td>
<td>Potentially good alignment of incentives, but high risk of burdensome regulation.</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics based on literature and industry reviews

In the following, we focus on the option of incorporating a quality parameter into the price cap regulation.

---

\(^{19}\) The default price cap is often tied to general price increases, i.e. inflation (CPI). Other variables can be added to this formula on top of inflation, such as expected efficiency increase (often called “X-factor”) or, as referred to here, quality performance (often called “Q-factor”).
2.2 Incorporating a quality parameter into the price cap

There are two main approaches for a regulator to control quality of service within the scope of a price-cap regulation:

1. The regulator can control quality via price signals in the price cap formula and let the operator adjust its level of quality accordingly.
2. The regulator can instruct the operator to achieve a predefined level of quality and adjust the allowed price increases under the price cap if the operator does not achieve the preferred level.

Controlling quality via price signals

The regulator can design the price cap formula such that (irrespective of the level of quality currently provided) the operator's quality performance directly carries over to a higher (lower) allowed price. In order to maximize its profits, the operator will then use its information about the cost of providing quality to balance the additional price increase allowed against the cost of providing additional quality.

In order to allow for an optimal outcome (a level of quality that maximises total social welfare, i.e. the sum of consumer surplus and producer surplus), the change in the price cap triggered by a change in the quality provided should mirror users' willingness to pay for the higher/lower quality (see chapter 1).

If the regulated price allows the operator to increase its price by more than the marginal benefit of quality (i.e. users' willingness to pay for a certain quality level), then the operator will increase quality to the point where the marginal cost of providing additional quality equals the allowed price change (which in this case is higher than users' willingness to pay). As a result, the level of quality will be higher than the socially optimal level and this will lead to a distortion in terms of a so-called dead-weight loss. This situation is illustrated in Figure 2.1 below. If the regulated price allows the operator to increase its price by less than the marginal benefit of quality, this will lead to a quality level below the socially optimal one.

A regulator applying this approach will thus “only” need information about users' willingness to pay to incentivise the operator to provide the socially optimal quality of service. This information, however, is not always easy to obtain. This is further discussed in chapter 4).

20 Dead-weight loss refers to the foregone social welfare from a sub-optimal level of, in this case, quality.
Controlling quality via price signals

When controlling quality via price signals, the regulator sets a pre-defined level of quality that it wants the operator to comply with. Based on how the operator performs in relation to that standard, the regulator may impose financial penalties (or rewards) by lowering (increasing) the price cap.

In order to achieve the socially optimal quality level (maximising total social welfare), the regulator must have sufficient information about user’s willingness to pay for quality (i.e. the marginal benefit of additional quality), as well as the operator’s marginal cost of providing additional quality. This is seldom the case. In practice, regulatory standards are therefore often based on social considerations regarding appropriate minimum quality requirements or targets to increase quality from a low level. If the quality level instructed is different from the socially optimal level, this will result in a loss of welfare in terms of a dead-weight loss. This is illustrated in Figure 2.2 below, where the quality standard is set above the optimal level.

Figure 2.1 Controlling quality via price signals

Note: DWL = dead-weight loss. Refers to the foregone social welfare from a sub-optimal level of quality.
Source: Copenhagen Economics
The financial penalty (or reward) associated with any deviation from the standard quality level has to be balanced thoughtfully. Most importantly, any penalty/reward has to be large enough to provide the operator with sufficient incentives, but small enough not to result in excessive provision of quality. Moreover, large penalties may create a large financial risk or regulatory burden for the operator. The setting of an appropriate punishment or reward is discussed in more detail in chapter 5.

### 2.3 Challenges when regulating quality of service

When regulating postal service quality, regulators are faced with several challenges:

*The quality regulation should fit with the whole range of policy objectives and priorities.*

If not, the regulation of quality might distort other regulatory objectives, such as efficient provision of services or affordable prices.
Quality is multi-dimensional. If the quality regulation focuses exclusively on certain dimensions (e.g., delivery speed), it might lower quality on other dimensions (e.g., reliability). The operator will thus have incentives to decrease quality on the dimensions that are not covered by the regulation. Further, when there are different dimensions included in the regulation, the regulator may also have to prioritise which dimension of quality should induce the strongest incentives.

Quality can be difficult or burdensome to measure. The measurement of some dimensions of quality might be difficult and require significant resources. This may either induce a high administrative burden on the regulator or, if certain dimensions simply cannot be measured, force the regulator to limit the quality dimensions to those which can be captured. If the measureable quality indicator is not a good proxy for the actual quality experienced by users, it may distort the incentives for the operator.

Information about the benefits and costs of changes in quality are difficult to obtain. In the absence of accurate knowledge regarding the value that customers place on elevated levels of service quality and the associated costs of providing it, it is difficult to identify appropriate service quality goals. It can be particularly challenging to assess the benefits and costs of a change in service quality in settings where the market is in dynamic transition and user needs are changing over time.

Finally, variation in quality can be due to factors beyond the control of the regulated operator. For example, harsh weather conditions can make on-time delivery difficult for a postal operator. This may lead to an arbitrary discussion of when and for how much of any change in quality the operator should be held responsible.

On top of these challenges, regulators must ensure that the regulatory design is adapted to the current situation and the specific goals that it wants to achieve. If the current quality level is considered too low, for example, the regulatory strategy could include incentives to improve quality. In this situation, including a reward for improvement may be considered, see label 1 in Figure 2.3. On the contrary, if the quality level is considered sufficiently high, the regulatory strategy may focus on keeping that level and preventing a deterioration of quality. In this situation, including a punishment for reducing quality may be considered, see label 2 in Figure 2.3.
In dynamic markets, such as the postal market, quality regulation comes with a risk of regulatory failure. Regulatory failure refers to the case where inappropriate regulatory intervention (or lack thereof) creates undesirable outcomes. This means that the regulatory design must be adapted to the current market situation. In this context, we identify two specific developments in the postal sector of which the regulator should be cautious:

1. **Changing user needs**

Postal users’ needs and preferences are changing over time. Today, for example, there may be a lower preference for speedy delivery of letters, but a higher preference for reliable delivery of packets and parcels, compared with ten years ago. This means that the perception of what constitutes high quality of postal services, and the willingness to pay for such quality, is changing over time. If the price cap is linked to estimates of users’ willingness to pay, these estimates have to be updated regularly to take any changes into account.

Similarly, quality instructions and standards based on historic measures of users’ preferences (e.g., 98 percent of letters should arrive by D+1) might not take this development into account over time. In order to avoid regulatory failure, a pre-defined quality standard should reflect the current situation on the market.

---

2. **Declining mail volumes lead to higher unit cost for postal operators**

Many postal markets are experiencing declining volumes\(^{22}\), which can lead to higher costs of providing additional quality of service\(^{23}\). By failing to consider such dynamics, inappropriately designed regulation may lead to two issues.

*Firstly*, it may lead to a faulty assessment of the optimal level of quality, because the higher marginal cost of providing quality will lead to a lower optimal quality level. Consequently, if, for example, the operator is instructed to provide a very high level of quality, then this will lead to even higher costs on top of those already caused by the volume decline.

*Secondly*, a strict quality regulation may leave the postal operator with insufficient flexibility to adapt its pricing to changing market conditions. When costs increase, the operator may need to adapt its prices in order to stay profitable. If the price regulation includes strong constraints on the operator, this can remove the operator’s flexibility to change its prices. As an example, the UK regulator Ofcom’s decision to abandon its price cap regulation entirely in 2012 was, in part, motivated by the risk of regulatory failure endangering Royal Mail’s financial stability (see chapter 3).

\(^{22}\) Universal Postal Union (2016) *Research on Postal Markets*

\(^{23}\) The postal sector is characterized by economies of scale, meaning that the average cost of delivering a letter will decline as the volume of letters increase. A specific example of this is the situation where a mail carrier walks his route every day, irrespective of the number of letters he needs to deliver. Since the cost of the mail carrier is the same, irrespective of the number of letters, a higher volume of letters in his mail bag will lead to a lower unit cost per letter delivered.
Chapter 3

Methods linking postal price changes to changes in service quality

In this chapter, we analyse different methods of quantifiably linking changes in service quality to changes in postal prices under a price cap. We start by investigating experiences from the postal sector on this topic. We then discuss the experience in other network industries. Finally, we review the academic research on the topic and present its relevance for the postal sector.

3.1 Quality parameters in postal price cap regulation

When a price cap regime for postal operators is already in place, one way to regulate quality of service is to incorporate an incentive for quality provision directly into the price cap formula. Regulators can do this either via a quality-adjusted efficiency factor (X-factor) or by means of a separate quality factor (Q-factor), see Box 3.1. The Q-factor describes an element in the price cap formula. Alternatively (or in addition to the Q-factor) regulators can also decide to regulate quality of service by other means, such as a penalty system for below-standard quality of service.

Box 3.1 Parameters in price caps

Price cap regimes define the allowable price increase for a basket of products over a defined time period. The simplest price cap allows for prices to change with inflation (e.g., the retail price index or the consumer price index).

\[
\text{Allowable price increase} \leq \text{CPI}
\]

More sophisticated price cap regimes include different kinds of parameters, such as

- **X-factor** (efficiency adjuster): The X-factor is a parameter in the price cap formula. It defines a level of efficiency improvements/cost reductions that the regulated operator is required to undertake in order to keep its prices constant. If the operator improves efficiency above the target, this enlarges the room for price increases.

- **V-factor** (volume adjuster): The V-factor allows the postal operator to increase its prices should costs increase due to significant volume declines.

- **Q-factor** (quality adjuster): The Q-factor aims at incentivising the postal operator to achieve optimal levels of quality under the price cap.

Source: Copenhagen Economics

We have reviewed the international postal sector experience of including a quality parameter in the price cap regime. For the countries where the postal price cap includes a quality parameter, we have analysed:

- Which dimensions of quality that are included in the price cap
How quality is measured
How the incentive mechanism is designed
What the benefits and disadvantages of the chosen design are
How price and quality have developed under the price cap

While postal price cap regimes are a common practice around the world, there is very limited experience with quality dimensions in postal price cap regimes, see Table 3.1.

Table 3.1 Overview of postal price cap regimes in our analysis

<table>
<thead>
<tr>
<th>Country</th>
<th>Inflation index</th>
<th>Efficiency adjuster</th>
<th>Volume adjuster</th>
<th>Quality factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Belgium</td>
<td>HI²</td>
<td>-</td>
<td>-</td>
<td>X</td>
</tr>
<tr>
<td>Germany</td>
<td>CPI</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>France</td>
<td>CPI</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Ireland</td>
<td>CPI</td>
<td>X</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Netherlands</td>
<td>CPI</td>
<td>-</td>
<td>X</td>
<td>-</td>
</tr>
<tr>
<td>Norway (until 2016)</td>
<td>LCI³</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Portugal</td>
<td>CPI</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>Sweden</td>
<td>CPI</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Italy</td>
<td>CPI</td>
<td>X</td>
<td>-</td>
<td>X (until 2015)</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>CPI</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>(until 2012)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Canada (until 2008)</td>
<td>CPI</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>United States</td>
<td>CPI</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

Note: ¹ This refers to the existence of quality parameters in the price cap formula. In addition to regulating quality within the price cap formula, the regulator might also decide to regulate quality outside the scope of the price cap, e.g. by imposing a penalty for substandard service quality. ²HI = ‘Healthy index’, a consumer price index excluding prices of ‘unhealthy products’ such as tobacco, alcohol etc. ³Labour cost index; 4 safeguard regime; a volume adjuster allows the postal operator to increase its prices should costs increase due to significant volume declines

Source: Copenhagen Economics

Main findings

Our analysis of quality factors in postal price cap regulations reveals that:

- Among Western jurisdictions, Belgium and Portugal are the only countries with a quality factor currently in place. Italy and the United Kingdom abandoned the quality factor, either because quality of service had attained a stable, high level (Italy) or because the regulator abandoned the price cap system altogether (United Kingdom²⁴). In these countries, the Q-factor was replaced by a fine system.

- There is very little information available about how the quality factors came about. Regulators mostly pursued the goal of improving or ensuring stable quality of service levels, but the design of the quality factor did not result from systematic considerations of the best way to link quality changes to price changes under the price cap. For

²⁴ The regulator chose to abandon the price cap mechanism altogether because it was considered to endanger the financial stability of the USO given dynamic market developments (see more detailed description below).
instance, in the UK, the quality regulation grew organically out of the postal operator’s own quality monitoring system, whereas in Portugal the regulator found inspiration in the telecommunications sector.

- The four price cap regimes with quality regulation have a few common features, but also differences:

  **Common features**
  - All of the investigated regimes resorted to incorporating a Q-factor in the price cap. None contained a quality-adjusted efficiency factor (X-factor) although efficiency factors are common in many of the regimes
  - In all countries, the quality is measured as an index of product-level quality, weighted by the respective importance of the product in terms of volumes or revenues
  - In all countries, the regulators resort to the quality standard approach whereby the regulator sets standards for quality of service and the Q is set to provide incentives to reach that standard (rewarding/penalising a positive/negative deviation of the postal operator from the set standard)

  **Differences**
  - The methods differ as to whether they employ a reward for meeting, or a punishment for failure to meet, quality standards, or a combination of the two
  - The methods differ as to the number and type of dimensions employed to measure quality of service. Only the UK employs a dimension related to performance in different parts of the country
  - In only two cases (Italy and the UK) did the regulator (at least in part) base a quantifiable link between quality changes and price changes under the price cap on an assessment of the costs underlying quality improvements or users’ willingness to pay for quality
  - The models employ different kinds of safeguards or no safeguard to limit the risk of extreme effects on allowed price increases

- It is difficult to assess whether or not the Q-factors were successful in ensuring high quality or improving quality of service. This is because quality of service in the postal sector is influenced by many factors, such as technological development, competition or external force majeure on the postal operator’s ability to provide high quality.

