Competition Commission of India
Journal on Competition Law and Policy
Doi: 10.54425/ccijoclp.v4.154
Vol. 4, No. 2, December 2023, pp. 159-185

Should Over-The-Top (OTT) Providers Pay the Telecom Industry?

Abhinav Chattaraj[1]

Abstract

The objective of this study is to investigate the prevailing conflict between the telecommunications and Over-The-Top (OTT) sectors in India. Telecom Service Providers (TSPs) have been urging OTTs to compensate them for network usage and revenue deficits. This study leverages an exhaustive literature review to scrutinize the various assertions and recommendations forwarded by diverse telecommunications bodies across the globe. The findings reveal that while the OTTs have favourably influenced the Internet Service Provider (ISP) segment of the telecom industry by functioning as a complementary good, it has negatively impacted the growth and revenues of traditional communication platforms like SMS and calling. The paper also identifies the competition issues attributed to the OTT market, as claimed by the TRAI and ITU. Through a dedicated model, an argument is substantiated that the disadvantages inflicted by OTTs on the TSPs surpass the benefits. We then propose our policy recommendation which necessitates that OTTs bear or share some of the costs of the TSPs. Two distinct models are introduced to calculate these compensations. The models factor in the different sizes of OTT and telecom firms to yield a balanced costing model. Subsequently, an in-depth analysis of the recommended policy implications is conducted. It is deduced that although our policy may instigate a debate about potential negative impacts on net neutrality, a similar approach adopted by the US government did not result in any adverse effects on the growth of their internet sector. On the contrary, it demonstrated notable expansion. The exploration undertaken in this paper illuminates various fallacies and misconceptions prevalent within the relationship between the telecommunication and OTT industries.

[1]Department of Economics, Rutgers University, New Jersey, United States; abhinav.chattaraj17@gmail.com

Keywords: Competition, net-neutrality vertical restraints, over-the-top, telecommunications

1. Introduction

Consider the dynamics between the owner of a house and an uninvited occupant as an analogy to illuminate the core of our investigation. Envision the owner owning a house, investing in its transformation into a successful shop, navigating bureaucratic processes, and adhering to local regulations. Suddenly, an outsider sets up shop within the same premises, bypassing all regulatory procedures, and offering similar goods at lower prices, thereby attracting the owner's customer base, and significantly impacting their revenue. Despite the downturn, the owner remains liable for the house's utility expenses such as electricity and water, while the newcomer contributes nothing. The scenario leaves the original owner with a legitimate demand that the outsider should bear a share of the operational costs. This situation mirrors the dilemma faced by the telecom industry (house owner) with the advent of the Over-the-Top (OTT) industry (the outsider), laying the groundwork for our research into whether OTT providers should compensate telecom companies.

This research paper investigates the complex dynamics between Over-The-Top (OTT) service providers and Internet Service Providers (ISPs), with a focus on evaluating whether OTTs ought to compensate ISPs for the costs they incur. OTTs, which deliver media content over the Internet, have experienced significant growth, largely facilitated by ISPs, especially telecommunication companies providing high-speed Internet access (International Telecommunications Union, 2017). However, this expansion of OTTs has, as will be discussed in subsequent sections, exerted pressure on ISPs, culminating in stagnation within the telecom sector due to a shift in revenue towards OTTs (ITU, 2017 and 2019).

The study delves into the intricate interplay between OTTs and the telecom industry, aiming to develop models that effectively address the financial challenges faced by ISPs.

The paper begins with an exhaustive review of the existing literature focusing on the relationship between the telecom industry and OTTs in the Indian context (Telecom Regulatory Authority of India 2018, and 2020). It identifies two key effects: a complementary effect, which encapsulates the

benefits accrued by telecom firms following the advent of OTTs, and a substitution effect, which highlights the adverse impacts (TRAI 2018, and 2020).

After this literature review, a theoretical framework is presented, pinpointing the problems identified from the literature. This framework examines various dimensions of the issue, including competition and regulatory discrepancies, investment considerations, and the overall net effects (Goldlovitch, Kotterink, Marcus, Nooren, *et al.,* 2015) (TRAI, 2020).

The discourse then progresses to the introduction of two cost models. These models offer intuitive methods for determining the appropriate financial contributions OTTs should make to telecom providers, considering factors such as the disparity in scale between the two entities, and the nuances of ad revenue versus premium subscription revenue, among others.

The paper also explores the policy implications of this relationship, particularly scrutinizing the various arguments surrounding net neutrality as presented by different stakeholders.

In conclusion, the study asserts that OTTs should indeed compensate telecom companies. This compensation, however, must be equitable and subject to regulation. The paper emphasizes the importance of governmental mindfulness regarding factors such as the varying sizes of different firms within this sector.

This paper centres on the vertically integrated market shared by telecommunication firms and OTT service providers, where telecom firms serve as distribution channels for OTT entities. The core objective of this research is to develop a comprehensive framework tailored to address the unique challenges inherent in vertically integrated markets like this one. This framework is not only specific to the telecom-OTT nexus but also has the potential to initiate an expansive research discourse. The insights and methodologies derived from this study could, with appropriate modifications and advancements, be extrapolated and applied to other similar markets. Thus, this paper is positioned not just as an analysis of the current telecom-OTT interplay but also as a foundational piece that could influence future research in analogous market structures.

2. Literature Review

2.1 Fair Cost Sharing

A few studies have delved into the optimal level and targets for cost-sharing, particularly in the context of ad-financed services. Economides *et al.,* (2012) in their research, tackled the issue from a two-sided market perspective, yet they did not consider any forms of transfers, be they monetary or non-monetary, between content providers and consumers. In a similar vein, Peitz and Schuett (2016), in their work, highlighted that cost-sharing could help mitigate traffic inflation by content providers and lessen network congestion. Building upon this concept, the current study expands the scope by permitting content providers to influence demand through the dual strategies of content quality selection and advertising intensity. This approach underscores the diversity in content, particularly in terms of its size and the revenue generated from advertising.

