Proposals for a levy on online content application providers to fund network operators

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An economic assessment prepared for the Dutch Ministry of Economic Affairs and Climate

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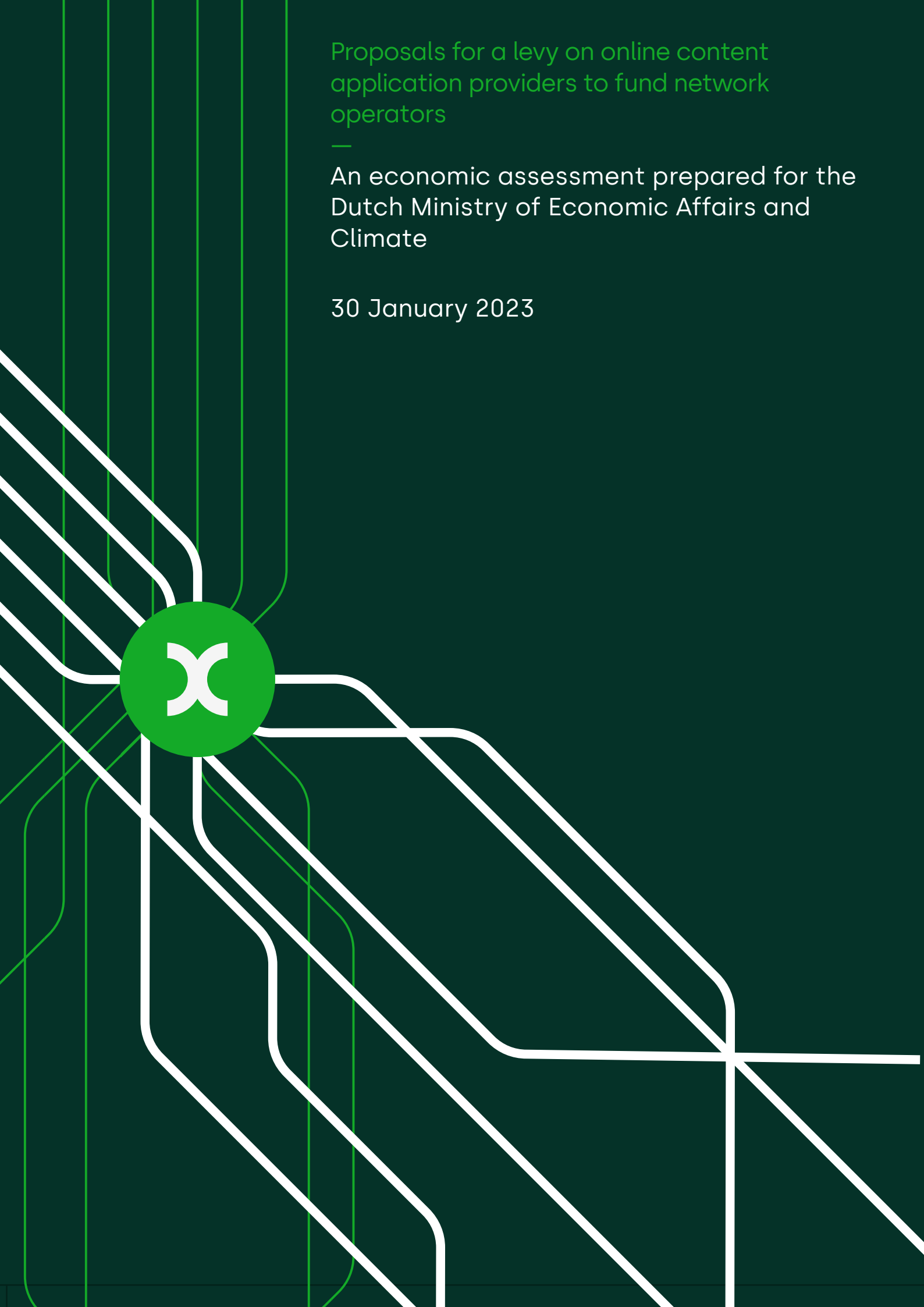

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Executive summary

Oxera has been commissioned by the Dutch Ministry of Economic Affairs and Climate to write this report, analysing the economic and broader impact of a proposal brought forward by large telecom companies ('telcos'), and by the European Telecommunications Network Operators' Association ('ETNO'), the organisation representing them. The proposal is that large Content Application Providers ('CAPs') should contribute to paying part of telcos' network costs. The proposal is often referred to as the 'fair share' discussion whereby telcos, in addition to charging consumers for access to the internet, would charge content providers for sending their data to consumers.

While broadband networks can also be seen vertically from a supply side perspective, we view the broadband internet market for the purpose of this study as a two-sided market between content providers and consumers. We describe the general economic theory of two-sided markets, and how this affects the charging structure in terms of the prices charged to both sides, which have to cover the platform operators' costs and get both sides of the market on board. We then investigate whether charging both sides of broadband markets would lead to such outcomes.

We use a basic economic model which abstracts from indirect and longer-term impacts such as investment in network capacity and content to make some illustrative calculations. The model considers the net welfare changes across both the broadband and content sides of the market.[1] We show that a levy tends to reduce prices on the broadband side, but increase prices on the content side. The results show that the overall policy judgement about introducing a levy depends upon judgements taken about the desirability of the transfers, rather than any reasonable expectation that there are significant efficiency gains to be unlocked. On the basis of sensitivity analyses around various parameter values, this conclusion is robust to various assumptions. However, as mentioned above, one must be mindful that these observations are limited to the static, direct welfare changes and take no account of the impact of incentives for investment and dynamic welfare changes.

We explore how such a scheme might be implemented, as well as the potential transaction costs. We looked at the role a regulator would need to play, given that negotiated transactions are not expected to result in economically efficient outcomes. The regulator would need to fulfil certain recurring tasks such as: (i) detailed traffic analysis and verification; (ii) dispute settlement; (iii) market monitoring; (iv) multilateral coordination with companies and other authorities. There might also be a need for regulatory alignment at the European level.

We looked at the effects of the introduction of a levy on the existing regulatory frameworks, in particular the so-called Significant Market Power (SMP) regime, which is the cornerstone for telecoms access regulation in Europe. We describe the different effects, some of which

[1] Effectively, the model trades off welfare gains in the broadband side of the market against welfare losses in the content production side of the market.

would potentially be distortive on these regulated markets. We also describe the need for regulators to reassess the existing regulatory market reviews and decisions to account for the additional revenue stream of some telcos—as the effects of a new regime that introduces a levy would need to be incorporated.

We conclude that the transaction and regulatory costs of the proposal would be significant. Aside from transaction and regulatory costs, there might also be additional costs in terms of a degradation of internet quality (as has been seen in South Korea), reduced investment incentives for CAPs, and competitive distortions between CAPs caught by the charges and those that are not.

We briefly consider an alternative scenario where CAPs are required to contribute to a (more centrally managed) fund from which telcos could draw. This could be an improvement on direct payments from CAPs to telcos, as it might limit the need for the many multilateral negotiations and interactions between CAPs and ISPs. This would potentially reduce some of the regulatory and transaction costs. However, most of the processes and risks associated with direct payments would still exist in this alternative scenario. On the other hand, the management and control of the central authority might create additional transaction costs.

Overall, our analysis of the proposals for a levy shows that such a policy cannot robustly be shown to increase economic efficiency, and would potentially bring substantial transaction and set-up costs.

From an economic perspective, once welfare losses in the market for content are accounted for, the net welfare gain from the policy is relatively small. There are also potential welfare losses we have not been able to quantify, including transaction costs, reduced innovation incentives for content providers, and competitive distortions between CAPs and between ISPs. These losses are likely to be significant and could strongly impact the European digital transformation.

There are other potential benefits from the policy, excluded from our model, which are difficult to quantify, such as—potentially—improved investment incentives for network operators. We observe that a proportion of funds would be passed on to consumers (if not, there would be no static welfare gain at all) in the form of price reductions, and therefore not available to invest. We also observe, from the economic literature, that the relationship between increased cash flow and investment is weak, and that any effects in the market for broadband connections would need to be offset against effects in the market for content-generating services by CAPs. We conclude that promoting investment by network operators is not an economically sound reason for instituting a levy—there are more effective ways of achieving such a goal.

The only other potential benefit is the pure transfer effect from CAPs to telcos and (potentially) their subscribers if one were to believe that such transfers were desirable. Commenting on whether such transfers are justified is beyond the scope of this contribution to the debate. We have focused on the economic aspects of the proposals, rather than

the political desirability of transferring resources from one group to another.

1 Introduction

Large telecoms companies and the organisations that represent them have highlighted that the largest content providers over the internet ('CAPs') are responsible for more than half of the traffic being carried by network operators ('telcos').[2] However, telcos query whether CAPs are paying their 'fair share' for maintaining and improving the infrastructure over which their data is carried, and which is crucial to their business model.[3]

For example, a report by Axon Partners Group, that was commissioned by the ETNO points out that internet usage has become an essential part of everyday life. They highlight that this development has been supported and enabled by the development of high-capacity networks which are the result of €500bn of investment by European network operators over the last ten years. The report goes on to highlight that 55% of the traffic carried on the networks originates from a small number of leading content providers.[4]

ETNO's position has been made clear—that:

> all European network operators investing in gigabit networks – no matter whether alternative or traditional, small or big – should be able to rely on a fair and proportionate contribution by big tech companies to the network costs they generate with their traffic.[5]

The argument then goes on to suggest that there should be a contribution from large CAPs to network operators, the benefits of which would be investments in their networks. ETNO's press statement says that they expect a contribution by big tech companies:

> [T]o strongly benefit users via network upgrades, to reinforce internet infrastructure and to be fully compatible with unrestricted access to all lawful content and applications on the internet.

In this study commissioned by the Dutch Ministry of Economic Affairs and Climate Policy we consider that promoting investment is just one economic reason to propose that CAPs make contributions to network operators. There are also other possible arguments.

In this report, we investigate two possible arguments in support of a contribution from CAPs to network operators. Specifically:

- that a contribution from CAPs to telcos would lead to lower prices in the market for broadband connections, which could increase economic efficiency;

[2] See, for example, Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', p.1.
[3] European Telecommunications Network Operators' Association (2022), 'Joint EU and National telecom sector statement on "fair contribution"', 18 July,
[4] See Axon Partners Group, (2022) 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators'.
[5] See European Telecommunications Network Operators' press statement, 18 July 2022, https://etno.eu/news/all-news/8-news/747-joint-eu-and-national-telecom-sector-statement-on-fair-contribution.html (accessed 15 December 2022).

- that a contribution from CAPs to telcos would lead to additional investment by telcos in their infrastructure, as well as more capacity on, and quality of, the networks.

In this report we focus on CAPs as providers of content over the public internet. Consumers who want to download content are on the other side of the market. Between them are Internet Service Providers (ISPs) which is a broad label. Within fixed line networks, these would include the network operators (telcos) as the operators that own the actual network, but also access ISPs who might lease part of the network (and potentially providing some of their own equipment) in order to connect subscribers to the internet. Over mobile networks, it would include Mobile Network Operators (MNOs) who own the networks of transmission towers on the 3G, 4G and 5G standards, and sell mobile internet connections to subscribers. It would also include Mobile Virtual Network Operators (MVNOs) who lease access to the networks of MNOs in order to sell connections to consumers. Access agreements in fixed networks are typically regulated; while access agreements in mobile networks are frequently unregulated.

This report is structured as follows.

- Section 2 considers in greater detail the various forms that a levy on CAPs might take.
- Section 3 sets out the framework of two-sided markets through which we consider these arguments.
- Section 4 considers the probable need for regulatory involvement to make any levy scheme work.
- Section 5 looks at the impact that a levy would be likely to have on economic efficiency.
- Section 6 describes transaction costs from the implementation of a levy.
- Section 7 considers the likely changes in investment as a result of the levy.
- Section 8 provides concluding statements.

2 The forms a levy might take

The design of any scheme for extracting 'fair share' payments from large CAPs is crucial for understanding its effects. There is no formal proposal (yet) from legislators, and the claims by ETNO have not been specific on how exactly the levy would be designed and the level at which it would be set. Design issues are crucial to understand the potential efficiencies and other effects.

