The Change in the Paradigm of the Telecom Industry after the Entry of Jio: An Empirical Study on the Indian Telecom Sector

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ABSTRACT

This study investigates the structural transformation of India's telecommunications market following the 2016 entry of Reliance Jio, using indicators such as the Herfindahl–Hirschman Index (HHI), subscriber-base trends, financial outcomes, and firm-level growth metrics. The findings reveal a steep rise in market concentration, with the HHI increasing from 1,634 in 2016 to 3,048 in 2024, reflecting a shift toward a highly concentrated duopoly dominated by Jio and Bharti Airtel, which together account for about 73.5% of wireless subscribers. Paired t-test results confirm significant subscriber erosion for Vodafone Idea ($t = –4.63$, $p < .01$) along with financial weakening for both Vodafone Idea and Airtel in the post-Jio period. The data further show Vodafone Idea's subscriber base shrinking by 150 million, Airtel growing by 70.9%, and Jio gaining 108 million users in its first operational year. These patterns indicate a clear competitive disruption driven by Jio's aggressive pricing, rapid 4G rollout, and substantial FDI support. Policy implications emphasize the need for enhanced regulatory safeguards to prevent anti-competitive behaviour and sustain long-term market diversity, consumer welfare, and innovation.

Keywords: Telecommunications, Market Concentration, Duopoly, HHI, Competition

1. INTRODUCTION

The Indian telecommunications sector has undergone a series of major structural shifts over the past two decades, transitioning from a state-dominated system to one of the world's most competitive and rapidly expanding telecom markets. Policy reforms under the National Telecom Policies of 1994 and 1999 ushered in private participation, spectrum management reforms, tariff rationalization, and widespread mobile penetration. The launch of 3G and later 4G/5G networks further accelerated digital adoption, redefining consumer behaviour and expanding the sector's contribution to economic growth and digital inclusion.

1.1 Background and Industry Evolution

Before 2016, India's telecom market comprised multiple comparable operators—including Bharti Airtel, Vodafone, Idea, RCom, Tata Docomo, Aircel, and Telenor. Market competition, although strong, was relatively balanced, and pricing revolved primarily around voice services. High spectrum costs and infrastructure inefficiencies limited innovation in affordable data services, keeping mobile internet penetration low. Reliance Jio's entry in September 2016 fundamentally altered this landscape. Jio introduced unprecedented strategies—free voice calls, extremely low-cost data plans, bundled digital services, and rapid nationwide coverage. This aggressive market disruption triggered an industry-wide price war, erosion of revenues, unprecedented consumer migration, and large-scale consolidation, including the Vodafone-Idea merger and the subsequent exit or collapse of several operators.

1.2 Research Gap

Three key gaps in the existing studies have been found:

- **Limited quantitative evidence** evaluating competition before and after Jio's entry using statistical tools such as paired t-tests and HHI concentration indices.
- **Absence of an integrated industrial organization lens**, particularly from oligopoly, duopoly, and market-power theories, to interpret post-Jio competitive dynamics.
- **Lack of consolidated financial–market linkage**, where firm-level metrics (subscribers, ARPU, profits, FDI inflows) are evaluated alongside market-concentration indicators.

1.3 Rationale of the Study

The rationale for undertaking this study is threefold:

- **Economic Importance:** Telecom is a foundational digital-infrastructure industry that drives productivity, financial inclusion, and national competitiveness.
- **Market Stability Concerns:** The post-Jio consolidation has created conditions similar to a duopoly, raising questions about long-term consumer welfare and competitive sustainability.
- **Policy Urgency:** The findings can inform TRAI and DoT on competition policy, spectrum pricing, and regulatory frameworks capable of preventing excessive market concentration.

1.4 Scope of the Study

This study examines four major operators—Jio, Airtel, Vodafone-Idea, and BSNL—using subscriber data, market shares, ARPU, financial performance, and HHI measures. Empirical tools are used to assess differences across pre- and post-Jio periods.

