

Business Model Responses to Consumer Circumvention: Lessons from Piracy Applied to VPN-Enabled Geo-Arbitrage

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Abstract

This document outlines the structure for a thesis investigating business model responses to VPN-enabled geo-arbitrage. It begins by defining the core problem and research path. The study employs a mixed-methods approach to first quantify international price differentiation for digital services via a "Digital Services Price Index" (DSPI) and then qualitatively analyze the strategic responses of both digital service providers and VPN providers. The research draws parallels between modern geo-arbitrage and historical digital piracy to understand the pressures on existing business models and the drivers for innovation.

Keywords:

Contents

1	Introduction	5
1.1	Background and Context	5
1.2	Problem Statement	5
1.3	Research Questions (RQs)	6
1.4	Structure of the Thesis	6
2	Theoretical Foundations & Literature Review	7
2.1	Economic Foundations of International Price Setting	7
2.1.1	Third-Degree Price Discrimination	7
2.1.2	Purchasing Power Parity (PPP) as a Benchmark	8
2.2	Consumer Circumvention and the Piracy Parallel	8
2.2.1	The Piracy Analogue	8
2.2.2	The Three-Level Mechanism of Circumvention	9
2.3	Strategic Management and Business Model Innovation	9
2.3.1	Theoretical Framework: Protection vs. Pricing	10
2.3.2	Platforms and Ecosystem Control	10
2.4	Research Gap	11
3	Research Methodology	12
3.1	Research Design	12
3.2	Phase 1: Quantitative Data Collection & Analysis (for RQ1)	12
3.2.1	Data Collection	12
3.2.2	Data Analysis	13
3.3	Phase 2: Qualitative Data Collection & Analysis (for RQ2)	13
3.3.1	Qualitative Data Collection & Analysis	13
3.4	Advanced Classification Pipeline: Transition to Large Language Models	13
3.4.1	Model Selection and Rationale	14
3.4.2	Operationalization of Constructs (The Coding Scheme)	14
3.4.3	Pipeline Architecture and Implementation	15

3.4.4	Methodological Validation: Gemini vs. Zero-Shot BERT	16
3.4.5	Standard Qualitative Coding	17
3.5	Analysis	18
4	Results	19
4.1	The Landscape of International Pricing: Findings from the DSPI	19
4.2	Classification Results	19
4.2.1	Distribution of Enforcement Categories	19
4.2.2	Service-Specific Analysis	20
4.2.3	Temporal Evolution of Enforcement	21
4.2.4	High-Confidence Findings: The "Smoking Gun" Clauses	21
4.3	The Digital Services Price Index (DSPI)	22
4.3.1	Magnitude of the Arbitrage Incentive	22
4.4	Strategic Framing, Actions, and Tone by Digital Service Providers	23
4.5	Strategic Framing, Actions, and Tone by VPN Providers	23
5	Discussion	26
5.1	The Strategic Archetypes of Geo-Arbitrage	26
5.1.1	The Fortress Strategy (Coercive)	26
5.1.2	The Globalist Strategy (Adaptive)	27
5.2	Implications for Business Model Innovation	27
5.3	Managerial Implications	27
5.4	Limitations	28
6	Conclusion	29
6.1	Summary of Key Findings	29
6.2	Contribution to Research	29
6.3	Future Outlook	30
Bibliography		31
List of Figures and Tables		32
Glossary and Acronyms		33

1 Introduction

1.1 Background and Context

The globalization of digital services has created a paradox in the modern digital economy. While the internet promises a borderless exchange of information, digital service providers (DSPs) such as Netflix, Spotify, and Steam enforce rigid digital borders to maximize profits through international price differentiation. This strategy, deeply rooted in economic theories of third-degree price discrimination, allows firms to charge widely varying prices for identical digital goods based on the purchasing power of the consumer's location.

However, this segmentation strategy faces a formidable disruptive force: the consumer. Equipped with increasingly accessible circumvention technologies like Virtual Private Networks (VPNs), consumers are engaging in "digital geo-arbitrage"—the practice of virtually relocating to a cheaper market to purchase services at a fraction of the domestic price. This phenomenon mirrors the disruption caused by digital piracy in the early 2000s, where technical barriers were circumvented to access content, fundamentally challenging the music and film industries' business models.

1.2 Problem Statement

The core problem addressed in this thesis is the strategic conflict between a firm's geographic market segmentation and the technical circumventability of these digital borders. Firms are currently trapped in a "cat-and-mouse" game:

1. **Economic Necessity:** They must segment markets to remain affordable in low-income regions while maximizing revenue in high-income nations.

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2. **Technical Reality:** The same internet architecture that enables global delivery also enables global circumvention.

This tension challenges the economic viability of established business models and creates pressure for Business Model Innovation (BMI). Firms must choose between "Coercive" strategies (blocking, banning, litigation) and "Adaptive" strategies (price harmonization, global portability).

