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# Assessing Regulatory Impact and Platform Engagement in the Streaming Economy: A two-stage Network DEA Analysis of Selected European Countries

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**Abstract:** This study evaluated the regulatory efficiency and performance of Over-the-Top (OTT) streaming platforms across ten European countries—France, Germany, Ireland, Netherlands, UK, Norway, Serbia, Greece, Italy, and Turkey—using a two-stage Network Data Envelopment Analysis (NDEA) framework. It also compared Europe to a global dataset that included countries from North America, South America, the Middle East & North Africa, and Asia-Pacific. The results from Stage revealed that European countries with modernized legislation, such as the UK, Germany, and France, demonstrated superior regulatory efficiency compared to those with outdated frameworks, such as Serbia. This highlighted the importance of up-to-date regulations, including net neutrality and data protection policies like GDPR, in fostering a strong regulatory environment. In Stage and the overall efficiency rankings ( $\theta_{\text{overall}}$ ), the UK emerged as the top performer in Europe with a score of 0.5454, driven by its coherent regulatory framework, effective taxation policies, and robust market competition. Germany (0.5171) and Italy (0.4449) followed, benefiting from structured regulations and diverse OTT offerings. However, countries like Serbia (0.0484), Greece (0.1527), Ireland (0.1243) and the Netherlands (0.1710) lagged, reflecting inconsistencies in translating regulatory strengths into market success. Globally, Europe achieved a mean regulatory efficiency score of 0.7823, surpassing other regions in Stage 1 except North America, but its overall efficiency ( $\theta_{\text{overall}} = 0.3059$ ) trailed North America (0.5631) and Asia-Pacific (0.3746). Europe's fragmented regulatory frameworks across countries and inconsistent implementation of taxation of international OTT platforms and OTT-specific policies hindered its ability to achieve unified market performance, despite its regulatory strengths. The findings underscored the need for European countries to adopt cohesive taxation frameworks for international streaming platforms, modernized OTT-specific regulations, and a more integrated regulatory approach to enhance the overall market efficiency.

**Keywords:** OTT, OTT regulation, Network DEA, EU, Europe, Media policy

## 1. Introduction

The rapid expansion of OTT platforms has reshaped global media consumption, transformed the way users' access and interacted with digital content. The proliferation of high-speed internet, advancements in cloud computing, and shifting consumer preferences have fueled the dominance of streaming services over traditional broadcasting. In Europe, this growth is driven by increasing broadband penetration, diversified content offerings, and evolving viewing habits, making regulatory oversight a critical factor in ensuring fair competition, consumer protection, and market sustainability.

Notably, the OTT video market in Europe is projected to generate €49.63 billion in revenue in 2025, with an anticipated compound annual growth rate (CAGR) of 5.36% from 2025 to 2029, reaching €61.13 billion by 2029. Within this, OTT video advertising is expected

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to lead with a market volume of €23.12 billion in 2025, though the United States will outpace Europe globally with €133.26 billion in revenue. User engagement is equally striking, with 636.9 million users projected by 2029, reflecting a penetration rate rising from 69.2% in 2025 to 75.6% by 2029, and an average revenue per user (ARPU) of €84.98 in 2025 (Statista a. 2025).

This expansion, increasingly propelled by tailored content strategies to engage Europe's diverse cultural tapestry, amplifies the pressing need for robust regulatory frameworks. Yet, the path to effective governance is fraught with obstacles. The intricate nature of digital markets, coupled with cross-border jurisdictional disparities, escalating data privacy expectations, net neutrality challenges, poses formidable challenges. European regulators are tasked with navigating a multifaceted landscape—ensuring platform accountability, equitable taxation, effective content oversight, and the protection of intellectual property rights while preserving a delicate equilibrium between fostering innovation and upholding market fairness. The European Union has sought to unify these efforts through landmark measures like the Digital Services Act (DSA) and the Audiovisual Media Services Directive (AVMSD), yet significant variations persist in national implementations, reflecting the complexity of harmonizing such a dynamic ecosystem (Cunningham and Eklund 2022).

Beyond EU-wide policies, individual European countries—both EU members and non-members—strive to keep pace with regulatory developments, adopting their own frameworks to address these challenges. Some align closely with EU standards, while others implement distinct policies tailored to their domestic markets. This study analyzes the regulatory frameworks of ten European countries—France, Germany, Ireland, the Netherlands, the UK, Norway, Serbia, Greece, Italy, and Turkey—assessing their effectiveness in addressing key challenges posed by OTT streaming platforms, including competition, piracy, and data protection. Turkey is included as a European country due to its historical and institutional ties with Europe, its partial geographical presence on the continent, and its alignment with EU media policies.

This study employs a two-stage Network Data Envelopment Analysis (NDEA) to assess the efficiency of regulatory frameworks governing OTT platforms. In the first stage, it evaluates regulatory efficiency across different European countries, identifying those with the highest scores and examining the regulatory characteristics that contribute to strong performance. This addresses Research Question 1 (RQ1): Which European countries demonstrate the highest regulatory efficiency in governing OTT platforms, and what regulatory characteristics contribute to these high scores?

Beyond regulatory efficiency, the study extends its analysis to assess the performance of European OTT platforms by incorporating regulatory scores as inputs in platform efficiency evaluations. This leads to Research Question 2 (RQ2): How efficiently do OTT platforms operate when regulation scores are used as inputs for assessing platform performance in European countries?

Finally, the research takes a global perspective by comparing Europe's overall regulatory effectiveness and platform efficiency with that of other regions, including Asia-Pacific, North America, South America, and the Middle East & North Africa (MENA). This comparative analysis addresses Research Question 3 (RQ3): How does Europe's regulatory performance in the OTT sector compare to that of other regions?