In order to tackle this lack of clarity, we have considered some variation in the different forms the proposals might take. We have identified four important dimensions where different options might be pursued.

1 **Who pays?** Under some options, all CAPs would be charged for the delivery of their content; alternatively, only a subset of content providers would pay.
2 **Who receives the payments?** Where the ISP is a telco providing that connection over its own infrastructure, this is a relatively simple issue. The ISP would receive the money. However, it might become more complicated if the ISP is a pure-access ISP using the access arrangements of a telco to provide the service. Should the ISP or the telco receive the payment? Directing the payment to the ISP rather than the telco might provide strong incentives to lower prices for consumers, but would be less effective at encouraging infrastructure.
3 **The structure of the levy that is charged.** The levy might be charged as a fixed fee to the CAPs that have to pay; or it might be charged as an amount which varies with traffic on some dimension. An example of a fixed fee would be to simply require all CAPs that have to pay to hand over, e.g. €5m. Examples of charges that vary with traffic might be where the charge is expressed as an amount per gigabyte of data, or as an amount per subscriber.[6]
4 **The structure of the levy that is received.** Irrespective of the structure of the levy that is charged to content providers, it might be received by ISPs in the form of a lump-sum payment (e.g. each ISP gets a fixed amount which will not change if it gets more subscribers or carries more data);[7] a payment per subscriber; or a traffic-related payment based on the number of their subscribers (e.g. a payment per gigabyte).[8]

Naturally, the options discussed above within these four dimensions are simplifications. Furthermore, there are complexities other than those captured in the four dimensions above which might be relevant. For example, the precise impact might vary according to how the traffic is routed to the final customer. Therefore, these four dimensions are not exhaustive. However, the description above sets out, at a relatively high level, the different options that could be pursued. Note that

[6] When modelling such a charge, we assume an amount per subscriber, which could be viewed as an approximation of an amount of traffic which takes into account that each new customer would bring with them a certain amount of traffic per month.
[7] Note that this would not necessarily mean that each ISP receives the same amount.
[8] The same modelling approximations discussed above, with respect to traffic-related payments or payments per subscriber, apply here.

considering two broad options within each of these four dimensions leads to 16 possible scenarios for a levy being levelled on CAPs and given to telcos.[9] These scenarios are shown in Table 2.1 below.

Table 2.1 Possible different versions of a charging scheme for providers

Scenario	Who pays	Who is paid	CAP pays fixed / variable amount	Recipient receives fixed / variable amount
1	Some CAPs	ISP	Fixed	Fixed
2	Some CAPs	ISP	Fixed	Proportionate to traffic
3	Some CAPs	ISP	Proportionate to traffic	Fixed
4	Some CAPs	ISP	Proportionate to traffic	Proportionate to traffic
5	Some CAPs	Network	Fixed	Fixed
6	Some CAPs	Network	Fixed	Proportionate to traffic
7	Some CAPs	Network	Proportionate to traffic	Fixed
8	Some CAPs	Network	Proportionate to traffic	Proportionate to traffic
9	All CAPs	ISP	Fixed	Fixed
10	All CAPs	ISP	Fixed	Proportionate to traffic
11	All CAPs	ISP	Proportionate to traffic	Fixed
12	All CAPs	ISP	Proportionate to traffic	Proportionate to traffic
13	All CAPs	Network	Fixed	Fixed
14	All CAPs	Network	Fixed	Proportionate to traffic
15	All CAPs	Network	Proportionate to traffic	Fixed
16	All CAPs	Network	Proportionate to traffic	Proportionate to traffic

Source: Oxera

It is outside the scope of our note to examine in detail the consequences of every single scenario. Instead, we have examined the various proposals that have been put forward by telecoms operators in various publications and reports, to determine which of these scenarios is the most likely to be implemented.

Neither do we go into a great deal of detail in terms of the various options for fees to be set at a fixed level, or in a manner that is proportionate to traffic. Rather, we consider these options at a high level. Such an exercise, including estimating what appropriate levels of such fees might be, is beyond the scope of this report.

Given that any scheme—due to practicality considerations (that we describe under Section 2.1 below)—is likely to charge only a subset of CAPs, we immediately narrow our focus on Scenarios 1–8. Within these scenarios, the proposals that have come into the public domain would seem to conform to either Scenario 4 or Scenario 8.

[9] 16 scenarios, because each scenario is a combination of choices of the two options within each dimension, so $2 \times 2 \times 2 \times 2 = 16$.

2.1 An 'All CAPs Pay' system would be unworkable

One key point when analysing the question of cost-sharing between telcos and CAPs is one of scope in terms of which firms (on the CAP side) are within the scheme.

CAPs come in many shapes and sizes, and one could even argue that every service, app or website is a CAP. This adds complexity when considering the introduction of a cost-sharing regime. Since charging a smaller number of CAPs might lead to distortions of competition between those that are charged and those that are not (we describe this in Section 6.1.5), there might be a preference for charging all CAPs. However, this would bring its own challenges.

First, a definition that extends to all content providers might be deceptively simple. In theory, this would extend to a significant part of the internet: when one person sends an email or an instant message to a group of their friends, they are sending content. Any person can access any side of multiple apps or services at any moment potentially leading to their being thought of as a CAP. The potential number of CAPs is enormous.

Second, and crucially, the internet is global—whereas telcos are (mostly) national (and in some cases regional). A scheme which would require all CAPs to contribute implies that they would all have to contract with all European telcos. A small content provider in Kathmandu might be surprised to receive a bill from a large number of European telcos because their content suddenly 'went viral' in Europe. In those circumstances, recovering the money 'owed' might be difficult.

Third, the internet is a dynamic environment, CAPs come and go on a real-time basis. It is almost impossible to monitor, let alone to adequately measure and analyse the traffic generated by all of these CAPs' users. Therefore, there would be a need for some degree of approximation and estimation in the absence of exact metering. The stakes could be high enough that such methodologies would be subject to repeated legal challenges.

These considerations are strengthened by our conversations with the Dutch Ministry of Economic Affairs and Climate Policy, and the fact that the proposals we have seen so far (e.g. by ETNO) propose to seek contributions from a small number of large CAPs. In this study, we therefore focus on scenarios where only a subset of CAPs would need to contribute. However, this carries its own economic costs.

2.2 Restricting attention to scenarios where a subset of CAPs pay

Given that a levy paid by all CAPs seems infeasible, any proposal would need to involve cut-offs so that only a subset of content providers would actually pay the charge. Indeed, this is what most of the proposals for a charge paid by CAPs suggest.

For example, the proposal by the Fédération Française des Télécoms (FFT)[10] suggests that contributions of incoming data should be

[10] Fédération Française des Télécoms, 2022, leaked internal document 'For a fair contribution of large bandwidth users to network financing'

measured and only those providers with contributions above a certain threshold should qualify to pay. Similarly, the report by Axon Partners, commissioned by the ETNO, suggested that:

> Among possible solutions, tools for a contribution of OTTs to network costs could preferably be based on a regulated mechanism for direct agreements with network operators. The scope of such tools could also be limited to just a few, very large OTTs, in line with the EU approach taken for the regulation of "gatekeepers" under the Digital Markets Act, and "very large online platforms" under the Digital Services Act.[11]

The remainder of this subsection attempts to pin down which of the scenarios would see only a subset of CAPs subject to the levy (Scenarios 1–8 in Table 2.1).

For example, the proposals from the FFT would appear to conform to Scenario 8 above. In particular, the charges would accrue and be received in a manner that was proportionate to traffic.

> The incremental costs thus calculated should be offset by the providers of content, services and applications targeted in point 1 and defined as the main beneficiaries of these investments, in proportion to their representativeness within the operator's traffic via an obligation to enter into an agreement.[12]

Similarly, the report by Axon Partners for ETNO would seem to suggest that payments from CAPs to telcos should be proportionate (in some way) to the CAPs' contribution to network costs.

> To achieve its goal, the relevant tool should define a clear obligation for the OTTs concerned (i.e., only the largest among them) to negotiate the conclusion of a direct agreement with ISPs/telcos upon request, and to accept to pay a fair and proportionate contribution to network usage costs, and other conditions in such an agreement.[13]

The proposals envisage direct negotiations between network operators and the CAPs involved, potentially backed up by a mediator capable of imposing a solution—we discuss in Section 4 why we believe a greater degree of regulatory involvement would be more realistic. As a result, the proposals would appear to suggest that payments (sent and received) would be in proportion to traffic, and that payments would be made to either ISPs or network operators, depending on the extent to which their costs were responsive to the traffic carried on behalf of the large CAPs.

These considerations suggest that the proposals are for a scheme that would look like either Scenario 4 or Scenario 8 from Table 2.1. That is to say: the levy would be paid by a subset of CAPs, CAPs would pay in proportion to their data usage; and the recipient would receive payment in proportion to the quantity of data sent to consumers they

[11] Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', May, p.2.
[12] Fédération Française des Télécoms, 2022, leaked internal document 'For a fair contribution of large bandwidth users to network financing', p.7.
[13] Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', May, p.2.

were serving. The outstanding issue is whether the payments would be made to the ISP or the network operator. This issue is, of course, only relevant where the ISP and the network owner are different, i.e. where the ISP is providing the service under an access contract.

Whether payments are received by ISPs or network operators might be relevant in terms of how the revenue that is raised would be used. If the revenue is paid to ISPs on the basis of their relationship with the end-consumer, then it might be more likely to be competed away to consumers in the form of price reductions. On the other hand, if the revenue is paid to network operators, then it might be more likely (especially if network quality is a dimension of competition, or the network in question has yet to achieve full national coverage) to be invested in the quality or reach of the network.

The distinction might not be stark. Many ISPs are also Network Operators (especially in terms of mobile connectivity). There are different levels of access arrangements, and some providers of ISP services via access agreements do also provide some of their own equipment.[14] Even pure access providers—which might not own any of the equipment used for providing ISP services, but would still be paying usage-based charges for the equipment—provide some of their own equipment. Therefore, we might expect that:

- where the recipient is the ISP, access ISPs would increase their willingness to pay for the use of Network Operators' networks and so some of the revenues would flow through to the network operators;
- where the recipient is the Network Operator they might lower access prices to access ISPs in order to attract more customers (and so increase the amount of money received from CAPs), so some of the funds would effectively flow through to access ISPs.

The report by Axon Partners for the ETNO group is most likely suggesting that the recipients should be the network operators. For example, the following extract appears to be calling for a contribution to the costs of network operators.

> Briefly, for the reasons discussed below, a direct implementation tool to ensure OTTs contribute fairly and proportionately to the costs of their use of telecom operators' networks would appear to be a more efficient and appropriate answer to the issues at stake, compared to any possible indirect implementation tools.[15]

In an earlier part of the report, 'telecom network operators' are described as those who:

> provide the underlying infrastructure, as the fabric needed to bring both these and telcos' own services to end-users.[16]

[14] For example, ISPs making use of (regulated) wholesale access (e.g. LLU, VULA), and alternative operators making (mostly) use of the telco's network (e.g. via bitstream access, or as an MVNO) will typically own some of their own equipment.
[15] Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', May, p.42.
[16] Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', May, p.6.

We therefore consider that the proposals for a contribution from CAPs would pass that contribution to the Network Operators, potentially bypassing the ISPs. This would suggest that the proposals for a contribution are likely homing in on Scenario 8 of Table 2.1.

2.3 Paying into a fund

An alternative to the CAPs making payments to the ISPs/telcos directly would be where the CAPs pay into a fund, e.g. run by the European Commission or by national governments. One advantage could be that this would potentially lower the transaction costs (which we describe in more detail under Section 6).

3 Two-sided markets and externalities

This section first describes the relevant elements of classic two-sided markets in general terms, then discusses how internet access can be viewed through the lens of two-sided markets.