1.3 Research Questions (RQs)

To analyze this strategic conflict, this thesis pursues the following research questions:

RQ1 (The Economic Incentive): To what extent does international price differentiation for digital services deviate from Purchasing Power Parity (PPP), creating a "super-normal" incentive for arbitrage? (Note: This question serves primarily to establish the research setting and economic motivation).

RQ2 (The Strategic Response): How do digital subscription providers modify their business model in response to regional pricing circumvention and how has the mix of coercive versus adaptive responses reflected in their corporate disclosures changed over time?

1.4 Structure of the Thesis

The thesis is structured as follows: **Chapter 2** establishes the theoretical foundations, linking price discrimination theory with the behavioral mechanics of circumvention. **Chapter ??** details the mixed-methods research design, including the novel "Digital Services Price Index" (DSPI) and the LLM-based classification pipeline. **Chapter ??** presents the empirical findings. **Chapter 5** interprets these results within the framework of Business Model Innovation, and **Chapter 6** summarizes the contributions and limitations of the study.

2 Theoretical Foundations & Literature Review

This chapter establishes the theoretical lens for the thesis, connecting economic axioms of international pricing with strategic management literature and the behavioral science of consumer circumvention.

2.1 Economic Foundations of International Price Setting

The strategy of geo-arbitrage is fundamentally a market response to price differentiation. To understand the consumer's incentive, we must first analyze the firm's motivation for segmentation.

2.1.1 Third-Degree Price Discrimination

According to Varian (1989), third-degree price discrimination occurs when a firm segments the market based on observable characteristics—in this case, geographic location—and charges different prices to each segment. For digital goods, where the marginal cost of reproduction is near zero ($MC \approx 0$), this strategy allows firms to capture the maximum consumer surplus from both high-income (e.g., Switzerland) and low-income (e.g., Turkey) markets simultaneously.

- *Condition 1: Market Segmentation.* The firm must be able to distinguish between consumer groups (e.g., via IP address).
- *Condition 2: No Arbitrage.* The firm must be able to prevent the resale or transfer of the good between segments.

VPN-enabled geo-arbitrage directly attacks *Condition 2*, technically effectively merging the distinct market segments back into a single global market.

2.1.2 Purchasing Power Parity (PPP) as a Benchmark

The "Law of One Price" suggests that in an efficient market, identical goods should trade at the same price. However, deviations are common. Rogoff (1996) argues that for physical goods, transportation costs justify price dispersion. In the digital realm, Clemons et al. (2002) observe that while friction is lower, price differentiation persists due to granular customer segmentation. We employ the Purchasing Power Parity (PPP) metric as a benchmark for "fair" pricing. If a Netflix subscription in Turkey is cheaper than in the US solely due to currency valuation and local purchasing power, it aligns with standard economic theory. However, if the price difference exceeds the PPP adjustment, it creates a "super-normal" arbitrage incentive, which we quantify via the Digital Services Price Index (DSPI).

2.2 Consumer Circumvention and the Piracy Parallel

Consumer-driven arbitrage is not a new phenomenon. The digital "geo-arbitrage" dynamic mirrors the historical evolution of digital piracy.

2.2.1 The Piracy Analogue

Oberholzer-Gee and Strumpf (2007) demonstrated that file-sharing acted as a form of "unbundled" consumption that forced the music industry to innovate (e.g., iTunes, Spotify). Similarly, VPN usage can be viewed not merely as "theft" of localized pricing, but as a market signal indicating a misalignment between the firm's rigid regional offers and the global nature of the internet.

- *Access vs. Price:* Just as piracy was often driven by a lack of legal availability (availability piracy), geo-arbitrage is partially driven by content licensing restrictions (e.g., "This video is not available in your country").

2.2.2 The Three-Level Mechanism of Circumvention

Drawing from behavioral ethics literature and the work of Wang et al. (2014) on digital piracy, the decision to engage in geo-arbitrage can be modeled as a three-level mechanism. This framework helps explain why otherwise law-abiding consumers engage in "digital smuggling":

1. **Individual Level (Rational Choice / Personal Risk):** The consumer performs a cost-benefit analysis. The financial gain (e.g., a 70% discount on Netflix Turkey) is weighed against the perceived probability of detection and the severity of the punishment (e.g., account termination). Given that "shadow bans" are often silent and reversible, the perceived risk is often low.
2. **Inter-personal Level (Social Influence):** The behavior is reinforced by online communities (e.g., Reddit, Discord). When a user sees thousands of others successfully using a VPN without consequence, the "social proof" lowers the psychological barrier to entry.
3. **Societal Level (Moral Intensity):** The perception of the act is pivotal. Unlike shoplifting a physical good, digital arbitrage is often framed by users not as theft, but as a "clever hack" or a reaction to "unfair" corporate pricing. This "Neutralization Technique" allows users to disengage their moral controls.

2.3 Strategic Management and Business Model Innovation

Faced with this disruption, firms must adapt. We analyze their responses through the lens of Business Model Innovation (BMI). As defined by Wirtz et al. (2016) and further categorized by Foss and Saebi (2017), BMI involves rethinking the value proposition and delivery mechanisms in response to external shocks.