2. KEY CONCEPTS AND DEFINITIONS

Market Concentration

Market concentration reflects how much of an industry's output, sales, or subscriber base is dominated by a few large firms, indicating a shift away from perfect competition toward a structure where a small number of powerful players shape market dynamics. Such high concentration often results from substantial entry barriers like heavy infrastructure costs, economies of scale, proprietary technologies, and consolidation through mergers and acquisitions. This reduced competition can lessen incentives for innovation, service improvement, and price reductions, while also creating allocative inefficiencies where prices exceed marginal costs, harming overall welfare.

Herfindahl–Hirschman Index (HHI)

The HHI is the quantitative standard for measuring market concentration, preferred by regulatory bodies because it is more sensitive to the distribution of market shares among firms than a simple concentration ratio.

Calculation and Interpretation: The HHI is calculated by summing the squares of the market shares (expressed as percentages) of all firms in the market.

Formula: HHI = $s_1^2 + s_2^2 + s_3^2 + ... + s_n^2$ (where s is the market share of each firm).

Regulatory thresholds say markets with an HHI below 1500 are considered unconcentrated, reflecting competitive environments with many firms, where mergers generally face little regulatory resistance. When the HHI falls between 1500 and 2500, the market is categorized as moderately concentrated, signalling growing consolidation. HHI above 2500 indicates a highly concentrated, oligopolistic market where a few dominant firms exert significant control.

Oligopoly

An oligopoly features a few interdependent firms whose pricing, output, and marketing decisions trigger strategic reactions from rivals. High entry barriers sustain limited competition, while products may be homogeneous or differentiated. In India's telecom sector, a differentiated oligopoly exists, where firms avoid price wars by competing through network quality, branding, services, and technology.

Duopoly

A duopoly is a highly concentrated oligopoly with two dominant firms whose strategic decisions strongly influence each other. The risk of tacit or explicit collusion is high, often attracting regulatory concern. Economic models like Cournot and Bertrand explain how duopolies balance price competition with incentives to act like monopolists.

3. THEORETICAL LINKAGES: COMPETITION THEORY, OLIGOPOLY FRAMEWORKS AND MARKET STRUCTURE

3.1 Competition Theory and Market Disruption

Competition theory explains that a disruptive entrant with significantly lower prices can impose strong pressure on incumbents, which aligns with Reliance Jio's entry into the Indian telecom market. Jio's near-zero tariffs created a major "price shock," causing rapid subscriber migration between 2016 and 2018. Given India's highly price-elastic telecom demand, the steep decline in data prices—from about ₹160/GB in 2016 to ₹10/GB by 2020—prompted widespread behavioural shifts consistent with consumer-choice theory. Post-entry dynamics reflect ongoing competitive adjustments, yet Jio's superior cost structure from its 4G-only network prevented the market from returning to pre-2016 equilibrium.

3.2 Oligopoly and Duopoly Theory

3.2.1 Strategic Interdependence

Oligopoly is defined by interdependent decision-making. Empirical evidence shows that Airtel lowered tariffs within days of each Jio announcement while Vodafone and Idea cut data rates repeatedly but failed to sustain losses. Pricing in the sector became reactive instead of proactive. This behaviour fits the oligopolistic model where firms observe and respond to each other's actions continuously.

3.2.2 The Dominant Firm and Competitive Fringe Model

Industrial organization theory describes the scenario where **one large firm sets the price**, forcing others to follow.

- Jio = Dominant firm
- Airtel = Strong competitor (semi-dominant)
- Vi + BSNL = Competitive fringe operating with limited pricing power

Jio's leadership in growth rate and number of subscribers reinforce this model.

3.2.3 Duopoly Formation and Market Power

According to duopoly theory, two major firms can exert **mutual market power**, indirectly discouraging entry. Price stabilization may occur even without explicit collusion. Smaller firms become marginal players with no strategic influence. By 2024, Jio and Airtel together held 73.5% of the market.

3.2.4 Game-Theoretic Interpretation

Several behaviours in the Indian telecom market align with game-theoretic models:

- **Penetration Pricing:** Jio's free services resemble a strategy designed to obtain rapid market penetration.