3.1 Two-sided markets in theory

The types of markets that are frequently described as two-sided markets in modern economic analysis have existed for a long time. For example, newspapers are a classic example of a two-sided market serving consumers who wish to remain informed and advertisers who want to get their attention. The concept of the two-sided market is not new, although much more emphasis has been given recently to the analysis of these types of markets using a two-sided framework. This is—in part—attributable to theories of two-sided markets taking on more salience as regulators turn their attention to payment systems and digital platforms. Greater attention to two-sided markets has also resulted from the rise of digital firms employing two-sided business models that have scaled quickly into global giants.

A two-sided market is essentially a platform which brings together groups of agents on either side who are mutually dependent upon each other. This mutual dependence means that the utility of the agents on one side of the market is affected by the number and type of agents on the other side of the market, and vice versa. This interdependence is characterised in technical terms as there being *cross group externalities*,[17] which represents the extent to which each group's utility depends on the number and types of agents in the other group. These cross-group externalities will not necessarily be symmetric. For example, while advertisers look for websites with a lot of viewers, some viewers are actively put off by a lot of adverts on websites—to the point where ad-blocking software has become a product of itself.

These interdependencies can be illustrated by considering payment cards. The larger the number of merchants there are that are willing to accept a particular payment card, the more the consumer benefits from using it. Similarly, as more consumers choose to use a particular payment card, merchants get greater value from accepting them. However, these effects are generally asymmetric. At the margin,

- an increase in the number of consumers wishing to use a payment card has a larger effect on the value of being able to accept cards for merchants than
- an increase in the number of merchants accepting a payment card has on a consumers' value from carrying using that card.

Charging structures often reflect this asymmetry, and merchants are typically charged more for each transaction than consumers.

These different charging structures do not reflect a difference in the cost of serving each side—the costs incurred are the costs of the

[17] See Oxera (2020), 'Two-sided market definition: some common misunderstandings', *Agenda*, September.

transaction which were agreed by both parties—they are *equally* responsible. Rather, the charging structure reflects the relative strength of the cross-group externalities.[18]

Sometimes it will be optimal for both sides of a two-sided market to face positive prices, but it is also possible that the optimal price for one side is zero (or even negative)—neither case would be unusual. Indeed, newspapers and magazines are clear examples of two-sided markets, bringing together readers and advertisers. These types of publications have a multitude of pricing structures. There are some fully advertising-funded publications—which are free to the reader—and there are other more upmarket publications which carry little advertising but are provided at a premium price to the reader.

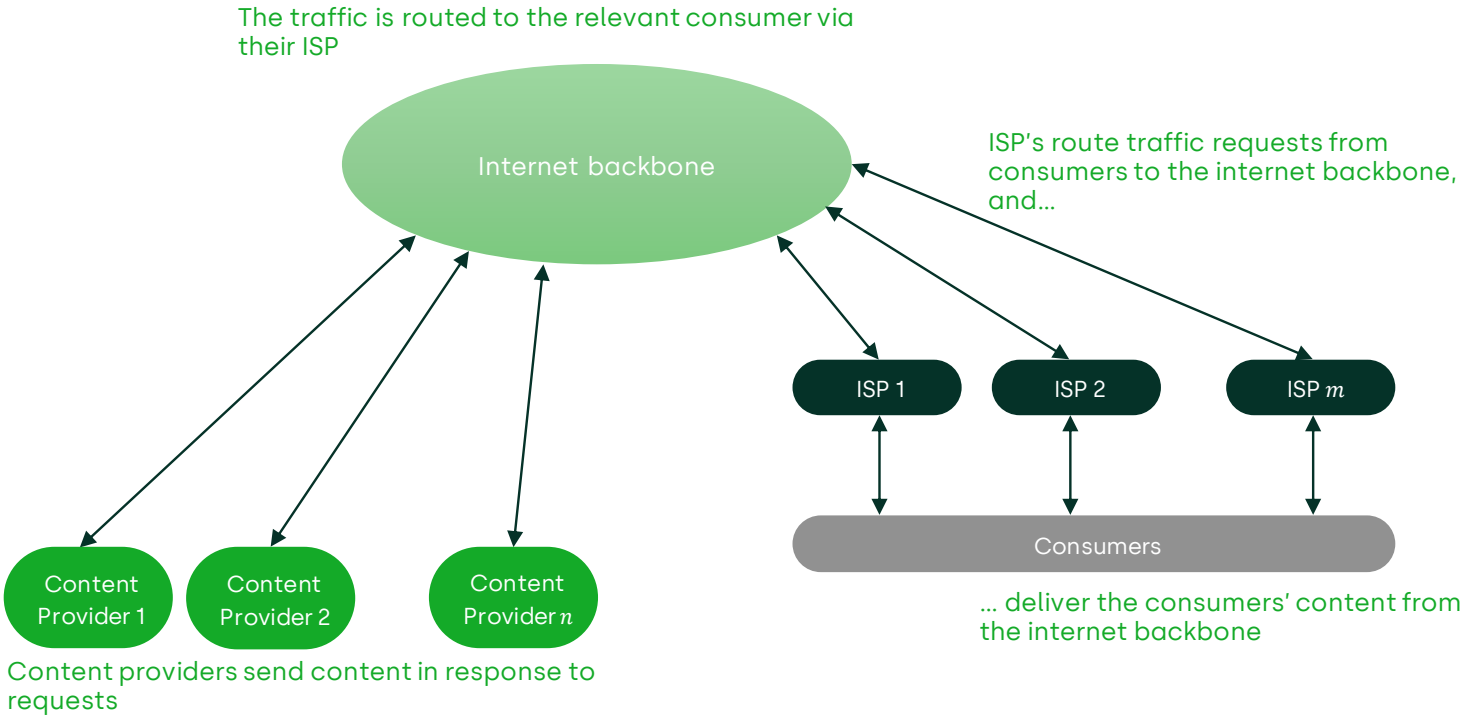
The key point is that the appropriate structure of prices is determined largely by the cross-group externalities, rather than the costs attributable to either side of the market.

3.2 Broadband internet connections as a two-sided market

Two-sidedness is a matter of degree, and many networks have other relevant economic characteristics (one-sided network effects, economies of scale, etc.). While broadband networks can also be seen vertically from a supply-side perspective, we focus for the purpose of this study on the two-sided characteristics of broadband networks. They bring together content providers on one side and consumers on the other. The agents on each side depend upon the agents on the other side in order to enjoy economic value from being on the network.

[18] That is not to say that costs—in particular, marginal costs—play no role in determining optimal prices. The marginal cost of providing a service to either side of a two-sided market is part of the consideration of optimal pricing structures, but the influence of marginal costs can frequently be more than offset by the effects of the cross-group externalities.

Figure 3.1 Broadband connections as a two-sided market



Source: Oxera

- Content providers need consumers to be able to access their content, paying for it either through subscriptions or through their attention to advertising. The more consumers there are, the greater the value of the network to content providers.
- Consumers gain value out of the network if there are content providers on the other side. The more content available to consumers, of greater quality, the greater the value of the network to them.

These relationships are the cross-group externalities discussed above,. They might vary across groups of consumers and types of content—they might also vary over time.

As discussed above, these cross-group externalities mean that a range of charging structures could be used to allow telcos to recover their costs. The present system, under which consumers pay the telcos' costs through their subscriptions, while content providers do not directly contribute, is simply the way the internet has evolved without any direct regulatory intervention.[19] We explore whether it would be possible to create a more efficient pricing structure by allowing both sides of the market to be charged as suggested by ETNO and telcos. We attempt to quantify, at a relatively high level, the welfare implications of different charging structures.

It is important to note that there is no clear evidence that the absence of charging CAPs means that telcos are unable to raise revenues and cover their costs. They are presently doing so through the

[19] Content providers do tend to invest significantly in their points of interconnection with the internet to get the content they are sending to the ISPs. This includes setting up Content Delivery Networks (CDNs) designed to store the content closer to the consumer so it can be delivered more cheaply.

(unregulated) prices they charge to consumers for internet access. It is also important to realise that the data that CAPs send to consumers is not being sent unsolicited, it is typically being sent at the request of the consumer who is paying for their access to the internet.

However, we first discuss how any such scheme is likely to require some level of regulatory involvement.

4 The probable need for regulatory involvement

Gains in economic welfare from more efficient charging structures, or improvements in the incentives to invest, are likely to depend upon some degree of regulatory involvement. A key issue that has been raised in these debates is the disparity of bargaining power.[20] Bilateral bargaining between individual CAPs and individual service providers to set the level of payments would be unlikely to result in an efficient or equitable outcome. The large CAPs have the preponderance in bargaining power, as internet access that does not offer access to them would likely violate net neutrality and reduce consumers' willingness to pay. These imbalances in bargaining power would be likely to dominate the cross-group externalities in a negotiated outcome. For that reason, it is unlikely that efficiency would be enhanced by an approach based on bilateral negotiations.[21]

Accordingly, it is likely that the charges would have to be set by the regulator. This could lead to contentious outcomes, as there would inevitably be an element of judgement involved in setting the contributions.

Any improvement to static consumer welfare would depend on payments from CAPs to network operators being passed on, (potentially through ISPs—an issue we discuss in the Section 5) to consumers in the form of lower connection prices. This might happen via a 'waterbed' effect: if the payments a network operator receives are likely to increase with more subscribers, they might lower prices (both direct and access prices) to attract more subscribers. However, depending on market features and the design of any levy, the rate of pass through to final consumers could be small.[22]

If competitive pressure is insufficient to ensure that network operators receiving payments from CAPs pass a significant proportion of those receipts on to access ISPs, a regulator might step in and bring the access price down to ensure some price reduction is passed on to consumers. This could be done by forcing network operators to charge lower access prices, since access prices can be regulated. Competitive retail markets (relative to network operators) would then likely ensure some of that price cut was passed on to consumers. At present, a regulator would only be able to step in if the telco in question had been designated as having SMP. If the telco were to not pass on any additional revenue from the CAP side in the form of price reductions on the subscriber side, that could lead to double recovery of their costs.

Without a consumer price reduction, the effect of a charging scheme is simply to transfer money from CAPs to telcos. However, such a transfer

[20] See, for example, Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', p.1.
[21] Unbalanced outcomes to negotiated payments could also have significant competitive impacts and distortions in addition to the distorted pricing structure that would be a likely result. We discuss some of these issues in more detail in the sections considering transaction costs.
[22] See, for example, Genakos, C. and Valletti, T. (2011), 'Testing the "waterbed" effect in mobile telephony', *Journal of the European Economic Association*, **9**:6, pp. 1114–1142.

might come with negative welfare effects on the CAP side of the market, for example, higher prices to consumers and less innovation.

There is tension between two of the potential benefits of a charging scheme. Money that is raised by such a scheme can be:

- passed on to consumers in the form of lower prices;
- kept by network operators and (potentially) used for investment in network quality.

A euro raised by the charge cannot be used to achieve both goals. Only that portion of the charge which is not competed away to consumers could plausibly be used to fund investments in network quality.[23]

Accordingly, in order to ensure that the contributions from CAPs result in lower consumer prices *and* additional investment, there would need to be some regulatory oversight of how the funds were used. This would be likely to result in disputes with no easy way of resolving them. Furthermore, this illustrates that the detail of the design might well be important in assessing its likely effects, especially in terms of who gets paid out of the levy and on what metrics that payment is to be based.

A second lesson is that it is important to be clear on the purpose of the levy. Is the purpose to (i) incentivise more investment in network capacity; (ii) provide a better deal for consumers in terms of lower prices; (iii) improve equity considerations by transferring resources from one group to another?

[23] Regarding investment in network quality, there might be another complication if the levy scheme bears more resemblance to Scenario 4 in Table 2.1 than to Scenario 8, i.e. if the payment is made to the ISP and not to the network operator. While those payments that are made to ISPs that also operate their own networks, and are not competed away in lower consumer prices, might lead to improvements in network quality, it is difficult to see how this could happen to payments to ISPs operating under access agreements.

5 The impacts on economic efficiency

In order to evaluate the potential size of the static efficiency gains that might come from a levy, we have carried out some illustrative calculations. Our calculations consider the case of a large European country in which such a charge might be introduced. We consider the case of a charge in the market for fixed broadband, and the market for mobile internet connections.