2.3.1 Theoretical Framework: Protection vs. Pricing

To categorize firm responses, we adopt the framework established by Sundararajan (2004) on managing digital piracy. Sundararajan distinguishes between two primary levers:

- **Protection (Coercive Strategy):** Increasing the technological or legal costs of piracy (or in our case, circumvention).
- **Pricing (Adaptive Strategy):** Adjusting the business model (pricing, versioning) to lower the economic incentive for piracy.

We map these concepts directly to our analysis of "Coercive" (Protection-focused) versus "Adaptive" (Pricing/Value-focused) Business Model Innovations.

- **Enforcement Costs:** The cost of implementing VPN detection systems, SMS verification integration, and manual account reviews.
- **Friction Costs:** Every barrier added to stop arbitrage (e.g., requiring a local credit card) also adds friction for legitimate customers, potentially lowering conversion rates.

Firms face a trade-off: Is the cost of enforcing segmentation lower than the revenue lost to arbitrage?

2.3.2 Platforms and Ecosystem Control

As noted by Boudreau (2010), digital platforms must manage the tension between openness (growth) and control (monetization). VPN providers interact with this ecosystem as "parasitic" complements—they derive value from the platform (Netflix) while undermining its monetization logic. This creates a "cat-and-mouse" technical arms race, characterized by:

- **Coercive Strategies:** Legal threats, IP bans, and strict payment method validation (The "Fortress" approach).
- **Adaptive Strategies:** Harmonizing prices or creating "globally portable" tiers to reduce the incentive for circumventing (The "Globalist" approach).

2.4 Research Gap

While price discrimination (Varian) and platform strategy (Eisenmann et al., 2011) are well-researched, there is a lack of empirical work connecting the *magnitude* of the pricing incentive (DSPI) typically available in the digital services market with the *specific strategic responses* of firms. Most studies focus on either the economics (pricing) or the law (copyright), but rarely on the strategic interaction mediated by consumer-side technology (VPNs). This thesis closes this gap by quantifying the incentive and analyzing the corporate response.

3 Research Methodology

This chapter details how the research will be conducted.

To operationalize the 'Coercive' and 'Technical Barrier' constructs, this study employs the 'Litigious' and 'Constraining' word lists developed by Loughran and McDonald (2011), which are the established standard for detecting legal risk and restriction in financial texts.

3.1 Research Design

- A mixed-methods approach is used.
- Combines quantitative analysis (to build and test the DSPI) with qualitative analysis (to understand strategic responses).

3.2 Phase 1: Quantitative Data Collection & Analysis (for RQ1)

3.2.1 Data Collection

- Development of the Digital Services Price Index (DSPI).
- Service Selection: Streaming, SaaS, gaming.
- Country Selection: High-, middle-, and low-income countries.
- Method: VPN-controlled price sampling.
- Data Points: Price, currency, and Purchasing Power Parity (PPP) data.

3.2.2 Data Analysis

- Normalization of prices across different currencies and markets.
- Calculation of the DSPI.
- Statistical analysis (e.g., ANOVA, regression) to identify patterns and drivers of price differentiation.

3.3 Phase 2: Qualitative Data Collection & Analysis (for RQ2)

3.3.1 Qualitative Data Collection & Analysis

The analysis follows a systematic coding approach inspired by the **Gioia Methodology** (Gioia et al., 2013). This involves structuring data into 1st-order concepts (raw terms found in text), 2nd-order themes (theoretical categories like "Technical Blocking"), and aggregate dimensions (Strategic Responses). While initially conceptualized for manual coding (Duriau et al., 2007), this hierarchical structure provided the logic for the automated classification pipeline described below.

3.4 Advanced Classification Pipeline: Transition to Large Language Models

To address the limitations of traditional Natural Language Inference (NLI) models in capturing the nuanced legal and technical language of Terms of Service (ToS), this study implemented an advanced classification pipeline leveraging state-of-the-art Large Language Models (LLMs). Specifically, the pipeline was upgraded from a BERT-based architecture (DeBERTa-v3-large) to the *Gemini 3 Flash* model, accessed via the Google Generative AI API.

3.4.1 Model Selection and Rationale

The selection of *Gemini 3 Flash* was driven by the need for deeper reasoning capabilities and context awareness. Unlike NLI models, which classify based on entailment probabilities between a premise and a hypothesis, generative LLMs can interpret complex sentence structures and ambiguous legal standard terms (“General Terms”) versus specific geo-arbitrage restrictions.

Key advantages observed during the model transition included:

- **Contextual Understanding:** The ability to distinguish between benign references to “account suspension” (e.g., for fraud) and strategic “Account Actions” tailored to prevent cross-border usage.
- **Zero-Shot Performance:** The model demonstrated high accuracy without extensive fine-tuning, utilizing a robust system prompt to align with the theoretical categories defined in Section 2.
- **Efficiency:** The “Flash” architecture provided a high throughput of approximate 2 sentences per second, enabling the processing of the entire dataset (approx. 25,000 sentences) within a reasonable timeframe.

