Compensating Data-Rich Digital Services: Should Telcos Carry the Burden Alone?

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Abstract:

The growth in online activity led to increased traffic across telecommunication networks, creating a need for infrastructure investments. These costs currently rest solely on telecommunication operators, sparking a debate over who should bear the rising expenses. Digital service providers rely on net neutrality, arguing that the financial burden should remain with telcos. In contrast, telcos advocate for the fair share principle, claiming digital service providers, particularly those driving significant traffic, should contribute to infrastructure costs. However, potential contributions from digital service providers could result in higher consumer prices for data-intensive services. This paper contributes by empirically analyzing consumers' willingness to pay and willingness to accept compensation for continued use or loss of various online services using an enhanced best-worst scaling method. Findings show varying consumer valuations and price sensitivity across service categories.

Keywords: Fair Share, Telecommunications, Best-Worst Scaling

Track: Service Marketing & Service Innovation

1 Introduction

The rapid growth in data usage, fueled by the rise of data-intensive services like video streaming, cloud gaming, and virtual meetings, demands substantial investments from telcos. These investments are essential to expand and maintain infrastructure, ensuring increased network capacity and reliability. Despite these rising costs, telcos primarily rely on customer subscription fees for revenue. At the same time, digital service providers, which are responsible for much of the data traffic driving these investments, do not currently contribute to infrastructure funding. The principle of net neutrality further complicates the issue by restricting telcos from charging digital service providers for their disproportionate traffic, intensifying tensions between national telcos and global digital platforms. This has sparked debates over whether the traditional net neutrality framework can align with the need for sustainable network investments. Because a robust telecommunications infrastructure is essential for ensuring the growth and reliability of digital services. At the same time, promoting a competitive and innovative market is crucial for driving consumer benefits and technological progress (Huang & Rust, 2013).

Within this context, there have been discussions about whether online service providers should contribute to future development projects. Recently, European telcos have proposed the fair share initiative, which calls for financial contributions from online service providers (Colangelo, 2024). This has created a debate with two distinct views, on one side supporters of the traditional idea of net neutrality and fair share advocates on the other. In literature, some studies have investigated the potential benefits and pitfalls of both views. Standing on the fair share side, Jeanjean (2023) and Condorelli et al. (2023) have analyzed the effects of cost-sharing models on consumer well-being and market dynamics, where they suggested equitable contribution models. On the other hand, opposing literature indicates that a fair share proposal would set barriers to innovation, and the potential increase in consumer prices could interfere with market dynamics (Colangelo, 2024; Neumann et al., 2022). The previous literature mainly focused on the direct economic impacts of a potential introduction of the fair share initiative, employing mostly conceptual and analytical methods while lacking a neutral stance for evaluation.

We aim to contribute to this discourse by introducing an empirical approach to assess the value online services bring to the telecommunications ecosystem through consumer valuations. Specifically, we explore whether consumers would accept higher prices for the usage of data-intensive services, which might result from a fair share model where online

service providers contribute to infrastructure costs, assuming that these costs are at least partly passed on to customers. By analyzing real-world consumer decision-making, we investigate consumer behavior in the digital services context to determine whether such shifts in cost distribution are feasible from the consumer perspective. Using an innovative modification of the best-worst scaling method, our approach provides valuable and unique insights into a potential solution to this ongoing debate.

2 Background

2.1 Net neutrality

Being the fundamental regulation of how the Internet works, the concept of net neutrality advocates for the equal treatment of all data traffic on the Internet. By doing this, creating a neutral platform that would give rise to the best possible applications for users (Wu, 2003). This would ensure the freedom of speech and foster innovation on the Internet. The regulation prohibits the telcos from blocking or restricting particular data packets over others. Thereby, monopolization of large online platforms through paid prioritization is prevented, and issues like data safety, transparency and user rights are protected (Colangelo, 2024).

2.2 Fair share initiative

The rapid technological advancement that online services have experienced has led to a necessity for telcos to enhance infrastructures to meet the needs of the end customers (Wieck & Vidal, 2011). The enhancements of the telecommunications infrastructure have resulted in cost-significant projects for telcos. European telcos have developed the fair share initiative to address the challenge of ensuring sustainable investment and financial support for Europe's communication networks. It focuses on creating a reliable financial contribution from online services to support necessary infrastructure investments (Condorelli et al., 2023). Therefore, the fair share concept calls for online service providers to come to an agreement on a financial contribution that would support the infrastructure investments for the delivery of the data traffic through national telecommunication networks to consumers.