In the following, we present these four price cap regimes with Q-factors in detail. An overview of the different price cap regimes is provided in Table 3.2.
Table 3.2 Price cap regimes with Q-factors

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Belgium</th>
<th>Italy</th>
<th>United Kingdom</th>
<th>Portugal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Approach</td>
<td>Quality standard approach</td>
<td>Quality standard approach</td>
<td>Quality standard approach</td>
<td>Quality standard approach</td>
</tr>
<tr>
<td>Products covered</td>
<td>Single piece items (small users' basket)</td>
<td>Single piece mail, transactional mail, direct mail, newspapers, periodicals, parcels</td>
<td>Single piece letters, international mail, parcels</td>
<td>Correspondence, editorial mail and parcels</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dimensions of quality in the price cap</th>
<th>Transit time</th>
<th>Transit time</th>
<th>Transit time, completion of delivery</th>
<th>Transit time, mail not delivered, waiting time in post offices</th>
</tr>
</thead>
<tbody>
<tr>
<td>Price cap formula</td>
<td>Allowed price increase ≤ CPI + Q</td>
<td>Allowed price increase ≤ CPI - X + Q</td>
<td>Allowed price increase ≤ CPI - X - K - Q + PP + G</td>
<td>Allowed price increase ≤ CPI + G - X - Q</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Formula for Q-factor*</th>
<th>( \frac{(OPT - 90)^2}{1000} ) ( a \Delta QI )</th>
</tr>
</thead>
</table>

| Link between quality changes and allowed price increases | Maximum price increase of 10% if share of on-time deliveries above 90%. The 10% maximum increase is based neither on cost, nor on users' willingness to pay. | Link based on the operator's extra cost for supplying better quality | Maximum penalty for below target quality level of 1%. The 1% is neither based on cost, nor on users' willingness to pay, but was instead inspired by existing practice within telecom |

<table>
<thead>
<tr>
<th>Reward/punishment/ combination</th>
<th>Reward</th>
<th>Combination</th>
<th>Punishment</th>
</tr>
</thead>
</table>

| Safeguards present | Factor is limited to maximum 10% price increase | Factor is not limited | Factor is limited to max. 5% of allowed revenues | Factor limited to max. 1% |

| Consideration of zonal variance in quality? | No | Yes, but outside price cap | Yes | No |

Note: *Specific calculations of quality factor are explained below for each case; **when punishment/ reward is not simple question of performance below/ above a set standard, but is graded according to how badly/ well the postal operator performs against a standard.

Source: Copenhagen Economics

Belgium: weighted on-time delivery target model

In Belgium, an inflation-based price cap model with a so-called quality bonus has been in place since 2006. The regulator’s goal was to increase the quality of service provided by bpost until it reached a stable level. Belgium is the only country where the Q-factor is still in place today.

Description of the Belgian model

The price cap applies to single piece items in the so-called small users’ basket. It contains a reward (not a penalty), i.e. an additional allowable price increase for quality levels

25 “Panier des petits utilisateurs” includes national and international outbound priority and non-priority mail (≤2kg), national and international outbound parcels (≤10kg) and registered and insured national and international outbound mail, BIPT (2016) Décision du Conseil de l’IBPT du 10 octobre 2016 Concernant le contrôle des délais d’acheminement pour l’année 2015 du courrier égrené intérieur prioritaire, du courrier égrené intérieur non prioritaire, des envois recomman-dés égrenés intérieurs, des colis égrenés en service intérieur et du courrier égrené entrant prioritaire, p. 3
above a certain target, calculated based on the weighted average quality reached by the bpost across a selection of products.

Under this system, the allowed price increase should be smaller than or equal to the “healthy” consumer price index (HI) augmented by the quality bonus (QB), according to the following formula:

\[
\text{Allowed price increase} \leq HI \left(1 + QB\right) - 1
\]

Where the quality bonus (QB) is calculated in the following manner:

\[
QB = \frac{(QMR - 90)^2}{1000}
\]

In the above formula, the QMR (Qualité Moyenne Réalisée) designates the weighted average quality reached by bpost. The only quality indicator taken into account for the calculation of the QMR is the share of products delivered within the prescribed transit times. More specifically, the QMR is calculated based on the percentage of single piece items in the ‘small users’ basket’ that are delivered on time, weighted per product category. Each year, the regulator BIPT and bpost consult together to determine the weights attributed to each of the services based on the (volume) share of each service in the totality of postal services within the small users’ basket, see Table 3.3.

<table>
<thead>
<tr>
<th>Transit time per product category</th>
<th>Weight, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority letter post D+1 (up to 2kg)</td>
<td>52.42%</td>
</tr>
<tr>
<td>Non-priority letter post D+2 (up to 2kg)</td>
<td>30.42%</td>
</tr>
<tr>
<td>International inbound letter post D+1 (up to 2kg)</td>
<td>12.43%</td>
</tr>
<tr>
<td>Registered letter post D+1 (up to 2kg)</td>
<td>3.99%</td>
</tr>
<tr>
<td>Parcel post D+2</td>
<td>0.74%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>


If average quality (i.e. the share of products delivered on time) is below 90 percent, the quality bonus drops to zero and prices are only allowed to increase by inflation. Any quality in between 90 percent and 100 percent of products delivered on time yields a quality bonus for bpost. By design of the formula, the maximum quality bonus is 10 percent for 100 percent of products delivered on time. This maximum value is neither based on cost considerations nor on willingness to pay.26 Instead, the Belgian model is a way to regulate quality levels by means of instructions, whereby the target is set at 90 percent and the BIPT provides sufficient incentives for bpost to perform or even outperform the target.

Box 3.2 provides an example of the calculation of the quality factor in Belgium.

---

26 Interview with bpost
If bpost delivers on average 95% of the items in the small users’ basket on time, the quality bonus (QB) amounts to:

\[
\frac{(95 - 90)^2}{1000} = 2.5\%
\]

This means that bpost is allowed to increase its prices by 2.5% on top of inflation within the given price cap period.

Source: Copenhagen Economics

In addition to granting a quality bonus for on-time delivery shares between 90 percent and 100 percent, the BIPT specifies transit time targets of 95 percent delivered by D+1 and 97 percent delivered by D+2 for each product in its management contract with bpost. However, these targets are merely reference values, since they do not enter the determination of the quality bonus/ failing to achieve them does not entail a penalty.

Benefits and disadvantages of the Belgian model
The Belgian model has many benefits, but also some disadvantages. The model itself is easy to understand and very simple, since it focuses on only one type of quality indicator. This also means that reporting requirements for bpost and data collection efforts for the BIPT are kept to a minimal level. The mechanical nature of the system as well as the clear rules for determining the product weights within the QRM minimise the regulatory burden on both operator and regulator. On top of this, the model does not threaten bpost’s financial sustainability, since it does not include a penalty for falling below an average quality of 90 percent of items delivered on time.

The model gives a clear incentive to increase quality as it can yield substantial rewards of up to 10 percent additional price increases. However, the pure reward system might not give sufficient incentives to maintain a high level of quality (i.e. a level around the 95/97 percent targets that the BIPT specifies) since drops in quality below a certain threshold are not penalised. This is especially true if it is costly for bpost to increase quality further. Furthermore, the focus on only one single quality indicator (on-time delivery) could provide incentives for bpost to decrease quality and save costs on other dimensions (e.g., retail branch opening hours) in order to increase the headroom under the price cap even further. An overview of the benefits and disadvantages of the Belgian model is provided in Table 3.4.
Table 3.4 Benefits and disadvantages of the Belgian model

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Benefits</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive to improve/maintain quality level</td>
<td>Substantial reward of up to 10% additional price increase gives clear incentive to improve quality</td>
<td>Only includes one quality dimension → could provide incentives to decrease quality and save costs on other dimensions</td>
</tr>
<tr>
<td>Transparency and simplicity</td>
<td>Very simple quality index, easy to understand, fully transparent</td>
<td>This pure reward system might not give incentives to maintain at a high quality level</td>
</tr>
<tr>
<td>Allowing for financial sustainability</td>
<td>No extensive data collection necessary</td>
<td></td>
</tr>
<tr>
<td>Burden on regulator/postal operator</td>
<td>No extensive reporting requirements</td>
<td>Low regulatory burden for the operator and the regulator</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics

Quality and price developments in Belgium
Before the existence of the quality bonus, on-time delivery of D+1 priority mail had already increased from 75 percent in 2001 to 92 percent in 2006. Since then, on-time delivery has been stable at between 92-96 percent for D+1 priority mail. Only in 2015, did quality drop to an unprecedented low of 91 percent. The quality index which was introduced in 2006 broadly follows the quality of the priority letter given its high weight in the QMR, see Figure 3.1.

Figure 3.1 Quality development in Belgium, 2006-2015

![Quality Development Chart]


The impact of the quality bonus on allowed price increases varied, for instance:\n
---

• In 2009, the quality bonus accounted for about 2.5 percentage points of the total allowed price increase (which was 7.6 percent)
• In 2015, the quality bonus only contributed about 0.5 percentage points to the allowed price increase (which was 6.8 percent)

In fact, the quality bonus has been considered the main reason for price increases under the Belgian price cap. The price for 20g D+1 letter increased from €0.42 in 2001 to €0.52 in 2006 (before the quality bonus) and then to €0.79 in 2016, see Figure 3.2.

**Figure 3.2 Price development of priority letters, Belgium, €**


**Italy: Weighted on-time delivery target model**

Between 1996 and 2015, the Italian postal operator, Poste Italiane, was subject to an inflation-based price cap regulation with an efficiency factor (X-factor) and a cost-based Q-factor. The system was introduced to incentivise Poste Italiane to significantly increase quality of service from a very low level at the outset.  

**Description of the Italian model**

The price cap system applied to single piece and transactional mail, direct mail, newspapers and periodicals, as well as parcels. For each basket of products, a price cap was set according to the following formula:

\[ Price_t = Reference\ tariff \times \left[ \left(1 + RPI_t^{expected} - X + Q\right) + \left(RPI_t^{realized} - RPI_{t-1}^{expected}\right) \right] \]

Where

---

29 WIK (2015) *Review of the postal market three years after full market opening on 1 January 2011*, p. 51
30 Somers and Peeters (2008) *De posttarieven in België sinds 1879*
31 Interview with Poste Italiane
32 Ufficiale (2010) *Contratto di programma 2009-2011 tra il ministero dello sviluppo economico e poste italiane*
The reference tariff was defined at the beginning of each regulatory period based on the tariff values established in the last price cap deliberation. It was additionally subject to verification of the actual cost.

RPI designates the retail price index, including an adjustment factor accounting for the difference between expected and realised inflation in the previous time period.

The change in headroom for Poste Italiane, \( Q \), depends on the quality results achieved against a set quality standard and the additional costs (or cost savings) incurred when exceeding (failing to meet) the quality level.

\[
Q = a\Delta Q_{basket}
\]

Where,
- \(\Delta Q_{basket}\) is a correction term (negative or positive) for the difference between Poste Italiane’s quality results and the quality standards set by the regulator
  \[
  \Delta Q_{basket} = Q_{basket}^{realized} - Q_{basket}^{standard}
  \]
- The coefficient \(a\) links quality levels to the cost of reaching them. In other words, it is designed so that Poste Italiane only recovers the costs of quality improvements without making any additional revenue.

The \textbf{Q-factor} in Italy was only based on a single quality indicator (on-time delivery of various products within a basket of services) and weighted according to the volumes or revenues of each service. More specifically, the regulator specified two targets related to the delivery times of each product, see Table 3.5.

<table>
<thead>
<tr>
<th>Product</th>
<th>Transit time*</th>
<th>Standard, % **</th>
</tr>
</thead>
<tbody>
<tr>
<td>Priority mail (posta non-massiva)</td>
<td>1.: D+1</td>
<td>89.0</td>
</tr>
<tr>
<td></td>
<td>2.: D+3</td>
<td>99.0</td>
</tr>
<tr>
<td>Bulk mail (correspondenza massiva)</td>
<td>1.: D+3</td>
<td>94.0</td>
</tr>
<tr>
<td></td>
<td>2.: D+5</td>
<td>99.0</td>
</tr>
<tr>
<td>Registered mail (posta raccomandata)</td>
<td>1.: D+3</td>
<td>92.5</td>
</tr>
<tr>
<td></td>
<td>2.: D+5</td>
<td>99.0</td>
</tr>
<tr>
<td>Assured mail (posta assicurata)</td>
<td>1.: D+3</td>
<td>93.0</td>
</tr>
<tr>
<td></td>
<td>2.: D+5</td>
<td>99.0</td>
</tr>
<tr>
<td>Parcels (pacco ordinario)</td>
<td>D+5</td>
<td>94.0</td>
</tr>
</tbody>
</table>

Note: * 1 = primary target, 2 = secondary target, ** for the period 2009-2011
Source: WIK report (2011) \textit{Quality Factors in Postal Price Regulation}

These targets enter the calculation of the Q-factor in the following way:\footnote{33 Interview with Poste Italiane; Dieke et.al. (2012) \textit{Quality factors in Postal Price Regulation}}:

- If the primary target (1) was not met, the quality factor would be negative by the difference between the primary target set by the regulator and the quality delivered by Poste Italiane.
- If the primary target (1) and the secondary target (2) were both met, the quality factor would be positive by the difference between the first target set by the regulator and the quality delivered by Poste Italiane.
• If the primary target (1) was met, but the secondary target (2) was not, the quality factor would be zero.

In other words, the actual calculation of the quality factor was only calculated based on the primary target. The secondary target was considered a ‘reliability objective’ that had to be met by Poste Italiane in order to get some additional headroom under the price cap.

The magnitude of the coefficient $\alpha$ was based on a cost study that intended to link quality improvements to the costs associated with those efforts. The cost study looked at the different steps of the postal value chain and the probability at each step of exceeding the processing time (i.e. increasing the probability of running late and decreasing quality). The calculation of the coefficient $\alpha$ was based on the following two considerations:

1. How much Poste Italiane needs to increase the probability of being on time at each step of the postal value chain in order to satisfy the quality standard
2. How much it costs Poste Italiane to increase the probability by X percentage points of the difference between the realised quality and the quality standard

$\Delta Q_{basket} = Q_{basket}^{\text{realised}} - Q_{basket}^{\text{standard}}$

The coefficient $\alpha$ is set equal to 1, i.e. a one percent increase in quality would allow Poste Italiane to increase its prices under the price cap by one percent.\(^{34}\)

In addition to the quality targets feeding into the Q-factor, the regulator specified additional quality targets for priority letters, see Box 3.3. Failing to meet these standards triggered a fine, but had no implications for the price cap.

\(^{34}\) The exact calculations underlying the coefficient $\alpha$ are unknown.
In addition to the quality targets feeding into the Q-factor, the regulator specified that the quality target set in Table 3.5 also applied at regional/route level for priority letters. The regulator specified four different types of routes:

1. Sender and receiver within the same city
2. Sender and receiver within the same county (but different cities)
3. Sender and receiver within the same region (but different counties)
4. Sender and receiver in different regions

Failing to meet these targets triggered a fine by the regulator. An example is the fine imposed to the region Campania in 2012, with the "DELIBERA N. 18/14/CONS". Because quality objectives missed with a gap of -8.25%, Poste Italiane received a fine of 300,000 €.