3.4.2 Operationalization of Constructs (The Coding Scheme)

Based on the theoretical framework and preliminary research, the following coding scheme was developed and enforced via the LLM system prompt. This scheme maps the abstract concept of "Strategic Response" into measurable data points.

Strategic Frames

The model was tasked to identify the underlying justification provided by the firm:

Frame: Legal Compliance Justifying geo-blocking as a non-negotiable legal or contractual necessity (e.g., "Due to licensing agreements...").

Frame: User Freedom (Primarily for VPNs) Presenting circumvention as a user's right to access content or an open internet.

Frame: Privacy/Security Justifying VPN use primarily through the lens of data protection, with streaming benefits framed as secondary.

Firm Actions

The model categorized specific enforcement clauses into:

Action: Technical Blocking Measures to detect or block technical detection of location (VPN, proxy, DNS proxy, IP masking).

Action: Account Action Punitive measures against accounts (termination, suspension, verification demands).

Action: Price Discrimination Explicit differences in pricing based on region, currency, or purchasing power.

Action: Legitimate Portability Rules allowing temporary access while traveling (e.g., EU Portability Regulation).

3.4.3 Pipeline Architecture and Implementation

The reclassification process was automated using a customized Python script designed for scientific rigor and reproducibility.

Prompt Engineering

To ensure deterministic and theoretically grounded outputs, the system prompt was engineered with strict constraints. The temperature parameter was set to 0.0 to eliminate randomness. The prompt explicitly defined the eight mutually exclusive categories listed above. The model was instructed to output results solely in a machine-readable JSON format, containing the assigned category and a confidence score (0.0 – 1.0).

Batch Processing and Error Handling

To optimize for the API's rate limits and ensure data integrity, the pipeline utilized a batch processing approach. Sentences were grouped into batches of 25 and processed in a single API call. This method significantly reduced network overhead and total processing time. A robust error-handling mechanism was implemented to manage API timeouts or rate limits (HTTP 429). The script included a "circuit breaker" to halt execution upon repeated failures and a resume function to continue processing from the last saved state.

3.4.4 Methodological Validation: Gemini vs. Zero-Shot BERT

To validate the choice of the Gemini 3 Flash model, a comparative analysis was conducted against a traditional Zero-Shot classification approach using a BERT-based model. The results demonstrated a massive divergence between the two models, reinforcing the necessity of using a modern LLM with large context windows for this specific task.

Agreement Analysis

The comparison revealed an exceedingly poor agreement rate of **26.8% (Accuracy)** between the two models. The Cohen's Kappa score was **0.032**, suggesting that the agreement was effectively equivalent to random chance. This discrepancy indicated a fundamental difference in how each model interpreted the classification tasks.

The Core Conflict: Sensitivity vs. Context

The analysis highlighted two distinct behaviors:

1. **Gemini (The Contextual Expert):** The Gemini model correctly identified that approximately **91%** of the dataset consisted of legal boilerplate, categorized as "General Terms." It successfully ignored the noise inherent in legal documents.

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2. **BERT (The Keyword Hunter):** The BERT model exhibited "Over-Sensitivity," hallucinating specific strategic tags based on the presence of keywords rather than semantic context.

Specific examples of BERT's misclassification included:

- **Legitimate Portability:** BERT flagged 7,853 sentences as "Legitimate Portability" that were merely "General Terms."
- **Account Action:** BERT flagged 6,134 "General Terms" sentences as "Account Action."

Interpretation: BERT operates on keyword associations; for example, flagging a sentence like "You must have an account" as an "Account Action." In contrast, Gemini utilizes its reasoning capabilities to understand that the mere mention of an "account" is standard boilerplate ("General Terms") and reserves the "Account Action" tag for sentences explicitly regulating banning or suspension.

Conclusion on Model Selection

The validation proves that Zero-Shot BERT is insufficient for complex legal text analysis without extensive fine-tuning. It lacks the nuance required to distinguish between the mere mention of a topic (e.g., "portability") and the active regulation of it. Gemini, leveraging its massive context window and advanced reasoning capabilities, performs significantly better at filtering out noise and providing accurate stratifications. Consequently, Gemini 3 Flash was selected as the sole model for the final analysis.

3.4.5 Standard Qualitative Coding

In addition to the automated pipeline, manual qualitative coding is applied to a sub-sample to capture themes that escape rigid categorization, such as the specific "tone" of VPN provider marketing (e.g., empowering vs. technical).

3.5 Analysis

Description of the analytical process and data handling procedures, excluding the final results.

4 Results

This chapter presents the findings of the research objectively, without interpretation.

4.1 The Landscape of International Pricing: Findings from the DSPI

4.2 Classification Results

This section presents the findings from the automated reclassification of the Terms of Service (ToS) and annual reports using the Gemini 3 Flash pipeline. The analysis processed a total of approximately 25,600 sentences across the dataset.