In their study, Jullien and Bouvard (2023) provide a detailed analysis of a fair cost-sharing mechanism between content providers and network operators. This model not only motivates content providers to regulate traffic but also affects consumer pricing for access and content. The study highlights that consumer welfare hinges on the content provider's ability to monetize its user base. With a strong monetization capacity, cost-sharing can lead to lower prices and enhanced consumer welfare. Additionally, the study assesses the longevity of these effects in relation to the operator's investments in cost reduction and varying consumer content preferences. It also notes the emergence of contractual externalities in scenarios with multiple providers and operators, suggesting a need for regulatory oversight. This framework offers a basis for the models that will appear in later sections.

In the subsequent section, we aim to discuss the growth trajectories of the telecom industry and OTTs, their synergy, and the different contrasting effects that the latter has had on the former.

2.2 Growth of ISPs and OTTs

Over the past decade, the growth of OTT has been remarkable, exerting a profound impact on both macro and microeconomic levels, encompassing businesses and individuals alike. *Economic impact of OTTs: Technical report,* an article published by the International Telecommunications Union

(2017) made several predictions regarding the expansion of OTT globally. However, for a more localized perspective, consider including data from TRAI's annual reports or market analysis specific to India, highlighting the rapid adoption and impact of OTT services in the Indian telecom sector (ITU, 2017). According to the report, approximately 5 trillion messages, out of a total of 10 trillion, were exchanged through OTT platforms, thereby accounting for roughly 50% of the overall messaging volume accredited to OTT services (ITU, 2017). Notably, in 2017, an astounding 45 trillion messages were exchanged via OTT platforms out of a total of approximately 56.5 trillion messages, representing an approximate share of 79.64% for OTT messaging. A comprehensive analysis reveals that the share of OTT messages exchanged relative to the total volume of messages exchanged has increased by approximately 59.28% (ITU, 2017). This substantial change can be attributed to the increased accessibility of mobile phones and networks over the past decade, facilitating widespread internet access and seamless utilization of these services.

Services such as communication and streaming platforms have witnessed a significant upsurge in popularity. WhatsApp, for instance, has become a significant player in the Indian market with a user base surpassing 487.5 million in 2022, reflecting a broader trend of OTT adoption in India's digital landscape.

Telecommunication has conventionally played an integral role in the Internet ecosystem, and ISPs serve as the network providers that enable OTTs to deliver their services, establishing a vertical relationship between the two. In lieu of this, there has been notable growth in the availability and affordability of mobile broadband services.

According to the ITU report, the coverage of 3G mobile data was accessible to approximately 45% of the global population, amounting to 7 billion individuals, in 2010. By 2015, the same report indicated that 69% of the global population, which had increased to 7.4 billion, had access to 3G mobile data. This expansion can be attributed to the growth in Gross Domestic Product, as increased per capita income has augmented individuals' ability to own mobile phones and utilize internet services (ITU, 2017).

2.3 Similarities and Disparities

Having familiarized yourself with the growth trajectories of the telecom and OTT industries, the following sections delve into examining their disparities and similarities. It is necessary to identify the global reach of OTTs as compared to Telecom Service Providers (TSPs).

2.3.1 Similarities Between Telecom and OTT Industries

1. Core Function and Market Expansion: Both the telecom industry and the OTT industry originated with a primary focus on communication. The telecom industry's market, while predominantly associated with communication services, has expanded its scope. Similarly, in the OTT industry, especially in the Indian context, there has been a diversification beyond traditional media consumption and communication, venturing into sectors like e-learning, telemedicine, and digital payments, reshaping the market landscape (ITU, 2019).
2. Global Impact and Consumer Reach: Both industries have significantly influenced global communication and media consumption. The telecom industry operates primarily within national boundaries, adhering to country-specific policies. In contrast, OTT services, with their widespread availability and universal accessibility, have achieved a global reach (ITU, 2019).
3. Interplay and Dynamic Relationship: The relationship between ISPs and OTT services illustrates their roles as both complements and substitutes in the market. This dynamic underscores the intricate interplay and mutual influence they exert on each other's market positions and strategies.

2.3.2 Disparities Between Telecom and OTT Industries

1. Regulatory Environment and Market Flexibility: The telecom industry, particularly ISPs, faces a complex regulatory environment in India, with requirements such as licensing, spectrum usage charges, and adherence to Quality-of-Service regulations (ITU, 2017). This influences their operational strategies significantly. Conversely, OTT firms encounter relatively lower barriers to entry and are subject to fewer regulations, which allows for more fluid investment allocation and operational flexibility (ITU, 2019).

2. Scope and Services Offered: The telecom industry provides communication services and facilitates the means to communicate. However, the OTT industry caters to a broader spectrum of sectors and offers a wider range of services, making its market more complex to define (ITU, 2019).
3. Cost-sharing and Investment Dynamics: A pertinent question arises regarding whether OTT firms should partake in cost-sharing and investments with ISPs. This issue stems from the observation that OTT services have, to some extent, supplanted traditional telecom providers in various domains while imposing additional costs upon them (ITU, 2019).
4. Pricing Strategies and User Base: OTT service providers, such as Jio, often employ zero pricing strategies to reach a significantly larger user base compared to TSPs. This contrasts with the telecom industry, where TSPs are subject to more stringent regulatory oversight, particularly in privacy and data management (ITU, 2019).

Using the observations hitherto, one can divide the Indian telecom industry into two parts: Internet Service Providers (ISPs) and Traditional Service Providers (TSPs). It can be seen in the next section that OTTs have had a contrasting effect on the two branches, one where they have bolstered a branch (complementary) and the other where they have negatively affected the branch (substitution).