Note: CMP, CP and CDP are different points on the delivery routes.
Source: Copenhagen Economics based on interviews with Poste Italiane

Benefits and disadvantages of the Italian model
The disadvantages of the Italian model largely dominate its benefits.

Firstly, it is questionable whether the system provides for effective incentives to improve or maintain quality. In theory, a Q-factor that only compensates the postal operator for the cost of providing extra service quality eliminates any incentive to provide extra quality. This is because providing more quality does not translate into higher profit for the

---

**Box 3.3 Additional quality targets for priority letters**

In addition to the quality targets feeding into the Q-factor, the regulator specified that the quality target set in Table 3.5 also applied at regional/route level for priority letters. The regulator specified four different types of routes:

1. Sender and receiver within the same city
2. Sender and receiver within the same county (but different cities)
3. Sender and receiver within the same region (but different counties)
4. Sender and receiver in different regions

Failing to meet these targets triggered a fine by the regulator. An example is the fine imposed to the region Campania in 2012, with the "DELIBERA N. 18/14/CONS". Because quality objectives missed with a gap of -8.25%, Poste Italiane received a fine of 300,000 €.

Note: CMP, CP and CDP are different points on the delivery routes.
Source: Copenhagen Economics based on interviews with Poste Italiane

Benefits and disadvantages of the Italian model
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Firstly, it is questionable whether the system provides for effective incentives to improve or maintain quality. In theory, a Q-factor that only compensates the postal operator for the cost of providing extra service quality eliminates any incentive to provide extra quality. This is because providing more quality does not translate into higher profit for the

---

35 Francesco et al. (2014) *Penale per la mancata realizzazione nell’anno 2012 degli obiettivi di qualità a livello regionale del servizio di posta non massiva nella regione campania*

36 To which 1.77 percentage points were subtracted due to force majeure events
postal operator. It is worth noting, however, that, in the Italian case, a fine system in addition to the price cap that punishes failure to meet quality standards does provide these incentives.\(^\text{37}\)

Furthermore, in practice, the Italian model might have provided particularly strong incentives for Poste Italiane to improve quality of service when it was at very low quality levels. This is because any deviation from the standard would trigger a punishment (i.e. a negative Q-factor), no matter whether or not Poste Italiane was actually improving quality compared to the previous price cap period, see Box 3.4 for an example.

**Box 3.4 Example of incentive under the Italian model**

Assume that Poste Italiane started out with an on-time delivery result of 75 percent for priority mail, and improved it to 80 percent in the subsequent price cap period. This would lead to a negative Q of -9 percent, since Poste Italiane fails the standard of 89 percent by 9 percent (difference to the 89 percent standards times an \(\alpha\)-coefficient equal to 1).

Source: Copenhagen Economics

Therefore, the system of quality regulation might have provided extremely strong incentives for quality improvements for actual quality levels far below the standard, but no incentives for quality improvements once the standard is reached. Moreover, the system only addressed one quality dimension. This could provide Poste Italiane with incentives to decrease the quality and save costs on other dimensions (e.g., post office opening hours) and thereby increase its headroom under the price cap.

**Secondly**, the simplicity and transparency of the Italian model is also questionable. On the one hand, the fact that there is only one quality indicator, measured per product and weighted per importance in terms of revenue of each product in the overall basket, is relatively simple and does not impose a large regulatory burden on operator and regulator. On the other hand, the composition of the \(\alpha\)-coefficient lacks transparency and is not traceable, records of the cost study underlying the result of 1 for the coefficient are not publicly available, and the cost-based system requires the regulator to conduct regular cost studies to adapt the \(\alpha\)-coefficient to reflect the market and technological developments. The latter imposes a high regulatory burden on the regulator and the operator. If regular updates of these cost studies do not take place, there is a strong risk of over- or under-compensation of the operator, distorting its incentives to provide quality.

Finally, the lack of a floor to the Q-factor creates a risk that allowable price increases are too low to secure financial sustainability. A summary of the benefits and drawbacks of the Italian model are found in Table 3.6.

\(^{37}\) The fine system meant that Poste Italiane had to pay a fixed fine for each percentage point of missed quality objective. The amount of the fine per percentage point of deviation from the quality target was stated in the contract between the operator and the regulator (Contratto di Programma) and the total fine was adjusted by any force majeure event.
Table 3.6 Benefits and disadvantages of the Italian model

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Benefits</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive to improve/maintain quality level</td>
<td>Dual system of reward and punishment may give incentives to maintain and increase quality levels</td>
<td>Compensation only for the cost of extra quality eliminates the incentive to provide higher quality</td>
</tr>
<tr>
<td>Transparency and simplicity</td>
<td>Simplicity with only one quality indicator</td>
<td>Composition of the α-coefficient lacks transparency and is not tractable, nor is it publicly available</td>
</tr>
<tr>
<td>Allowing for financial sustainability</td>
<td></td>
<td>Lack of a floor to the Q-factor creates a risk that allowable price increases are too low to secure financial sustainability if an additional volume adjuster is not included in the price cap.</td>
</tr>
<tr>
<td>Burden on regulator/postal operator</td>
<td></td>
<td>Measurement of 27 indicators and composition of α-factor based on cost studies could constitute a burden (but measurement of indicators is conducted by an independent institute, IZI SpA, paid by Poste Italiane)</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics

Quality and price developments in Italy

Since 2008, Poste Italiane has either reached or surpassed most quality standards. For instance, on-time delivery of D+1 priority mail has increased from 82 percent in 2001 to 91 percent in 2008 and stabilised at and above the 89 percent target from 2008–2015, see Figure 3.3.

![Figure 3.3 On-time delivery of priority mail in Italy](image)


The impact of the Q-factor on allowed price increases ranged between ± ~5 percentage points. During the period, the price for the 20g D+1 letter decreased from € 0.62 in 2001 to € 0.60 in 2010, but then increased drastically to € 2.80 in 2016.38

38 By this drastic price increase Poste Italiane intended to shift volumes from the D+1 letter to slower letter parts in a long-term strategic plan to abandon the D+1 letter altogether.
When Poste Italiane successfully increased service quality for all services under the price cap, the Q-factor was abandoned in 2015. A fine for failure of service quality targets is still in place today.

**United Kingdom: Automatic revenue adjustment (multi-dimensional Q-factor)**

In the UK, a multi-dimensional Q-factor (called C-factor) in a revenue cap was in place between 2003 and 2010.

*Description of the British model*

The revenue cap covered single piece letters, international mail and parcels. It applied to different baskets according to the following formula:\(^{39}\):

\[
AR_t = \left( \frac{100 - CP}{100} \right) b_{p_{t-1}} \left( \frac{100 - RPI_t - X}{100} \right) v_t - K_t + C_t + PP_t + G_t
\]

Where

- AR designates the allowed revenue
- CP describes the maximum punishment - initially set to 0.09 (later increased to 0.5)
- \( b_{p_{t-1}} \) describes the basket price
- \( RPI \) is the retail price index
- \( v \) is mail volume
- \( X \) is an efficiency improvement factor
- \( K \) is a carry-over factor for unused headroom under the previous price cap period
- \( C \) is the quality factor
- \( PP \) is a pension deficit factor
- \( G \) is a volume adjuster

The C-factor was based on the following formula:

\[
C_t = \left( \frac{CP}{100} \right) f_t b_{p_{t-1}} \left( \frac{100 - RPI_t - X}{100} \right) v_t
\]

Where \( f \) was a performance fraction that takes on a value between 0 and 1 depending on the difference between the postal operator’s quality performance and the quality standard set by the regulator:

\[
f_t = \sum_{m=1}^{m=4} \left( \frac{(5-\{t_{mt} - p_{mt}\})m_w}{5} \right)
\]

Where

- \( t_{mt} \): quality target
- \( p_{mt} \): quality performance

---

• \( m_w \): weight of each indicator

If \((t_{mt} - p_{mt}) > 5\), then the value of \((t_{mt} - p_{mt})\) in the formula would be 5. If \((p_{mt} > t_{mt})\), i.e. the target is beaten, then the value of \((t_{mt} - p_{mt})\) would be equal to zero.

The maximum punishment was subtracted from the allowed revenue and then a fraction of the same amount would be returned depending on the quality of service performance. If all targets were met, then allowed revenues did not include any punishment.

The quality performance consisted of eight quality indicators within two categories: transit time (percentage of items delivered on time) and completion (collection completion, delivery completion, correct delivery), Table 3.7.\(^{40}\)

It is noteworthy that one of the transit time indicators (quality indicator 5) took into account Royal Mail’s varying performance in different postcode areas through a postcode area floor\(^{41}\). This means that, on top of achieving high service levels on average, Royal mail was required to show consistent performance across postcode areas.\(^{42}\)

<table>
<thead>
<tr>
<th>Table 3.7 Determinants of the C-factor, UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quality indicator</td>
</tr>
<tr>
<td>------------------------------------------</td>
</tr>
<tr>
<td>Transit time indicator</td>
</tr>
<tr>
<td>1st class &amp; stamped and metered</td>
</tr>
<tr>
<td>2nd class &amp; stamped and metered</td>
</tr>
<tr>
<td>Standard parcel</td>
</tr>
<tr>
<td>European international delivery</td>
</tr>
<tr>
<td>Postcode area floor</td>
</tr>
<tr>
<td>Completion indicator</td>
</tr>
<tr>
<td>Collection completion</td>
</tr>
<tr>
<td>Delivery completion</td>
</tr>
<tr>
<td>Correct delivery</td>
</tr>
</tbody>
</table>

Note: PCA= Postcode area
Source: Swinand & Scully (n.a.) p.13; based on Postcomm (2006) Condition 21 of Royal Mail’s licence

The C-factor was calculated based on a weighted average of the difference between the actual performance and the standard, for each indicator. The weightings of the different products were based on a broad assessment of their relative revenues. The targets for each indicator were originally developed based on Royal Mail’s internal targets, at first focusing only on transit time, but extended later to also include completion.

The system contained two safeguards for Royal Mail. Firstly, there was a maximum set on the C-factor of 5 percent of allowed revenues for the period 2006-2010. Secondly, Royal

---

\(^{40}\) Postcomm (2004) Memorandum by Postcomm

\(^{41}\) House of Commons (2006) Postcomm and the quality of mail services, pp. 5,12

\(^{42}\) There are 124 postcode areas in the United Kingdom
Mail would only lose revenue when performance fell *materially* below the required standard. In 2006–2010, a *de minimis* threshold of 1 percent below standard applied for quality indicators 1 to 6, and 0.1 percent below standard applied to quality indicators 7 and 8. Box 3.5 provides a calculation example of how performance was measured.

**Box 3.5 Calculation example, British performance fraction**

<table>
<thead>
<tr>
<th>Product</th>
<th>$p_{mt}$</th>
<th>$t_{mt}$</th>
<th>$wm$</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>92</td>
<td>93</td>
<td>0.4</td>
</tr>
<tr>
<td>B</td>
<td>91</td>
<td>91.5</td>
<td>0.3</td>
</tr>
<tr>
<td>C</td>
<td>96</td>
<td>98.5</td>
<td>0.15</td>
</tr>
<tr>
<td>D</td>
<td>90</td>
<td>90</td>
<td>0.15</td>
</tr>
</tbody>
</table>

Then the performance fraction amounts to **0.82**

$$f = \left(\frac{5-(93-92)}{5}\right)0.4 + \left(\frac{5-(91.5-91)}{5}\right)0.3 + \left(\frac{5-(98.5-96)}{5}\right)0.15 + \left(\frac{5-(90-90)}{5}\right)0.15 = 0.82$$

*Source: Copenhagen Economics*

**Benefits and disadvantages of the British model**

The British C-factor has a number of advantages, but also disadvantages.

To start with, the British price cap regulation is well documented. At the same time, the multiplicity of quality indicators in the model makes it the most complex of the models considered in this report.

While the modelling of the PCA targets on Royal Mail’s delivery network allowed direct monitoring by Royal Mail and facilitated changes to the system, the overall regulatory burden on Royal Mail and the regulator Postcomm was high. In fact, the C-factor regime generated an industry of reporting and discussion between Postcomm and Royal Mail about why targets could not be met and what kind of ‘force majeure’ arguments were acceptable (snow, union action, road blockages etc.). For instance, Royal Mail directed a lot of resources towards writing reports where it set out a detailed analysis of the reasons for failing on certain targets, and Postcomm then had to review and respond to these reports.43

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43 Interview with Ofcom
In relation to the effects on Royal Mail’s financial sustainability, it can be noted that the granular service level standards reduced Royal Mail’s commercial flexibility considerably. Furthermore, Royal Mail criticized the model for leading to too high revenue exposure for quality of service failure. It argued that the model did not take into account that a deterioration in service quality would naturally lead to lower demand, i.e. volume losses.

Concerning the incentives provided, the model had both pros and cons.

Firstly, the fact that the system did not include a reward for beating the quality of service standards set by Postcomm avoided the risk of gold-plating by Royal Mail, i.e. unnecessary quality improvements that simply served the purpose of increasing the headroom under the price cap. In fact, Postcomm had refused Royal Mail’s request to install additional headroom for outperforming the quality standards on the basis that this was not likely to make consumers better off, and, even if this was the case, Royal Mail would naturally benefit from outperforming standards as competition developed (provided that quality was valued by consumers). However, the lack of incentives to outperform the target also made the system more vulnerable to regulatory failure, i.e. a situation where the regulator underestimates consumers’ preferred level of quality and thereby sets the target quality level too low. This was a likely risk in the British case, since it is not apparent that Postcomm set the quality of service standards for Royal Mail based on studies of postal users’ preferences or their willingness to pay for quality.

Secondly, it is questionable whether the quality standards were set such that they actually had an impact on Royal Mail’s performance. In fact, the effective targets were generally evaluated as being rather lax, because, in combination, the safeguard mechanism and the margin of error of quality surveys that were taken into account when computing the C-factor, meant that Royal Mail could underperform quite substantially before being punished under the regulation.

As opposed to this, some targets in the model were set too strictly. For instance, there was not a single year where Royal Mail reached the target to deliver 91.5 percent of first class items by the next working day for all PCAs. Setting unachievable targets might lead to a situation where both operator and regulator accord less importance to the specific standard, thereby reducing the incentives to achieve it.