- **Limit Pricing:** Jio priced services at a level that incumbents could not match sustainably.
- **Nash Equilibrium Shift:** After several rounds of price cuts, firms reached a new equilibrium with permanently lower tariffs.

Thus, the industry's economic trajectory post-2016 strongly mirrors game-theoretic competition outcomes.

Theoretical Framework of Oligopoly and Market Competition

Oligopoly theory provides a strong basis for analysing India's telecom market, where a few dominant firms engage in strategically interdependent competition. Nash equilibrium explains how operators adjust pricing, investment, and service decisions in response to rivals. The Cournot model, with output-based rivalry in high fixed-cost industries, reflects telecom capacity constraints, while the Bertrand model clarifies post-Jio price compression in markets with similar services. Product differentiation through network quality, branding, and bundled offerings helps avoid purely price-driven competition. High entry barriers such as spectrum costs and infrastructure needs reinforce market concentration, consistent with the Bain–Sylos view of incumbents using aggressive pricing to block new entry.

Evolution of Market Structure in Indian Telecommunications

India's telecom industry has evolved from a state monopoly into a privately driven oligopoly. The pre-reform phase suffered from high tariffs and unmet demand (Jain & Sridhar, 2003), prompting liberalization under the National Telecom Policies of 1994 and 1999, though rural access remained weak (Ray & Ray, 2010). As the sector expanded to become the world's second-largest telecom market (Kumar & Ratne, 2023), competition gradually concentrated among a few major operators. Jio's 2016 entry triggered aggressive price cuts and market exits, producing a tightly concentrated structure (Parsheera & Trehan, 2022). High infrastructure costs sustain natural monopoly tendencies (Mondal & Singh, 2021), while Jio's leadership reflects Stackelberg-style competition.

Competitive Dynamics and Market Performance

India's telecom sector has evolved from a state monopoly into a privately driven oligopoly. Liberalization under the 1994 and 1999 telecom policies increased competition, though rural access lagged (Ray & Ray, 2010). Today, India is the world's second-largest telecom market (Kumar & Ratne, 2023), but consolidation has intensified, especially after Jio's 2016 entry, triggering price wars and exits (Parsheera & Trehan, 2022). High infrastructure costs sustain natural monopoly traits, while Jio's leadership reflects Stackelberg dynamics.

Regulatory Interventions and Competition Policy

Regulation continues to shape competitive outcomes due to inherent tendencies toward concentration. TRAI's interventions in tariff regulation, spectrum pricing, and interconnection charges seek to prevent anti-competitive behaviour (Mondal & Singh, 2021). Spectrum policy remains especially influential: reforms have enabled competition but persistent scarcity increases costs and risk (Kumar & Ratne, 2023). According to contestability theory, entry barriers determine whether potential competitors can discipline market power. Economic literature (Fiveable, 2025) notes that high barriers allow incumbents to sustain profits, while low barriers push prices toward marginal cost. Mondal and Singh (2021) show that regulatory delays, AGR disputes, and financial instability have increased entry barriers in India, potentially reinforcing market concentration and reducing competitive pressure.

4. LITERATURE REVIEW

Aurobindo Ghose (1972) in his paper Monopoly in Indian Industry: An Approach talked about the characteristics of Indian economy. First, India remains an underdeveloped economy in the process of growth. Secondly, the role of the State is significant, in terms of both direct State ownership of the means of production and use of State economic policies for promoting and regulating private economic activity. Thirdly, foreign capital is significant in India, quantitatively and qualitatively, and indigenous monopoly is itself linked with it. All these characteristics require to be appropriately accounted for in a theory of behaviour of Indian monopoly. This is the task of a larger study of which this paper forms only an initial part.