We first discuss the nature of our illustrative calculations and describe, in economic terms, the effects we are able to estimate. Next, we describe the results of the illustrative calculation and show that the changes in welfare as a result of charging CAPs in addition to broadband subscribers are very small. Finally, we discuss these results and their implications for the policy proposal.

5.1 The nature of our illustrative calculation

In our model, we consider a charge based on a share of the incremental traffic-sensitive cost of carrying data. There is much debate about the levels of these costs and we have not attempted to resolve the questions that have arisen in these debates. However, in order to conduct this exercise, we have used the information set out in the Frontier Economics report which was also used by Axon Partners in their work for ETNO.[24] The cost estimates in this work have been challenged as being at, or above, the maximum credible level of costs, and our use of them does not imply our endorsement of them.[25]

However, they have been derived from real-world accounting data, so we take them as a basis for conducting illustrative calculations and bear in mind that they might in fact overstate the true level of data-driven costs.[26] We recognise that lower values for the traffic-sensitive element of network costs should be considered before drawing firm conclusions from this work.

Box 5.1 Who causes costs

Some of the justifications for a levy on CAPs effectively suggest that traffic is caused by the CAPs that are sending it—in much the same way as a phone call is caused by the party that dials a number rather than the party that picks up the receiver. This view is implicit in phrases such as 'Five internet corporations cause 50 per cent of data traffic in Germany'. However, when considering the full set of relationships between consumers and CAPs, it would seem wrong to suggest that

[24] See, Frontier Economics (2022) 'Estimating OTT traffic-related costs on European telecommunications networks: A report for Deutsche Telekom, Orange, Telefonica and Vodafone', 7 April.
[25] Williamson, B. (2022), 'An internet traffic tax would harm Europe's digital transformation', July.
[26] We note that assessing incremental costs is notoriously complicated as one needs to establish the relationship between traffic volume and costs; a relationship that cannot be derived simply from accounting data. Regulators have used complex bottom-up models to determine such cost-volume relationships in networks in order to set price ceilings for interconnection charges between telecom operators.

CAPs cause the traffic. The traffic is typically caused by a consumer. For example, the streaming of music or a film occurs because the consumer sent a request to the CAP to send them the film. The CAP then obliges. The cause of the traffic is the consumer's initial request rather than the CAP's fulfilment of that request. This is the view taken by the Body of European Regulators of Electronic Communications (BEREC) in their preliminary assessment of the underlying assumptions of payments from large CAPs to ISPs.

Source: WIK Consult (2022), 'Competitive conditions on transit and peering markets: Implications for European digital sovereignty', 28 February, footnote 24. Body of European Regulators of Electronic Communications (2022), 'BEREC preliminary assessment of the underlying assumptions of payments from large CAPs to ISPs', 7 October.

We consider a situation where the six largest CAPs are associated with 60% of telcos' traffic-sensitive costs.[27] We then assume that the payments from these six CAPs would add up to 50% of the traffic costs for which they are deemed responsible. The motivation for this 50% share is that consumers and CAPs are jointly responsible for the traffic generated and so half of the costs should be recouped from CAPs, and half should be recouped from consumers via their subscriptions to ISPs.

The calculations in the model then proceed as follows:

- from the above, we calculate the total charge to be received by each network;
- for each type of network, the total charge is divided up between the largest CAPs in proportion to their use of bandwidth giving the total payment by each CAP to each network;
- the total payments by the CAPs included in the calculation are then divided by the number of customers on each type of network;
- This gives a payment to each network per customer.

Each fixed and mobile network is then assumed to receive a per subscriber payment of these amounts, so that customers effectively carry with them a 'bounty' in the form of the CAP-funded payment. When a customer joins a network, that network will begin receiving that stream of payments immediately.[28] This bounty is effectively the same as a reduction in the marginal cost of serving a customer.

Both economic theory and empirical work suggest that this should result in telcos passing some share of this bounty through to consumers in the form of lower prices for their broadband connections.[29] This is commonly referred to as a waterbed effect. In our

[27] The choice of 60% is slightly above the estimates of 55% that have been made elsewhere. See, Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', p.1.
[28] Note that we are not saying that payments would be made and received on a per subscriber basis necessarily. They might be made and received on a per terabyte basis. However, in this case, 'per subscriber' would be a convenient modelling proxy on the assumption that each subscriber brought with them a certain amount of data on average.
[29] Note that, where a consumer is being served by an access ISP rather than an ISP that is also a telco, the payment might accrue to the telco from which the ISP buys access. In this case, we assume that the telco passes on at least some of the lower marginal cost to the access seeker. A telco certainly has the incentive to pass on the cost saving to the customers it serves directly as an ISP; and if it did not grant access seekers similar reductions in wholesale prices, they might be guilty of a margin squeeze offence. In any

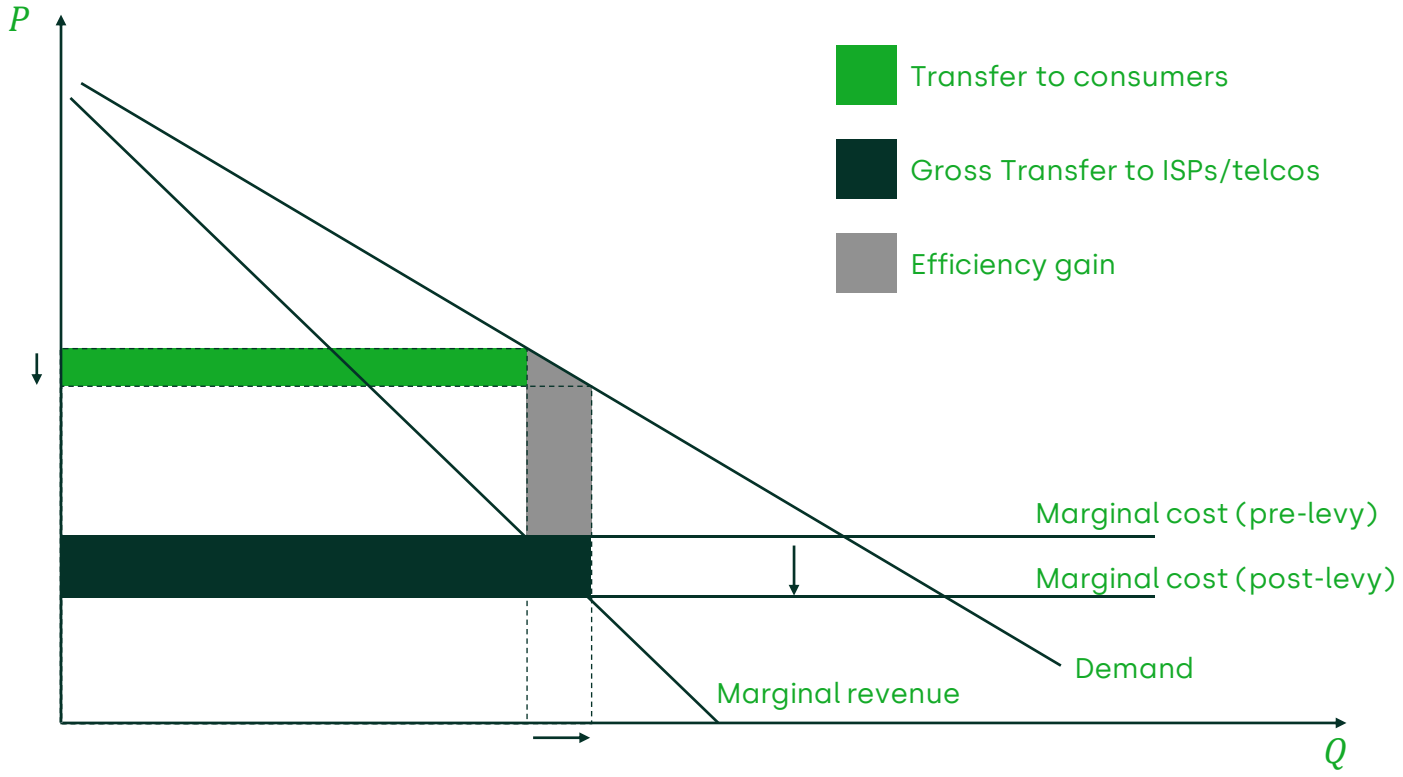
model, the size of the effect is an input variable. The base-case level is 50%, a level supported to a reasonable degree by theory and empirical evidence.[30]

The reduced price has two key effects:

1 the charge on CAPs paid to ISPs and partially passed on to consumers in the form of lower prices creates a transfer from CAPs to telcos and consumers;
2 the lower prices for broadband internet connections lead to increased broadband consumption / uptake.

The extent of these effects depends on the size of the charge and extent to which it is passed on to consumers. The size of the second effect—the quantity response—also depends on the elasticity of demand (the responsiveness of demand to price changes), which is a key parameter in the analysis. This is assumed to be 0.5 in the base case.

Figure 5.1 The transfers and efficiency benefits of a levy in the market for broadband provision



Source: Oxera.

This would suggest that there are three key effects as a result of a levy.

1 There would be a gross transfer from CAPs to telcos, as telcos' marginal costs would be effectively subsidised by their income from the levy.

case, if lower consumer subscription prices are a goal of the policy, then regulatory intervention could secure lower access prices, but (under current rules) only if the telco has SMP.

[30] See, for example, Genakos, C. and Valletti, T. (2011), 'Testing the "waterbed" effect in mobile telephony', *Journal of the European Economic Association*, **9**:6 pp.1114–1142.

2 There would be a transfer to consumers as the units that would have been purchased anyway are now purchased at a lower price—this transfer would be paid for out of the gross transfer to the telcos.[31]
3 The larger number of units consumed would create an efficiency gain as more units are consumed (either in terms of more internet connections or people trading up to faster internet connections than they would otherwise have opted for). Consumers derive welfare from consuming these extra units and ISPs increase their profits by supplying them.

These three effects are shown in the diagram in Figure 5.1.

In this context, model transfers (points one and two above) do not result in any additional welfare gain. They are merely moving surplus from the CAPs to the telcos, and on to final consumers. From the perspective of economic efficiency, what really matters is the new surplus that is generated that did not exist before (point three above). Our illustrative calculations are capable of estimating the relative sizes of these effects.