A summary of the benefits and drawbacks of the British model is provided in Table 3.8.
Table 3.8 Benefits and disadvantages of the British model

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Benefits</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive to improve/maintain quality level</td>
<td>Lack of a reward for outperforming targets avoids gold-plating.</td>
<td>Risk of regulatory failure if standards are not set according to consumer preferences/ willingness to pay.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Safeguard mechanism, in combination with accounting for error margin of quality survey, effectively implies lax standards.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No clear evidence of quality of service improvements by Royal Mail under the price cap with C-factor.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Too strict targets on PCAs, which Royal Mail persistently failed to achieve.</td>
</tr>
<tr>
<td>Transparency and simplicity</td>
<td>System is well documented and documents are publicly available.</td>
<td>Complex formula based on a multiplicity of indicators.</td>
</tr>
<tr>
<td>Allowing for financial sustainability</td>
<td></td>
<td>Many granular targets reduced postal operator’s commercial flexibility.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Royal Mail criticized the model for leading to too high revenue exposure for quality of service failure.</td>
</tr>
<tr>
<td>Burden on regulator/postal operator</td>
<td>The targets for PCAs were conceived based on Royal Mail’s delivery network.</td>
<td>System generated an industry of reporting and discussion about why targets could not be met.</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics

Quality and price developments in the UK
There is no clear evidence of quality of service improvements by Royal Mail under the price cap with C-factor and quality has not shown constant improvements. For instance, on-time delivery of D+1 priority mail was very volatile between 2001 and 2010, oscillating between 85 percent and 95 percent of mail. In the beginning of the price cap regulation, there was a series of fines and appeals for below-target performance by Royal Mail. In 2007 and 2009, Royal mail recorded a string of decreases in the quality of first call mail.

At the same time, the price for 20g D+1 letter increased from GBP 0.27 in 2001 to 0.41 in 2010.

When Ofcom took over responsibility from its predecessor Postcomm (in 2011), it decided to abandon the price cap mechanism (in 2012), thereby also abandoning the C-factor. The reasons for this lay in the weaknesses of the price cap regime, which restricted Royal Mail’s pricing flexibility in a declining market, did not provide sufficient efficiency incentives and constituted a threat to the Universal Service.

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50 Interview with Ofcom
In order to ensure a sufficiently high quality of service, Ofcom continued to monitor the same types of performance indicators that fed into the formation of the C-factor and issues a fine if Royal Mail fails to meet the set standards.

**Portugal: Multi-dimensional quality factor**

A quality of service indicator was included in the Portuguese inflation-based price cap with an efficiency factor in 1995. It still applies today to correspondence, editorial mail and parcels\(^5\). The regulator's goal was to incentivise stable high-quality service provision by CTT, to avoid a drop in quality for the purpose of cost reductions under the price cap, and to compensate anonymous consumers for poor service quality.\(^5\)

The price cap functions according to the following (simplified) formula:

\[
\Delta P \leq \text{CPI} + G - X - Q
\]

Where \(G\) is a volume adjustor and \(X\) is an efficiency adjustor. The Q-factor relied on a complex calculation using 10 different Quality of Service Indicators (QSI), for which both a minimum and a target level were specified, see Table 3.9.\(^5\)

<table>
<thead>
<tr>
<th>Quality indicators in Portugal</th>
<th>Weight (RI), %</th>
<th>Minimum, %</th>
<th>Target, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit time non-priority Mail (D+3)</td>
<td>45.0</td>
<td>95.5</td>
<td>96.3</td>
</tr>
<tr>
<td>Transit time non-priority Mail (mainland) (D+1)</td>
<td>15.0</td>
<td>93.5</td>
<td>94.5</td>
</tr>
<tr>
<td>Transit time priority mail - MAM (D+2)</td>
<td>4.0</td>
<td>84.0</td>
<td>87.0</td>
</tr>
<tr>
<td>Non-priority mail not delivered</td>
<td>5.0</td>
<td>2.3</td>
<td>1.4</td>
</tr>
<tr>
<td>Priority mail not delivered</td>
<td>3.0</td>
<td>2.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Transit time newspapers + periodicals (D+3)</td>
<td>11.0</td>
<td>95.5</td>
<td>96.3</td>
</tr>
<tr>
<td>Transit time intra-community cross-border mail (D+3)</td>
<td>3.5</td>
<td>85.0</td>
<td>88.0</td>
</tr>
<tr>
<td>Transit time intra-community cross-border mail (D+5)</td>
<td>3.5</td>
<td>95.0</td>
<td>97.0</td>
</tr>
<tr>
<td>Transit time non-priority parcels (D+3)</td>
<td>5.0</td>
<td>90.5</td>
<td>92.0</td>
</tr>
<tr>
<td>Waiting time at post offices</td>
<td>5.0</td>
<td>75.0</td>
<td>85.0</td>
</tr>
</tbody>
</table>

Note: Standards are for 2008-2010

Source: WIK report (2011) Quality Factors in Postal Price Regulation


\(^5\) These indicators, targets, objectives minimums and weights were negotiated between the regulator and the postal operator in so-called quality of service conventions upon consultation with consumer representatives. The system originally started out with six quality of service indicators established in 1995. More and more quality of service indicators were added with subsequent revisions, reflecting changes in public demand. Castro and Agostinho (2009), Price and quality of service regulation in Portugal, in: Crew and Kleindorfer (2009) Progress in the competitive agenda in the postal and delivery sector, p. 42.
Based on these, an Overall Quality of Service Index (OQSI) is calculated in the following way. Each indicator was valued at a scale between 0 and 100 by relating the performance to both the target value and the minimum value.

- If performance matched the target, it was given the value 100.
- If performance was below the minimum value, it was given the value 0.
- If performance was between the target and minimum values, the proportional value from 0 to 100 was given.
- For values above the target, the classification would also be above 100, in proportion to the positive variation in relation to the target.

In the next step, the classifications given to each QSI are weighted by their corresponding relative importance (RI) based on revenues.

The quality factor in the price cap is represented by a two-fold deduction in the allowed price increase if the postal operator fails to meet the specified quality targets:

\[
Q = Q_{OQSI} + Q_{QSI}
\]

The first deduction relates to the overall performance of the postal operator (\(Q_{OQSI}\)):

- If the OQSI was 100 or above, the \(Q_{OQSI}\) takes on a value of zero.
- If the OQSI was below 90, the \(Q_{OQSI}\) takes on a value of 1 percent.
- If the OQSI was between 90 and 100, \(Q_{OQSI}\) is a proportional deduction.

The second deduction relates to the individual QSI performance (\(Q_{QSI}\)):

- For any individual QSI that is lower than the minimum standard, the deduction corresponded to the relative importance (RI) of the QSI multiplied by the maximum deduction.
- However, if the OQSI is below 90, the \(Q_{QSI}\) takes on a value of zero.

Failure to comply with the quality of service levels could affect the next year’s price variations by up to 1 percent.

**Benefits and disadvantages of the Portuguese model**
The Portuguese model showed several disadvantages.

*Firstly*, the quality incentives provided by the Q-factor are not sufficiently differentiated. The quality indicator react to even small deviations from the targets, as it includes a double punishment and a double counting of indicators. At the same time, it quickly reaches its maximum of 1 percent. This means that there is not much difference for CTT between performing slightly or substantially below standard. The upside to the cap at 1 percent is that the financial burden of the Q-factor do not risk endangering CTT’s financial sustainability.

*Secondly*, CTT could simply concentrate on outperforming on the indicator with the highest weight (transit time of non-priority mail) to compensate for underperformance on other indicators. In practice, in the years 2007 and 2009, CTT compensated for failing the
quality target of mail not being delivered by over-performing on the other quality targets.\textsuperscript{55}

Thirdly, the limited effect on incentives stands in stark contrast to the high complexity of the Q-factor and the large burden imposed on both CTT and the regulator for the measurement of the multiple indicators. A much simpler system could have reached the same effects. A summary of the benefits and disadvantages of the Portuguese model is provided in Table 3.10.

### Table 3.10 Benefits and disadvantages of the Portuguese model

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Benefits</th>
<th>Disadvantages</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentive to improve/maintain quality level</td>
<td>Since the quality indicator is very reactive, there is not much difference for CTT between performing slightly or substantially below standard, as the quality factor quickly attains its maximum. Includes a double punishment due to double counting of indicators, but its overall effect is limited due to the cap at 1%. CTT can simply concentrate on the indicator with the highest weight to compensate for underperformance on other indicators.</td>
<td></td>
</tr>
<tr>
<td>Transparency and simplicity</td>
<td>Highly complex Q-factor. The same effects could have been reached by a much less complex system.</td>
<td></td>
</tr>
<tr>
<td>Allowing for financial sustainability</td>
<td>Limited financial burden on CTT due to the 1% cap on the Q-factor.</td>
<td>Large burden due to measurement of different quality factors.</td>
</tr>
</tbody>
</table>

| Burden on regulator/postal operator | |

Source: Copenhagen Economics

**Quality and price developments in Portugal**

Under the Q-factor, quality provision by CTT has been stable at high levels. For instance, on-time delivery of D+1 priority mail remained stable at around 95 percent.

In practice, the Q-factor has not had a major impact on allowed price increases, since it has often been set to zero (except for 2003 and 2006). Between 2001 and 2010, the price for 20g D+1 letters increased slightly from €0.42 to €0.47.

### 3.2 Examples from other network industries

We have analysed price regulation with quality elements in relation to electricity distribution and transmission, airports, telecoms, water and motorways to see whether regulatory practice in these other network industries can provide valuable insights relative to the postal sector.

We find that Q-factors in other network industries often are based on a (weighted) measure of easily quantifiable indices and rely on bonus and/or penalty systems, similar to the Q-factors found in the postal sector.

The quantifiable link between service quality and price changes is often more explicitly based on assessments of the costs that the regulated operator bears in providing certain levels of quality (e.g., motorways in Italy) or evaluations of the willingness to pay of customers for certain levels of quality (e.g., electricity in the Netherlands).

We describe the applicable regulations in the following.

**Electricity distribution and transmission**

Quality regulation in the electricity sector focuses on quality aspects such as continuity of supply\(^ {56}\), commercial quality and voltage quality. Italy, the United Kingdom, the Netherlands, Hungary and Lithuania are examples of countries that have incorporated quality in their price/revenue cap regulation. Here, a quantifiable link between quality and price is often constructed based on cost studies or studies of consumers’ willingness to pay for, or accept, a certain quality of service level.

Box 3.6 presents how quality is regulated under the price cap applicable to the Dutch Distribution System Operators.

---

**Box 3.6 Case study - Netherlands**

In the Netherlands, Distribution System Operators (DSOs) are subject to quality regulation within the price cap, according to the following formula:

\[
\Delta TI_t = \left( 1 + \frac{(Q - X + Q)}{100} \right) TI_{t-1}
\]

Where,

- \( TI_t \): total income of the DSO in year \( t \)
- \( Q \): quality factor
- \( X \): efficiency factor
- \( CPI_t \): consumer price index in year \( t \)

The regulator employs one indicator for measuring quality (continuity of supply). The individual DSO’s performance is compared to a standard of quality derived from the average level of quality of supply across all DSOs (so-called yardstick competition). There is no distinction between urban and rural areas. The Q-factor allows for both reward and penalty and is capped at +/- 5% of the total income of the DSO to ensure financial sustainability.

The quantification of the link between quality changes and allowable price changes relies on a cost estimation survey. Any deviation from the average quality is valued at 22 eurocents per minute per customer for any interruption of continuity of supply. This figure is based on conjoint analysis, which investigated customers’ willingness to pay for quality.

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\(^{56}\) For instance SAIDI (System Average Interruption Duration Index), SAIFI (System Average Interruption Frequency Index), CAIDI (Customer Average Interruption Duration Index), European Commission (2015) *Study on tariff design for distribution systems*
Note: Based on measurement of SAIFI (System Average Interruption Frequency Index) and CAIDI (Customer Average Interruption Duration Index)


Telecommunications
Quality regulation in the telecommunications sector focuses on quality aspects such as service supply time, the fault repair time, the fault report rate, the complaint rate and service availability (for fixed line operators). In the United States, many states have implemented a price cap or other types of ‘incentive regulation’ and some have introduced a ‘quality factor’ alongside the more common ‘productivity factor’ in price caps, see Box 3.7.

Box 3.7 Case study – United States

Verizon’s price cap regulation contained a "Q" component that worked by increasing the productivity offset by one-twelfth of one percent in the subsequent annual filing for each month that Verizon missed the service quality standard.

The price cap scheme did not include any type of reward for above-average performance in service quality standards, giving Verizon a financial incentive to meet, but not beat, the service quality.


Airport sector
In the airport sector, several national regulators have set up criteria or standards for the quality of service that the airport provides to airlines. Quality regulation focuses on aspects such as turnaround times, security waiting time, and transfer time for transfer passengers. Quality goals may be set by the regulator (e.g. with penalty/incentive mechanisms) or agreed between the airport and the airlines as part of the negotiations (and reward/penalty scheme can be agreed).

In France and United Kingdom, the price cap regulation for airports includes a Q-factor, see Box 3.8.
Box 3.8 Case study – France and the United Kingdom

Regulation of Aéroports de Paris, France
Price regulation incorporates seven standard quality of service indicators linked to financial incentives (penalty of -0.04% per indicator on the allowed price increase if the airport fails to meet the standards); “excellence indicators” with penalty / incentive of +0.08%/-0.08% to incentivize airport to exceed minimum criteria.

Regulation of Heathrow Airport, United Kingdom
Heathrow airport is subject to a price cap following the (simplified) formula of
\[ \text{RPI} - X - Q \]
Where,
X: efficiency factor
Q: quality factor

The Civil Aviation Authority (CAA) introduced both a Service Quality Rebate and Bonus Scheme to identify the service standards that airlines and passengers could expect from Heathrow in return for the regulatory charges. Service standards for instance relate to passenger elements (e.g., queuing, availability of seating, flight information systems, and cleanliness) and the state of different types of equipment (e.g., elevators, moving walkways, etc.). If performance falls below a certain level, Heathrow must repay a proportion of charges levied back to the airlines. For instance, a sub-par score for cleanliness at Terminal 1 leads to a deduction of 0.008% on the allowable price increase each month, up to a maximum of 0.36%. There is a maximum bonus of 0.36% for meeting a service standard. According to the CAA, incentives (reward/penalty) are “calibrated with respect to consumer priorities” and follow a detailed consultation with stakeholders.

Toll motorways
The liberalisation of the provision of motorway services in Europe has come with accompanying (incentive) regulation where quality of maintenance is an important factor. In countries where motorways are privately owned, the concessionaires are subject to price regulation. In Italy, the price regulation contains a Q-factor, see Box 3.9.