By benchmarking Europe's approach against global standards, this research aims to offer valuable insights that can inform the development of future regulatory frameworks and economic strategies for OTT platforms.

## **2. Background Information**

### **2.1 Regulatory Challenges of OTT Streaming Platforms and Responses**

The emergence of OTT streaming platforms has fundamentally reshaped the global media landscape by delivering content directly to consumers via the internet, circumventing traditional broadcast and cable systems (Tana, Eirola, and Nylund 2020; Tefertiller 2018). This transformative shift, while fostering innovation and expanding consumer choice, introduces a complex array of regulatory challenges that have garnered significant discussions. These challenges span competition, taxation, privacy, content moderation, and technological convergence, necessitating a reevaluation of existing regulatory frameworks to address the unique dynamics of the digital media ecosystem.

The dominance of global OTT platforms, such as Netflix and Amazon Prime, has raised critical concerns about monopolistic practices, exclusive content deals, and competitive imbalances with local broadcasters and providers (Flew 2021; Malone et al. 2023). Traditional broadcasters and local OTT platforms often operate under stringent regulations, including content quotas and licensing requirements, while international OTT platforms, leveraging their global reach, face fewer constraints, creating an uneven playing field (Storsul and Syvertsen 2007). Taxation further complicates this landscape, as OTT providers frequently exploit cross-border operations to minimize local tax obligations, undermining fiscal equity (Kerševan Smokvina 2021). Scholars argue for modernized, comprehensive regulatory frameworks to ensure fair competition and curb market dominance by global players (Cunningham and Eklund 2022; Enli et al. 2019). Just (2018) emphasizes the need for competition laws tailored to the digital economy, incorporating considerations of pricing strategies, innovation incentives, and data protection. On the taxation front, international cooperation is deemed critical to adapt fiscal policies to the borderless nature of digital services, ensuring equitable taxation that supports local content industries and prevents revenue erosion (Vázquez 2023).

OTT platforms' extensive data collection sparks privacy concerns, compounded by opaque algorithms and global operations (Evens and Donders 2020; Kwak and Kim 2020). Regulators struggle to keep pace with evolving user behaviors and algorithmic adaptations. Transparency in algorithmic decision-making is critical to ensure accountability and content diversity (Evens and Donders, 2020). Tekin Bilbil (2018) proposes robust data protection laws emphasizing transparency, limited collection, and safeguards against misuse. Cunningham and Eklund (2022) stress platform-specific regulations, while Chitranshi and Dhar (2018) advocate for clear guidelines and public awareness campaigns.

Furthermore, technological convergence blurs traditional regulatory boundaries, challenging fragmented oversight bodies (Kwak and Kim 2020). Scholars debate unified versus separate regulators, with Dwyer (2010) and Iosifidis (2002) favoring a single authority for efficiency and clarity, as exemplified by the UK's Ofcom (Vanberg 2023). However, concerns about sectoral dominance persist (Menon 2006). Convergent authorities, spanning media, telecom, and OTT jurisdictions, could streamline regulation, harmonize standards, and foster collaboration, supporting innovation while protecting consumers and cultural diversity (Flew 2015; Napoli and Dwyer 2018).

Regulating content on OTT platforms involves balancing freedom of expression, cultural diversity, and consumer protection (Flew 2015; Flew, Martin, and Suzor 2019). Challenges include moderating user-generated content and promoting local content against global dominance. Ramasoota and Kitikamdhorn (2021) suggest a regulatory framework with moderation accountability, while Bais (2021) proposes content classification and parental controls. International collaboration and funding for local production are vital to sustain

cultural diversity (Baladron and Rivero 2019).

In addition, net neutrality, the principle of treating all internet traffic equally, is critical to ensuring fair competition, but OTT platforms' reliance on high-speed delivery raises concerns about potential prioritization by internet service providers (ISPs), which could disadvantage smaller players (Baladron and Rivero 2019; Szabó and Pham 2022). Enforcement remains challenging due to limited regulatory oversight and competitive market pressures. Scholars recommend transparent net neutrality policies and international coordination to uphold equitable access, with the EU's Regulation (EU) 2015/2020 often cited as a model, despite its interpretive ambiguities and implementation challenges (Meese 2020; Poell, Nieborg, and van Dijck 2019).

Lastly, the evolution of piracy, facilitated by OTT boxes and hotlinks, poses significant enforcement challenges, driven by economic disparities and lenient penalties (Borja, Rodriguez, and Roby 2024; Wang 2021). Addressing this issue requires a multifaceted approach, combining technological solutions like digital rights management (DRM), international cooperation to harmonize enforcement, and copyright enforcement rules to avoid the consumption of pirated content, all while respecting user privacy (Adermon and Liang 2014; Fredriksson 2020). Adaptive, forward-looking frameworks are essential to protect intellectual property and sustain the economic viability of content creators in the digital age (Hobbs 2023).

In conclusion, regulating OTT platforms demands a dynamic, coordinated, and multifaceted response to address competition, privacy, content, and technological challenges. Academics underscore the need for flexible, technology-neutral frameworks that balance innovation, market fairness, and cultural preservation. International collaboration, robust enforcement mechanisms are pivotal to navigating this complex and evolving digital ecosystem, ensuring OTT platforms contribute positively to global media while addressing their regulatory challenges effectively.