2.4 Complementary Argument

Drawing from neoclassical microeconomics, one understands the concept of complementary goods as those that are utilized together. This concept finds a clear illustration in the Indian telecom market, where the complementary nature of OTT services and ISPs is particularly pronounced. Platforms like Hotstar and JioTV, pivotal in the surge of OTT usage, have directly contributed to an increased demand for high-quality ISP services (TRAI, 2018 and 2020). This interdependence is underscored in the ITU report, highlighting the critical synergy between network providers and OTT providers. These two industries, coexisting within the same ecosystem, not only offer consumers the means to communicate but also provide a rich array of media content. It is now commonplace for consumers with a mobile device to engage with both ISP services for connectivity and OTT content for entertainment and information. This

scenario where a network connection becomes indispensable for accessing OTT content further emphasizes their mutual reliance.

This interdependence substantiates the notion that the telecommunications industry and the OTT industry, while distinct, are interconnected facets of the same overarching system. Recognizing the importance of this relationship for the market's well-being, it becomes imperative for both industries to collaborate and operate in harmony (ITU, 2019). The ITU report recommends encouraging practical cooperation between OTTs and network operators. Particularly, Section 7 of the report focuses on fostering innovative, sustainable, and viable business models through this cooperation, aiming to yield socio-economic benefits (ITU, 2019).

However, while this interplay underscores a generally positive relationship, it is crucial to recognize that the substitution aspect, wherein OTT services replace certain functions traditionally fulfilled by network operators, carries substantial weight. In fact, the volume of substitution might even overshadow the complementary aspect. Therefore, it becomes necessary to duly consider this substitution, or competitive, relationship between these two entities alongside their cooperative dynamics. Such a balanced view helps in understanding the full spectrum of interactions between ISPs and OTT services, shaping policies and business strategies that cater to the evolving market landscape.

2.5 Substitution Argument

The ITU report acknowledges the dual nature of the relationship between ISPs and OTTs. It illustrates how OTTs have not only complemented but also replaced traditional telecom systems, like SMS provided by Telecom Service Providers (TSPs). This phenomenon is mirrored in India, as highlighted by the 'Indian Telecommunications Market Analysis', which observes a significant decline in traditional SMS revenues. This decline is attributed to the rise of OTT messaging platforms such as WhatsApp and Telegram, evidencing a clear substitution effect.

Supporting this trend, TRAI reports a reduction in the Average Revenue Per User (ARPU) for traditional telecom services, a pattern echoed in other regions including the Americas and Europe. Specifically, TRAI notes, "Average Revenue Per User (ARPU) from wireless services has also

come down due to increased competition" (TRAI, 2011). This decline in ARPU is a direct consequence of the competitive pressure exerted by OTT platforms.

Further illustrating this shift, the ITU report details the increasing use of OTT voice, video, and text communications across computers and mobile devices. A striking example is Skype, an OTT service that saw its international traffic surge by 35 billion minutes in 2014, reaching a total of 248 billion minutes. Although international telephone traffic still surpasses Skype's volumes, the latter's growth is significant. In 2013, Skype's international traffic was four times greater than that of the world's largest telecommunications company, and its growth in 2014 exceeded the combined volume growth of all carriers worldwide by nearly 30 percent.

These statistics from the ITU report (ITU, 2017) highlight the profound impact of OTT services, such as Skype, on the telecommunications landscape, showcasing their immense growth in user engagement and traffic volume. This trend is indicative of a broader shift where users increasingly favour OTT services over traditional telecom services.

In response, telecom firms have been compelled to adapt, leading to the development of new business models. A prevalent strategy among telecom firms is to bundle OTT services with their own offerings. This arrangement provides consumers with a comprehensive package that includes both the telecom firm's services and those offered by OTT companies, often at a discounted rate. This strategy aligns with the concept of complementary goods discussed earlier.

In the theoretical framework, it is observed that the substitution effect, which represents the negative impact of OTTs on TSPs, outweighs the complementary effect, the positive impact of OTTs on ISPs. This leads to the conclusion that the net effect of OTTs on the Indian telecom industry is predominantly negative.

2.6 Intuition

The relationship between OTT services and the telecom sector, encompassing both ISPs and TSPs, is characterized by an intricate balance of complementary and substitution effects. This interplay, as evidenced in various studies and reports, including those by ITU and TRAI, reveals

how OTTs have revolutionized communication by offering alternatives to traditional telecom services, while concurrently relying on the underlying telecom infrastructure for service delivery. This duality is evident in the way OTTs, like WhatsApp, Telegram, and Skype, have driven consumer demand for robust internet services, benefiting ISPs, as highlighted in the ITU report.

However, this complementarity is counterbalanced by a significant substitution effect, where OTT platforms replace traditional services like SMS and voice calls, affecting the revenue streams of TSPs. This trend of OTTs encroaching on the traditional telecom market is a global phenomenon, leading to a decline in ARPU, as reported by TRAI. The substantial increase in user engagement and traffic volume on OTT platforms, such as the notable rise in Skype's international traffic (ITU, 2017), exemplifies this shift. Consequently, while OTTs foster greater internet usage, aiding ISPs, they also pose challenges to the revenue models of TSPs.

The ensuing section of this paper builds on these insights, presenting a model that quantifies the net effect of these contrasting dynamics between OTTs and the telecom sector. The model leverages the empirical data and trends discussed earlier, including the insights from the ITU and TRAI reports. It aims to provide a comprehensive understanding of how the complementary and substitution effects of OTTs influence the overall telecom industry. This analysis is crucial for determining the extent to which OTTs impact telecom operators, guiding strategic decisions and policy considerations.