Since 1996, motorway concessionaires in Italy are subject to price cap regulation with a simple quality index, according to the following formula:

$$\Delta P \leq \Delta CPI \cdot X + \beta \Delta Q$$

Where,
- $\Delta P$: change in price allowed
- $\Delta CPI$: rate of inflation
- $X$: expected rate of productivity
- $\Delta Q$: Percentage variation of a quality indicator

The quality index is a weighted index based on two indicators - pavement quality (60%) and total accident rates (40%).

A factor $\beta$ links the change in the quality index with the allowed change in average toll level. $\beta$ varies continuously with the initial quality level:
- it is higher (lower, respectively) the higher is the initial quality level, when the concessionaire improves (worsens) its quality performance
- it increases (decreases) more rapidly with the increase (decrease) in the performance when the initial quality of the service is already high

The relationship between allowed price and quality development relates to the cost borne by the firm when providing higher quality.

Source: Rotondo and Stocchi (2006) *Italian Toll Motorways Regulation procedures*

**Water and sewerage services**

In the water sector, the most common approach to quality regulation is to set minimum standards and evaluate each year, with penalties for the operator if it does not live up to the minimum standards. Some countries however, have incorporated quality of service into the price control. To the best of our knowledge, the quality is not incorporated via a quality factor, see Box 3.10.
Box 3.10 Case study – United Kingdom

In the United Kingdom, quality performance is incorporated in the price control. The main regulatory feature is an Overall Performance Assessment (OPA). It compares the performance of the different providers of water and sewerage services to each other. The relative performance of each operator affects the price restrictions it faces in the next period.

The price limits are adjusted only for those operators that perform evidently better or worse than the average. The OPA translates into a one-off financial adjustment to the price limit of the next regulatory period, not the next year.

The magnitudes of the adjustments range between +0.5% of revenues to -1% of revenues.

Besides the price control, there are also minimum standards attached to a range of quality measures, with the possibility of fines if standards are not met. Further, there is a customer compensation scheme in place that deals with specific customer complaints.

Source: Rotondo and Stocchi (2006) Italian Toll Motorways Regulation procedures

3.3 Insights from academic literature

Academic literature may provide a better understanding of how the possible trade-off between quality and price can be understood and approached. We therefore surveyed the academic contributions discussing the incorporation of quality into price regulation regimes, see Table 3.11.

Based on our research, we find the following:

- It is suggested, both by economic theory and applied research, that a direct link between quality and price should be connected to consumers’ willingness to pay for quality in order to obtain an optimal level of quality.

- Other methods (e.g. benchmarking) could potentially be used to link changes in service quality to changes in allowed price increases. However, the specific implementation of these methods in the context of the postal sector is not well researched.
Q-factor design principles

In a 2007 paper entitled “A practical approach to quality-adjusted price cap regulation”, Currier gives a theoretical illustration of how a quality factor works and why the magnitude of the quality factor should be linked to consumers’ willingness to pay for quality.

Since quality is like a good to consumers, the setting of the price of quality should reflect how much consumers are willing to pay for it. The willingness to pay for additional quality will generally be very high when quality is low and decrease as the level of quality increases. The Q-factor should reflect the rate at which quality can be traded off against price.

The author suggests two possible versions of a Q-factor, for a firm that is constrained by a price cap of the form \( p^t \leq p^{t-1} (1 + \text{RPI} - X + Q) \):

The first version is a lagged quality index, which uses lagged values of marginal social valuation and output, and can be written as
\[ Q^L = \frac{1}{p^{t-1} x^{t-1}} (q^t - q^{t-1}). \]

The second version is a current quality index, which uses marginal social valuation and output at time \( t \), and can be written as

\[ Q^C = \frac{1}{p^{t-1} x^t} (q^t - q^{t-1}) \]

where,

- \( Q^L = \) lagged quality index
- \( Q^C = \) current quality index
- \( x \): output, that depends on price and quality (at time \( t \) or \( t-1 \) depending on whether it is the current or lagged output)
- \( p \): price
- \( q \): quality indicator
- \( v \): marginal social valuation of a change in quality at price \( p \). It depends on price and quality at time \( t \) when current and at time \( t-1 \) when lagged.

The paper shows that, in order to guarantee a welfare increase in each period, the regulator should use information on quality performance, demand and social valuation of quality from the current period. It is also noted, however, that this is often unlikely to be possible in practice and the lagged alternative is proposed as an alternative.

The author further discusses the practical challenges associated with developing a first-best assessment of the quality factor and further develops a more practical, yet still theoretical, approach to its design.

The paper highlights several important principles in the design of a quality factor.

- Firstly, there are multiple dimensions to quality, which creates a need for several quality indicators.
- Secondly, user needs are constantly changing, which means that the set of relevant quality indicators also changes over time.
- Thirdly, the regulator should ideally account for changes in volumes.
- Finally, the regulator should base its Q-factor on an assessment of consumers’ willingness to pay for quality.

**Quality-corrected price caps**

Another theoretical paper by Currier, entitled “Quality-corrected price cap” presents a theoretical model of how a quality factor within the price cap can lead to optimal price and quality provision. The author defines the concept of efficient prices and efficient quality provision and presents a theoretical model of quality constrained price caps that leads to efficient price and quality levels.

The paper finds that a quality-corrected price constraint can lead to efficient prices and quality provision. The proposed regulation employs an alternating series of Laspeyres
price index constraints and Paasche quality index constraints, which leads to steady-state efficient levels of price and quality.

More specifically, the firm first chooses its quality level for the next period subject to a Paasche quality index of the form

\[ P(q_{t+1}; q_t, p) = \frac{v(p, q_{t+1})q_{t+1}}{v(p, q_t)q_t} \geq 1 \]

where,

- \( q_t \): quality at time \( t \)
- \( p_t \): price at time \( t \)
- \( v(p, q_{t+1}) \): the marginal social valuation of quality changes for a given price

The firm then observes demand for the current price and new quality level and thereafter sets a new price subject to a Laspeyres price index constraint of the form

\[ L(p_{t+1}; p_t, q_t) = \frac{p_{t+1}x(p_t, q)}{p_t x(p_t, q)} \leq 1 \]

where,

- \( x(p_t, q) \): output for a given price and quality level.

The paper reaches two important conclusions:

- Firstly, consumers’ willingness to pay for a quality increase is highest when the quality level is low.
- Secondly, if the regulator constrains the quality level based on consumers’ valuation of increased quality, it allows the firm to employ its informational advantage (e.g., knowledge of the cost function) in a manner that increases social welfare in each time period.

**Quality regulation via quality adjusted X-factor and C-factor**

In their paper “Incorporating Quality of Service Measures Into Price-caps for Post”, Swinand and Scully investigate the theory and practice of quality of service standards in postal regulation. The paper develops an approach for how to incorporate quality of service improvements into price caps using economic concepts related to productivity growth measurement and hedonic pricing.

The proposed price cap regime incorporates quality of service via two channels:

1. **Firstly, ex ante**, via an efficiency factor as a forecast of the achievable rate of quality adjusted total factor productivity (TFP) growth
2. **Secondly, as a quality factor directly incorporated in the price cap**

Accordingly, the authors propose a price cap of the form: \( p^i_t = RPI - X + C \). Here, \( C \) is the quality factor which adjusts prices **ex post**. The magnitude of \( C \) should be an estimate.
of consumers’ willingness to pay for additional quality multiplied by the increment in quality of service:

\[ C = \%\Delta QoS \cdot WTP_{quality}. \]

Further, the variable X in the price cap is an efficiency factor, which is measured by a forecast of the achievable rate of quality adjusted by total factor productivity (TFP) growth.

The paper raises several practical and detailed questions that should be taken into account in the design of a quality adjusted price regulation:

- Should the price cap include dead-bands, i.e. movements in measured quality which trigger no impact on price? This can be viewed as an insurance for the operator.
- Should the impact from the quality factor be capped such that there is a limit to the financial implications of quality performance?
- Should specific exclusion elements be included in the price cap design, i.e. a force majeure clause?

**Linking quality and prices through Hedonic Price Equations**

Pearsall and Trozzo’s 2011 paper entitled “Evaluating the Effects of Reductions in the Quality of Postal Services”, quantifies the link between qualitative features of postal service and prices in the postal market via the use of Hedonic Price Equations. The authors use a large data set, containing information about postal products’ prices and other characteristics over a series of years. They then adapt conventional econometric curve fitting to the task of statistically estimating the impact of different product characteristics on prices.

The Hedonic Price Equation (HPE) relates postal rates to indices of several qualitative properties of the mail, including the delivery time. Via the theory of hedonic pricing, price changes can be decomposed into pure changes and changes associated with product attributes (e.g., the movement from D+1 to D+3 delivery). This gives insights into how product features drive prices of postal products and can thus be used to quantify the link between different product features and prices. The method is less suitable to link quality to prices within the framework of a postal price cap regime. The reason for this at least threefold: First, the hedonic price equation only contains information about product characteristics, and not quality aspects such as the share of items delivered on time, or the share of failed deliveries. Second, as the method is based on historical information about product features and prices, it is of little value in the estimation of current levels of users’ willingness to pay. Third, the method is very data intensive and requires the collection of price data, not only from public price lists, but also from individual contracts, in order to include the prices actually paid by customers to the postal operator.
Linking quality and prices through Data Envelope Analysis
The paper “Price cap regulation, incentives and quality: The case of Brazilian telecommunications” by Facanha and Resende (2004) investigates the use of yardstick schemes based on Data Envelope Analysis (DEA) to provide incentives for efficiency and how quality can be incorporated in this scheme.

The authors argue that DEA-based overall quality indicators can provide useful ingredients for quality adjustments in price cap schemes. For this purpose, relative efficiency measurements for quality of service and related yardstick schemes can be useful. The flexibility of the DEA approach can be particularly useful for quality assessments as it allows for simultaneous consideration of multiple dimensions of quality.

The DEA approach involves comparing the inputs and outputs of different service suppliers (or units within one supplier). It uses statistical techniques to estimate the efficient use of resources and can be implemented to incentivise the regulated firm to use resources more efficiently. By incorporating quality measures into the efficiency scores, this paper explores the possibility of mitigating potential quality degradation from revenue-constraining regulation.

The concept of benchmarking regulation is based on relating the efficiency performance of each unit to the “efficient frontier” by comparing outputs and inputs. By taking quality of service into consideration it extends the concept to efficiency improvements, given quality improvements. How well, if at all, this methodology can be applied to the postal industry is as of yet unexplored.
Chapter 4

Evaluation of options

In this chapter, we evaluate the different options identified in chapter 3 and discuss their benefits and drawbacks with respect to the implementation of a quality factor in the price cap for market dominant products in the US.

Based on our analysis, we conclude that:

- The selection of a regulatory approach includes important trade-offs (for instance between a simple model with low administrative and regulatory burden and a regulatory design that captures different dimensions of service quality or aims at maximising total social welfare)
- Changing postal market conditions call for a cautious regulatory approach whereby quality regulation should be justified by real concerns regarding the quality levels provided by the postal operator
- Once the regulator chooses to regulate quality under the price cap, this should preferably be done via a stand-alone quality factor (Q-factor) and not a quality-adjusted X-factor
- The choice between a one-dimensional and a multi-dimensional quality standard depends on the level of complexity and administrative burden the regulator is willing to accept and impose on the postal operator
- If the regulator’s goal is to maximize social welfare, the link between quality and price changes within the price cap should be based on consumers’ willingness to pay. In reality, however, regulators have applied more simple approaches and set a target quality level and combined it with financial incentives in the price cap (i.e. regulation based on instructions rather than price signals).

4.1 Framework for evaluation

When regulating the quality of service, a regulator has to make many decisions regarding the regulatory design:

- Decide which regulatory approach to apply (monitoring and publication of results, regulatory standards, inclusion of a quality component in the price cap etc.)
- Decide how to include a quality component in the price cap mechanism (by means of a quality-adjusted X-factor or a stand-alone Q-factor)
- Decide how to explicitly link changes in quality to changes in prices allowed under the price cap

In this chapter, our focus lies on the incorporation of a quality component in the price cap and the main decisions triggered by this regulatory options. In particular, we discuss the following questions (see Figure 4.1).
• Whether to include quality in the price cap through a quality-adjusted efficiency factor or through a separate quality factor
• How to measure quality, and
• How to link changes in quality to changes in the prices allowed under the price cap

Figure 4.1 Evaluation of methods to provide quality incentives

![Figure 4.1 Evaluation of methods to provide quality incentives](image)

In order to provide a valuable recommendation, we evaluate the methods for linking quality to price changes under price caps against a set of criteria. Based on this evaluation, we propose a way forward which forms the basis for providing concrete guidance regarding the application of the method in the U.S. postal market context (chapter 5).

We proceed by first composing a list of evaluation criteria. We then discuss the pros and cons, as well as the opportunities and pitfalls, of the different methods in relation with these evaluation criteria.

Table 4.1 shows a list of potential evaluation criteria that regulators and policy-makers should consider in choosing a method for linking quality to price changes under price caps. These can be broadly divided into criteria relating to policy/ regulatory goals that the methods can pursue, and criteria relating to practical considerations of implementing a method.

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57 This selection of criteria is based on our experience from advising in price cap regulation and covers the criteria that were considered by regulators in the cases presented in chapter 3.
On top of these criteria, it is important for any chosen model and its parameters to allow for financial sustainability of the postal operator. In other words, the model should ensure that the postal operator has the ability to adjust its operations and product mix to allow for financially sustainable provision of postal services. This is especially important in times of declining mail volumes. Cost savings through service level reductions should be possible as long as the costs saved are larger than the revenue loss from consumers substituting away from the service in question.

It is also important for policy makers to clearly define the policy goals for quality regulation (i.e. the purpose of the Q-factor), and to show that the design of the Q-factor reflects these policy goals. For example, if the overall goal of the Q-factor is to maximise social welfare (the sum of consumer surplus and producer surplus), the design of the Q-factor has to account for both consumers’ and mailers’ price-quality trade-offs, see Box 4.1.
Box 4.1 Importance of policy objectives for Q-factor design

Consider a situation in which the postal operator considers reducing delivery frequency from D+1 to D+3. It is visible from the table to the left below that total social welfare (i.e. consumer surplus + producer surplus) for D+1 delivery (80) exceeds that for D+3 delivery (70). With a price cap that does not correct for the difference in quality between the two services (i.e. is set at 60 for both), the postal operator would have an incentive to provide only D+3 service since this generates higher profits (higher producer surplus at 40).