Jain and Sridhar (2003) examine India's shift from a state telecom monopoly to an oligopoly after liberalization, using a techno-economic system-dynamics model to simulate subscriber growth linked to price, quality, and regulation. Drawing on global studies, they highlight pre-reform inefficiencies like high tariffs and poor service. They emphasize quality differentiation and note that while competition improved fault repair rates (TRAI, 2003), overall service standards lagged due to weak infrastructure. Their causal-loop model for Andhra Pradesh predicts BSNL's continued dominance because of scale advantages. They recommend unified licensing to deepen competition and support efficient market expansion.

Dr. Papori Baruah and Rashmi Baruah (2014) in their paper Telecom Sector in India: Past, Present and Future have talked about how globalization, privatization and liberalization accelerated all round reforms in many sectors, especially in developing economies, in the world. Developing countries-like India have realized the importance

of communication in the later part of 20th century. Indian Telecom Sector is one of the fastest growing telecom sectors and it has become the second largest network in the world, next to China. The Government of India really has encouraged the telecom sector to penetrate in the new markets across the country by adopting appropriate policies. Therefore, this sector is found to be in a growing path and with its potential will continue to do so in the future also. Keeping these in view, the study analyses the history & evolution of Indian Telecom Sector, its growth & developments in present scenario along with the future opportunities of the sector in India.

Mondal and Singh (2021), in *Managing Natural Monopolies: Interplay of the Regulator and Telecom Companies in India*, analyse the telecom sector's natural monopoly characteristics arising from high infrastructure costs and scale economies. They examine how TRAI balances competition with preventing anti-competitive behaviour in a market dominated by few operators. While liberalization increased participation, the authors argue that strong regulatory oversight remains necessary for fair pricing, quality service, and universal access. They highlight TRAI's influence through tariff regulation, spectrum allocation, and interconnection charges, while critiquing policy delays and AGR disputes that destabilize firms. The paper concludes that a hybrid regulatory model—price caps for essentials and market-based mechanisms for premium services—offers optimal outcomes.

Sharad Gautam and Dr. Anurag Agarwal (2022), in *The Overall Impact of Jio on the Telecom Industry of India – A Study on BSNL*, examine Reliance Jio's disruptive impact with a focus on BSNL, which struggled post-Jio. They argue that Jio's aggressive pricing, heavy infrastructure investments, and integrated digital ecosystem triggered price wars, consolidation, and financial stress for incumbents, particularly BSNL. The paper shows BSNL's decline stemmed from bureaucratic delays, slow 4G rollout, and inability to match Jio's low-cost, customer-centric model. Regulatory delays, including spectrum issues, further weakened BSNL. Drawing on disruption theory (e.g., Christensen), the study highlights SOE vulnerabilities and recommends strategic partnerships, faster decision-making, and technology upgrades to restore BSNL's competitiveness.

S. Parsheera and V. Trehan (2022), in *A Structural Analysis of the Mobile Telecommunications Market: Exploring the Jio Effect*, examine how Reliance Jio's 2016 entry reshaped India's telecom structure, triggering price wars, consolidation, and the exit of smaller firms. While Jio's free voice and low-cost data democratized digital access, the authors argue it pushed the industry toward an oligopoly, raising concerns about future competition and innovation. Drawing on Bresnahan and Reiss (1991) and

Kahn and Shew (1987), the study critiques TRAI's mixed regulatory response, particularly on predatory pricing and IUC decisions. The paper highlights gaps in assessing rural digital inclusion and calls for further research on post-5G dynamics to balance disruptive innovation with equitable competition.

Synthesis and Research Gap

The literature synthesis reveals strong consensus that India's telecommunications sector has transitioned from a state monopoly to a fragmented competitive phase and ultimately to a concentrated oligopoly. While early reforms expanded participation, they did not establish sustainable competitive structures. The contemporary market is dominated by a small number of large private operators, raising concerns about long-term competition and innovation, as highlighted by Parsheera and Trehan (2022), especially given the weakened position of BSNL. Theoretical implications extend beyond the sector, illustrating how capital-intensive industries with high fixed costs naturally evolve toward oligopoly. India's sequential structural shift reflects game-theoretic predictions for markets with economies of scale. Jio's entry produced price outcomes consistent with Bertrand competition, while subsequent moves toward digital ecosystems and service bundling illustrate strategic differentiation aimed at escaping the Bertrand paradox. The sector's evolution also underscores the complex interaction of market forces, regulation, and firm strategy. TRAI faces the challenge of balancing competition, financial viability, and universal service objectives, each with inherent trade-offs.