Considering this model, the discourse on the financial relationship between OTTs and telecoms becomes particularly relevant. Given the nuanced interplay between these sectors, the model's findings will inform the debate on whether OTTs should bear financial responsibilities towards telecoms. This discussion is not just an economic consideration but also a reflection of the evolving telecommunications landscape, highlighting the need for policies that support sustainable growth and collaboration between OTTs and telecoms (ITU, 2019).

3. Theoretical Framework

3.1 The Problem

International bodies and national authorities, including in India, are concerned about the impact of OTT services on network operators' investments, affecting the adoption of new technologies like 4G and 5G. Traditional TDM networks are still prevalent, despite VoIP's growth, due to investment concerns and a focus on maximizing current revenue (TRAI, 2018).

OTT services have caused a significant increase in internet traffic, raising the costs for ISPs. However, the rate of internet traffic growth is slowing, contradicting the notion that OTT services are leading to increased demand for ISP services. TSPs face risks such as loss of customer relationships, increased competition, potential commoditization, and the necessity for digital engagement.

3.2 Competition and Regulatory Discrepancies

- OTT providers face lower barriers to entry compared to ISPs, who are subject to numerous licensing provisions and regulatory fees (BEREC, 2016). This discrepancy gives OTT players a competitive advantage, allowing them to offer services at lower tariffs while leveraging TSPs' networks (Goldlovitch, Kotterink, Marcus, Nooren, *et al.*, 2015).
- The rapid growth in video consumption and the expectation that video will account for a significant portion of mobile data traffic raise concerns about the telecom industry's ability to support this influx (Bijl, Renda, Motta, *et al.*, 2015). TRAI mandates telecom providers to expand infrastructure while maintaining fair pricing, a challenge given the growing costs and traffic (TRAI, 2020).
- Critics argue that OTT players bypass regulatory obligations, exploiting alternative revenue streams, leading to an imbalance in competition. Allegedly, large OTT players are leveraging their scale to dominate the market, leading to reduced turnover and industry dynamism.

3.3 Investments

Another critical aspect to consider is the advent of 5G, which is one of the most highly anticipated developments in the telecommunications industry and is expected to benefit OTT services as well. However, the

deployment of 5G requires substantial capital investment from telecom providers. The existing situation, where ISPs bear significant costs while OTT providers enjoy competitive advantages, has limited the telecom firms' ability to invest extensively in technical advancements without incurring deficits and overwhelming costs. Consequently, this may lead to either significantly increased prices for telecom consumers, thereby resulting in a decline in consumer welfare - a crucial goal outlined in the Competition Act in India (Ministry of Corporate Affairs, 2002) (TRAI, 2020).

3.4 Net Effect of OTTs on Telecom

In the literature review above, it was claimed that although the telecom industry has derived certain benefits from OTTs, the losses incurred by the sector outweigh these gains. To test this assertion, a model that analyzes the long-term steady-state growth patterns of the telecom industry will be introduced. The analysis and assumptions are grounded in the existing literature reviewed thus far.

3.5 Rationale

In constructing the theoretical model to analyze the impact of OTT services on the telecom sector, observed market trends and empirical data have been drawn upon, as highlighted in reports by ITU and TRAI. The choice of variables and the underlying assumptions in our model are deeply influenced by these insights. The model primarily revolves around two sets of variables: those representing the complementary effect (ISP revenues from OTT services and network costs) and those signifying the substitution effect (lost revenues from traditional telecom services and OTT advertising revenues).

The rationale for focusing on these variables emerges from the notable trends in the telecommunications industry. As indicated by TRAI, there has been a discernible decline in traditional telecom revenues, especially in sectors like SMS and voice services, attributable to the rise of OTT platforms like WhatsApp and Telegram (TRAI, 2011). This decline in revenue signifies the substitution effect, where OTT services are replacing traditional telecom functions. Additionally, the ITU report (ITU, 2017) underscores the substantial growth in user engagement and traffic volume on OTT platforms, such as Skype's significant increase in international

traffic. This growth in OTT platforms, particularly in advertising revenue, further validates our focus on these variables to represent the substitution effect.

Concurrently, the complementary effect, characterized by the interaction between ISP revenues and network costs, is grounded in the understanding that OTTs, while enhancing internet usage, necessitate significant investments in network infrastructure. This is reflected in the ITU's observation of the critical interdependence between network providers and OTT providers (ITU, 2019). While OTTs drive demand for high-quality ISP services, they also impose substantial costs for network maintenance and upgrades, leading to a scenario where network costs potentially grow faster than ISP revenues.

Given these market dynamics, our model assumes that the substitution effect is larger than the complementary effect. This assumption is based on the evident trend where the rapid growth and economic benefits of OTTs, particularly in advertising revenues, are not sufficient to offset the losses incurred in traditional telecom service revenues. The model, therefore, posits that in the long run, the net effect of OTTs on the telecom industry is negative. This theoretical stance is not only aligned with the empirical observations documented in the ITU and TRAI reports but also reflects the broader shifts in consumer behaviour and the evolving digital economy.

3.6 The Model

For this model, one can introduce a group of time series equations with variables that serve as parameters to estimate the effect of OTTs on the telecom industry. The equations can then be brought to a steady state form and calculate the net effect. The net effect will be calculated theoretically using the data and trajectories observed so far.

The following are assumed:

- The rate of change of each state variable depends linearly on the current states and exogenous shocks.
- The coefficients are constant over time.
- The exogenous variables follow a fixed deterministic pattern, and their effects on π_t, c_t, λ_t, α_t respectively are known.

- The network costs (c_t) grow faster than ISP revenues (π_t), i.e., $\beta_2 > \beta_1$ and/or $\rho_2 > \rho_1$.
- The OTT ad revenues (α_t) grow faster than the lost revenues from traditional services (λ_t), i.e., $\beta_4 > \beta_3$ and/or $\rho_4 > \rho_3$.