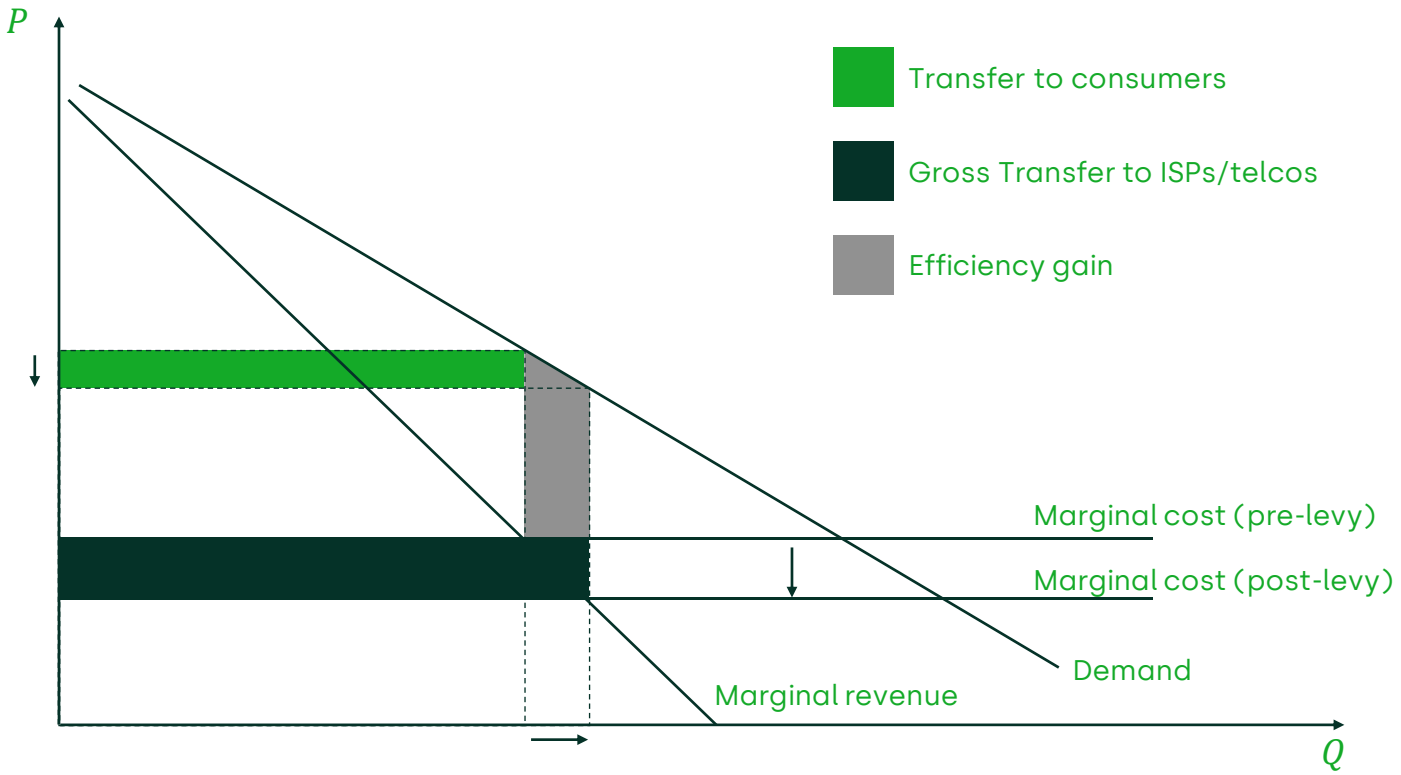
There would also be offsetting welfare changes on the CAP side of the market. The model includes payments by six CAPs (Amazon, Netflix, Google, Meta, Apple and Microsoft), which have different funding models. Some rely on subscriber charges, some on advertising revenue, while others might rely on both sources of income ('freemium' models of funding).

- Subscriber-funded operators, such as Netflix, are assumed to pass on a significant proportion of the levy through higher prices to their customers;
- advertising-funded operators are assumed not to pass it on at all;[32]
- hybrid-funded operators pass on some of it, depending on the extent of their reliance on subscriber charges.[33]

The degree to which subscriber-funded operators pass on the levy depends on the degree of competition that that they face. We have assumed, in the base case for each such operator, that half of any cost increase is passed on. This proportion is the pass on one would expect from a monopolist facing linear demand. To the extent that CAPs do actually face some competition, this assumption might be conservative.

[31] The net transfer to the ISP/telcos will therefore be the gross transfer to the ISP/telcos less the transfer to consumers.
[32] In relation to advertising-funded operators, we recognise that there might be some welfare effects, as operators adjust their adverting models and customers (i.e. viewers) might face some added costs in terms of attention. However, for simplicity, these effects are not included in the model. In terms of evaluating the proposals for a fair-share levy, this omission is conservative.
[33] Details of these assumptions are included in Appendix A1

Figure 5.2 The transfers and efficiency losses of a levy in the market for internet content



Source: Oxera.

Where pass-through takes place on the CAP side of the market, there is a change in welfare and transfer of surpluses in the same way as described above in relation to the broadband customer side of the market. The key difference is that the welfare effects are negative and the transfers are in the opposite direction, as the effects are those of a cost increase rather a cost fall. This has been shown in Figure 5.2.

Our illustrative calculations trade-off the welfare improvements in the internet connection side of the market, against the welfare losses in the internet content side of the market, to consider the net effect of the introduction of a levy.

Box 5.2 Second order effects

Before discussing our results, it is worth pausing to reflect on some of the relevant two-sided market aspects which mean that we could be over-estimating the extent to which a levy might be welfare improving. Consumers do not want a connection to the internet for its own sake. They want a connection to the internet because of the content that it will allow them to access. In other words, the consumer value of an internet connection is the consumer surplus in the internet content market. If that consumer surplus falls as a result of higher prices, consumers' demand for internet connections would also likely fall—represented by an inwards shift of the demand function in that market. This would also tend to reduce consumer surplus in the telco side of the market. Our model is unable to account for this effect as we take the demand curve (with respect to which consumer surplus is measured) as a given.

Source: Oxera.

5.2 Results of illustrative calculation

Before presenting our results, we stress that these calculations truly are illustrative in nature, and focus solely on the static welfare effects. They take no account of dynamic effects, such as the results of any change in investment on either side of the market. The model we have built necessarily involves a series of simplifying assumptions, not least of which is that the market for internet connections is a single two-sided market with content providers on one side, and consumers on the other. In reality there are a series of inter-related multi-sided markets between the content providers. Some content providers are themselves multi-sided marketplaces with (partially) ad-funded business models or market-making business models. For tractability, this has been simplified to one two-sided market, where we consider the welfare changes caused by price movements and volume changes on both sides of the market.

An additional complication comes from considering the potential for perverse incentives being created by taxing activity that uses bandwidth. The alternative to the use of bandwidth and economic activity taking place online might be that it would otherwise have happened in a brick-and-mortar context. Many activities that take place in the non-digital world could be done more efficiently (not least with respect to carbon emissions) online, but—for whatever reason—digital transformation has yet to reach these sectors. Transitions to new technologies (in the broadest economic meaning of the word 'technology') are not instantaneous, and policy makers must be careful not to discourage activities with one hand which they are trying to encourage with the other.

Table 5.1 below sets out a summary of the results of the illustrative calculations. The full description of the model from which these results are drawn can be found in Appendix A1.

Table 5.1 Change in static welfare from introduction of a levy—illustrative calculation

	Low sensitivity	Base case	High sensitivity
Waterbed (Internet price reduction)	Low	Intermediate	High
Pass-through (CAP subscription increase)	High	Intermediate	Low
Gross transfer to/from telcos, from which:	0	0	0
• transfer to/from consumers	-57	243	556
• net transfer to telcos	57	-243	-556
Efficiency gain/loss, from which:	-25	44	114
• consumer's gain/loss	-3	1	4
• companies' gain/loss	-22	43	110
Overall change in consumer surplus	-60	244	561
Overall change in company profit	35	-200	-447
Overall change in surplus	**-25**	**44**	**114**
Overall change in surplus as a % of telcos revenue (pre-levy)	**-0.08%**	**0.15%**	**0.38%**

Note: All numbers are in €m. For the waterbed, intermediate is 50%, high is 75%, and low is 25% (percentages refer to the percentage of any 'bounty' on a new subscriber that is passed on in the form of price cuts). For pass-throughs, intermediate is 50% for subscription, 25% for hybrid, and 1% for ad-funded; high is 75% for subscription, 37.5% for hybrid, and 1% for ad-funded; and low is 25% for subscription, 10% for hybrid, and 1% for ad-funded (percentages refer to the proportion of any cost increase that is passed through to consumers). All other values are kept equal.
Source: Oxera analysis.

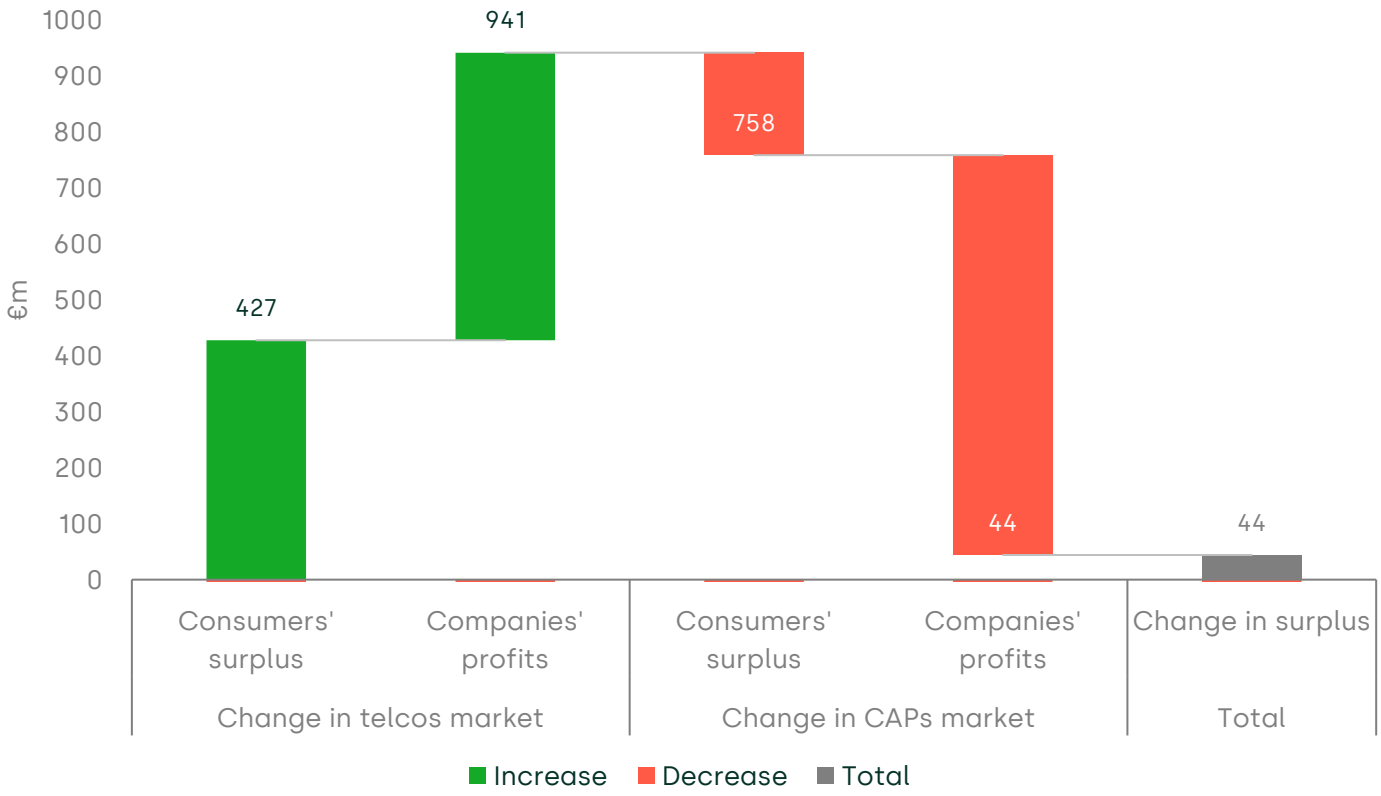
The table presents three different cases: the base case, a low sensitivity (with a low waterbed—pass-on of cost reductions to lower prices on the telco side and high pass-through—pass-on of cost increases on the CAPs side) and a high sensitivity (with a high waterbed and low pass-throughs).

For the base case, the overall effect is a €44m p.a. improvement in consumer and producer welfare compared with a case where there was no levy. Nevertheless, this number becomes negative (approximately - €25m p.a.) when a low waterbed and high pass-throughs are assumed. Alternatively, for the high sensitivity case, the magnitude increases to approximately €114m p.a..

Overall, the transfers account for a much more substantial amount than the efficiency gains/losses in both markets. However, when considering social welfare, the welfare gains on the telco side of the market are almost eliminated by welfare losses on the CAP side of the market.

Figure 5.3 below illustrates the transfers across the two markets and how they work in opposite directions in terms of consumer and producer welfare for the base case specified in Appendix A1.

Figure 5.3 Change in static welfare from introduction of a levy—base case.



Note: All numbers are in €m. The parameters used are those of the base case defined in the Appendix A1.
Source: Oxera analysis.

As expected, broadband consumers' lower costs and higher telco profits show a net gain in welfare (€941m p.a. in the base case) while higher costs for CAPs' consumers and lower CAP profits show a net reduction in welfare (€897m p.a.). This leads to an overall positive welfare effect, taking the two sides together, of €44m p.a. This corresponds to 0.15% of the initial revenue in the ISP side—c. €30bn Thus, there is a small overall increase in static welfare. However, as discussed briefly above, and in greater detail in Sections 6 and 7:

- there might also be changes in dynamic welfare as investment incentives might change on both sides of the market;
- such a system would necessarily involve substantial transaction costs which might be larger than the identified net gain in welfare.