5. DATA AND METHODOLOGY

This study is based on secondary data and examines four major telecom operators—Reliance Jio, Bharti Airtel, Vodafone Idea, and BSNL—using key performance metrics such as profit–loss accounts, ARPU, subscriber base, over multiple years. A paired t-test at a 5% significance level is used to evaluate market dominance by analysing subscriber trends and profitability. Additionally, the Herfindahl-Hirschman Index (HHI) is applied to assess market concentration. Data has been sourced from TRAI, DoT Telecom Statistics, NSE, Moneycontrol, and other reliable databases.

Methodology: Data Selection, Assumptions, and Limitations

5.1 Data Selection Rationale

The dataset used in this study has been chosen strategically to allow a structural comparison of competition before and after Jio's entry.

Time Period: 2009–2024: This 15-year window captures the pre-Jio competitive landscape, The disruptive phase of 2016–2020 and the consolidation period of 2020–2024.

Firms Selected: Jio, Airtel, Vodafone-Idea, and BSNL were chosen because they collectively represent **over 95%** of India's wireless subscriber base. Other minor operators exited or merged, making them statistically irrelevant.

Variables Used:

- **Subscribers** → measure market power
- **Market share** → compute concentration
- **HHI** → identify competition level
- **ARPU** → revenue strength
- **Profit/Loss** → financial sustainability
- **CAGR** → long-term growth

5.2 Assumptions Underlying the Study

(a) Data Accuracy - TRAI's subscriber and market-share data are assumed to be reliable, consistent, and comparable across years.

(b) Market Segmentation - The industry is treated as one integrated national market, although competition varies across circles.

(c) Distinct Competitive Eras - Two periods are assumed:

- **Pre-Jio period (2009–2016)**
- **Post-Jio period (2016–2024)**

(d) Financial Data Reflect Operational Reality - Company-reported revenues and profits are assumed to reflect real market performance despite occasional accounting adjustments.

5.3 Limitations

(a) Merger Issues - Vodafone and Idea merged in 2018, creating break in longitudinal data.

(b) Data Frequency - Most variables are annual, more granular monthly data could improve accuracy.

(c) BSNL's Nature as a Public Sector Enterprise - Because BSNL does not operate on profit motives, its data may distort competition analyses.

(d) Statistical Assumptions - The paired t-test used assumes:

- Approximate normal distribution
- Homogeneity of variances

Subscriber data may violate these assumptions due to extreme outliers (especially Jio).

(e) External Factors Not Modelled

- AGR dues crisis
- Spectrum auctions and debt
- Government relief packages

6. DATA ANALYSIS

6.1 Trend of customers pre and post Jio era

TOTAL NUMBER OF CUSTOMERS (IN MILLIONS)					
YEAR	**JIO**	**AIRTEL**	**VODAFONE**	**IDEA**	**BSNL**
2009		93.92	68.76	46.6	64.3
2010	-	130.00	100.86	63.82	97.28
2011	-	165.50	134.57	89.50	117.06
2012	-	184.55	150.48	112.72	120.98
2013	-	191.48	152.39	121.61	121.65
2014	-	217.22	178.68	150.54	113.14
2015	-	229.43	183.88	157.81	93.24
2016	0	254.90	198.04	175.07	101.58
2017	108.68	277.51	209.2	195.37	115.09
2018	186.56	308.12	222.92	211.21	124.75
2019	306.72	329.36	395.17		126.81
2020	387.52	332.21	319.62		128.52
2021	426.25	357.17	284.23		124.96
2022	410.17	366.18	261.35		121.17
2023	439.3	375.34	236.8		103.6
2024	481.8	406.3	219.8		88.06