## **2.2 European Regulation of OTT Streaming Platforms and Addressing Key Challenges**

The European Union (EU) has crafted a sophisticated regulatory framework to govern OTT streaming platforms, tackling challenges like competition, taxation, net neutrality, content regulation, piracy, data privacy, and regulatory authority structures. Anchoring this framework is the Digital Services Act (DSA), which enforces rigorous standards for OTT platforms, demanding transparency in content policies, accountability for removing harmful material, protection for vulnerable users, and oversight of advertising to enhance digital safety. The Body of European Regulators for Electronic Communications (BEREC) ensures uniform enforcement across member states. The General Data Protection Regulation (GDPR) strengthens data privacy and algorithmic accountability, paired with net neutrality rules that guarantee equal access for service providers. The Digital Markets Act (DMA) fosters fair competition by curbing unfair practices, while the EU Copyright Directive updates creator protections, promoting equitable digital practices. Finally, the Audiovisual Media Services Directive (AVMSD), among other things, endorses the inclusion of European content in platform's libraries. This holistic strategy strives to reconcile innovation, consumer rights, and cultural diversity across the EU.

In Table 1 the Regulatory frameworks of the 10 countries, included in this study are presented. The regulation of OTT streaming platforms in Europe varies by country, addressing competition, piracy, data protection, content regulation, taxation, and net neutrality. As digital content consumption grows, regulatory frameworks evolve to align with national and EU policies. Competition laws maintain market fairness, with Germany, France, Italy, and the UK

**Table 1. Regulatory Frameworks in the selected European Region Countries**

Countries	Competition	Piracy	Data Protection	Content Regulation	Regulatory Authorities	Taxation Of International Otts	Net Neutrality Rules
France	Competition Laws (up to 2023)	Digital Republic Act, 2021	GDPR, 2018	Law No. 2020-1508	ARCOM & ARCEP	Implementation with active policies	There is a legislative framework
Germany	German Act Against Restraints of Competition (ARC), 2023	Copyright Act, 2021	GDPR, 2018	Media State Treaty, 2021	Federal Cartel Office, Federal Network Agency & Local Media Authorities	Implementation with active policies	There is a legislative framework
Ireland	Competition Act (Amendment in 2022)	Copyright and Other Intellectual Property Provisions Act, 2019	GDPR, 2018	Online Safety and Media Regulation Act, 2019	CCPC, ComReg & Media Commission	Absence of specialized legislation	There is a legislative framework
Netherlands	Competition Act, 2014	Copyright Act, 1912 (revisions 2017)	GDPR, 2018	Media Act, 2020	ACM & Dutch Media Authority (DMA)	Absence of specialized legislation	There is a legislative framework
United Kingdom	Competition Act, 2019	Copyright, Designs and Patents Act 1988 (revisions 2019)	Data Protection Act, 2018	Broadcasting Code (Ofcom, 2021)	Competition Markets Authority (CMA) & Ofcom	Implementation with active policies	There is a legislative framework
Norway	Competition Act (revisions 2023)	Copyright Act, 2019	GDPR, 2018	Broadcasting Act and Audiovisual Media Services Act, 2023	Nkom, Media Authority & Norwegian Competition Authority	Implementation with active policies	There is a legislative framework
Serbia	Law 95/2013	Copyright and Related Rights Act, 2019	Data Protection Law, 2018	Electronic Media Law, 2016	REM, RATEL & Competition Commission	Absence of specialized legislation	There is a legislative framework
Greece	Law 3959/2011 (amendment 2022)	Copyright Law 4481/2017	GDPR, 2018	Law 4779/2021	EETT, NCRTV & Hellenic Competition Commission	Absence of specialized legislation	There is a legislative framework
Italy	Competition - Law No.214, 2023	Copyright – Law No. 93, 2023	GDPR, 2018	Decree No. 208, 2021	Communications Authority (AGCOM) & Competition Authority (AGCM)	Implementation with active policies	There is a legislative framework
Turkey	Law No. 7333, 2024	Law No. 5846 on Intellectual and Artistic Works, 2021	Protection of Personal Data No. 6698 (LPPD), 2016	Law No. 6112, 2018 & Law No. 5809, 2018	The Radio and Television Supreme Council (RTÜK) & Turkish Competition Authority (TCA)	Implementation with active policies	Absence of specialized legislation

enforcing robust frameworks, while Greece and Serbia operate under older but revised laws. Turkey's 2024 competition law reflects its market adaptation. Authorities like Germany's Federal Cartel Office and the UK's CMA oversee compliance. Piracy laws also differ, with France's Digital Republic Act (2021), Germany's Copyright Act (2021), and Norway's Copyright

Act (2019) strengthening enforcement. The UK, Greece, and the Netherlands rely on older but updated copyright laws. Data protection is largely standardized under GDPR (2018), and Turkey follows its own framework. As for content regulation, all countries in the study—except Serbia—have adopted up-to-date regulatory frameworks addressing OTT services.

Regulatory authorities also differ, with France's ARCOM, Germany's multi-agency model, and the Netherlands' ACM providing structured oversight, while Serbia and Turkey follow a decentralized approach. International OTT taxation is enforced in France, Germany, and Italy but remains absent in Greece, Ireland, and Serbia. Net neutrality laws are upheld across all countries, ensuring non-discriminatory access. Turkey's inclusion in this study reflects its regulatory alignment with EU policies. The analysis reveals both convergence in data protection and net neutrality and divergence in competition, piracy enforcement, and taxation, highlighting the complexity of OTT governance in Europe.

### **3. Methodology**

This study employs a two-stage Network DEA framework (Lafuente, Ács, and Szerb 2024) and integrates standardized scales (Färe, Grosskopf, and Whittaker 2007) to assess regulatory factors. This approach ensures a consistent, comparative evaluation of regulatory efficiency and its impact on OTT platform performance across countries. The methodology unfolds in two stages, culminating in an overall efficiency score.