2.3 Scientific recommendations

In this section, we provide some of the studies that made arguments for and against the fair share proposal. The supporting journal articles primarily use analytical models, often centered around game-theoretic frameworks. Despite their varied approaches, the recommendations consistently aim to achieve a reasonable cost distribution model. Condorelli et al. (2023) suggest a negotiation between the online service providers and telcos on a

contribution plan. Im et al. (2017) propose a contribution plan according to the traffic generated by the respective online service, arguing that the solution is easy and fast to implement. Further research recommends a general cost-sharing approach that creates a positive cycle of benefits for all stakeholders, including reduced consumer prices (Jeanjean, 2023). The literature opposing the fair share argument relies mainly on conceptional analysis. Colangelo (2024) highlights the unnecessity of the initiative, suggesting that it would disrupt market dynamics and private negotiations without clear evidence of market failures. Preta (2023) argues that fair share regulations could potentially lower the quality of content through high end consumer prices and discourage innovation.

Author(s)	Positioning	Methodology	Recommendation(s)
Colangelo (2024)	Contra	Conceptual	Controlled regulatory measures and consideration of a general taxation framework.
Condorelli et al. (2023)	Pro	Analytical (economic analysis)	Traffic-based payments align investments with social welfare through traffic contractibility.
Preta (2023)	Contra	Conceptual	Rejection of regulated interconnection charges due to innovation constraints and increased consumer costs.
Jeanjean (2022)	Pro	Analytical (game-theoretic model)	Support for cost-sharing between telcos and online services to create a virtuous cycle of benefits.
Neumann et al. (2022)	Contra	Conceptual	Easier peering for telcos as a more effective alternative to payment mechanisms.
Im et al. (2017)	Pro	Analytical (economic analysis)	Telco traffic monitoring could incentivize online services to share profits or reduce traffic generation.

Table 1. Selection of scientific recommendation(s)

A thorough review of existing studies revealed a critical gap in the literature: consumer perceptions of online services are often overlooked when assessing their value to telcos. This is a significant oversight, as consumers' willingness to pay plays a pivotal role in determining the viability of any proposed solution to the ongoing cost-sharing debate between telcos and digital service providers. To address this gap, we implemented an empirical approach that evaluates how consumers perceive and value online services, focusing on their preferences and financial thresholds. This empirical approach not only fills an important gap in the literature but also provides actionable insights that can inform both policy and business decisions. By centering the research on consumer perspectives, we ensure that proposed solutions are aligned with real-world expectations, which is essential for developing a sustainable approach to infrastructure investments. Ultimately, this consumer-centered approach supports healthier market dynamics by ensuring that any changes in cost distribution do not discourage consumer spending or engagement, fostering long-term market stability.

3 Method

The aim of this study is to assess the value of online services to telcos by analyzing consumer preferences for these services and quantifying their associated financial value. Building on the study from Brynjolfsson et al. (2019), we conducted an empirical study that employed an enhanced best-worst scaling (BWS, case 1) integrated with the contingent valuation methods willingness to pay (WTP) and willingness to accept (WTA). BWS is an extension of the discrete choice experiments that measure the participant's preference for a number of items through a sequence of item comparisons (Louviere et al., 2013). WTP measures the amount consumers are willing to pay to continue the use of a service, while WTA reflects the compensation required to forgo it. Using both WTP and WTA in our study is critical, as the way valuation questions are framed can significantly affect consumer responses. The bias associated with using WTP to assess losses is widely recognized, and the persistent practice underscores the importance of incorporating both measures to ensure a more complete and accurate evaluation (He et al., 2024).

Which of the three scenarios seems most likely/unlikely to you?

WTP Version			**WTA Version**		
Most likely		**Most unlikely**	**Most likely**		**Most unlikely**
X	I continue to use at least one of the services shown here and pay an additional fee of €2 per category. Info: This amount is billed separately by the telecommunications provider on a monthly basis and is independent of the costs of the online services (e.g., Netflix).		X	I forego at least one of the services shown here and receive a discount of €2 per category. Info: This amount is billed separately by the telecommunications provider on a monthly basis and is independent of the costs of the online services (e.g., Netflix).	
	I do not use online gaming services such as Playstation (Plus), Xbox (Live) and do not pay an additional fee.			I continue to use cloud storage services such as Google Drive, OneDrive and do not receive a discount.	
	I do not use video streaming services such as Netflix or Amazon Prime and do not pay any additional fees.	**X**		I continue to use (video) messaging services such as WhatsApp, iMessage and do not receive a discount.	**X**

Figure 1. Illustration of a best-worst choice set (left WTP, right WTA version)

Figure 1 illustrates the use of the enhanced BWS method employed in this study. The respondent is asked to choose the "best" and the "worst" option from an item collection representing the extremes on a subjective continuum (Louviere et al., 2015). This study utilized "most likely" and "most unlikely" to represent the extremes of the latent. In the WTP version, respondents are asked to evaluate their willingness to continue using services for an additional fee, while in the WTA version, respondents are asked to assess their willingness to forgo services in exchange for a discount.