Consider the following system:

$$\pi_{t+1} = \pi_t + \beta_1 (\pi_t - \rho_1 c_t) + \varepsilon_t^{\pi}$$

$$c_{t+1} = c_t + \beta_2 (\pi_t - \rho_2 \alpha_t) + \varepsilon_t^{c}$$

$$\lambda_{t+1} = \lambda_t + \beta_3 (\lambda_t - \rho_3 \alpha_t) + \varepsilon_t^{\lambda}$$

$$\alpha_{t+1} = \alpha_t + \beta_4 (\alpha_t - \rho_4 \pi_t) + \varepsilon_t^{\alpha}$$

For time $t \in$ T, π_t represents ISP revenues from OTT services, c_t represents network costs. The difference between these two variables gives us the complementary effect of OTTs on ISPs. λ_t represents lost revenues and α_t represents OTT ad revenues. n TSPs. M

The difference between these two variables represents the substitution effect of OTTs on TSPs. Meanwhile ε_t^{α} represents exogenous shocks affecting ISP revenues from OTT services, ε_t^{c} for network costs, ε_t^{λ} for lost revenues and ε_t^{α} for OTT ad revenues.
The net effect can be computed as:

$$\eta_t = (\pi_t - c_t) - (\lambda_t - \alpha_t)$$

This basically tells us that if the complementary effect is higher, the net effect will be positive and if the substitution effect is higher, the net effect will be negative.

It is assumed that the system quickly reaches a steady state (in one period), where:

$$\pi_{t+1} = \pi_t = \pi^*$$

$$c_{t+1} = c_t = c^*$$

$$\lambda_{t+1} = \lambda_t = \lambda^*$$

$$\alpha_{t+1} = \alpha_t = \alpha^*$$

If steady state net effect is less than 0, it would suggest that in the long run, the net effect of OTT on telecom is negative, as per this model.

Given the assumptions, it can be determined that in the steady state, $c^* > \pi^*$ and $\alpha^* > \lambda^*$.

Therefore, the net effect in the steady state (η^*) is negative:

$$\eta^* = \left(\delta^* - c^*\right) - \left(\varepsilon^* - \alpha^*\right) < 0$$

Our theoretical model, under certain assumptions, demonstrates that the net effect of the introduction and growth of OTT services on the telecom industry is negative. This is embodied in our solution $\eta^* < 0$, which indicates that the additional costs and losses brought about by OTT services surpass the benefits that accrue from increased data demand. Our model's assumptions, crucially, are that the network costs grow at a faster rate than ISP revenues, and the ad revenues of OTT services expand faster than the losses in traditional communication service revenues.

The result provides a theoretical backing to our initial hypothesis that the OTT phenomenon negatively impacts the telecom industry. Importantly, while this model provides a theoretical perspective, it is designed to mirror real-world scenarios and trends observed in the telecom sector globally. The rapid proliferation of OTT services has undeniably reshaped the telecommunications landscape, impacted traditional revenue streams and increased demand for data services. By encapsulating these dynamics, our model serves as a valuable tool for gauging the net impact of OTT services on the telecom industry.

Considering these considerations, it becomes logical to propose that OTTs should bear some form of contributory costs towards the telecom industry for the competitive advantages they have been enjoying. The subsequent section will delve further into this topic, exploring potential mechanisms for addressing this issue.

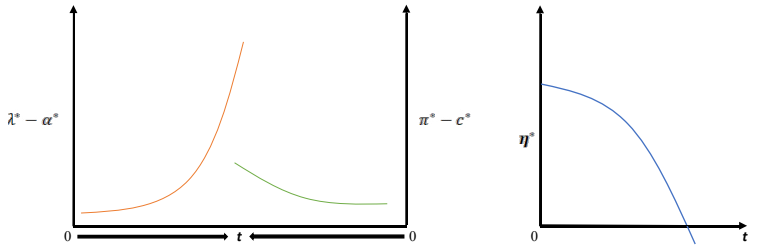

Figure 1. Long run net effect of OTT on telecom.

3.7 The Solution

One can now introduce the subsequent models employed in this study, each targeting distinct aspects of the issue at hand. The first model concentrates on fair cost sharing, investigating the equitable distribution of costs. The second model centres around fair revenue sharing, examining the equitable allocation of revenues. These two models collectively contribute to our comprehensive understanding of the multifaceted nature of the problem.

4. Modelling

4.1 Model 1: Fair Cost Sharing

One needs to employ a model to calculate the proportion of total costs incurred by the telecom industry attributed to supporting OTT services. We will be deploying a model like that of Frontier Economics which was used to compute the same for the European Union.

The following assumptions have been made in this model:

i. γ: The assumed value in the model requires validation through thorough surveys conducted by regulatory authorities like the Telecom Regulatory Authority of India (TRAI). Accurate determination of this value necessitates empirical research and data collection to correctly portray the actual situation.
ii. *Global revenues*: The model operates on the assumption that revenues considered are global rather than specific to a region. This approach aligns with the 2023 amendment to the Competition Act, particularly Section 27(b). By taking global revenues into consideration, the model

strives to offer a more comprehensive view of revenue distribution and fairness within the telecommunications sector.

The limited number of assumptions in this model contributes to its usability and practical implementation. The existing assumptions are unambiguous and can be effectively utilized to determine fair costs within the given context.