To provide a comprehensive global perspective on OTT platform regulation and performance, this study incorporates the 10 European countries—France, Germany, Ireland, Netherlands, United Kingdom, Norway, Serbia, Greece, Italy and Turkey—into a broader dataset alongside 21 other countries spanning all continents (total 31 countries). This expanded sample includes nations from North & Central America (e.g., United States, Mexico), Asia (e.g., South Korea, India), Africa (e.g., Egypt, Morocco), South America (e.g., Brazil, Argentina), and Oceania (e.g., Australia), ensuring a diverse representation of regulatory frameworks and market dynamics. By integrating these countries, the analysis captures varying approaches to competition, taxation, net neutrality, content regulation, piracy, data privacy, and regulatory structures, enabling a robust comparison of Europe's OTT ecosystem against global benchmarks using the two-stage Network DEA methodology.

In Stage 1, regulatory effectiveness ( $\theta_1$ ) is evaluated using as inputs: competition laws, content regulation laws, copyright laws for piracy controls, data protection laws, taxation policies, net neutrality rules, and regulatory authorities. These factors are scored on specific scales to reflect regulatory robustness (Sarkis, 2007).

For competition, content regulation, piracy and data security a 0–3 scale is applied: 0 indicates no policies exist; 1 denotes early legislation (pre-2018) focused on telecommunications or broadcasting; 2 reflects post-2018 updates with sectoral OTT regulations; and 3 signifies comprehensive OTT-specific rules post-2018. Taxation and net neutrality use a 0–1 binary scale: 0 represents no taxation policies for international OTT platforms or no clear/enforceable net neutrality laws; 1 indicates taxation policies for both local and international platforms or strong, enforceable net neutrality laws. For regulatory authority structures, a separate 0–3 scale is applied: 0 indicates no regulatory authorities; 1 represents a highly fragmented system with three or more distinct authorities; 2 denotes a moderately converged system with two regulatory bodies overseeing OTT services; and 3 signifies a single, fully converged authority managing all aspects of OTT regulation.

As far for the stage 2 ( $\theta_2$ ), due to the wide range of data, we applied a natural logarithm transformation,  $\ln(x)$ , to compress large values, stretch smaller ones, and reduce skewness. This approach stabilizes variance and preserves relative relationships, making the

data more suitable for statistical analysis.

For the stage 1 scores are normalized by dividing each by its scale's maximum (3 or 1), yielding values between 0 and 1. The regulatory effectiveness score ( $\theta 1$ ) is calculated as a weighted sum of these normalized inputs, with equal weights ( $Y_d = 1/7$ ) assigned to all seven factors.

The equation is:

$$\theta 1 = \max \sum_{d=1}^D Y_d \text{Norm}_{zdi}$$

Where:

$Y_d$  = : Weights for the regulation aspects for country  $i$ ,  $i = 1, \dots, N$

$d = 1, \dots, D$

$Y_d$  = : Weights for the regulation aspects for country  $i$

$\text{Norm}_{zdi}$  = The normalized score for each regulation aspect for country  $i$

max = the maximum weighted sum across all countries.

Additional Constraints:

$$Y_d > 0$$

$$\sum_{d=1}^D Y_d \text{Norm}_{zdi} \leq 1 \text{ (for all countries)}$$

Stage 2 evaluates OTT platform effectiveness ( $\theta 2$ ), integrating  $\theta 1$  as an input alongside platform-specific metrics—average revenue and average users drawn from (Statista b. 2025). These metrics undergo min-max normalization to a 0–1 scale, ensuring comparability across countries. Platform effectiveness ( $\theta 2$ ) is then calculated as the weighted sum of these normalized metrics, with equal weights ( $\omega_y = 1/2$ ) assigned to each, divided by  $\theta 1$  to reflect the influence of the regulatory environment.

The  $\theta 2$  equation is:

$$\theta 2 = \max \left( \sum_{y=1}^Y \omega_y \text{Norm}_{y_i} \right) / \theta 1$$

Where:

$i = 1, \dots, N$

$y = 1, \dots, Y$

$\text{Norm}_{y_i}$  = The normalized score for each platform aspect for country  $i$

$(\omega_y)$  = Weights for the platform aspects for country  $i$

Additional Constraints:

$$\sum_{y=1}^Y \omega_y \text{Norm}_{y_i} - \sum_{d=1}^D Y_d \text{Norm}_{zdi} \leq 0$$

$$\sum_{d=1}^D Y_d \text{Norm}_{zdi} = \theta 1$$

$$\theta 1 > 0$$

$$\omega_y > 0$$

Finally, the overall efficiency score ( $\theta_{\text{overall}}$ ) integrates  $\theta 1$  and  $\theta 2$ , providing a comprehensive measure of how regulatory frameworks correlate with OTT platform success.



The Overall equation is:

$$\theta_{overall} = \theta_1 \times \theta_2$$

#### 4. Results

The regulatory landscape for the OTT platforms across the selected European countries demonstrates significant evolution over time, as shown in Table 2. Prior to 2018, regulatory approaches were fragmented, with early legislation covering competition (20%), piracy (30%), and content regulation (20%). Post-2018 updates led to a substantial shift, with competition and piracy laws being updated in 80% and 70% of cases, respectively, and content regulation seeing a 70% update rate, with 10% of countries adopting comprehensive legislation.