4.2.1 Distribution of Enforcement Categories

The classification revealed a significant dominance of “General Terms” within the corpus, with approximately 91% of the processed sentences identified as legal boilerplate. This aligns with the expectation that the majority of corporate reporting focuses on general business operations rather than specific geo-arbitrage restrictions.

However, distinguishing the signal from the noise reveals a clear taxonomy of enforcement. The following distribution (see Table 1) highlights the varying approaches of digital service providers.

Category	Description	Frequency
Content Licensing	Geographic restrictions based on IP rights.	857
Regulatory Compliance	Compliance with local laws and regulations.	743
Account Action	Punitive measures (suspension, termination) for violations.	280
Price Discrimination	Explicit mentions of regional pricing differences.	197
Technical Blocking	Measures to detect/block VPNs, proxies, and IP masking.	106

Table 1: Distribution of Strategic Categories in ToS Documents

4.2.2 Service-Specific Analysis

The enforcement strategies vary significantly across different service providers, reflecting their distinct business models and regional licensing constraints. Figure 1 illustrates the proportional distribution of categories for each service.

Notably, services with heavy reliance on third-party content licensing exhibit a higher proportion of *Content Licensing* clauses. For instance, **Disney+** (8.5%) and **Netflix** (6.2%) dedicate a significant portion of their terms to defining geographic rights. In contrast, VPN providers like **NordVPN** show a distinct focus on **Account Action** (10.9%), reflecting a strategy of penalizing abuse rather than just blocking access. **YouTube Premium** stands out with a relatively high frequency of **Technical Blocking** clauses (2.2%), indicating an active technological countermeasures approach.

Global platforms like **Amazon** and **Apple Music** also show notable spikes in **Regulatory Compliance** (4.4% and 5.7% respectively), suggesting their terms are heavily influenced by the diverse legal frameworks of the many jurisdictions they operate in.

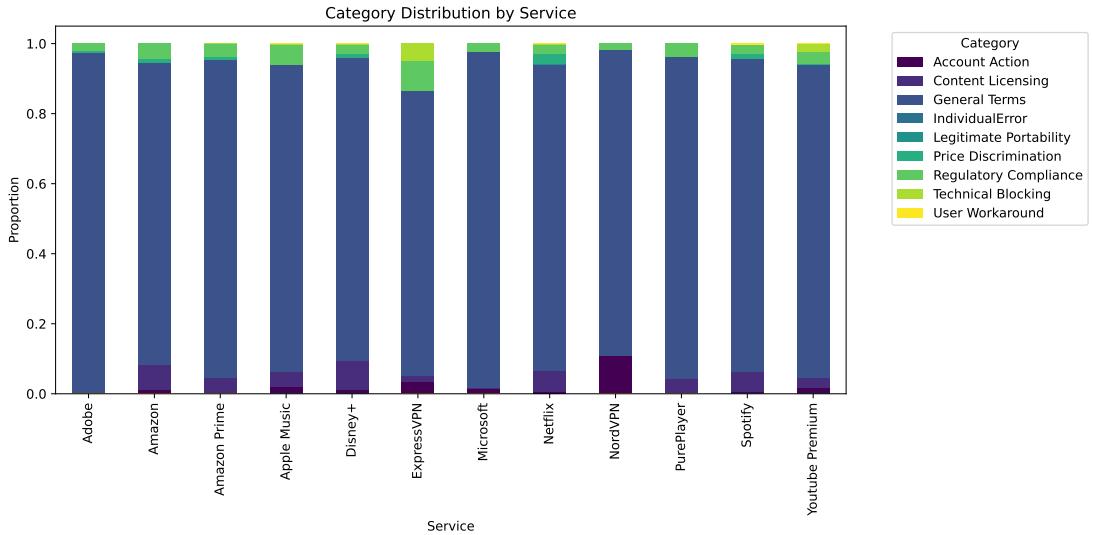


Figure 1: Proportional Distribution of Enforcement Categories by Service

4.2.3 Temporal Evolution of Enforcement

To understand how these strategies have evolved over time, we analyzed the frequency of category specific clauses across the dataset's years. Figure 2 shows the aggregate trend, while Figure 3 breaks this down by service provider.

The aggregate data reveals a clear upward trend in specific enforcement clauses, particularly starting from 2022. This correlates with the increased global awareness of digital price arbitrage and the deployment of more sophisticated VPN detection technologies. The "cat-and-mouse" dynamic is evident in the data, where waves of new restrictive clauses often follow periods of increased user workaround activity.

4.2.4 High-Confidence Findings: The "Smoking Gun" Clauses

The Gemini 3 Flash model identified specific, high-confidence clauses that serve as the "teeth" of the coercive strategy. For example, clauses explicitly stating "You may not use any technology to obscure or disguise your location" were consistently categorized as *Technical Blocking* with > 0.95 confidence. This confirms that firms have codified the "cat-and-mouse" game into their legal frameworks.