These results reflect the expectation that the payments from the CAP side of the market to the ISP side would generate a waterbed effect, so that output is expanded and additional surplus is created. This is offset to a degree by a reduction in welfare on the CAP side because some of the payments are passed on to CAP customers, with a corresponding reduction in output and surplus. The scale of this offset depends on the amount of pass-through that is assumed to take place

A key determinant of the overall welfare effect is the relative size of the waterbed on the ISP side of the market, compared with the passed through percentage on the CAP side. In the base case, where the waterbed on the ISP side is assumed to be 50%, and the pass-through for subscription services on the CAP side is also assumed to be 50%, the overall effect on welfare is positive but very small. The two sensitivities reported in the table above show the results of flexing these assumptions. The results demonstrate that it is possible for a larger, but still relatively modest, positive effect on surplus to occur, if the waterbed is greater than the CAP pass-through. However, it is quite possible for total welfare to be reduced if the pass-through on the CAP side is assumed to be larger than the waterbed effect on the ISP side.

A fuller set of sensitivities is set out in the table in Appendix A1, in which the parameter values for the key parameters in the model are flexed in both directions. The overall outcome is that the values for the key parameters might result in greater increases in welfare than occurs in the base case, but the changes are still relatively modest. Importantly, the sensitivities show that while the majority of results show a positive effect on welfare, it cannot be ruled out that the effect could be negative as some scenarios produce a reduction in welfare.

The sensitivities set out in Appendix A1 show the results of tweaking individual parameters one at a time. It is possible to combine sensitivities, and to create scenarios which generate larger positive or negative effects on surplus. However, while the sensitivities do not rule out the possibility of a large effect, perhaps a more important result is that they also do not rule out the possibility of a significant negative effect. On the basis of the calculations conducted, and noting the limitations of the model, there is no clear evidence of potential welfare gains from a move to a two-sided market approach to pricing.

5.3 Discussion

What is striking from the results is that by far the largest effects are transfers between CAPs, and telcos and telco customers, with the overall changes in welfare on each side of the market being very modest. This is because the changes in overall surplus depend upon changes in the levels of output, which in turn depend upon the elasticities, and the percentage changes in prices. The percentage changes in prices are small, and this is the main reason why the welfare effects are small. The percentage price changes are minor because the assumed scale of the payments by CAPs is small in relation to the starting prices and revenues on the telco side of the market (€851m p.a. in total, compared with telco revenues of €30bn p.a.).

These results suggest that there is unlikely to be a strong case for introducing a levy on the grounds of static economic efficiency analysis (especially once accounting for the transaction costs discussed in Section 6). It is true that the results outlined here depend upon several assumptions which could be flexed so that different results could be obtained. However, it is not clear that alternative reasonable assumptions would move the results in the direction of greater efficiency gains. For example, while the proportion of costs paid for by the CAPs could be changed, as this would be essentially a policy

variable determined by the regulator, it would also be possible that reasonable estimates of the traffic-sensitive costs would be at a lower level than those assumed in the base case. Similarly, the assumed elasticities are relatively low, but where markets are close to being saturated, it seems unlikely that high levels for the elasticity should be regarded as reasonable, certainly not over a significant range.

Furthermore, we note that there are a number of factors that are not taken into account in our model, even in terms of static welfare analysis. These include competitive distortions between CAPs and ISPs, and effects on the incentives of CAPs and ISPs to interconnect in the most efficient way. These effects could have a negative impact on economic efficiency; increase total costs; reduce quality (i.e. latency) and resilience. There is evidence that this is what has happened in the Republic of Korea.[34] Therefore, the small static welfare gains we have found might, in fact, not exist when other factors are taken into account. Note that this is before we take account of the substantial transaction costs that would be inherent in a charging scheme (see Section 6); or the changes to investment incentives for CAPs and telcos (See section 7).

However, irrespective of the size of the welfare gains the transfers could indeed be substantial and significant, as they are essentially equal to the total payments made by the CAPs. It is worth considering whether the transfers themselves might be a legitimate reason for pursuing a levy on CAPs, rather than any improvement in economic efficiency. The small improvement in economic efficiency is (as discussed below) likely to be wiped out by fairly significant transaction costs that would be involved in a levy. However, a government might (for their own reasons) consider that the transfer provides sufficient justification as they might give greater weight to the welfare of telcos than to the welfare of the CAPs.

Such decisions are inherently political in nature. There is no economic basis on which to comment on the appropriateness or otherwise of a transfer from one group deemed politically less deserving to another group deemed politically more deserving. However, economics can offer some insights on the efficiency of the transfer in terms of the incentives it will provide, and the transaction costs involved in implementing it. For example, if the motive is redistributive, then it might be more appropriate to tax CAP profits rather than their use of bandwidth.

[34] WIK Consult (2022), 'Competitive conditions on transit and peering markets: Implications for European digital sovereignty', 28 February, p. 52.

6 Transaction costs

Transaction costs represent the cost (in terms of time and money) of coming to an agreement. Such costs are important when evaluating the net impact of changing policy / charging structure. They are certainly present in the context of the relationships between telcos and CAPs. Any increase in transaction costs arising from the introduction of a levy would need to be offset against any welfare gain. The costs of billing alone, where every CAP might need to settle with large numbers of telcos across Europe have the potential to become a large administrative burden.[35]

A levy on content providers would represent a fundamental change in the way CAPs and telcos operate, or even, in the way the public internet functions today. Therefore, it is important to investigate how potential welfare gains as described in the previous section might translate into practical welfare gains and how those gains compare to the potential transaction costs.

Currently, transaction costs are low in the market(s) between CAPs and ISPs. Most peering and transit agreements are voluntary and there have been few disputes or other regulatory interventions.[36] From the available studies we understand there have not been many allegations of anticompetitive behaviour.

However, a levy on CAPs would likely increase disputes and lead to regulatory interventions since it would introduce a legal means to force payments from CAPs to telcos. It might also lead to a different structure of the internet with less peering and hand-over further away from the end-user. This would result in fewer routes, higher transmission costs, and therefore less resilience.

The payments would follow some (at present) unknown methodology. That methodology is likely to be expressed—at least initially—as a set of principles rather than a series of equations. A legal right to enforce such a payment means there must also be a key role for a regulator (or regulators) to ensure that the appropriate methodology is followed. Below, we describe the role of that regulator and how this role relates to transaction costs. We then briefly consider an alternative in terms of any levy being paid into a fund rather than being paid directly from CAPs to telcos.

6.1 The role of a regulator

There would be a key role for a regulator, since any new law mandating a regime with a levy for several CAPs would require enforcement. Since there is no clear set of accounting data indicating the extent of costs for which CAPs in general—let alone an individual CAP—is responsible, enforcement must be exercised by a specialist regulator with relevant knowledge that can exercise judgement. Obviously, it would depend on the institutional design regarding which authorities would be given

[35] Granted these CAPs already deal with millions of consumers, but on the basis of a take it or leave it price offer, not negotiated prices.
[36] See, for example, WIK-Consult (2022), 'Competitive conditions on transit and peering markets', Section 5.2, (accessed 8 December 2022).

which additional roles, but it is highly likely that it would mean that existing National Regulatory Authorities (NRAs) and the European Commission would need to be involved.[37] Therefore, where we refer to a 'regulator' below, this could also be read as 'multiple regulators'.

The new tasks of a regulator would (at least) include the following:[38]

- assessing costs and setting prices;
- traffic analysis and verification;
- dispute settlement and litigation;
- reassess SMP market reviews;
- deal with the effects of distortion of competition;
- monitoring;
- coordination and alignment.

Below, we briefly discuss each of these tasks and describe (mostly in qualitative terms) the associated transaction costs.

6.1.1 Cost assessment and price setting

As discussed above we consider the most likely framework to be one where only the largest CAPs in terms of traffic generated would need to pay a levy. It might, for example, be as few as six CAPs paying a levy to all telcos. That levy would need to be cost related, which raises the question: which costs should be included? ETNO suggests this should be the 'traffic-sensitive costs' of the network, but which costs are traffic sensitive? The answer might well differ for each telco.

Therefore, it would be necessary to determine what *are* the traffic-sensitive costs for each telco—this is complex and disputable. Furthermore, a typical EU country has multiple telcos including fixed and mobile networks, each with different cost structures. So there are potentially over a hundred telcos and six (or more) CAPs in scope of a fair-share levy across the EU. Consequently, there will be hundreds telco-to-CAP relationships, each with different costs and different traffic profiles.[39]

Any practical implementation would need some way of averaging and approximating cost structures and traffic profiles—they cannot be calculated directly. But approximation and averaging increase the risk of disputes. Each step takes you further from the actual costs/traffic of one ISP. Where there is averaging over telcos, the average that is assumed might not reflect the true incremental cost for all telcos, some ISPs would be overcompensated and some ISPs would be undercompensated, potentially distorting competition between ISPs.

Lastly, costs are not prices, so there needs to be a (cost-based) pricing methodology, which would consider how much above, or below, cost the price per terabyte or per subscriber would be. Traffic is jointly caused by CAPs and consumers, and the consumers are already being

[37] Further reasons for involving these regulators come from the way in which the issues here are likely to interact with the issues of SMP and more generally the European Electronics Communication Code (EECC).
[38] In the absence of a regulator, these decisions and dispute settlements could only take place through the courts and so we would anticipate even higher transaction costs.
[39] Traffic profiles within these relationships would be just as disputable as costs (see next subsection).

charged something for the traffic (see Box 5.1). This could lead to additional discussions, negotiation, arbitration and litigation as any methodology has its advantages and disadvantages.

Furthermore, we note that all of the factors that determine costs (e.g. network technology, available traffic routes, availability of Content Delivery Networks (CDNs)), and the appropriate mark up above cost to achieve a price are likely to differ across member states of the EU, comparable to termination charges in mobile networks.[40]

6.1.2 Traffic analysis and verification

In the current discussions and reports around this topic, a lot of different percentages are mentioned making claims that a small group of CAPs (or—more accurately—their users) generate most of the traffic, e.g. '55% of traffic is caused by six CAPs'.[41] While this might be a reliable approximation, regulation cannot be based on such statements (which would otherwise lead to more disputes and litigation), so there must be a verification process by an objective authority.

Any attempt to accurately assess traffic from CAPs presents some immediate challenges, including:

- the traffic responsibility will differ across countries, and even across telcos within the same country;
- some of this traffic will be harder to identify given the different routes followed, potentially making use of intermediate CDN-providers and consumers potentially using VPN connections;
- what traffic can be said to cause which elements of cost might also be the subject of disputes e.g. one could argue that costs are driven by the share of traffic, or by the share of traffic at busy hours (in which case, which hours are busy hours might become a source of dispute);
- traffic patterns and costs could change significantly over time.

If accurate cost and traffic estimates are to be used as the basis for determining CAPs' involvement and contributions, such complex and potentially controversial calculations would need to be performed almost in real-time by the regulator, also because the relative importance of different CAPs can change quickly.

This methodology also needs to determine whether CAPs need to contribute at all. Some of the CAPs might be above or below the threshold (which still has not been defined), but very close to it. A CAP that ceases to be popular and so no longer needs to contribute should be identified quickly as should a CAP that has suddenly become sufficiently important to contribute. Otherwise, there is a risk of compounding the competitive distortions of the threshold.

All these processes would be costly and potentially give rise to even more costly disputes for the regulator, the telcos and CAPs involved. Of course, as discussed above, in a two-sided market, prices charged to

[40] See for example, Body of European regulators for Electronic Communications (2021), 'Termination rates at European level'.
[41] See, for example, Axon Partners Group (2022), 'Europe's internet ecosystem: socio-economic benefits of a fairer balance between tech giants and telecom operators', p.1.

each side need not be cost based. However, without a cost base, there should be some other objective justification, otherwise a levy would be arbitrary, and so open to appeal.