Table 2. **Percentage Scores of OTT Regulation Across the selected European Countries**

Challenges	Score 1 (%) (Early Pre-2018 Legislation)	Score 2 (%) (Post-2018 Updates)	Score 3 (%) (Comprehensive OTT Legislation)
Competition	20%	80%	0
Piracy	30%	70%	0
Data Protection	0	100%	0
Content Regulation	20%	70%	10%
	<b>Score 1 (%) (3 or more distinct Authorities)</b>	<b>Score 2 (%) (2 Authorities )</b>	<b>Score 3 (%) (Single Converged Authority)</b>
Regulatory Authorities	60%	40%	0
	<b>Score 0 (%) (No Policy)</b>	<b>Score 1 (%) (Clear/Enforceable Policy)</b>	
Taxation	40%	60%	
Net Neutrality	10%	90%	

Data protection showed the highest uniformity, with 100% alignment to post-2018 regulations, reflecting the widespread adoption of GDPR or relevant regulations. Regarding regulatory authorities, 60% of countries maintain three or more distinct bodies, while 40% have consolidated into two. No country has yet fully converged regulation under a single authority. Taxation remains inconsistent, with 40% of countries lacking a clear policy, whereas 60% enforce taxation rules. Net neutrality policies are strongly established, with 90% of countries implementing enforceable policies.

Table 3 presents the Two-Stage Network Data Envelopment Analysis (DEA) efficiency scores across selected European countries. In Stage 1, France, the UK, Norway, and Italy exhibit the highest efficiency scores (0.9412), while Serbia and the Netherlands report the lowest (0.5882). In Stage 2, Turkey achieves the highest efficiency score (0.6056), whereas Serbia (0.0823) and Ireland (0.1761) have the lowest scores. When considering overall efficiency, the UK (0.5454) and Germany (0.5171) perform best, while Serbia (0.0484) and Ireland (0.1243) rank the lowest. This suggests that while most countries have implemented relatively efficient regulatory structures, effectiveness varies significantly in practice. Notably, some countries, such as France and Italy, demonstrate strong Stage 1 efficiency but experience a drop in Stage 2, indicating potential difficulties in enforcement or the practical application of regulations.

Conversely, Turkey, despite a moderate Stage 1 efficiency score, outperforms several peers in Stage 2, suggesting a relatively effective implementation phase.

**Table 3. Two-Stage NDEA: European Countries' Scores**

Country	Stage 1 Efficiency (θ1)	Stage 2 Efficiency (θ2)	Overall Efficiency (θoverall)
France	0.9412	0.5111	0.4810
Germany	0.8823	0.5860	0.5171
Ireland	0.7058	0.1761	0.1243
Netherlands	0.5882	0.2907	0.1710
UK	0.9412	0.5795	0.5454
Norway	0.9412	0.1927	0.1814
Serbia	0.5882	0.0823	0.0484
Greece	0.6471	0.2360	0.1523
Italy	0.9412	0.4727	0.4449
Turkey	0.6471	0.6056	0.3918

Table 4 highlights the average efficiency results for regions. North & Central America leads in overall efficiency (0.5631), followed by Asia-Pacific (0.3746) and Europe (0.3058). South America (0.2905) and MENA (0.2277) trail behind. Europe demonstrates moderate efficiency in Stage 1 (0.7823), indicating strong initial regulatory frameworks, but experiences a significant drop in Stage 2 (0.3732), suggesting challenges in enforcement and implementation. The MENA region exhibits the lowest efficiency in Stage 1 (0.5392) and overall efficiency (0.2277), pointing to weaker regulatory structures and enforcement mechanisms compared to other regions. These variations reflect differences in policy adoption, regulatory maturity, and market-specific challenges.

**Table 4. Average Efficiency Results by Region**

Region	Stage 1 Efficiency	Stage 2 Efficiency	Overall Efficiency	Countries Included
Europe	0.7823	0.3732	0.3058	France, Germany, Ireland, Netherlands, UK, Norway, Serbia, Greece, Turkey, Italy
North & Central America	0.9020	0.6512	0.5631	USA, Canada, Mexico
South America	0.7353	0.3839	0.2905	Brazil, Argentina, Chile, Uruguay
Asia-Pacific (APAC)	0.7206	0.5156	0.3746	India, South Korea, Singapore, Thailand, Taiwan, Japan, Australia, New Zealand
Middle East & North Africa (MENA)	0.5392	0.4476	0.2277	Israel, Egypt, Morocco, Saudi Arabia, Algeria, Tunisia

## 5. Concluding Remarks

The results indicate that European countries with modern, well-structured regulations achieve higher regulatory efficiency (Stage 1 efficiency scores), particularly those with post-2018 legislative updates, such as Germany's "Act Against Restraints of Competition (ARC, 2023)" and the UK's "Competition Act (2019)." Countries with converged or moderately converged regulatory authorities, such as Ofcom in the UK, demonstrate more effective oversight, ensuring stronger compliance with competition, piracy, and data protection policies. Furthermore, countries that incorporate taxation frameworks specific to international OTT platforms—such as France's digital services tax—also exhibit higher regulatory efficiency. Net neutrality provisions, which are present in nearly all examined countries, further reinforce regulatory efficiency by ensuring fair market conditions for both domestic and international OTT platforms. The highest efficiency scores are observed in Germany and the UK, followed closely by France. In contrast, countries with fragmented regulatory oversight and outdated legislation, such as the Netherlands, Greece, Turkey and Serbia, experience significant inefficiencies, as reflected in their lower efficiency scores. While the EU provides a broad regulatory framework, national disparities in implementation and infrastructure limit the effectiveness of regulation across Europe. These findings underscore the necessity of continuous regulatory adaptation to evolving digital market dynamics.