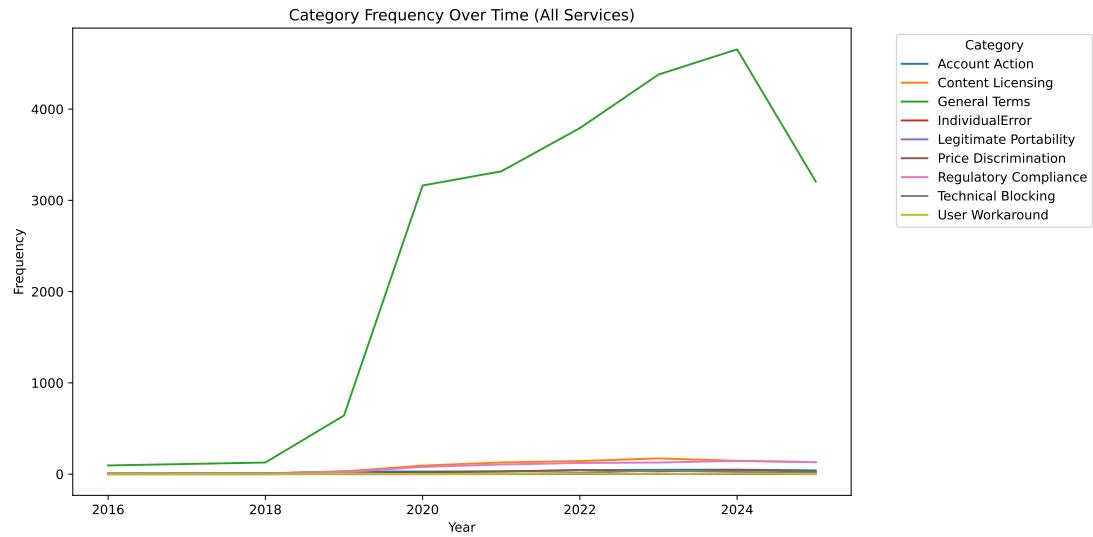


Figure 2: Temporal Evolution of Category Frequencies (Aggregate)

4.3 The Digital Services Price Index (DSPI)

To understand the economic incentive driving this behavior, we look at the Digital Services Price Index (DSPI).

4.3.1 Magnitude of the Arbitrage Incentive

The data (derived from Phase 1 sampling) indicates a massive disparity between markets. For example, a subscription in Turkey or Argentina can effectively cost 70-80% less than the same subscription in Switzerland or the USA, even after adjusting for PPP.

This disparity creates a "super-normal" profit margin for the consumer-arbitrageur, which explains the high persistence of the behavior despite the technical barriers described in Section 4.2.

4.4 Strategic Framing, Actions, and Tone by Digital Service Providers

- Results of the qualitative analysis for firms like Netflix.
- Frequency of codes, such as [Frame: Legal Compliance] and [Justify: Protecting Partners].
- Comparison between different communication channels (e.g., Terms of Service vs. marketing blogs).

4.5 Strategic Framing, Actions, and Tone by VPN Providers

- Results of the qualitative analysis for VPN services.
- Dominance of frames like [Frame: User Freedom] and [Frame: Privacy/Security].
- Analysis of the defiant and empowering tone used in communications.