Source: Telecom Regulatory Authority of India

There is a dramatic shift in India's telecom landscape following Reliance Jio's market entry in 2016. In the pre-Jio era (2009-2015), established players like Airtel, Vodafone, and Idea grew steadily. However, Jio's disruptive free-data strategy caused an unprecedented market shakeup - within just one year of launch (2016-2017), Jio captured 108 million customers. The post-Jio period (2017-2024) shows Jio's meteoric rise to dominance, reaching 481 million subscribers by 2024, while competitors either stagnated or declined. Airtel demonstrated resilience, growing from 277 million to 406 million in this period, but Vodafone and Idea (which merged in 2018) collapsed from a combined 404 million in 2017 to just 236 million by 2024. State-run BSNL steadily lost market share throughout both periods, dropping to just 88 million by 2024.

6.2 Loss of subscribers

Upon conducting Paired t-Test for Two Sample for Means on the number of subscribers the major operators had from the period of 2009-2016 and 2017-2024, it was found that they had lost a significant number of subscribers after the price warfare of 2016.

t-Test: Paired Two Sample for Means	AIRTEL	
	Variable 1	*Variable 2*
Mean	196.1536	335.1271
Variance	1745.745	1193.022
Observations	7	7
Pearson Correlation	0.990874	
Hypothesized Mean Difference	0	
df	6	
t Stat	-41.4244	
P(T<=t) one-tail	0.00000000662	
t Critical one-tail	1.94318	
P(T<=t) two-tail	0.0000000132	
t Critical two-tail	2.446912	

Source: Computed

t-Test: Paired Two Sample for Means	VI	
	Variable 1	*Variable 2*
Mean	156.9851	275.6129
Variance	1099.204	4200.311
Observations	7	7
Pearson Correlation	0.16587	
Hypothesized Mean Difference	0	
df	6	
t Stat	-4.63431	
P(T<=t) one-tail	0.001781	
t Critical one-tail	1.94318	
P(T<=t) two-tail	0.003562	
t Critical two-tail	2.446912	

Source: Computed

t-Test: Paired Two Sample for Means	BSNL	
	Variable 1	*Variable 2*
Mean	109.2757	120.7
Variance	137.6511	76.1896
Observations	7	7
Pearson Correlation	0.663393	
Hypothesized Mean Difference	0	
df	6	
t Stat	-3.42315	
P(T<=t) one-tail	0.007045	
t Critical one-tail	1.94318	
P(T<=t) two-tail	0.014089	
t Critical two-tail	2.446912	

Source: Computed

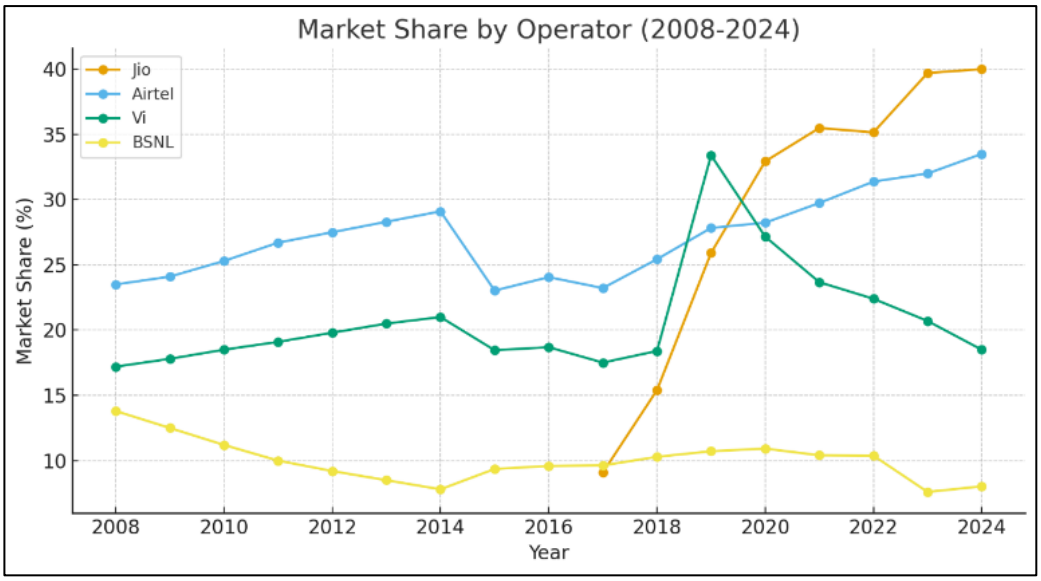
The analysis shows contrasting impacts of Jio's entry on major operators. Airtel displayed strong resilience, with its subscriber base rising from 196.15 million to 335.13 million (about 70.9%), supported by data-centric strategies and network expansion. Reduced variance (1745.75 to 1193.02), a high correlation ($r = 0.9909$) and a highly significant t-test ($t = –41.42$, $p < 0.01$) indicate stable and sustained growth. Vodafone Idea, however, showed major instability; its subscriber increase (156.99 to 275.61 million) stemmed mainly from merger consolidation, while variance sharply increased (1099.20 to 4200.31), correlation weakened ($r = 0.1659$), and t-test results ($t = –4.63$, $p < 0.01$) confirm severe decline. BSNL recorded modest, government-supported growth (10.4%) with reduced volatility. Overall, Jio reshaped competitiveness, strengthening Airtel and destabilizing VI.