Consider the following expression for total costs of a TSP:

$$T_h = \delta + \bar{K}_h W_h + O_h$$

In the above expression, for telecom provider $h = 1,2,3\ldots..H$,

T_h = Total costs incurred by telecom provider h

δ = Sum of annual depreciation

$\bar{K}_h$ = Capital employed by h

W_h = Weighted Average Cost of Capital (WACC)

O_h = Operating Cost of h

Now that we have an expression to compute the total costs, we can go on to the expression to compute the proportion of costs attributed to OTT providers,

$$\pi_h = T_h \gamma_h$$

In the above equation,

T_h = Total costs incurred by telecom provider h

γ_h = Proportion of busy hour traffic of telecom provider h attributed to OTT

π_h = Costs incurred by h attributed to OTT

Now, move on to the OTT's side. A key aspect of this model is that one must account for the disparity in the turnovers of different OTTs. Here is the first expression:

$$\beta_i = \pi_i \left[\frac{\alpha_i}{\sum_{i=1}^{I} \alpha_i} \right]$$

In the above equation, for OTT provider $i = 1,2,3\ldots. I$,

α_i = Market size of OTT provider i, given by global revenue

π_i = Share of TSP's total costs attributed to supporting OTT services

β_i = Fair share of T that i should contribute

This equation gives the fair share of the total compensation that each firm in the OTT industry would provide. One can say that $\frac{\alpha_i}{\sum_{i=1}^{I}\alpha_i}$ represents the market share of firm i. Now, we need to account for the differing scales of the OTT and telecom firms. Introduce a "scale factor" over here that would fairly adjust the final amount paid by OTT providers according to the above-mentioned difference in scales. Look at the following expression:

$$\theta = \begin{cases} \frac{\sum_{i=1}^{I}\alpha_i}{Y}, & if \sum_{i=1}^{I}\alpha_i < Y \\ 1, & if \sum_{i=1}^{I}\alpha_i > Y \end{cases}$$

In the above equation,

Y = Global revenue of the telecom industry

$\sum_{i=1}^{I}\alpha_i$ = Global revenue of the OTT industry

θ = Scale factor

Note that if $\sum_{i=1}^{I}\alpha_i < Y$, i.e., if the OTT firm has a smaller global revenue than that of the telecom provider, the amount paid by firm i will be scaled 'down', whereas if $\sum_{i=1}^{I}\alpha_i > Y$, i.e., if the OTT provider has a larger global revenue compared to that of the telecom provider, the amount paid by firm i won't be scaled.

The above-mentioned equation introduces a mechanism to find the relative revenue of the OTT industry with respect to the telecom industry. Using this, one can find the final amount that the OTT provider must pay to the telecom providers.

$$C_i = \beta_i \theta$$

In the above equation,

β_i = Fair share of that I should contribute

θ = Scale factor

C_i = Final amount paid by firm i

The value C_i will then be divided according to the respective market shares of each telecom provider. For instance, if a telecom provider firm *H* has a market share of 30%, the compensation *H* will receive from *i* will be [(0.30) C_i].

The model presented is characterized by its intuitive nature and straightforward interpretability. The initial equation delineates the total costs associated with a TSP, drawing upon a conventional formulation frequently utilized in accounting literature. This equation comprehensively incorporates various cost components: depreciation, an indirect cost element; weighted cost of capital, encompassing expenses related to capital assets such as machinery; and operating costs, representing the routine expenditures of the TSP.

Subsequently, the analysis progresses to an equation delineating the costs incurred by a TSP attributable to OTT services. Prior observations have linked a rise in total costs to augmented OTT activities. This equation allocates the total costs in relation to the heightened traffic during peak hours, which is a direct consequence of OTT services.

Further, the paper introduces an equation to ascertain the portion of the TSP's total cost attributable to a specific OTT entity. Here, the gross costs incurred by the TSP due to OTT services, as determined in the preceding equation, are refined to net costs by considering the market share of the OTT firm. For instance, should the TSP's total costs attributable to OTT services amount to Rs. 500 crores, and an OTT firm holds a 5% market share, the cost apportioned to this firm would be Rs. 25 crores, equating to 5% of Rs. 500 crores.

The final segment of the model addresses two scenarios: one where the OTT firm's size surpasses that of the TSP and another where the

reverse holds. The comparative analysis of their revenues serves as the basis for this distinction. In instances where the OTT firm's revenue exceeds that of the TSP, the firm is liable for the full cost computed in the equation. Conversely, if the TSP's size is greater, the calculated cost is proportionately reduced according to the relatively smaller scale of the OTT firm. This adjustment ensures the financial feasibility for smaller OTT firms to shoulder these costs.

4.2 Model 2: Ad Revenue Model

This model proposes a unique methodology to estimate how OTT companies can equitably contribute fees to telecom providers. It factors in ad revenue and differentiates between basic and premium subscriptions available through the OTT platform. The OTT service offers two types of subscriptions: basic and premium. The basic service is free, with the provider earning revenue through advertisements shown to these users. In contrast, premium subscribers pay a set fee at regular intervals for an ad-free experience.

Assumptions:

i. Greater number of regular subscribers: This assumption is because OTT providers often have a larger customer base for their regular services, as they are lower priced and therefore more accessible to more people.
ii. Pre-determined values: The model assumes that parameters ϕ and σ, which define ad and premium revenue shares, are predetermined, ensuring transparency in revenue sharing.
iii. Subscribers as primary revenue source: The model assumes that the main revenue for the OTT provider comes from regular and premium subscriptions.
iv. Two versions of service: The model is specific to OTT providers offering only two service versions - regular and premium. It does not consider other service versions or payment plans.

The revenue for the OTT firm can therefore be delineated as follows:

$$\pi_i = \rho_i \left(N_i - n_i \right) + \hat{\rho}_i n_i + \varepsilon_i$$

In the above expression,

N_i = Total subscribers of provider i

n_i = Premium subscribers of provider

ρ_i = Ad revenue per subscriber

$\hat{\rho}_i$ = Unit price of premium subscription

ε_i = Exogenous revenue

The final cost paid by the firm to ISP provider *k* would be:

$$C_i = \beta_k \left(\frac{\rho_i \left(N_i - n_i \right)}{\sigma} + \frac{\hat{\rho}_i n_i}{\phi} \right) + \varepsilon_k$$

In the above expression,

β_k = Market share of *k*

σ = Pre-decided ad revenue share of *k*

ϕ = Pre-decided premium users' revenue share of *k*

ε_k = Fixed usage fee paid to *k*. Note that $1 < \phi < \sigma$.