In the case to the right, where the price cap accounts for the difference in quality between the two services, the postal operator has an incentive to provide the D+1 service, since the profits from that service are higher. This can be done by including a Q-factor in the price cap that accounts for consumer surplus (i.e. mailers’ trade-off between price and quality), leading to a higher price cap for D+1 products (90). This requires information about mailers’ willingness to pay for quality.

<table>
<thead>
<tr>
<th>Without correctly defined Q-factor in price cap</th>
<th>A correctly defined Q-factor allows for the maximisation of total social welfare</th>
</tr>
</thead>
<tbody>
<tr>
<td>Without correctly defined Q-factor in price cap</td>
<td>A correctly defined Q-factor allows for the maximisation of total social welfare</td>
</tr>
<tr>
<td>D+1</td>
<td>D+3</td>
</tr>
<tr>
<td>A. Mailers’ willingness to pay</td>
<td>120</td>
</tr>
<tr>
<td>B. Price allowed by price cap</td>
<td>60</td>
</tr>
<tr>
<td>C. Cost of provision</td>
<td>40</td>
</tr>
<tr>
<td>D. Consumer surplus (A-B)</td>
<td>60</td>
</tr>
<tr>
<td>E. Producer surplus (B-C)</td>
<td>20</td>
</tr>
<tr>
<td>F. Total social welfare</td>
<td>80</td>
</tr>
<tr>
<td>• Incentive to reduce delivery speed as this generates the largest profit (40 instead of 20)</td>
<td>• Incentive to maintain D+1 delivery speed as this generates the largest profit (50 instead of 40)</td>
</tr>
<tr>
<td>• This decision will not maximise total social welfare</td>
<td>• This decision will also maximise total social welfare</td>
</tr>
</tbody>
</table>

Note: Hypothetical example
Source: Copenhagen Economics

4.2 Evaluation of methods

When deciding how to regulate quality within a price cap, regulators’ should pay attention to at least two general considerations.

Firstly, the selection of the preferred method includes important trade-offs.

• A trade-off between capturing several quality dimensions versus maintaining a relatively simple model with a low administrative and regulatory burden
• A trade-off between allowing for the maximisation of total social welfare versus having a model with low administrative burden
• A trade-off between maintaining stable price/quality relationships versus providing sufficient commercial flexibility in times of changing postal market dynamics.58

58 See discussion in chapter 2
Secondly, changing market conditions call for a cautious regulatory approach. Quality should be regulated if the deterioration of quality is a real concern in the market considered, for instance, due to a lack of competition on quality. Moreover, the products for which quality is really a concern should be carefully identified. If there is uncertainty about whether the concern regarding service quality is real or not, regulators should limit their action to ‘soft’ measures, such as monitoring of quality in order to avoid over-regulation. On top of this, any introduction of more stringent policy measures should be accompanied by a timely review process/allow for adjustments.

If regulation of quality under the price cap is the preferred option for the regulator, there are two ways of incorporating quality into the price cap regulation:

- By means of a quality-adjusted efficiency factor (X-factor approach)
- By means of a stand-alone quality factor (Q-factor approach)

We will discuss these two options in turn.

**Incorporating quality into an efficiency factor (X-factor approach)**

Quality could be accounted for by a quality-adjusted efficiency factor in the price cap. Linking quality performance to prices in the X-factor can be done either via benchmarking or hedonic pricing. However, we find that both methods are very burdensome for the regulator while providing potentially little incentive to the operator. This is because both methods are complex and require extensive data. Moreover, the X-factor approach does not provide incentives to increase quality levels, but can only limit the degrading effect on quality from the price cap by limiting the efficiency requirement. Finally, there is no experience of regulators applying these methods in practice.

We therefore recommend to discard the X-factor approach as a way of regulating quality under the price cap.

**Designing the quality factor in the price cap (Q-factor approach)**

The design of a quality factor for a price cap, broadly speaking, contains two main sets of decisions. The first set of decision involves the choice of how to measure quality and quality performance (which dimensions to include, how to weight them etc.), while the second set of decisions relates to defining the approach for linking allowed price changes to service quality performance (whether to punish and/or reward the operator, how to quantifiably link quality and prices). We will present these steps in turn.

**Choosing how to measure quality**

As a first step, the regulator/policy-makers should decide how to measure quality, i.e. which quality dimension(s) to include in the regulation and how they should be weighted.

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59 see for instance Facanha and Resende (2004) *Price cap regulation, incentives and quality: The case of Brazilian telecommunications*

60 see for instance Pearsall, Trozzo (2011) *Evaluating the Effects of Reductions in the Quality of Postal Services*
The more quality dimensions included, the more complex the model becomes, and the higher is the administrative and regulatory burden for the operator and the regulator.

Based on our research of previous experience with quality parameters in price caps, we have identified two main approaches of measuring quality for the Q-factor:

- One-dimensional quality standard model
- Multi-dimensional quality standard model

The one-dimensional quality standard model has been applied in Belgium and Italy and typically focuses on the share of on-time deliveries as a quality indicator.

Table 4.2 presents a detailed evaluation of this model. Based on this evaluation, we conclude that the one-dimensional quality standard model is a simple model with a low administrative and regulatory burden that allows the regulator to define a minimum level of desired quality. Whether the model maximises consumer or total welfare depends on the design of the Q-factor.

<table>
<thead>
<tr>
<th>Table 4.2 Evaluation of one-dimensional quality standard model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Criterion</strong></td>
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<tr>
<td>---------------------</td>
</tr>
<tr>
<td><strong>Regulatory goals</strong></td>
</tr>
<tr>
<td>Incentives to increase/maintain service quality</td>
</tr>
<tr>
<td>Affordable prices</td>
</tr>
<tr>
<td>Welfare maximisation</td>
</tr>
<tr>
<td>Efficiency incentives</td>
</tr>
<tr>
<td>Commercial flexibility</td>
</tr>
<tr>
<td><strong>Practical considerations</strong></td>
</tr>
<tr>
<td>Data availability</td>
</tr>
<tr>
<td>Transparency</td>
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<tr>
<td>Regulatory certainty / future-proofing</td>
</tr>
<tr>
<td>Administrative burden for the regulator</td>
</tr>
<tr>
<td>Regulatory burden for the operator</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics

In addition to on-time deliveries, the multi-dimensional quality standard model includes additional quality dimensions. Examples of additional dimensions that could be included are the share of completed collections, waiting time at post offices or targets for specific parts of the country. Regulators in the UK and Portugal have applied/currently apply such models.
Table 4.3 presents a detailed evaluation of this model. Based on this assessment, we conclude that this model is complex, but allows the regulator to define a minimum level of desired quality for several dimensions. The increased complexity of the model implies higher administrative and regulatory burden. Whether the model maximises consumer or total welfare depends on the design of the Q-factor.

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Evaluation of model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incentives to increase/maintain service quality</td>
<td>Incentive to increase/maintain quality limited to the factors included in the model. Application of weighted targets prevents strategic behaviour and incentivises a sufficiently high level of quality across all products and services captured by the model (as well as across geographical areas). Safeguard floor can ensure that quality does not fall materially below the defined standard.</td>
</tr>
<tr>
<td>Affordable prices</td>
<td>No specific consideration of affordability, but extreme price increases can be prevented by restricting the size of the extra headroom allowed by the quality factor.</td>
</tr>
<tr>
<td>Welfare maximisation</td>
<td>Maximisation of total social welfare requires consideration of users' willingness to pay when linking changes in quality to changes in the price cap headroom. Consumer welfare could be taken into account in a modified version of the model where some/all quality criteria could be replaced by the percentage of satisfied users of different types of postal services (letter/parcel delivery frequency, delivery times, opening hours at the post office, alternative ways of receiving parcels, etc.).</td>
</tr>
<tr>
<td>Efficiency incentives</td>
<td>May prevent efficient provision of service depending on criteria included. In the UK case, the percentage of delivery walks served each day was a quality criteria with a target at 99.9%. In this case, the quality target would not allow Royal Mail to reduce delivery frequency to become more efficient.</td>
</tr>
<tr>
<td>Commercial flexibility</td>
<td>The quality factor does not as such prevent the postal operator from defining quality-price combinations for products according to consumers' needs and willingness to pay.</td>
</tr>
<tr>
<td>Data availability</td>
<td>More dimensions in the quality formula make the method less transparent.</td>
</tr>
<tr>
<td>Transparency</td>
<td>More dimensions in the quality formula make the method less transparent.</td>
</tr>
<tr>
<td>Regulatory certainty/future-proofing</td>
<td>Clear criteria for the quality factor increase the regulatory certainty, but dynamic market developments may make other quality criteria more important and postal operators may want to reduce e.g. the delivery frequency.</td>
</tr>
<tr>
<td>Administrative burden for the regulator</td>
<td>Although the formula for calculating the extra headroom from service quality is straightforward, more dimensions in the quality formula increases the administrative burden (calculations and data collection).</td>
</tr>
<tr>
<td>Regulatory burden for the operator</td>
<td>More dimensions in the quality formula increases the burden on the regulated operator (more data collection).</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics

Choosing how to link allowed price changes to changes in service quality

In a second step, the regulator has to define the quantitative relationship between changes in service quality and changes in prices allowed under the price cap.

In theory, the goal of maximising total social welfare would require the Q-factor to reflect users’ willingness to pay for changes in quality. However, in practice we observe that willingness to pay estimates seldom are included in the Q-factor (although in the UK, Postcomm took willingness to pay into account when defining the maximum allowable price increase from the Q-factor). Instead, regulators have conceived this quantitative link based on cost changes (Italy) or informed opinions regarding the reward/penalty necessary to incentivise the operator to provide a specific level of quality. Whereas these approaches are easier to implement, they will not allow for an optimal level of quality.
Regulators can choose between three approaches to link allowed price changes to quantitative changes in service quality:

1. Quality-price link based on cost estimates
2. Quality-price link based on incremental willingness to pay
3. Quality-price link based neither on costs, nor on willingness to pay

We assess these approaches in turn.

Using cost estimates to construct a link between quality and prices is discussed in academic literature and has found practical application in the Italian Q-factor that was in place until 2015. The below table presents our detailed assessment of this method. Based on this evaluation, we conclude that this model should be discarded as it does not allow for the maximisation of total social welfare, nor does it provide incentives for the operator to change the quality of service if the extra headroom in the price cap corresponds to the cost of providing higher quality. Linking allowed price changes to costs creates a principal-agent problem, as the operator knows its costs better than the regulator.

### Table 4.4 Quality-price link based on cost estimates

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Evaluation of model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulatory goals</td>
<td></td>
</tr>
<tr>
<td>Incentives to increase/maintain service quality</td>
<td>If the compensation of providing extra quality is limited to the cost of providing that quality ⇒ operator (all else equal) indifferent between providing extra quality and not doing so. ⇒ NO INCENTIVE created by the regulation</td>
</tr>
<tr>
<td>Affordable prices</td>
<td>Approach compatible with affordable prices as price increases are limited to corresponding increases in costs. Risk of gold-plating of services if there is no maximum level to the allowed price increase.</td>
</tr>
<tr>
<td>Welfare maximisation</td>
<td>Refraining from taking willingness to pay into account will not allow for maximisation of total social welfare.</td>
</tr>
<tr>
<td>Efficiency incentives</td>
<td>The model does not counteract incentives to increase efficiency (cost reductions that do not lead to reductions in quality will translate into higher profit).</td>
</tr>
<tr>
<td>Commercial flexibility</td>
<td>Low commercial flexibility as price increases for higher quality are capped at the extra cost of providing higher quality. Level of commercial flexibility will also depend on the number of products in the price cap basket and the ability for the regulated operator to rebalance prices across products.</td>
</tr>
<tr>
<td>Practical considerations</td>
<td></td>
</tr>
<tr>
<td>Data availability</td>
<td>Estimation of the cost of providing extra quality can be complex, depending on the dimension(s) of quality to be measured.</td>
</tr>
<tr>
<td>Transpcrency</td>
<td>Transparent method as long as the calculation of cost changes is transparent.</td>
</tr>
<tr>
<td>Regulatory certainty / future-proofing</td>
<td>In order to ensure regulatory certainty, cost effects of changes in quality must be calculated/updated on a regular basis.</td>
</tr>
<tr>
<td>Administrative burden for the regulator</td>
<td>High administrative burden inherent in the calculation of cost effects for different changes in service quality on a regular basis</td>
</tr>
<tr>
<td>Regulatory burden for the operator</td>
<td>High regulatory burden if the regulated operator has to provide input to the regulator for the calculation of cost effects.</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics
Linking quality and price based on consumers’ *incremental willingness to pay* for the different quality levels in question is an approach discussed in the academic literature, but it has not been fully implemented by any postal regulator. The UK postal regulator has so far been the only regulator to consider willingness to pay when setting the maximum price effect of the Q-factor.

The table below presents a detailed assessment of the method. Based on this evaluation, we conclude that this method allows for maximisation of total social welfare under the price cap. At the same time, however, it creates a high administrative burden due to the need to estimate users’ willingness to pay at regular intervals.