6.3 Percentage of Market Share

PERCENTAGE OF MARKET SHARE					
Year	**Jio**	**Airtel**	**Vi**	**BSNL**	**Others**
2008	-	23.5	17.2	13.8	45.5
2009	-	24.1	17.8	12.5	45.6
2010	-	25.3	18.5	11.2	45.0
2011	-	26.7	19.1	10.0	44.2
2012	-	27.5	19.8	9.2	43.5
2013	-	28.3	20.5	8.5	42.7

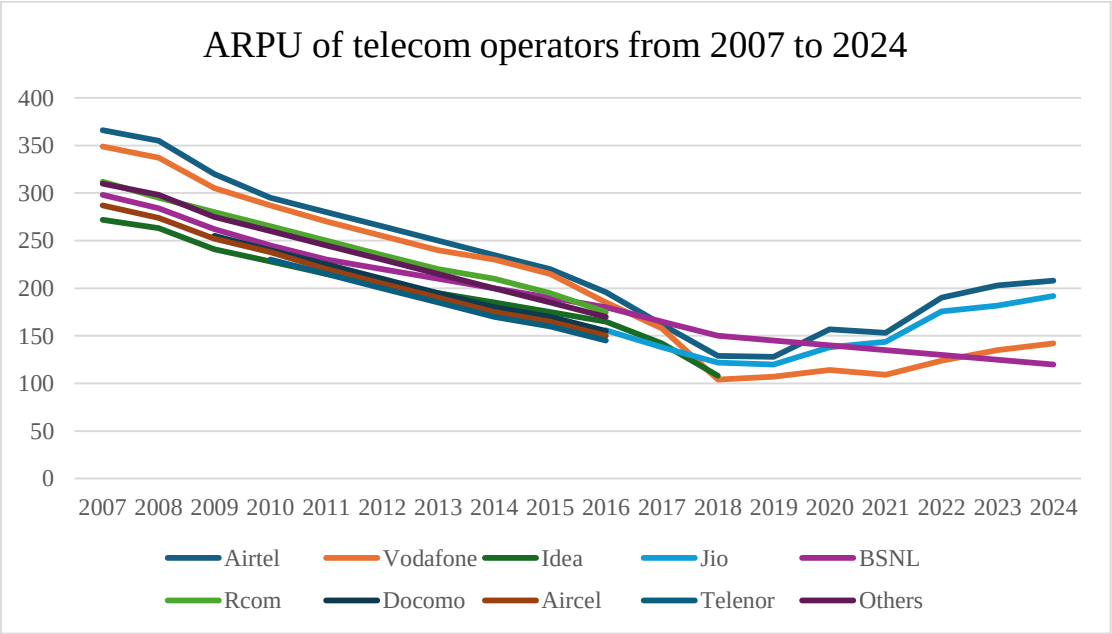
2014	-	29.1	21.0	7.8	42.1
2015	-	23.03	18.46	9.36	-
2016	-	24.06	18.69	9.59	-
2017	9.09	23.22	17.51	9.63	-
2018	15.40	25.43	18.40	10.29	-
2019	25.92	27.83	33.39	10.72	-
2020	32.93	28.23	27.16	10.92	-
2021	35.49	29.74	23.67	10.41	-
2022	35.15	31.38	22.40	10.38	-
2023	39.70	32.00	20.70	7.60	-
2024	40.00	33.50	18.50	8.03	-