The model assigns a higher value to ad revenue share compared to premium revenue share. This decision acknowledges that streaming numerous advertisements to a wider audience generates increased network traffic, thus imposing a higher cost burden on ISPs.

The initial equation in the analysis methodically calculates the revenue of an OTT firm. This calculation incorporates a bifurcated revenue structure: one segment emanates from advertising revenues generated by non-premium service customers, while the other stems from subscription revenues accrued from premium service clients. Additionally, the equation judiciously integrates a variable specifically designated to encapsulate any exogenous revenue streams that the OTT firm may benefit from.

Following this, the model adopts a nuanced approach to distribute the calculated revenues. It applies a weighting mechanism to the revenue streams, effectively moderating them to reflect a more realistic financial scenario. Subsequently, the resultant adjusted revenue figures are apportioned among various TSPs. This distribution is meticulously aligned with the market shares of each TSP, ensuring that the allocation

of final costs is proportional and reflective of their respective market standings. This methodology not only captures the diverse revenue sources of OTT firms but also ensures an equitable distribution of costs among TSPs based on their market influence.

5. Policy Implications

The Indian Government introduced the Telecommunications Bill in 2023. This analysis will delve into the bill's critical elements and elucidate the implications of both the Act and our theoretical models on policy and regulation.

Section 3 of the bill accentuates the theme of exclusive privilege, delineating the government's comprehensive authority to regulate telecom entities, grant licenses, and assign spectrum. In contrast, Section 4 underscores the multifaceted licensing and payment obligations of the telecom industry (Department of Telecommunications, 2022). These sections collectively depict a future of stringent governmental control, thereby amplifying existing entry barriers in the sector.

Section 5(7) advocates for technological innovation, allowing providers to deploy novel technologies, contingent on licensing fees. While fostering innovation, it does not mitigate the prevalent financial constraints. In contrast, Section 6 proposes efficient spectrum utilization, allowing sharing, trading, leasing, and surrendering of assigned spectrum. This section seems to be a transition towards fostering agreements between telecom and OTT sectors, and our models could shed light on the potential terms and conditions.

However, the proposed collaboration does not address the vertical relationship between OTTs and telecom providers or the potential violation of net neutrality principles, which advocate for equal treatment of all internet traffic. The history of regulatory shifts in net neutrality, particularly in the United States, underlines the potential complexities in interpreting the forthcoming Indian Telecommunications Bill.

Ajit Pai's tenure as the United States Federal Communications Commission (FCC) Chairman marked significant changes, arguing for fostering competition, reinstating United States Federal Trade Commission's (FTC) oversight, eliminating redundant regulations, and advocating transparency requirements. Contrary to the speculated 'Death

of the Internet', data reveals significant growth in broadband speeds, internet user proportion, and ISP financial performance, refuting the contention that a decline in net neutrality would adversely affect the Internet (FCC, 2017).

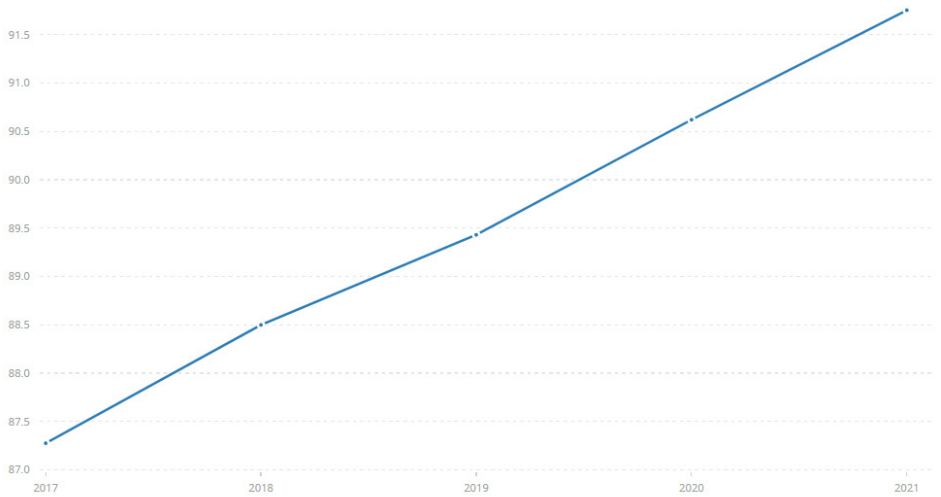

Figure 2. Number of internet users (%) in the USA.

Considering the increases in the quality of internet service, the number of internet users, and the improved sector performance, it is reasonable to refute the contention that a decline in net neutrality would trigger the alleged 'death of the internet' (FOCUS, 2018).

6. Conclusion

Our extensive research on the relationship and dynamics between OTTs and ISPs suggests a need for a systematic re-evaluation of the financial and competitive landscape of these industries. The study illuminates significant challenges in maintaining a balanced level playing field due to the difference in market entry barriers and the subsequent competitive advantage enjoyed by OTT firms. Based on our findings, one can conclude that OTTs should compensate ISPs to rectify the disparity created by their rapid growth and inherent competitive advantage.

The remarkable expansion of the internet and OTT sectors has come with a complicated blend of complementing and substituting effects.