### Table 4.5 Quality-price link based on incremental willingness to pay

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Evaluation of model</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Incentives to increase/maintain service quality</strong></td>
<td>The model allows the regulated operator to adjust prices according to changes in customers’ willingness to pay (triggered by changes in service quality). The operator will choose to increase service quality as long as the marginal willingness to pay for extra quality is higher than the marginal cost of supplying extra quality. Similarly, the operator will choose to reduce quality levels as long as the incremental cost saving from reduced service quality is larger than the incremental reduction in willingness to pay.</td>
</tr>
<tr>
<td><strong>Affordable prices</strong></td>
<td>Since the model will allow price increases corresponding to increasing willingness to pay, this implies that prices (on average) will be affordable. However, certain user groups with low willingness to pay may be hurt if the operator decides to increase service quality and thereby prices.</td>
</tr>
<tr>
<td><strong>Welfare maximisation</strong></td>
<td>Taking willingness to pay into account in the link between quality and prices allows for maximisation of total social welfare as the regulated operator bases its decisions on marginal costs and marginal benefits of increased/reduced service quality.</td>
</tr>
<tr>
<td><strong>Efficiency incentives</strong></td>
<td>The model creates incentives to increase efficiency (cost reductions that do not lead to reductions in quality will translate into higher profit).</td>
</tr>
<tr>
<td><strong>Commercial flexibility</strong></td>
<td>The model encourages the regulated operator to define quality-price combinations for products according to consumers’ needs and willingness to pay. Level of commercial flexibility will also depend on the number of products in the price cap basket and the ability for the regulated operator to rebalance prices across products.</td>
</tr>
<tr>
<td><strong>Data availability</strong></td>
<td>Estimations of mailers’ willingness to pay requires extensive data collection and analysis. Two options: stated preferences and conjoint analysis (requires representative survey of user preferences). Both approaches need to be updated on a regular basis to represent current willingness to pay.</td>
</tr>
<tr>
<td><strong>Transparency</strong></td>
<td>Transparent method as long as the calculation of willingness to pay is transparent.</td>
</tr>
<tr>
<td><strong>Regulatory certainty / future-proofing</strong></td>
<td>In order to ensure regulatory certainty, measures of willingness to pay must be updated on a regular basis.</td>
</tr>
<tr>
<td><strong>Administrative burden for the regulator</strong></td>
<td>High administrative burden inherent in the calculation of willingness to pay for different changes in service quality on a regular basis.</td>
</tr>
<tr>
<td><strong>Regulatory burden for the operator</strong></td>
<td>High regulatory burden if the regulated operator has to provide input to the regulator for the calculation of willingness to pay.</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics
While, from the point of view of incentives, it would be preferable to base the price-quality link on incremental willingness to pay, a pragmatic approach to designing the Q-factor would call for a simpler model with lower administrative burdens where the link between quality and prices is based neither on costs, nor on user’s willingness to pay. In fact, as revealed in our analysis of quality factors applied in postal price cap regulation, many regulators introduce a link between changes in quality and changes in allowed price increases that they believe will provide sufficient incentives for the regulated operator. Although the financial impact of changing quality performance must be larger than the corresponding change in cost for the operator in order to incentivise a change in quality, these financial incentives are not necessarily linked to willingness to pay or cost.

### 4.3 Selection of a preferred method

The identification of broad regulatory goals can give useful initial guidance on how to design the Q-factor (i.e. which of the methods discussed above to apply). Broadly speaking, the regulator can choose among three different goals with different implications for the regulatory design.

- **If the regulatory goal is to maximise total social welfare**, the Q-factor has to capture users’ willingness to pay. Ways to estimate willingness to pay are for instance stated preference surveys or conjoint analyses. Such estimations require continuous updates at regular intervals to reflect that user preferences change over time.

- **If the regulatory goal is to ensure satisfied users of postal services**, the Q-factor should be designed to account for changing user needs and preferences.

- **If the goal is to guarantee a minimum level of quality for all postal users**, a safeguard method with defined minimum standard(s) (e.g., the percentage of on-time deliveries) would be appropriate. Allowed price increases can then be set at a level that provides sufficient incentives (i.e. above the cost to provide the additional quality), that are not necessarily linked to willingness to pay or cost.

In the next chapter, we provide hands-on guidance regarding the application of two of the methods discussed above: (i) a Q-factor that maximises total social welfare by taking customers’ willingness to pay for quality into account and (ii) a Q-factor with a target quality of service and associated penalties/rewards, implemented to guarantee a minimum/stable level of quality for postal users in the US.
Chapter 5

A practical approach to introducing a Q-factor in the price cap

In this chapter, we present a practical guide for regulators and policy makers to implement a Q-factor in a price cap regime.

We focus on the two different approaches explained in the previous chapters:

- **Price signal approach**: The Q-factor is designed to maximise total social welfare by constructing a link between quality and prices based on users' willingness to pay
- **Quality standard approach**: The Q-factor is designed to guarantee stable levels of quality, by determining a preferred quality standard and a ‘sufficient’ financial incentive for the operator\textsuperscript{61}

The implementation of a Q-factor in the price cap consists of seven steps:

1. Selecting quality dimension(s) in the Q-factor
2. Measuring quality
3. Weighting quality dimensions to construct a quality index
4. Setting targets and a reward and/or punishment mechanism (only relevant for the Quality standard approach)
5. Defining the quantitative link between quality and price
6. Identifying data needs to quantify the link between quality and price
7. Constructing the Q-factor in the price cap

Table 5.1 presents these steps and the question any regulator will have to answer in the implementation process.

\textsuperscript{61} This approach is similar to a reward/penalty approach outside the scope of the price cap.
We start by presenting the steps related to the selection, measuring and weighting of quality dimensions in the Q-factor (5.1). Subsequently, we will discuss how to link changes in quality to changes in price (5.2). In the last section, we propose ways of constructing the Q-factor within the price cap formula (5.3).
5.1 Selecting, measuring and weighting quality criteria in the Q-factor

Step 1: Selection of quality dimension(s) in the Q-factor
The first step consists of defining the concept of service quality for the purpose of the Q-factor, i.e. identifying the dimensions of quality that should feed into the Q-factor. The choice process and the dimensions chosen should follow a few guiding principles.

- **Firstly**, the quality dimensions chosen should reflect the quality aspects that are important to postal service users (defined as the totality of residential consumers and business mailers).

- **Secondly**, the choice of quality dimensions should be future-oriented in that they account for possible changes in demand patterns in the near future. If, for instance, recipients tend to fetch their parcels more and more at post offices instead of getting them delivered to their homes, waiting time at the post office might become an important quality dimension to include in the Q-factor. On top of that, at every price cap review, the regulator should review the relevance of the current dimensions and consider dropping/adding new dimensions in the light of market developments.

- **Thirdly**, the regulator can also choose quality dimensions to reflect specific problem areas with respect to postal service quality, which it has identified in the past or that might become relevant in the near future.

- **Fourthly**, the quality dimensions should be measurable, i.e. the Postal Service or an independent body should be able to conceive a measurement unit and be able to conduct measurement at regular intervals.

- **Finally**, the quality dimensions should be limited to a small number to avoid a heavy regulatory burden.

The regulator can adopt a more ambitious or a more practical approach in identifying the quality dimensions to include in the Q-factor, see Table 5.2. While the regulator could rely on studies and surveys for a systematic identification of problem areas and the quality dimension important to postal service users, conducting such studies is resource and time consuming. A more practical and simple approach would be to depart from the monitoring system currently in place and to engage in the discussion with the Postal Service to conceive possible additions or changes.

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52 When referring to service quality dimensions, we do not include the changes of product specifications, for instance from D+1 to D+3.
Table 5.2 Choice of quality dimensions

<table>
<thead>
<tr>
<th>Criterion</th>
<th>Questions for the regulator</th>
<th>How to answer them</th>
</tr>
</thead>
<tbody>
<tr>
<td>Continuity with current monitoring system</td>
<td>Which quality dimensions are currently monitored under the regulation?</td>
<td>Identify the quality dimensions currently monitored and apply them for all market dominant products. Engage in a consultation/discussion with the Postal Service both on which quality dimensions are important for postal service users and whether they are measurable.</td>
</tr>
<tr>
<td>Systematic identification of problem areas of postal service quality</td>
<td>How is the Postal Service performing currently? Which service quality areas are problematic? Is the Postal Service’s performance varying greatly in different parts of the country?</td>
<td>Review Annual Performance Reports and identify problem areas. Conduct an all-encompassing study on a large number of possible quality dimensions.</td>
</tr>
<tr>
<td>Gauging the quality dimensions that are important to users of postal services</td>
<td>Which quality dimensions are important to customers and will they be important in the future?</td>
<td>Identify key drivers of user satisfaction based on existing studies and current trends in postal market development (e.g., rising e-commerce). Conduct a study (e.g., conjoint analysis) on postal service users’ valuation of different quality dimensions.</td>
</tr>
</tbody>
</table>

Source: Copenhagen Economics

Moreover, existing studies and surveys can give useful insights to the regulator about the quality dimensions that postal service users consider important, see Box 5.1.
Box 5.1 Use of previous studies to identify quality dimensions important to postal service users

One example of a previous study that could service the identification of important service quality dimensions is the USPS OIG’s 2015 study on “What Postal Services Do People Value the Most? A Quantitative Survey of the Postal Universal Service Obligation”. The study can yield, among others, the following conclusions concerning quality dimensions important to users of postal services.

<table>
<thead>
<tr>
<th>Study result</th>
<th>Teachings for choice of quality dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Consumers and businesses value lower prices and may be willing to accept lower levels of service to keep prices from rising sharply</td>
<td>General teaching about postal service users’ attitudes towards the price-quality trade off → any regulatory set-up should avoid gold-plating (too high quality at too high price)</td>
</tr>
<tr>
<td>Consumers and businesses place a high value on maintaining delivery to the door and/or curb rather than delivery to cluster boxes or parcel lockers. This is especially true for parcels and even more so for consumers that currently receive mail via cluster box. Both consumers and businesses place value on human interaction with a Postal Service employee at a post office rather than alternative access options such as postal counters in non-postal retail stores and self-service kiosks. However, respondents seemed to find more limited hours of operation acceptable. Both consumers and businesses value not moving to 3-day a week delivery</td>
<td>The share of households with the option of door delivery could be included as a quality dimension in the Q-factor Post office opening hours should not be included in the quality dimensions Customer satisfaction with touchpoints could figure among the quality dimensions The share of post offices vs. alternative access options could be a quality parameter (only, if postal service users are also willing to pay for the more expensive post office) Delivery completion per day according to product specification is an important quality dimension</td>
</tr>
</tbody>
</table>

Note: Other possible previous studies that could give more insight into preferred quality criteria are: USPS OIG (2013) What America Wants from the Postal Service; USPS OIG (2014) What America wants and needs from the postal service.


On top of that, the quality dimensions employed by other postal regulators in the Q-factor can serve as useful guidance. The following quality dimensions have in the past being included in the Q-factor in other countries.

- Transit times: share of products arriving within the specified transit time (currently monitored by the PRC)
- Delivery completion: share of delivery walks completed each day
- Collection completion: share of collection points served each day
- Correct delivery: share of items delivered correctly
- Waiting time in post offices
- Opening hours of post offices
- Customer satisfaction with customer touch points (currently monitored by the PRC)
- The share of households with the option of door delivery (based on Box 5.1 above)

It is important to note that, for the purpose of the construction of a Q-factor within a price cap, product specifications (e.g., whether letters are delivered within one (D+1) or three (D+3) days) should not be considered a quality dimension. In other words, the change of
product specification (e.g., a move from D+1 to D+3) is not a change in a quality dimension but equivalent to deleting a product from the price cap and introducing a new one. If the Postal Service changes the specification of a product, e.g. from D+1 to D+3, the price cap should then be adapted by postal service users’ willingness to pay for the change in delivery time (reflecting the new product mix upon which the price cap is based).

**Step 2: Measurement of quality dimensions**

A second step in the implementation of a Q-factor consists of measuring the identified quality dimensions. This involves two decisions:

Firstly, the regulator has to define a measurement unit for each quality dimension and agree on a way to measure it. Thereby most regulators resort to measurement by the postal operator directly or by an independent body or the combination of the two for cross-checking purposes, see Table 5.3.

<table>
<thead>
<tr>
<th>Quality dimension</th>
<th>Unit of measurement</th>
<th>How to measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transit times</td>
<td>% of items received in defined transit time</td>
<td>Via internal Postal Service system*</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Delivery completion</td>
<td>% of delivery walks completed each day</td>
<td>Via internal Postal Service system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Collection completion</td>
<td>% of collection points served each day</td>
<td>Via internal Postal Service system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Correct delivery</td>
<td>% share of items delivered correctly</td>
<td>Via internal Postal Service system</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting time at post offices</td>
<td>Minutes of waiting time at post offices</td>
<td>Time measurement study</td>
</tr>
<tr>
<td>Opening hours of post offices</td>
<td>Opening hours</td>
<td>Official Postal Service records</td>
</tr>
<tr>
<td>Customer satisfaction with customer touch points</td>
<td>Marking system/ Share of postal service users satisfied with customer touch points</td>
<td>Use/ update of Postal Services CI (customer insight) measurement system measuring performance at customer touch points</td>
</tr>
</tbody>
</table>

Note: *The system currently in place measures transit time from the time of mailing at a Post Office™ until the time of delivery for parcels for which a customer requested USPS Tracking™ service ** EXFC is an external sampling system measuring the time it takes from deposit of mail into a collection box or lobby chute until its delivery to a home or business.

Source: Copenhagen Economics

Secondly, the regulator can decide to measure certain quality dimensions at different levels: (i) at product or aggregate level, (ii) at national or lower level, (iii) at route level.

(i) **Product vs. aggregate level**

The choice between measuring quality at product or aggregate level defines how flexible the Postal Service will be concerning its quality performance for single products. Aggregate measure means that the Postal Service can compensate below-standard performance on one product with above-standard performance on other products. This measure could be applied if the Postal Service should be granted more flexibility. Product-level measure
could be applied, if there is a wish to constrain the Postal Service to meet quality targets for single products.

(ii) National vs. lower level

Measuring performance and national level allows the Postal Service to compensate below-target performance in one part of the country with above-target performance in another. A measurement at a lower level, e.g. regional level or district level, forces the Postal Service to meet the quality standard in each defined geographical region and is relevant if there is a sufficiently strong variation in the Postal Service’s performance between regions.

The Postal Service’s Q2 performance results for 2015 showed, for instance, that on-time delivery performance varied substantially between districts. For overnight delivery, the Postal Service failed the 96 percent target by over 26 percentage points in Los Angeles while scoring close to 100 percent in Greater South Carolina. This issue could be addressed by geographically more granular measures of quality dimensions, e.g. quality measurement by ZIP Code. This approach is currently used for measuring performance of single piece first class mail.

(iii) At route level

A further way of measuring quality dimensions at a more granular level is to construct a measure for different delivery routes (within cities versus within the country side). This is relevant if there is an urban/rural divide for delivery or if the Postal Service e.g. performs worse for routes across the country than within an individual region. This choice, however, requires that delivery quality is measured between different points in the value chain (e.g., different types of sorting centers).

Step 3: Weighting quality parameters to construct a quality index

Once the regulator has chosen the quality dimensions and defined how to measure them, the third step of implementing a Q-factor consists in the weighting of the quality dimension into a single quality index.

The regulator has to find weights between:

- The different dimensions of quality, e.g., between on-time delivery and customer satisfaction at touchpoints
- The different types of products within a single quality dimension, e.g., between first class and standard mail, and between first class letters for residential and for business customers
- The different geographical dimensions of quality measures, e.g., national versus regional measurement of quality dimensions

Table 5.4 gives illustrates the output of such a weighting exercise.