The study design consists of nine items, of which seven of them are online service categories, and two of them are differentiating price points. Reflecting the data consumption statistics, the online services categories *video streaming*, *music streaming*, *social media*,

online gaming, *cloud storage*, *(video) messaging*, and *news* were selected. We modified the best-worst scaling method with the addition of two financial items, *2€* and *4€*, to enable the measurement of WTP and WTA. The price points of *2€* and *4€* were chosen arbitrarily. By incorporating these price points into the BWS method, we introduce a financial dimension to the ranking process. Using two distinct price points allows us to account for cost considerations while ranking items. Building on the inter- and extrapolation concepts from Kristrom (1990), we can further derive the concrete consumer valuations. This approach enhances our understanding of the economic value associated with the items by incorporating the relative distance between online service categories and financial items within the BWS framework.

The study surveyed a convenience sample of 193 respondents (59.6% male), mostly university students, meaning the insights are limited to this small sub-sample of the population. Of these, 95 completed the WTP questionnaire and 98 the WTA questionnaire, with respondents randomly assigned to one of the two. In each questionnaire, the respondents received a total of 12 questions, and each of the nine items appeared 4 times in total.

4 Results

Figure 2 summarizes the best-worst scores for all items in which we normalized between 0 (least likely to reflect the behavior) and 100 (most likely to reflect the behavior) for each experimental condition of WTP and WTA. In the WTP case, a higher BWS score indicates a high willingness to forgo the online service category and not to pay an additional fee. Conversely, in the WTA case, a higher BWS score indicates a high willingness to keep the online service category and not get a discount.

The sub-table illustrates shifts in relative ranking positions by inverting the ranking order of the WTA condition. Comparing the WTP and WTA BWS scores, we see that the rankings of the online services with the financial thresholds exhibit comparable reversed results. This relationship is also reflected through the Pearson's correlation coefficient between the WTP and WTA, which is -0.989 ($p<.01$). Both rankings suggest that *(video) messaging* has the highest perceived value from respondents, followed by *music streaming*, *video streaming*, and *social media*. These items share similar characteristics, as they all rank below the *4€* item in WTP or above in WTA. This indicates that respondents were generally willing to pay at least four euros for these services and would reject a four-euro discount to give them up. Furthermore, *online gaming* is suggested to be the most likely to be foregone and the least

likely to be retained, having a lower perceived value than the item *2€*. The general relationships observed between price points and service categories in both experimental conditions provided insights into the value assigned to each category. This demonstrates the effectiveness of using alternative threshold options as financial incentives. The thresholds suggest a classification of service categories according to respondents' financial perceptions.

	(Video) Messaging	**Music streaming**	**Video streaming**	**Social media**	**Cloud storage**	**4€**	**News**	**2€**	**Online gaming**
Normalized mean BW scores (WTP)	14.74	25.26	40.53	47.50	50.26	55.53	64.47	67.89	83.82
Normalized mean BW scores (WTA)	82.27	72.96	63.52	53.83	47.58	48.34	34.57	35.08	11.86
Correlation between WTP and WTA	-0.989***								
Ranking differences WTP to WTA	0	0	0	0	-1	1	-1	1	0

Note: N = 193 (WTP: 95, WTA: 98), *: p < .1; **: p < .05; ***p < .01

Figure 2. Results of best-worst scaling analysis

Furthermore, we have investigated the correlations between the nine items. The financial items showed a positive correlation with a correlation coefficient of around 0.5 (p< .01). This finding suggests that the respondents who are likely to pay *2€* or accept a *2€* discount for a category are also expected to pay *4€* or accept a *4€* discount for the category. Table 2 shows a comparative analysis between financial thresholds across service categories through the frequency with which an item, under each respective condition, was ranked above or below the *2€* and *4€* thresholds. A positive change (delta) in the WTP condition (F) indicated that more respondents were likely to forgo the category as the fee rose. Conversely, a negative change in the WTA condition (K) suggested that more respondents would not keep the service as the discount increased.