When assessing platform efficiency (Stage 2 efficiency scores) based on regulatory inputs, significant disparities emerge among European nations. The UK demonstrates the highest platform efficiency, benefiting from regulatory stability, taxation policies, and strong data protection laws under the Data Protection Act (2018). France, despite its high regulatory efficiency, registers a lower platform efficiency score, indicating that effective regulation alone does not guarantee strong market performance. Germany, with a robust regulatory framework, showcases a more balanced approach between regulation and platform efficiency. The overall efficiency ranking reinforces these findings, with the UK maintaining the highest score, followed by Germany and France. Conversely, Greece, Serbia, and the Netherlands register the lowest platform efficiency scores, suggesting that inefficiencies in regulatory oversight contribute to weaker market performance. These findings highlight that while regulation is a key enabler of market efficiency, additional factors—such as digital infrastructure, broadband penetration, competition with traditional media, and consumer adoption—may play crucial roles in determining platform success (Chen 2019; Katz, Jung, and Callorda 2024; Nhedzi 2018) .

Regulatory efficiency in Europe varies significantly across countries, with some, such as the UK and Germany, demonstrating strong performance, while others, including the Netherlands, Ireland, Greece, and Serbia, exhibit inconsistencies in both regulatory effectiveness and platform outcomes. Although the EU framework establishes overarching regulatory principles, national disparities in implementation and infrastructure continue to hinder uniform efficiency (van Duijvenvoorde 2022). In particular, the Netherlands' relatively lower efficiency scores highlight the limitations of fragmented enforcement, restricting its ability to fully leverage EU-wide regulations. As Biggam (2015) argues, a shift from directive-based governance to directly applicable regulations could facilitate a more cohesive and adaptive regulatory landscape across member states.

A global comparison of efficiency scores further underscores Europe's challenges in balancing regulation and market success. North & Central America emerges as the most efficient region (0.5631), benefiting from streamlined governance and market-driven adaptability. The Asia-Pacific region (0.3746) maintains moderate performance, with

technologically advanced economies compensating for weaker regulatory structures in emerging markets. Europe (0.3058), despite its structured regulatory approach, struggles with scalability and market performance. Meanwhile, Latin America (0.2905) and the Middle East & Africa (0.2277) continue to experience inefficiencies, highlighting a persistent gap between regulatory intent and market outcomes.

A key differentiator between Europe and North & Central America lies in regulatory convergence. While countries such as the USA, Canada, and Mexico have consolidated regulatory authorities—ensuring more efficient governance—Europe remains fragmented, with separate bodies overseeing telecommunications, competition, and media policies. This institutional separation reduces enforcement efficiency and slows regulatory adaptation. Taxation policies also vary significantly across Europe, with only a few countries, such as France, implementing digital taxes on international OTT platforms, leading to inconsistent market conditions. Conversely, North American economies operate under more uniform and up-to-date legislative frameworks, providing greater market predictability. However, Europe holds a distinct advantage in data protection, with GDPR and similar regulations ensuring a high level of privacy standards across both EU and non-EU countries. In contrast, North America lacks uniform data privacy protections, with regulatory fragmentation at the national and state levels creating significant disparities.

While Europe demonstrates strong regulatory efficiency, particularly in areas like data protection and net neutrality, it lags behind North America and certain Asia Pacific countries in implementing specific legislation tailored to the unique challenges of OTT platforms. Notably, several nations in these regions have enacted laws explicitly addressing content regulation for streaming services, a practice observed within Europe only in Norway. This disparity highlights a crucial area for improvement within European regulatory frameworks. The forthcoming Media Act in the UK, slated for 2025, represents a promising step towards addressing this gap, signaling a potential shift towards more targeted and effective OTT governance across the continent (Government of the United Kingdom 2024). European countries must prioritize the development and implementation of explicit OTT-specific regulations to ensure a level playing field and foster a competitive digital ecosystem.

These findings suggest that while Europe has established a comprehensive regulatory foundation, its effectiveness remains constrained by fragmented oversight and slow implementation. Addressing these inefficiencies through greater regulatory convergence and a shift toward directly applicable legislation could enhance Europe's ability to govern OTT platforms more effectively and improve overall market outcomes.

Overall, this study delivers a robust and insightful evaluation of OTT regulatory efficiency and its consequential impact on platform performance, spanning Europe and beyond. Its innovative integration of regulatory efficiency into platform performance assessments offers a fresh perspective on the dynamic relationship between governance and market outcomes. Notably, the findings underscore the benefits of up-to-date legislation, converged or moderately converged regulatory authorities, strategic taxation frameworks for international platforms, and robust net neutrality provisions in driving market efficiency. By providing a clear comparative analysis, the research illuminates Europe's position within the global OTT landscape, revealing that while Europe scores well in regulatory measures, particularly behind North & Central America, it faces challenges in translating these scores into overall market performance. This stems from the lack of a unified regulatory body or legislation, leading to discrepancies in implementation across member states – some implement taxation while others do not, regardless of EU directives. As digital markets rapidly

evolve, this study lays a critical foundation for future regulatory research, emphasizing the imperative of adaptive policies to cultivate competitive and efficient OTT ecosystems.

## 6. Limitations and Future Research

Despite its valuable findings, this study acknowledges limitations that point to future research avenues. Future studies could enhance the two-stage Network DEA model by incorporating consumer satisfaction and technological innovation metrics, besides revenues and users. In addition, This research accounts for legal frameworks and regulations up to early 2024; nonetheless, subsequent laws and updates may have emerged, which warrants attention, acknowledging that certain nations might have implemented prior classifications via recent amendments, though these changes may not apply to OTT platforms, leaving the classification in this study unchanged.