6.1.3 Dispute settlement and litigation

As mentioned above, it is to be expected that a cost-based levy would lead to new disputes and—eventually—lengthy and costly litigation. Litigation is an expensive and time-consuming business. The costs of litigation are not just measured in terms of fees paid to courts, lawyers and advisers, but also in terms of management time that is drawn into focusing on litigation rather than improving business operations.

Essentially, the time and effort of senior management at both telcos and CAPs would be diverted to rent-seeking activities (see Section 6.1.7) rather than productive activities in terms of improving their products and business operations.

6.1.4 Reassess SMP market reviews

Most of the telcos that have been vocal about the proposal (directly or via ETNO) are the telco incumbents. Many of these incumbents have been designated by their NRA as having SMP at the wholesale local access level, and are therefore subject to wholesale access obligations.

A levy might well have an effect on the access regime leading to further disputes and litigation. ISPs providing connections through an access regime might have grounds for complaints if the full levy associated with their subscriber is not passed through to them in terms of cheaper access prices. The access ISPs are paying for the traffic of their consumers going over the telcos' infrastructure. If they do not receive lower prices, they would perceive that the telcos are effectively charging twice for the same service.

The SMP regime might therefore need to be modified to account for the proposed fair-share levy. This might require new market reviews, new alignment between NRAs and the European Commission and ultimately it could be another factor leading to new disputes and litigation.

6.1.5 A levy could distort competition

There are other competitive effects to consider as well.

First, competition could be distorted between CAPs, in particular, under schemes in which only some CAPs are required to pay the levy. Imagine two CAPs offering streaming services, competing on the merits. One of them meets the threshold for payment and the other does not. This could distort competition for streaming services and lead to negative welfare effects. This argument obviously goes for all categories of CAPs. This could be compounded by vertical integration, e.g. if an ISP who receives levy payments also has a streaming service that competes directly with the CAPs paying the levy. The scale of any such distortion would have to be assessed and any such assessment is likely to be a subject of dispute.

We note that this difference in charging would not be cost reflective. A subscriber to a large streaming service that is caught by any contribution requirements does not use more bandwidth than a subscriber to a streaming service small enough to avoid the charge. This could create a competitive distortion.

Second, there could be other distortive competition effects that should be investigated more in-depth, e.g. between larger and smaller ISPs, between access ISPs and ISPs that operate their own network, or between ISPs who are vertically integrated (offering content themselves) and others who are not. Depending on the methodology chosen, and the actual market situation, these effects could potentially be distortive and should be investigated.

6.1.6 Monitoring

To keep track of developments the regulator would need to regularly monitor the different markets for broadband connections (mobile and fixed). Numerous studies (e.g. BNetzA,[42] BEREC,[43], ACM[44]), have shown that this is not an easy exercise. However, to monitor, check and verify actual data flows and how they develop is even more burdensome. As described above, there might also be technical limitations to tracking the origin of the traffic.

The complexity also depends on the methodology that would be chosen. The more averaging, sampling, or approximating that can be used, the less costly the exercise would be. However, more averaging, sampling and approximation would lead to more discussion, disputes, and litigation.

6.1.7 Costs of compliance

Above, we described the role and tasks of the regulator, but where regulators must act, companies must interact with them. Essentially, companies engage with regulators to affect regulatory decisions that will impact them. Where rivals are also engaging with regulators, their efforts are frequently designed to cancel each other out. This behaviour is sometimes referred to as rent-seeking and, from the perspective of society, the effort expended here is unproductive and could be better used elsewhere. Nevertheless, firms are trapped in a Prisoners' Dilemma logic—the interactions are costly, but companies undertake it because the alternative (allowing a rival to influence a regulator exclusively) is even more costly.

Higher compliance costs would affect companies unevenly. Some companies have people and processes in place already and regularly interact with the regulator (e.g. because they have been designated with SMP) and are familiar with litigation. However, some new and smaller CAPs and telcos might be new to these issues. For all

[42] WIK-Consult (2022), 'Competitive conditions on transit and peering markets'.
[43] Body of European Regulators of Electronic Communications (2022), 'BEREC preliminary assessment of the underlying assumptions of payments from large CAPs to ISPs', 7 October
[44] Autoriteit Consument & Markt (2021), 'Study into the Market for IP interconnections 2021'.

companies involved though, more regulatory discussions, disputes and more litigation would mean higher costs.

6.1.8 Observations on regulatory transaction costs

In some ways, there is always a cost of any regulation. However, these costs can be substantial, which is why the gains that might be achieved by regulation should also be substantial. Therefore, we should be reasonably certain that regulation would bring economic gains that outweigh these costs. Given the relatively small efficiency gains we have found in our illustrative calculation, this is far from certain.

6.2 The alternative of paying into a fund

As mentioned under section 2, an alternative for direct payments between CAPs and telcos could be that CAPs' contributions would go into a centralised fund, as suggested by the Ministry, managed by the European Commission, or another European authority. The advantage of this would be that there is no need for CAPs to pay directly to all telcos in Europe, where each relationship could potentially lead to discussions or disputes. It might further avoid fragmentation within the single market.

6.2.1 No change in static welfare analysis

The consequences of this policy option obviously depend on the exact regulatory design choices of such a fund. However, assuming this would still be a traffic-based contribution, the underlying welfare analysis in Section 5 as applied to CAPs does not change. The key point that costs would increase for CAPs remains leading to reduced welfare on that side of the market.

A distribution mechanism would also be necessary to approximate what would otherwise be a direct payment from CAPs to that particular telco. The same questions and welfare analysis that we described under Section 5 would then apply to the individual telcos.

The overall conclusion for the fund alternative in terms of welfare is similar to the one described above. That the economic welfare changes are relatively small, but the transfers could be significant. While it is not within the realm of economic analysis to opine on the desirability or otherwise of transfers from one group to another, it is possible to take a view as to whether a particular transfer mechanism is efficient or not.

6.2.2 Potentially reduced transaction and compliance costs

While the overall welfare analysis does not change, there could be some benefits of a fund if transaction and regulatory costs were lower.

Traffic analysis and verification would still be necessary, and national NRAs would most likely still be involved since they are closest to the national telcos and best placed to manage such a process. All arguments described in Section 6.1 about traffic verification per country and telco still hold.

Cost assessment and price setting would still be necessary. One could choose to do this at the European level, by way of approximation and

averaging over CAPs, countries and telcos. This would avoid having to spend time grappling with the diverse nature of telcos and countries across the single market. This will likely reduce transaction costs. The risk that arises is that any methodology averaging at the European level would move further away from the real costs of a particular telco. This would lead to a more serious distortion of competition between telcos.

While there would be a shift from national dispute settlement and litigation to the European level, the number of disputes would not necessarily decrease.

It is also unlikely that paying into a fund would have any effect on the potential need to conduct market reviews and reassess the SMP status of some telcos. A central fund disbursing payments to telcos in proportion to what they could be expected to receive from a series of decentralised negotiations (with a legal requirement as a backstop) would lead to similar potential market distortions. Therefore, SMP status would need to be reassessed taking these payments and their distribution in to account.

The costs of compliance of each telco and CAP will likely be lower in this scenario, but must be weighed against the costs of setting up and running new regulatory authority dealing with this fund.

6.2.3 Paying into a fund would have similar effects to direct payments

Overall, we conclude that paying into a fund would have similar static welfare implications to direct negotiations overseen by a regulator. Similarly, paying into a fund would not lead to substantially lower transaction costs. The fund (as is the case when the policy is enacted without a fund) would lead to a transfer of money from one group (CAPs) to another (telcos). Such a transfer might be desirable from a political point of view. Such political choices are beyond the scope of this report, but there does not seem to be an economic reason for this.

The above is based on the assumption that the funds are distributed to ISPs in proportion to their traffic, in order to mimic the compensation they would have received from a more direct levy. An alternative could be that the fund explicitly aims to redistribute from well-connected areas to under-served areas and reduce digital inequality between different areas of the EU.

7 Investment incentives

Advocates of a fair-share levy suggest that the money might be used by network operators to invest in additional infrastructure, thus increasing the capacity and speed of their networks.

From a static welfare perspective, we note that this is not consistent with the money being used to lower prices and thus increase consumer welfare. While the revenue from a levy on CAPs might be split between these two use-cases, each euro raised by the levy can only be used once.

From a dynamic welfare perspective, unless there is a clear mechanism mandating that extra funds must be used for greater investment, any additional investment would be modest. Standard corporate finance and economic theory suggests that firms should invest in those projects where the return exceeds the cost of capital.

The cash payments from CAPs are unlikely to significantly reduce the required cost of capital to finance such investments, as that depends on the risk-free rate in the market, the required returns to equity and debt investors. There's no reason to believe that any of these things would significantly fall as a result of the policy. The recent empirical literature finds that the relationship between cash flow and investment is near zero.[45] This also accords with the observations of telecoms regulators that have seen ISP CAPEX levels unaffected by fluctuations in cash flow or other financial indicators.

There might be an increase in incentives for networks to broaden and improve the quality of their coverage. This increase is brought about if there is a 'bounty' attached to each subscriber, this would intensify the competition to sign up subscribers. Hence, such incentives are stronger to the extent that networks compete on coverage and quality. Most of the fixed networks owned by the pre-existing national monopolist will have universal coverage, so will not be affected by incentives around broadening network coverage. Challenger fixed networks will have slightly stronger incentives to build out their networks, but this would involve building out to less densely populated areas. As such telcos have made their initial investments in more densely populated areas where it is possible to lay a network at a lower cost per home passed. However, the strength of this additional incentive would depend on the size of the 'bounty' per customer, relative to the cost of expanding their network to go past enough homes to pick up an additional customer.

Similarly to the extent mobile networks compete on coverage and quality, their investment incentives might increase.

Furthermore, against any dynamic benefits from greater capacity investment incentives for telcos (if they materialised), one would need to trade off reduced incentives for investment by CAPs, which could be different for different CAPs depending on their respective business model. Take the example of streaming services. These competitors

[45] See, Chen, H. J. and Chen, S. J. (2012), 'Investment-cash flow sensitivity cannot be a good measure of financial constraints: Evidence from the time series', *Journal of Financial Economics*, **103**:2, pp. 393–410.

would see lower net present value from their content investments as a result of a levy. This is because, at the margin, any investment that produces better content that everyone wants to watch will generate higher levels of traffic, and therefore increase the payments they must make under the levy. As a result, at the margin, there will be lower incentives to invest in better content. Other online content providers will face similar reduced incentives:

- any improvement in their content would only be profitable if it attracted more traffic;
- however, the marginal payoff to attracting more traffic is reduced, as attracting more traffic attracts higher levies.

Note that the example above is seen most clearly with respect to streaming services, but applies more widely to all content produced by large CAPs. It would also apply to video conferencing services—potentially raising the costs of conducting business remotely, which has environmental advantages in terms of reduced travel. Furthermore, it would also apply to other innovative services that might be offered by large CAPs or firms that might come to be seen as large CAPs, such as remote consultations with doctors or other health professionals who might be able to diagnose and prescribe treatments via remote video consultation, rather than in-person consultations.

CAPs don't just invest in their content, they also invest in network equipment designed to reduce their bandwidth use and lower the costs of sending data to subscribers. Subjecting them to a levy is likely to alter their incentives to undertake such investment. A well-designed levy might actually increase these incentives—the devil is in the detail. However, attempting to design these features will introduce more complexity and higher transaction costs as discussed above.

For the reasons set out above promoting investment by network operators is not an economically sound reason for instituting a levy.

- a proportion of funds would be passed on to consumers in the form of price reductions and hence not available to invest;
- the relationship between increased cash flow and investment is weak;
- any effects in the market for broadband connections would need to be offset against effects in the market for content generating services by CAPs.

8 Conclusions

First, our analysis of the proposals for a levy shows that such a policy cannot robustly be shown to increase economic efficiency. This is because the static welfare gains in the market for internet access have to be weighed against the static welfare losses in the markets for internet content. Furthermore, the traffic-sensitive costs of telcos are likely to be sufficiently small compared to the prices being paid by consumers, that price movements would actually be quite small. Therefore, even if welfare gains in the market for internet access outweigh welfare losses in the market for internet content, the small price movements suggest that any welfare gains would be minor.