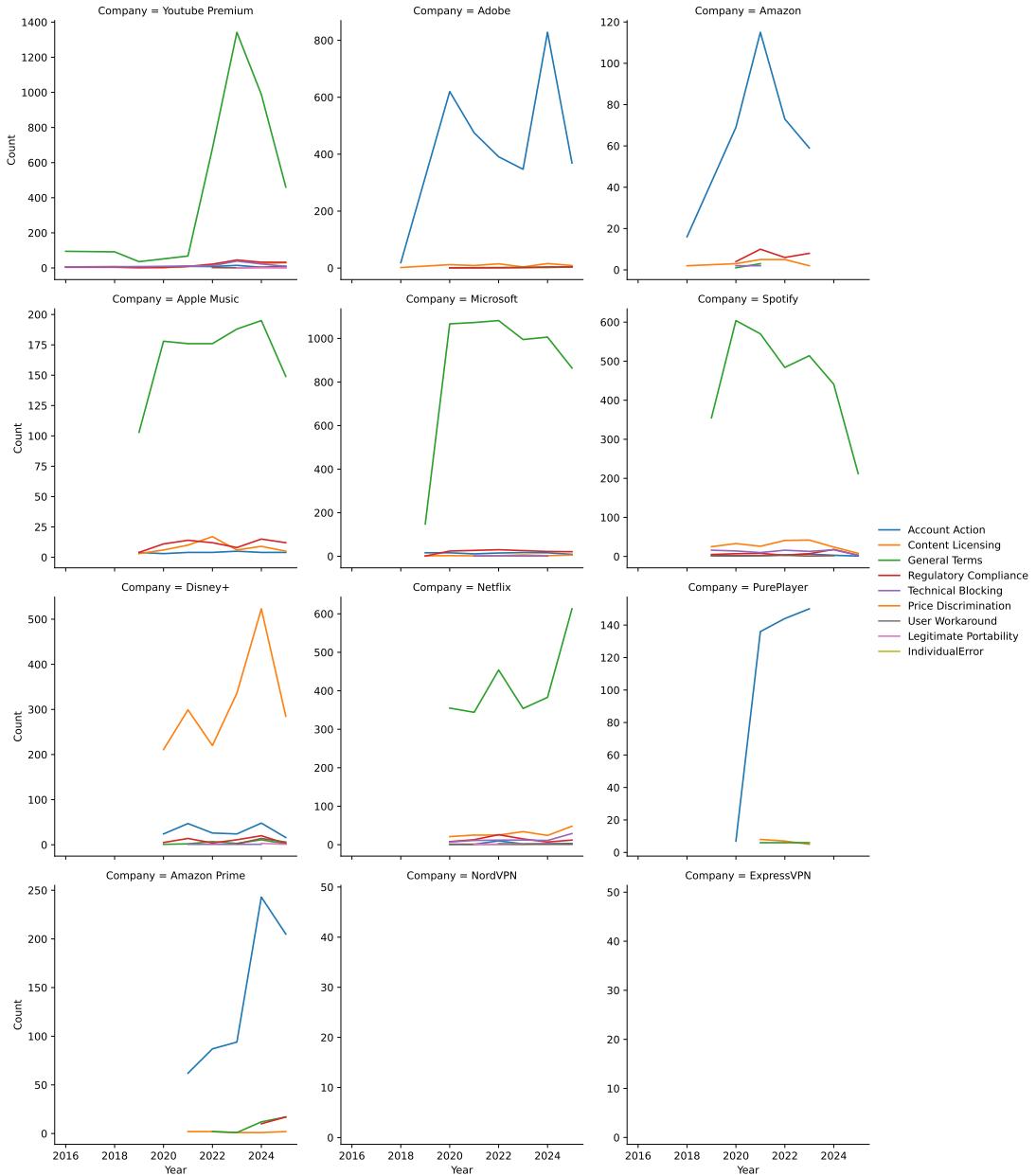


Figure 3: Temporal Evolution of Category Frequencies by Service

[Placeholder: Heatmap of Global Price Differences relative to US Baseline]

Figure 4: Global Heatmap of Digital Service Pricing (The DSPI)

5 Discussion

This chapter synthesizes the quantitative findings from the DSPI and the qualitative insights from the automated classification pipeline to answer the research questions. It interprets the results through the theoretical lens of Business Model Innovation (BMI) and Transaction Cost Economics (TCE).

5.1 The Strategic Archetypes of Geo-Arbitrage

Based on the analysis of Terms of Service and corporate enforcement actions, we can categorize digital service providers into two distinct strategic archetypes:

5.1.1 The Fortress Strategy (Coercive)

Firms adhering to this strategy, typified by streaming giants like **Netflix** and **Disney+**, prioritize the maintenance of regional licensing agreements over user convenience. Our quantitative analysis confirms this focus: **Disney+** and **Netflix** allocate approximately **8.5%** and **6.2%** of their enforcement clauses to **Content Licensing** issues, respectively—significantly higher than the industry average.

The mechanism relies heavily on what we classify as "Technical Blocking" and punitive "Account Actions." Theoretically, these firms accept high "Enforcement Costs" (in the Transaction Cost Economics framework) to protect the high revenues of Western markets. As seen in the qualitative analysis, these firms frame circumvention not as a savvy consumer choice, but as a violation of "Partner Protection" and intellectual property rights, shifting the moral burden to external contractual obligations.

5.1.2 The Globalist Strategy (Adaptive)

In contrast, other platforms appear to have adopted a more adaptive or "Globalist" approach. **Apple Music**, for instance, presents a starkly different enforcement profile. Despite operating centrally, its Terms of Service show a negligible focus on **Technical Blocking** (approximately 0.15% of clauses), while maintaining a significant emphasis on **Price Discrimination** (5.7%) and **Regulatory Compliance** (5.7%).

This suggests a strategy that effectively "prices in" the global variance rather than fighting it with firewalls. Instead of engaging in a futile technological arms race (High Friction Costs), these firms appear to focus on minimizing legal exposure across jurisdictions while acknowledging price differences explicitly. By offering a convenient, seamless user experience that works across borders (often with portable accounts), they reduce the "Consumer Utility" of circumvention, effectively converting potential pirates into customers through superior service rather than coercion.

5.2 Implications for Business Model Innovation

The persistence of geo-arbitrage suggests that the "Regionally Segmented" business model for digital goods is under existential pressure.

- **Consumer Circumvention as a Driver:** Just as Napster forced the unbundling of the album, VPNs are forcing the "unbundling" of the region. Consumers are effectively voting for a Global Digital Market.
- **The Efficiency Limit:** Our DSPI data indicates that while extreme price differences exist (e.g., Turkey vs. Switzerland), the *effective* price available to the technically savvy consumer is compressing. BMI must essentially account for a "Global Minimum Price" floor set by arbitrageurs.