While the OTTs have been a catalyst for the internet boom, traditional telecom services have taken a hit due to the substitution effect. This has led to stagnant growth and reduced revenues among TSPs. The revenues traditionally accrued from advertisements and subscriptions have instead shifted to OTT providers. This discrepancy is exacerbated by the fact that OTT companies face fewer regulations and scrutiny, a fact that confers them an arguably unfair competitive advantage.

To maintain a competitive and fair marketplace, we advocate for a restructuring of the financial relationship between OTT firms and telecom providers. This could manifest as a compensatory arrangement where OTT firms contribute towards the investment costs incurred by telecom providers in managing increased internet traffic. The proposed compensation would not only level the playing field but also bolster the telecom industry's ability to invest in technological advancements, which is crucial for the overall development and sustainability of the digital ecosystem.

Our proposed models offer a robust mechanism for determining the right compensatory amount. The first model considers the cost side of ISPs, estimating the expenditures directly related to OTT activities. The second model incorporates the concept of ad revenue and different payment tiers within an OTT service. By considering the disparity in firm sizes and financial resources, these models ensure that the compensation is equitable, proportionate, and non-discriminatory.

Finally, the policy implications of our hypothesis were tested and compared to a similar approach adopted by the US. We find that the policy, which would expectedly violate net neutrality, would not lead to any harm to the telecommunication providers or consumers, therefore ensuring market welfare.

In conclusion, the extraordinary growth and influence of OTT service providers on the digital landscape, coupled with their competitive advantage, necessitate a rebalancing of the financial equations governing these sectors. OTT firms should indeed bear some responsibility for the increased costs faced by ISPs, as a result of their own success.

6.1 Balanced Responsibilities

As the recommendations for OTTs to share infrastructural costs with TSPs are considered, it is equally important to highlight the responsibilities that TSPs hold within this partnership. TSPs are not merely passive recipients of compensation but active participants in fostering a sustainable and innovative market environment. Their commitment to improving service efficiency, investing in advanced technologies, and exploring new business models is fundamental to maintaining a healthy digital ecosystem. The onus is on TSPs as well to adapt to the evolving market needs and to seek opportunities that benefit the consumer base and the market at large.

TSPs could adopt strategies such as diversifying their service offerings beyond traditional telecommunication, like venturing into cloud services or IoT solutions. This not only capitalizes on their existing infrastructure but also aligns with the digital demands of a modern economy. Additionally, TSPs should prioritize investment in 5G and fibre-optic technologies to enhance connectivity and service quality, thereby complementing the digital services provided by OTTs.

Moreover, regulatory frameworks should be designed to encourage such collaborations while ensuring fair competition and consumer protection. Policymakers might consider implementing regulatory sandbox environments that allow TSPs and OTTs to experiment with new business models and services under temporary regulatory relaxations. This approach can foster innovation while allowing regulatory bodies to adapt their policies based on real-world data and outcomes.

Concluding, this discourse acknowledges the symbiotic relationship between OTTs and TSPs, emphasizing that the path forward requires a confluence of efforts from both parties. As the industry strides into the future, it is the shared responsibility and collaborative approach of TSPs and OTTs that will ensure the resilience and growth of the telecommunications infrastructure, ultimately serving the collective interest of a connected world. The guiding principle here is one of mutual advancement and adaptive innovation, where both OTTs and TSPs work in tandem to not just share costs, but also drive the industry forward with new technologies and business models, benefiting the broader digital ecosystem and its myriad stakeholders.

References

Body of European Regulators for Electronic Communications. (2016). Report on OTT services. *BoR,* (16) 35.

Department of Telecommunications. (2022). *Indian Telecommunication Bill, 2022.* https://dot.gov.in/relatedlinks/indian-telecommunication-bill-2022

Economides, Nicholas, and Benjamin, E., Hermalin. (2012). The economics of network neutrality. *The RAND Journal of Economic, 43*(4), 602-29. https://doi.org/10.1111/1756-2171.12001 Federal Communications Commission. (2017). *FCC acts to restore internet freedom* [Press release]. https://docs.fcc.gov/public/attachments/DOC-347927A1.pdf

Focus. (2018). U.S. Communications service provider quarterly. *10*(4).

Goldlovitch, I., Kotterink, B. J., Marcus, S., Nooren, P., *et al.* (2015). Over-the-Top (OTT) players: Market dynamics and policy challenges.

International Telecommunication Union (ITU). (2017). *Economic impact of OTTs: Technical report*.

International Telecommunication Union (ITU). (2019). *SERIES D: Tariff and accounting principles and international telecommunication/ICT economic and policy issues, ITU-T D.262*. Telecommunication Standardization Sector of ITU (05/2019).

Jullien, B., and Bouvard, M. (2023). *Fair cost sharing: Big Tech vs Telcos*. Toulouse School of Economics.

Marcus, J. S. (2014). *The economic impact of internet traffic growth on network operators*. https://doi.org/10.2139/ssrn.2531782

Ministry of Corporate Affairs. (2002). *The Competition Act of India*. https://www.mca.gov.in/Ministry/actsbills/pdf/The_competition_Act_2002.pdf

Peitz, Martin and Schuett. (2016). Net neutrality and inflation of traffic. *International Journal of Industrial Organization. 46*, 16-62. https://doi.org/10.1016/j.ijindorg.2016.03.003

Telecom Regulatory Authority of India (TRAI). (2011). *consultation paper on mobile value-added services (Consultation Paper No. 5/2011)*. https://www.trai.gov.in/sites/default/files/1-main.pdf

Telecom Regulatory Authority of India (TRAI). (2018*). Consultation paper on regulatory framework for Over-The-Top (OTT) communication services*. New Delhi, India, 12th November.

Telecom Regulatory Authority of India (TRAI). (2020). *Recommendations on regulatory framework for Over-The-Top (OTT) communication services*. New Delhi, India, 14th September.