Additionally, exploring alternative weighting schemes for regulatory factors could provide a more nuanced evaluation than the current equal-weighting approach. A more detailed examination of specific policies, such as net neutrality or copyright enforcement, could further illuminate the complexities of the OTT regulatory landscape. While regional categorization provides valuable insights, future studies could benefit from alternative classifications, like distinguishing between Western and Eastern countries, to better capture regional variations and regulatory contexts.

Finally, this study views copyright as the main legal shield against piracy on OTT platforms. Yet not every country relies solely on some unique rules, agencies, and tools. For data protection, independent data authorities and, in certain nations, cybersecurity bodies handle broad internet data, but they're not key regulators for OTT here, playing a supporting role instead. Media, telecom, and competition agencies take the lead. This focus limits the study, as it doesn't fully cover varied national tactics. Future work could expand on this or stand alone, using this study (network DEA) or a different approach. While this paper focuses primarily on Europe, future research will address the complete dataset, offering a global assessment of OTT regulatory effectiveness and market performance.

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## References

- Adermon, Adrian, and Che-Yuan Liang. 2014. "Piracy and Music Sales: The Effects of an Anti-Piracy Law." *Journal of Economic Behavior & Organization* 105:90–106. doi: 10.1016/j.jebo.2014.04.026.
- Bais, Simran. 2021. "Regulation of OTT Services: An International Perspective." *SSRN Electronic Journal*. doi: 10.2139/ssrn.3924770.
- Baladron, Mariela, and Ezequiel Rivero. 2019. "Video-on-Demand Services in Latin America: Trends and Challenges towards Access, Concentration and Regulation." *Journal of Digital Media & Policy* 10(1):109–26. doi: 10.1386/jdmp.10.1.109\_1.
- Biggam, Ross. 2015. "The Challenges for Public Policy of Adjusting to a Multi-Platform Environment." *Journal of Media Business Studies* 12(1):89–102. doi: 10.1080/16522354.2015.1027111.

- Borja, Karla, Shannon Rodriguez, and Christopher Roby. 2024. "Streaming Movies, Series and Shows: Attitudes and Beliefs among Gen Zers." *Young Consumers*. doi: 10.1108/YC-04-2024-2057.
- Chen, Yi Ning Katherine. 2019. "Competitions between OTT TV Platforms and Traditional Television in Taiwan: A Niche Analysis." *Telecommunications Policy* 43(9). doi: 10.1016/j.telpol.2018.10.006.
- Chitranshi, Bhavya, and Anup Dhar. 2018. "Rethinking Development Communication." in *Oxford Research Encyclopedia of Communication*. Oxford University Press.
- Cunningham, Stuart, and Oliver Eklund. 2022. "State Actor Policy and Regulation Across the Platform-SVOD Divide." Pp. 191–208 in *Digital Platform Regulation. Palgrave Global Media Policy and Business.*, edited by T. Flew and F. R. Martin. Palgrave Macmillan.
- van Duijvenvoorde, Gera. 2022. "Regulating Connectivity: Linking the EU Telecommunications Framework to the Digital Future." Pp. 63–96 in *The Interaction of Competition Law and Sector Regulation*. Edward Elgar Publishing.
- Dwyer, Tim. 2010. *Media Convergence*. 1st ed. New York: McGraw-Hill Education.
- Enli, Gunn, Tim Raats, Trine Syvertsen, and Karen Donders. 2019. "Media Policy for Private Media in the Age of Digital Platforms." *European Journal of Communication* 34(4):395–409. doi: 10.1177/0267323119861512.
- Evens, Tom, and Karen Donders. 2020. "Regulating Digital Platform Power." *Journal of Digital Media & Policy* 11(3):235–39. doi: 10.1386/jdmp\_00024\_2.
- Färe, Rolf, Shawna Grosskopf, and Gerald Whittaker. 2007. "Network DEA." Pp. 209–40 in *Modeling Data Irregularities and Structural Complexities in Data Envelopment Analysis*. Boston, MA: Springer US.
- Flew, Terry. 2015. "Content Regulation." Pp. 1–10 in *The International Encyclopedia of Digital Communication and Society*. Wiley.
- Flew, Terry. 2021. "The Challenge of Media Platform Regulation for Small and Medium-Sized Nations." *SSRN Electronic Journal*. doi: 10.2139/ssrn.3951610.
- Flew, Terry, Fiona Martin, and Nicolas Suzor. 2019. "Internet Regulation as Media Policy: Rethinking the Question of Digital Communication Platform Governance." *Journal of Digital Media & Policy* 10(1):33–50. doi: 10.1386/jdmp.10.1.33\_1.
- Fredriksson, Martin. 2020. "Information Commons Between Enclosure and Exposure: Regulating Piracy and Privacy in the EU." *International Journal of the Commons* 14(1):494–507. doi: 10.5334/ijc.1034.
- Government of the United Kingdom. 2024. "Media Act 2024." *UK Public General Acts*. Retrieved March 14, 2025 (<https://www.legislation.gov.uk/ukpga/2024/15>).
- Hobbs, John Maxwell. 2023. "Securing the Digital Frontier: Effective Anti-Piracy Approaches for OTT Platforms." Retrieved March 21, 2024 (<https://www.ibt.org/features/securing-the-digital-frontier-effective-anti-piracy-approaches-for-ott-platforms/10469.article>).