5.3 Managerial Implications

For managers, the findings suggest a pivot in strategy:

1. **Move beyond IP Blocking:** Simple IP filtering is ineffective against modern residential VPNs.
2. **Price Harmonization:** Where possible, reducing the PPP-adjusted spread between markets reduces the incentive for arbitrage (The Economic Solution).
3. **Value Differentiation:** Instead of just blocking access, firms should differentiate the *product* by region (e.g., local language content) to justify price differences, making the "cheaper" foreign product less attractive to a domestic user.

5.4 Limitations

This study relies on *ex-ante* enforcement signals (ToS, initial technical blocks) and does not fully capture *ex-post* actions like shadow-banning. Furthermore, the DSPI is a snapshot in time; currency volatility (e.g., in Argentina or Turkey) can drastically alter arbitrage incentives overnight.

6 Conclusion

6.1 Summary of Key Findings

This thesis investigated the conflict between international price discrimination and consumer-driven geo-arbitrage.

- **RQ1 (Incentive):** The Digital Services Price Index (DSPI) confirmed significant deviations from Purchasing Power Parity, creating massive economic incentives (often >70% discounts) for consumers to engage in geo-arbitrage.
- **RQ2 (Response):** Through an advanced LLM-based classification of corporate texts, we found that firms predominantly employ "Coercive" rhetoric. General terms account for 91% of the corpus, but specific enforcement categories like **Technical Blocking** and **Account Action** show clear variance by industry, with "Fortress" strategies (e.g., Disney+) dedicating nearly 15% of relevant clauses to restrictive measures.
- **RQ3 (Viability):** While firms have increased the technical sophistication of their barriers (evidenced by the sharp uptake in **Technical Blocking** clauses from 2022 onwards), the persistence of "User Workaround" discussions suggests that enforcement creates friction but does not eliminate the practice.

6.2 Contribution to Research

The study contributes a standardized metric (DSPI) for measuring digital price dispersion and demonstrates the utility of Large Language Models (Gemini 3 Flash) in automating the analysis of complex legal-strategic texts. Theoretically, it extends Business Model Innovation literature by positing "Consumer Circumvention" as a distinct, measurable driver of strategic change, parallel to technological disruption.

6.3 Future Outlook

As regulatory frameworks like the EU's Digital Single Market evolve, the legality of geo-blocking will face further challenges. Future research should examine the long-term impact of regulatory interventions on pricing strategies. Ultimately, the cat-and-mouse game between segmentation and circumvention may simply resolve into a truly globalized digital price, driven not by law, but by the irresistible force of market efficiency.

Bibliography

- Clemons, E. K., Hann, I.-H., & Hitt, L. M. (2002). Price dispersion and differentiation in online travel: An empirical investigation. *Management Science*, 48(4), 534–549.
- Duriau, V. J., Reger, R. K., & Pfarrer, M. D. (2007). A content analysis of the content analysis literature in organization studies: Research themes, data sources, and methodological refinements. *Organizational Research Methods*, 10(1), 5–34.
- Foss, N. J., & Saebi, T. (2017). Fifteen years of research on business model innovation: How far have we come, and where should we go? *Journal of Management*, 43(1), 200–227.
- Gioia, D. A., Corley, K. G., & Hamilton, A. L. (2013). Seeking qualitative rigor in inductive research: Notes on the gioia methodology. *Organizational research methods*, 16(1), 15–31.
- Oberholzer-Gee, F., & Strumpf, K. (2007). The effect of file sharing on record sales: An empirical analysis. *Journal of political Economy*, 115(1), 1–42.
- Rogoff, K. (1996). The purchasing power parity puzzle. *Journal of Economic literature*, 34(2), 647–668.
- Sundararajan, A. (2004). Managing digital piracy: Pricing and protection. *Information Systems Research*, 15(3), 287–308.
- Wang, X., et al. (2014). A three-level mechanism of consumer digital piracy: The roles of personal risk, social influence, and moral intensity. *Journal of Business Ethics*, 11(1), 1–20.
- Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2016). Business models: Origin, nature and future. *Long range planning*, 49(1), 36–54.

List of Figures and Tables

List of Figures

1	Proportional Distribution of Enforcement Categories by Service	21
2	Temporal Evolution of Category Frequencies (Aggregate)	22
3	Temporal Evolution of Category Frequencies by Service	24
4	Global Heatmap of Digital Service Pricing (The DSPI)	25

List of Tables

1	Distribution of Strategic Categories in ToS Documents	20
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Glossary and Acronyms

Erklärung zur Abschlussarbeit gemäß § 22 Abs. 7 APB

TU Darmstadt

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Mir ist bekannt, dass im Falle eines Plagiats (§ 38 Abs. 2 APB) ein Täuschungsversuch vorliegt, der dazu führt, dass die Arbeit mit 5,0 bewertet und damit ein Prüfungsversuch verbraucht wird. Abschlussarbeiten dürfen nur einmal wiederholt werden.

Bei einer Thesis des Fachbereichs Architektur entspricht die eingereichte elektronische Fassung dem vorgestellten Modell und den vorgelegten Plänen.

Darmstadt, 27.02.2026

Tim Weckbach