Furthermore, working against any welfare gains that might be achieved one could expect substantial transaction costs. Efforts of CAPs and telcos would be diverted to rent-seeking behaviour, as they argue over the size of any levy where the parameters that should determine an appropriate level are difficult to measure and, in any case, disputable. The rent-seeking efforts of CAPs and telcos will likely draw in the dispute resolution services of the state in the form of courts and regulators.

While some might still advocate for a levy in order to promote investment in network capacity by telcos, and so improve dynamic welfare, such improvements seem unlikely. First, investment by established firms tends not to be constrained by cash flows, as they have access to credit markets. Investment will take place if the expected return from the project exceeds the cost of capital of pursuing the project. Second, there might be some modest increase in the return on investment projects for telcos that increase their footprint or the quality of their network. The benefits of any increased investment by telcos would need to be weighed against any reduction in investment by content producers. For large content producers caught by the policy, the levy would likely reduce the returns to investment projects (as successful investment in content will lead to more traffic and so higher levies).

A levy might still achieve its goals, if those goals centre around the transfers from CAPs to telcos, which could be substantial. Economics has little to say about the value of such transfers—those are political decisions. However, such transfers might be more efficiently achieved by taxing profits rather than bandwidth use. Furthermore, if one is to transfer resources from CAPs, one could reasonably ask whether telcos would be the best sector in which to direct these transfers, rather than, for example, education or healthcare spending.

A1 The model

This appendix gives further details on the quantitative analysis which provided our illustrative results.

We constructed a simple spreadsheet model, populated with data scaled to a large European country on:

- prices, quantities and traffic-sensitive costs on the ISP side of the market;
- prices and quantities on the CAP side of the market.

We then considered the impact on consumer surplus, profits and overall economic welfare of a move to a charging arrangement in which both sides of the market are charged. As noted above, such an analysis necessarily only considers the static welfare changes in these related markets. It cannot consider the changes to dynamic welfare brought about by changes to investment incentives. Those issues have been discussed in Section 7. Neither does such analysis account for transaction costs which can be substantial (discussed in Section 6).

The imbalances in negotiating positions among the various parties outlined earlier would appear to imply that it is improbable that negotiated settlements would improve efficiency or promote competition. Therefore, we assume that the regulator has a key role in setting the size of the payments to be made by the CAPs. We assume that this is calculated as a contribution to the telcos' traffic-sensitive costs. These costs are assessed separately for fixed and mobile networks, reflecting the fact that the different network types have different costs and cost structures.

We have used the estimates of traffic sensitive costs laid out in the Frontier Economics report that was prepared for Axon Partners in its report for ETNO. However, we are aware that there are credible challenges to the cost numbers that we have used. For example, these estimates of traffic-sensitive costs have been strongly challenged by some commentators, such as Communications Chambers in a report for the Computer and Communications Industry Association.[46] We have not attempted to arbitrate on these claims and challenges, but have used the Frontier Economics/Axon Partners figures, noting that this will give an upper bound to the scale of the payments, and therefore an upper bound on the welfare changes.

We assume that only the six largest CAPs, in terms of the bandwidth used to supply their services, are required to pay a share of network costs. We assume that each CAP is required to make a contribution to the traffic sensitive costs on the basis of the bandwidth used to supply its services. The six participating CAPs are required to pay, in total, a prescribed share of the traffic sensitive costs that are estimated to be incurred when providing their services. Estimates of the proportion of telco traffic-sensitive costs that are accounted for by the six largest CAPs vary, but we assume the proportion to be 60%. At this stage of

[46] Williamson, B. (2022), 'An internet traffic tax would harm Europe's digital transformation', *Communications Chambers*, July.

the calculation, we have derived the total traffic sensitive costs that are associated with the provision of services by the six largest CAPs.

The next step is to consider what share of these costs should be paid by the six CAPs. This proportion is an input to the model. In our base case, this is assumed to be 50%, on the basis that this is a reasonable basis for assessing a claim that a 'fair share' approach to costs should be taken. ISPs should recover the remaining 50% from the other side of the data transaction—the consumer who sent the request to download the data.

The payments made by the CAPs go into a 'pot' which is passed on to the telcos, on the basis of a fixed amount per telco customer. The model works on the basis that these payments generate a strong but incomplete waterbed effect, which leads to lower prices on the telco side of the market as a result of the contributions made by the CAPs. Since the 'pot' of cost contributions is distributed to telcos on the basis of their subscriber numbers, there is effectively a 'bounty' associated with telco customers. A telco winning a customer will attract a payment from the 'pot'. This could be regarded as equivalent to a reduction in the marginal cost to a telco in serving a customer, and the waterbed effect is the extent to which that reduction in marginal cost is passed on to telco consumers. The size of the waterbed effect is an input to the model, and the base case uses a figure of 50%, as this is supported by the (limited) empirical evidence that is available on this type of effect.

The model is then used to calculate the changes in telco volumes that result from the lower prices following the operation of the waterbed. This depends on an assumption about demand elasticity, which is assumed to be 0.5 in the base case. This assumed elasticity is based on past estimates of price elasticities for telephone services, and is corroborated by work by Richard Cadman and Chris Dineen which found an elasticity for broadband services in the OECD of 0.43.[47] Again, the use of an elasticity slightly above this level reflects a choice to err on the side of welfare effects at the higher end of expectations. This guards against making a finding of no welfare effect, due to an over-conservative set of assumptions

It is assumed that there are non-traffic sensitive costs which vary with the number of customers (maintenance costs, retail costs etc.). These are assumed to grow with the number of customers, on the basis of a cost–volume relationship: in the base case, 0.75 is assumed for the fixed market, and 0.5 for the mobile market, since the latter is expected to have fewer costs associated with installation of hardware and similar.

Changes in consumer surplus and producer surplus are then calculated. On the telco side of the market, the payments from the pot

[47] See, Cadman, R. and Dineen, C. (2008), 'Price and Income Elasticity of Demand for Broadband Subscriptions: A Cross-Sectional Model for OECD Countries', *SPC Network*, 7 February.

are partly passed on through the waterbed effect, with the remainder being left with the firms.[48]

On the CAP side of the market, the payments into the pot are assumed to be passed on to the CAPs' customers, according to the business and funding model adopted by each CAP. The assumption about pass-through might be varied by CAP, but in the base case the value for all paid services is 50%, while for advertising-funded services it is 1%.

The model then calculates changes in volumes for each of the CAPs, on the basis of the assumed pass-through and elasticity in each case. In the same way as for the telcos, changes in consumer surplus and profits are then estimated. There is again an assumption that volume changes drive changes in costs, with a base case assumption of a cost–volume elasticity of 0.5.[49] The final stage is to sum the effects on consumer surplus and profits and overall economic welfare on each side of the market, and to calculate the changes in consumer and producer surplus, combining both sides of the market.

A caveat to the results is that some of the inputs to the calculations are estimates or assumptions, rather than being based on firm data, so firm conclusions should not be drawn from these results. However, certain key issues and drivers of the result can be identified, and it is possible to use the model to establish the conditions under which economic efficiency would likely be improved by charging both sides of the market—and the conditions under which such an approach would probably not be worthwhile.

Table A1.1 Change in static welfare from introduction of a levy—base case by market

	Telcos market	CAPs market	Total
Gross transfer to/from ISPs, from which:	851	-851	0
• transfer to/from consumers	425	-182	243
• net transfer to/from ISPs	425	-669	-243

[48] That remainder is theoretically available for additional investment in networks. However, the model does not identify any mechanism by which any additional investment results from the receipt of the bounty, and such dynamic issues are beyond the scope of the model.

[49] We note that this might be a bit high given the high fixed cost, low marginal cost business model of most CAPs. However, the higher this elasticity, the lower the welfare effects one would expect. Therefore, this is a conservative assumption.

	Telcos market	CAPs market	Total
Efficiency gain/loss, from which:	90	-47	44
• consumers' gain/loss	2	-1	1
• companies' gain/loss	88	-45	43
Total change in consumer surplus	427	-183	244
Total change in company profit	513	-714	-200
Total change in surplus	**941**	**-897**	**44**

Note: All numbers are in €m. The parameters are set, as in the base case described above.
Source: Oxera analysis.

Table A1.2 Change in static welfare from introduction of a levy—illustrative calculations

	High sensitivity	Base case	Low sensitivity
Waterbed	Low	Neutral	High
Pass-through	High	Neutral	Low
Aggregated transfer to/from ISPs, from which:	0	0	0
• aggregated transfer to/from consumers	-57	243	556
• aggregated net transfer to/from ISPs	57	-243	-556
Efficiency gain/loss, from which:	-25	44	114
• consumers' gain/loss	-3	1	4
• companies' gain/loss	-22	43	110
Total change in consumer surplus	-60	244	561
Total change in company profit	35	-200	-447
Total change in surplus	**-25**	**44**	**114**

Note: All numbers are in €m. For the waterbed, intermediate is 50%, high is 75%, and low is 25% (percentages refer to the percentage of any 'bounty' on a new subscriber that is passed on in the form of price cuts). For pass-throughs, intermediate is 50% for subscription, 25% for hybrid, and 1% for ad-funded; high is 75% for subscription, 37.5% for hybrid, and 1% for ad-funded; and low is 25% for subscription, 10% for hybrid, and 1% for ad-funded (percentages refer to the proportion of any cost increase that is passed through to consumers). All other values are kept equal.
Source: Oxera analysis.

Table A1.3 Change in static welfare from introduction of a levy—sensitivities

Specification	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**	**(12)**	**(13)**	**(14)**	**(15)**	**(16)**
Non-traffic marginal costs ISPs—fixed market	75%	75%	50%	50%	50%	75%	75%	75%	75%	75%	75%	75%	75%	75%	75%	50%
Non-traffic marginal costs ISPs—mobile market	75%	25%	25%	25%	25%	50%	50%	50%	50%	50%	50%	50%	50%	50%	50%	25%
Waterbed	50%	50%	50%	50%	50%	25%	25%	75%	75%	50%	50%	50%	50%	50%	25%	75%
Marginal costs CAPs market	50%	50%	50%	25%	75%	50%	50%	50%	50%	50%	50%	50%	50%	50%	25%	75%
Pass-through																
1. Subscription	50%	50%	50%	50%	50%	50%	80%	50%	25%	50%	50%	50%	50%	50%	80%	25%
2. Hybrid	25%	25%	25%	25%	25%	25%	50%	25%	10%	25%	25%	25%	25%	25%	50%	10%
3. Ads	1%	1%	1%	1%	1%	1%	5%	1%	1%	1%	1%	1%	1%	1%	5%	1%
Elasticity ISPs	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-75%	-75%	-50%	-25%	-25%	-25%	-75%
Elasticity CAPs	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-50%	-75%	-75%	-75%	-25%	-75%	-25%
Gross transfer to ISPs, from which:	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1. Transfer to/from consumers	243	243	243	243	243	31	-126	456	556	243	245	245	245	242	-122	556
2. Net transfer to ISPs	-243	-243	-243	-243	-243	-31	126	-456	-556	-243	-245	-245	-245	-242	122	-556
Efficiency loss, from which:	7	81	91	68	113	-1	-43	88	114	89	66	21	-25	22	-171	305
1. consumers' gain	1	1	1	1	1	-1	-4	3	4	2	1	0	-1	0	-7	7

Specification	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
2. companies' gain	6	80	90	67	113	0	-39	85	110	87	65	21	-23	21	-164	298
Total change in consumer surplus	244	244	244	244	244	30	-130	459	561	245	246	245	244	242	-128	563
Total change in company profit	-237	-163	-153	-176	-131	-31	87	-371	-447	-156	-180	-224	-268	-221	-43	-258
Total change	7	81	91	68	113	-1	-43	88	114	89	66	21	-25	22	-171	305
Total change as % of telcos revenue (pre-levy)	0.02%	0.27%	0.30%	0.23%	0.38%	0.00%	-0.14%	0.29%	0.38%	0.30%	0.22%	0.07%	-0.08%	0.07%	-0.57%	1.01%

Note: All numbers are in €m.
Source: Oxera analysis.

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