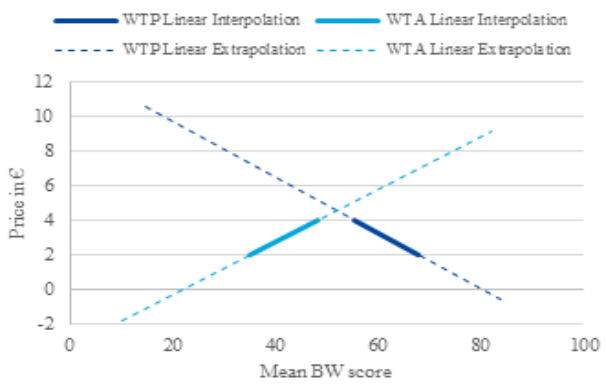
The comparative analysis shows that certain online services, such as *(video) messaging*, were highly valued, with only 6% willing to forgo them even at a 4€ fee, showing a high financial threshold for these services. The WTA condition revealed that consumers were more likely to forgo services, like *video streaming* and *social media*, as discount offers increased, indicating higher price sensitivity. *Music streaming* and *cloud storage* had smaller deltas, suggesting that their values were perceived as intrinsic and less affected by price changes. *Online gaming* stood out, as willingness to forgo it rose significantly with a higher fee but didn't change as much with increased discounts, suggesting other factors at play. Overall, financial thresholds influence consumers' decisions on online services, revealing varied price sensitivities across different service types.

	Video streaming		**Music streaming**		**Social media**		**Online gaming**		**Cloud storage**		**(Video) Messaging**		**News**	
Condition	F	K	F	K	F	K	F	K	F	K	F	K	F	K
Above 2€	19	73	9	84	29	63	66	15	31	56	5	88	41	46
Above 4€	29	64	13	79	35	53	79	14	38	50	6	82	52	32
Delta	10	-9	4	-5	6	-10	13	-1	7	-6	1	-6	11	-14

Note: WTP: F = Forgo access to service; WTA: K = Keep access to service

Table 2. Comparative analysis between financial thresholds and service categories

Leveraging the framework developed by Kristrom (1990), we adapted and refined the inter- and extrapolation of the item price points to approximate the WTP and WTA for each online service category. For simplicity reasons, we have assumed a linear relationship between BWS scores and price points. Figure 3 illustrates the extrapolated WTP and WTA results for each service category. Price points that the analysis has led to suggest individual financial thresholds for online services. WTP for each service category was higher than WTA for the same service category, with the average WTA being 17% lower than the average WTP. *(Video) messaging*, *music streaming*, *video streaming*, and *social media* have the highest consumer value, as their valuations exceed the 4€ threshold in both conditions. *Online gaming* has been identified as having no additional perceived value to customers, with a valuation of 0€. This indicates that, when given the option to forgo a service in exchange for a discount, consumers did not view online gaming as valuable enough to justify paying for it or accepting a price adjustment. These results highlight that consumer valuations of online services vary significantly across different categories.



Services	WTP	WTA	Delta
(Video) Messaging	10.60 €	9.12 €	-16%
Music streaming	8.89 €	7.71 €	-15%
Video streaming	6.43 €	6.29 €	2%
Social media	5.30 €	4.83 €	-10%
Cloud storage	4.85 €	3.88 €	-25%
News	2.55 €	1.92 €	-33%
Online gaming	0 €	0 €	0%

Note: N = 193 (WTP: 95; WTA: 98); Correlation: 0.9932 ($p < .01$)

Figure 3. Inter- and extrapolation of item price points for each threshold

5 Conclusion

Managerial implications. Consumers' financial perceptions vary across online service categories, indicating that a one-size-fits-all solution to the fair-share debate is unlikely to succeed. Our findings suggest that the high consumer valuation of particular online services, including *(video) messaging*, *music streaming* and *video streaming* are not fully monetized to finance infrastructure projects. The examination of price sensitivity shows that some online services have consumers highly affected by the financial alterations while for other services, consumer behavior is not influenced through the alternating price levels. Hence, a tiered contribution model, shaped by consumer valuation of online services, can be suggested as an alternative, supported by empirical evidence, to the fair share proposal.

Understanding consumer valuation is critical for identifying revenue opportunities arising from online services, yet it remains underexplored in the context of the fair share debate. Earlier research has primarily focused on the direct economic implications of the fair share mechanism. In response, our study adopts an empirical approach to assess how consumers perceive the financial value of online services, providing a nuanced understanding of their willingness to pay and willingness to accept. By investigating these financial thresholds, we position the valuation of online services as a foundational step toward developing a cost-sharing framework for telecommunications investments. Our findings highlight that consumer perceptions should be integrated into discussions of cost-sharing to ensure that solutions align with real-world expectations and are more likely to succeed. Certain online services are of significant importance to the telecommunications industry, highlighting their strategic value for telcos. However, in the current infrastructure investment model, potential monetization opportunities are often overlooked. This presents an opportunity for collaboration between

global online service providers and national telcos. Such collaboration could create mutually beneficial agreements that foster industry growth while ensuring that infrastructure investments remain sustainable. Future research could enhance the understanding of consumer valuations by adding more price points to the study design and employing longitudinal methods in data collection.

6 Literature

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