---

Table 5.4 How to measure quality dimensions

<table>
<thead>
<tr>
<th>Quality dimension</th>
<th>Product type</th>
<th>Weights</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-time delivery</td>
<td>All</td>
<td>50%</td>
</tr>
<tr>
<td>First class mail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standard mail</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parcels</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Regional target</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Waiting time at post offices</td>
<td>N/A</td>
<td>25%</td>
</tr>
<tr>
<td>Customer satisfaction with service touch points</td>
<td>N/A</td>
<td>25%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td>100%</td>
</tr>
</tbody>
</table>

Note: The system currently in place measures transit time from the time of mailing at a Post Office™ until the time of delivery for parcels for which a customer requested USPS Tracking™ service ** EXFC is an external sampling system measuring the time it takes from deposit of mail into a collection box or lobby chute until its delivery to a home or business.

Source: Copenhagen Economics

The weights that feed into the quality index should primarily reflect the importance of certain products in the overall mail mix. This means that the weighting between products should be based on the share of the volume of each product in the overall letter mail volume subject to the price cap.64

To make the price cap simpler, the weighting by volumes can be such that only the most important products in terms of volumes (e.g., above a threshold of 5 percent of total volumes) are included in the calculation of the overall quality index. This would mean that the quality of the products under the volume threshold does not affect the allowable price increase under the price cap.

Step 4: Target levels and punishment/reward
If the regulator chooses to apply the quality standard approach, this requires the setting of appropriate target levels that the operator should meet. The regulator further has to choose whether to punish failure to meet targets or to give a reward for meeting or beating the set targets. These choices depend first and foremost on both the Postal Service’s initial level of quality and the regulator’s level of ambition for the improvement or

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64 In addition, to the product volumes, the quality index could also reflect the valuation of quality by postal service users for each product and differences in cost for the Postal Service of providing high quality for certain products (i.e. how strong a cost-driver quality provision is for total cost). However, this type of weighting can become quite burdensome and has to our knowledge not been applied in the postal sector.
maintenance of service quality. In addition to that, a number of guiding principles can be found from the experiences made in other countries:

- **First**, setting targets requires knowledge of the maximum quality needed to make users of postal services sufficiently well off. For instance, the regulator should know (or form an opinion about) whether or not users are any better off beyond a quality of e.g. 97 percent or 99 percent on-time delivery of a certain letter service. Knowing this level informs the regulator about the upper bound quality target beyond which additional quality provision by the Postal Service should not be rewarded. This avoids gold-plating of the service and a mismatch with users’ willingness to pay for quality.

- **Second**, in order to define credible targets these have to be both achievable and subject to clearly defined rules for exemption. This means that the regulator has to clearly define under which circumstances the targets are upheld and under which circumstances failure to meet the targets does not trigger a change in allowable price increases. This could for instance be the case in force majeure events such as unexpectedly heavy snow storms or network restructuring measures that might disrupt mail delivery in significant ways.

- **Third**, when setting the target levels, the regulator has to account for the volatility in the delivery process. Since postal operators cannot manage all processes ‘perfectly’ they have to aim for a higher performance than the set standard to allow for some slack if there are, for instance, weather problems (not severe enough to cause exemption, but enough to imply a quality drop). The regulator has to take this into account both when setting the targets and when linking quality changes to price changes.

In the following, we describe the combination of target levels and reward/punishment mechanisms to choose depending on the concerns and quality of service goals that the regulator and policy makers might have. We can broadly distinguish between three stylised cases:

(i) Minimum standard with penalty for underperformance

If the regulator’s concern is that quality of service will fall below a certain level and drop to a level that is unacceptable since below that level consumer welfare is substantially reduced, the regulator should set a low minimum standard and punish the Postal Service if the minimum standard is not reached. This can be the case of the Postal Service has provided very volatile levels of quality with large drops in the past or if the regulator is concerned that the Postal Service will lower quality beyond that level to gain more headroom under the price cap.

This system gives the Postal Service flexibility to conceive a quality level that is above the target according to postal user’s needs. In other words, for quality levels beyond the minimum level, normal market mechanisms will apply without an impact on the allowed price increase under the price cap, see Figure 5.1.
(ii) Standard, maximum target and reward
If the regulator’s goal is for the Postal Service to reach ambitious quality targets because (i) quality is already at a good level and should be even higher, (ii) the Postal Service is currently providing low levels of quality and should attain an acceptable quality level, or (iii) there are no concerns about the risk of (further) quality deterioration, the regulator should set an ambitious target or an acceptable standard and reward the Postal Service for getting closer to a maximum target, see Figure 5.2.

(iii) Standard and reward and/or punishment
If the regulator aims at maintaining a stable level of quality around a certain standard because the Postal Service is already performing around an acceptable quality level and quality should be further stabilized, the regulator should set an acceptable standard and make deviations from that standard subject to punishment and/or reward, see Figure 5.3.
5.2 Linking changes in quality to changes in price

In this section, we explain the steps needed to construct the quantitative link between quality levels (measured and weighted through the dimensions and weights chosen in the previous section) to the allowable change in price.

We consider (and contrast) the implementation of two approaches for linking changes in quality to changes in price. The two approaches reflect different policy goals and different levels of regulatory ambition (see Chapter 4).

- **Price signal approach**: A Q-factor that maximises total social welfare (i.e. with a link between quality and prices based on users’ willingness to pay)
- **Quality standard approach**: A Q-factor that aims to guarantee stable levels of quality (i.e. introducing 'sufficient' financial incentives for the operator, similar to a penalty-mechanism outside the scope of the price cap)

For each approach we discuss how to define the quantitative link between quality and prices (steps 5) and the data needed for that (step 6).

### Step 5: Defining the quantitative link between quality and prices

**Price signal approach**

When the regulator has chosen to regulate quality via price signals the quality performance should be measured as a percentage change in quality level (i.e. the quality index constructed in step 3) and the link to price should reflect postal service users’ willingness to pay for the additional/lower quality.

For each time period (i.e. each time the price cap/Q-factor is revised), the regulator should require an estimate of how postal service users value additional quality of service or a reduction in quality of service compared to the current level of service quality. The change in quality should then translate one-to-one into an allowed price change corresponding to the value of the willingness to pay for such a change in quality. That is, the
full change in willingness to pay, for a given a change in quality, should be translated into the allowed price change.

It is in this context important to note that the willingness to pay for quality can be symmetric or asymmetric. This means that postal service users may not value an increase in quality by 1 percent with the same dollar amount as they value a reduction in quality by 1 percent. Further, the relationship between quality changes and willingness to pay is likely to depend on the current level of quality of the Postal Service (see Chapter 2).

Quality Standard approach
When the regulator has chosen to regulate quality via quality standards the quality performance should be measured as a deviation from the standard and the link to price should be based on a trade-off between giving sufficient financial incentives to the Postal Service and risking to put the Postal Service under financial stress or to impose excessive quality provision.

In order to provide sufficient financial incentives for the Postal Service, the revenues from a price change due to penalty (reward) for performing below (above) the standard has to exceed the change in costs of getting further away from (closer to) the set quality standard.

In order to avoid financial stress or excessive quality provision the magnitude of a penalty cannot be so large that it puts the financial sustainability of the operator at risk (for an illustrative example, see Box 5.2). Similarly, for a reward, the magnitude cannot be so large that it risks excessive quality provision that does not benefit postal service users.
Box 5.2 Quality Standard and the trade-off between large incentives and risk of financial stress

When determining the financial incentives for the Q-factor, the regulator faces a trade-off between giving large enough incentives to comply with the standard quality and not risking too large financial burden for the operator. The means that the chosen penalty has to be:

- above a certain level in order to give incentives for the operator to stay above the minimum quality level (the green and yellow areas in the graph below)
- below a certain level in order to not risk too large financial burden for the operator (the green and blue areas in the graph below)

This implies that there is a range of well-designed magnitudes where these two objectives overlap (s the green area in the graph below).

If the postal operator is already under financial stress, the risk of regulatory failure is larger (see chapter 2). Since the upper point above which the magnitude of a penalty is too large is lower, the range of well-designed magnitudes is narrower. Such as situation requires prudence when choosing penalty levels.

Step 6: Identifying data needs to quantify the link between quality and price

Price signal approach
Measuring postal users’ willingness to pay requires information on

- how much postal service users would consider paying for receiving additional quality for a given product and;
- how much postal service users would need to get compensated for a reduction in quality of a given product to be equally well off.

We can explore postal users’ willingness to pay by means of surveys of a representative sample of each group of users (residential, small/medium business customers, large business customers). Two main survey methods for estimating willingness to pay are contingent valuation and conjoint analysis.

1. **Contingent valuation** estimates the value that users place on quality of service for different products by asking the users to report either their willingness to pay (WTP) to obtain a specified quality and/or their willingness to accept (WTA) a quality reduction.

2. **Conjoint analysis** (also called contingent choice method) is similar to contingent valuation in that it can be used to estimate economic values for virtually any service. It differs, however, in how the survey is constructed where conjoint analysis is based on values inferred from the hypothetical choices or tradeoffs that people make in a survey. In other words, conjoint analysis presents the consumer with a number of hypothetical choices (price-quality combinations), between which the consumer has to indicate the preferred option.

Figure 5.4 provides an illustration of the two methods.

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**Figure 5.4 Example of survey questions to examine willingness to pay**

<table>
<thead>
<tr>
<th>Contingent valuation survey, example of question:</th>
<th>Conjoint analysis survey, example of question:</th>
</tr>
</thead>
<tbody>
<tr>
<td>If the current level of service ensures that your mail is delivered the next working day with a probability of 92% and costs 30 cents, indicate how much you would be willing to pay for a product with a service level that ensures your mail is delivered the next working day with a probability of 95%?</td>
<td>Thinking about your mail options for first-class letters that arrive the next day, which would you choose?</td>
</tr>
</tbody>
</table>

- **Option A**: 99% of your mail is delivered the next working day and the cost of a stamp is 31 cents.
- **Option B**: 92% of your mail is delivered the next working day and the cost of a stamp is 30 cents.

Source: Copenhagen Economics

We recommend the use of conjoint analysis for two main reasons: Firstly, conjoint analysis is better at treating many dimensions of quality since it can use bundles of attributes in

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each option. Secondly, some quality dimensions can be difficult to relate to for respondents and the contingent valuation may be more exposed to this problem. In other words, conjoint analysis gets closer to a real-life situation where a consumer has to choose between many different price/quality combinations.

**Quality Standard approach**

Linking quality and price changes under the quality standard approach necessitates two different types of information.

1. **Information about the Postal Service’s costs**

In order to give large enough incentives the magnitude of a penalty or reward has to be larger than the extra cost of providing higher quality. This requires information on the cost of providing higher/lower quality.

A first practical approach for the regulator to obtain that information would be to request information from the Postal Service about the cost related to providing different levels of quality and quality levels that are in line with the set standards. The regulator should require the Postal Service to justify and explain its cost estimates by explaining in detail the measures that the Postal Service needs to take in order to enhance quality and how cost drivers will be affected (e.g., rise in labour cost in delivery, rise in fuel costs for delivery trucks etc.).

2. **Information about the Postal Service’s financial situation**

In order to avoid risk of too large financial burden for the operator a penalty has to be small enough not to endanger the financial sustainability of postal service provision. This requires information on financial sustainability of the Postal Service for market dominant products and the need for financial flexibility. The regulator can review previous reviews and reports to assess whether the market is currently under critical financial stress or whether it is likely to be under such financial stress in the future. The regulator can further conduct a financial performance and financial risk analysis to gauge:

- whether the Postal Service is under financial stress that implies additional implications from the constrains of a price cap
- at what level of price reduction the Postal Service will incur financial stress that endanger the sustainability of its service provision

3. **Information on consumer preferences**

In order to avoid risk of excessive quality provision and take affordability into account a reward has to be small enough. This requires information on the maximum quality needed to make consumers better off. In order to find the point above which consumers will not be better off with an increase in quality of service accompanied by an increase in price, the regulator can conduct or use existing studies on consumer preferences.
5.3 Constructing the Q-factor in the price cap

Step 7: Designing the Q-factor
Following from the previous steps, the regulator should at this point have selected the quality dimensions, defined how to measure and weight them and identified the link between quality changes and allowable changes in prices. The final step then consists of introducing the Q-factor in the functional form of the price cap.

In the following, we will propose a functional form for the Q-factors reflecting our recommendations in the previous sections:

i. A Q-factor based on price signal (Price signal approach)

ii. A Q-factor based on quality standards (Quality standard approach)
   a. with a low level (minimum) standard
   b. with a high level (target) standard
   c. with a medium level standard

i. Q-factor based on price signal
A Q-factor based on price signal takes the following functional form

\[
\% \Delta price \leq CPI + Q \\
\text{where} \\
Q = \% \Delta quality \times WTP
\]

The allowable increase in price is smaller or equal to inflation augmented by the quality factor. The quality factor is equal to the change in quality times the postal users willingness to pay for that change in quality.

ii. Q-factor based on quality standards

a. Q-factor based on quality standards with a low level (minimum) standard

The Q-factor with minimum standard takes the following form:

\[
\% \Delta price \leq CPI - Q \\
\text{where} \\
Q = (minimum \ standard - realised \ quality) \times \beta \\
\beta = \text{a coefficient based on the trade-off between incentives and risk of too large financial burden (see step 4)}
\]


b. Q-factor based on quality standards with a high level (target) standard

The Q-factor with target standard takes the following form:

\[ \% \Delta \text{price} \leq CPI + Q \]

Where

\[ Q = (\text{realised quality} - \text{target standard}) \times \beta \]
\[ \leq (\text{Maximum standard} - \text{target standard}) \times \beta \]

\[ \beta = \text{a coefficient based on the trade off between incentives and risk of excessive quality provision and reduced affordability.} \]


c. **Q-factor based on quality standards with a medium level standard**

The Q-factor with a medium level standard takes the following form

\[ \%\Delta price \leq CPI \pm Q \]

where

\[ Q = (\text{standard} - \text{realised quality}) \times \beta \]

\( \beta \) = a coefficient based on the trade off between incentives and risk of both too large financial burden and excessive quality provision and taking affordability into account (see step 4).
Example

Quality is measured by percentage of mail delivered on time and a standard is set to 90%. A coefficient beta is set to 0.5.

If the operator, in a given year delivers below this, say 85% on-time delivery, it will be punished by:

\[ Q = (90 - 85) \times 0.5 = 2.5 \]

The allowed price increase will be:

\[ \% \Delta \text{price} \leq CPI - 2.5 \]

Note that the operator also can get rewarded for achieving above the standard.
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