- Iosifidis, Petros. 2002. "Digital Convergence: Challenges for European Regulation." *Javnost* 9(3):27–47. doi: 10.1080/13183222.2002.11008805.
- Just, Natascha. 2018. "Governing Online Platforms: Competition Policy in Times of Platformization." *Telecommunications Policy* 42(5):386–94. doi: 10.1016/j.telpol.2018.02.006.
- Katz, Raul, Juan Jung, and Fernando Callorda. 2024. "The Role of Video on Demand in Stimulating Broadband Adoption." *Telecommunications Policy* 48(4):102751. doi: 10.1016/j.telpol.2024.102751.
- Kerševan Smokvina, Tanja. 2021. "'Netflix Tax' from the Perspective of National and EU Audiovisual Policies and What It Brings to Film Funding in Small States." *Journal of Digital Media & Policy* 12(3):471–88. doi: 10.1386/jdmp\_00076\_1.
- Kwak, Dongchul, and Minjung Kim. 2020. "Trade Negotiations in the Digital Era: The Case of OTT Video Streaming Services." *Global Policy* 11(S2):14–22. doi: 10.1111/1758-5899.12819.
- Lafuente, Esteban, Zoltán J. Ács, and László Szerb. 2024. "Analysis of the Digital Platform Economy around the World: A Network DEA Model for Identifying Policy Priorities." *Journal of Small Business Management* 62(2):847–91. doi: 10.1080/00472778.2022.2100895.
- Malone, Jacob B., Aviv Nevo, Zachary Nolan, and Jonathan W. Williams. 2023. "Is OTT Video a Substitute for TV? Policy Insights from Cord-Cutting." *Review of Economics and Statistics* 105(6):1615–23. doi: 10.1162/rest\_a\_01132.
- Meese, James. 2020. "Telecommunications Companies as Digital Broadcasters: The Importance of Net Neutrality in Competitive Markets." *Television & New Media* 21(5):530–46. doi: 10.1177/1527476419833560.
- Menon, Siddhartha. 2006. "Policy Initiative Dilemmas Surrounding Media Convergence: A Cross National Perspective 1." *Prometheus* 24(1). doi: 10.1080/08109020600563937.
- Napoli, Philip M., and Deborah L. Dwyer. 2018. "U.S. Media Policy in a Time of Political Polarization and Technological Evolution." *Publizistik* 63(4):583–601. doi: 10.1007/s11616-018-0440-2.
- Nhedzi, Abyshey. 2018. "The Relationship between Traditional and Digital Media as an Influence on Generational Consumer Preference." *COMMUNITAS* 23(1):18–38. doi: 10.18820/24150525/Comm.v23.2.
- Poell, Thomas, David Nieborg, and José van Dijck. 2019. "Platformisation." *Internet Policy Review* 8(4). doi: 10.14763/2019.4.1425.
- Ramasoota, Pirongrong, and Abhibhu Kitikamdhorn. 2021. "'The Netflix Effect' in Thailand: Industry and Regulatory Implications." *Telecommunications Policy* 45(7):102156. doi: 10.1016/j.telpol.2021.102156.
- Statista a. (2025), "Video-on-Demand - Worldwide". Retrieved: February 29, 2025 (<https://www.statista.com/outlook/dmo/digital-media/video-on-demand/worldwide?currency=EUR>).

- Statista b. 2025. "OTT Video - Europe." Retrieved February 21, 2025 (<https://www.statista.com/outlook/amo/media/tv-video/ott-video/europe?currency=EUR>).
- Storsul, Tanja, and Trine Syvertsen. 2007. "The Impact of Convergence on European Television Policy." *Convergence: The International Journal of Research into New Media Technologies* 13(3):275–91. doi: 10.1177/1354856507079177.
- Szabó, Andrea, and Vinh Pham. 2022. "Net Neutrality and Consumer Demand in the Video On-Demand Market." *Information Economics and Policy* 61:100993. doi: 10.1016/j.infoecopol.2022.100993.
- Tana, Jonas, Emil Eirola, and Mats Nylund. 2020. "When Is Prime-Time in Streaming Media Platforms and Video-on-Demands Services? New Media Consumption Patterns and Real-Time Economy." *European Journal of Communication* 35(2):108–25. doi: 10.1177/0267323119894482.
- Tefertiller, Alec. 2018. "Media Substitution in Cable Cord-Cutting: The Adoption of Web-Streaming Television." *Journal of Broadcasting & Electronic Media* 62(3):390–407. doi: 10.1080/08838151.2018.1451868.
- Tekin Bilbil, E. 2018. "Methodology for the Regulation of Over-the-Top (OTT) Services: The Need of A Multi-Dimensional Perspective." *International Journal of Economics and Financial Issues* 101–10. doi: 10.32479/ijefi.5809.
- Vanberg, Aysem Diker. 2023. "Coordinating Digital Regulation in the UK: Is the Digital Regulation Cooperation Forum (DRCF) up to the Task?" *International Review of Law, Computers & Technology* 37(2):128–46. doi: 10.1080/13600869.2023.2192566.
- Vázquez, Juan Manuel. 2023. "Digital Services Taxes in the European Union: What Can We Expect?" *Kluwer International Tax Blog*. Retrieved March 21, 2024 (<https://kluwertaxblog.com/2023/02/14/digital-services-taxes-in-the-european-union-what-can-we-expect/>).
- Wang, Shujen. 2021. "Platformization, Pan-Entertainment and Piracy: What the Fast-Changing Chinese Mediasphere Tells Us about Technology, Policy and the State." *Journal of Digital Media & Policy* 12(2):293–309. doi: 10.1386/jdmp\_00043\_1.