Source: Department of Telecommunications



From 2008 to 2015, India's telecom market operated as a slow-moving oligopoly, with Airtel increasing its share from 23.5% to 29.1%, Vodafone and Idea holding 17–21% with slower data adoption, and BSNL declining due to inefficiencies. Jio's 2016 entry radically shifted competition, boosting its share from 9.09% to 15.4% through free data and voice offers, pushing Vodafone and Idea into a merger and disrupting Airtel's dominance. From 2018 to 2024, consolidation intensified as Jio grew to nearly 40%, Airtel regained strength, Vodafone Idea fell to 18.5%, and BSNL survived primarily through government support.

6.4 ARPU



Source: TRAI

ARPU declined by 35% between FY17 and FY19, making it difficult for firms like Airtel and Vodafone to service long-term debt and AGR dues. While large operators survived through extensions and tariff revisions, smaller firms collapsed. TRAI intervened repeatedly, raising minimum recharge levels to stabilize ARPU. Vi's recent ARPU rise is due mainly to subscriber loss, not performance improvement. Only Airtel maintained stable revenue during Jio-driven price disruptions.

6.5 Profit and loss of companies

Profit/Loss for the period(in Cr.)				
Year	**Jio**	**Vodafone**	**Airtel**	**BSNL**
2008	-	1044.36	6244.19	300.94
2009	-	1001.21	7743.84	574.85
2010	-	1070.83	9426.15	-1822.65
2011	-	844.6	7716.9	-6384.26
2012	-	576.54	5730	-8850.7
2013	-	818.26	5096.3	-7884.44
2014	-	1689.31	6600.2	-7019.76
2015	-	2809.84	13200.5	-8234.09
2016	-	2646.29	7780.3	-3879.92
2017	-31	-831.08	-9925.6	-4793.21
2018	728	-4458.3	79.2	-7992.85
2019	2968	-14056	-1869.2	-14904.24

2020	5556	-73131.5	-36088.2	-15499.52
2021	12017	-46293.7	-25197.6	-7441.12
2022	14817	-28237.2	-3625	-6981.62
2023	18207	-29307.8	-89.6	-8161.41
2024	20466	-30414.2	4988.2	-5367.45

Source: Moneycontrol

Paired t-test is conducted on the profit levels of the leading companies mentioned. Here are the results:

t-Test: Paired Two Sample for Means	Vodafone		t-Test: Paired Two Sample for Means	Airtel	
	Variable 1	*Variable 2*		*Variable 1*	*Variable 2*
Mean	1432.11	-28341.2225	Mean	7911.77375	-8965.975
Variance	744100.3945	552138892.1	Variance	6393525.497	204888010.3
Observations	8	8	Observations	8	8
Pearson Correlation	0.117307249		Pearson Correlation	0.613590962	
Hypothesized Mean Difference	0		Hypothesized Mean Difference	0	
df	7		df	7	
t Stat	3.596927151		t Stat	3.695523073	
P(T<=t) one-tail	0.004387844		P(T<=t) one-tail	0.003850151	
t Critical one-tail	1.894578605		t Critical one-tail	1.894578605	
P(T<=t) two-tail	0.008775688		P(T<=t) two-tail	0.007700302	
t Critical two-tail	2.364624252		t Critical two-tail	2.364624252	

Source: Computed

The t-test results clearly show a significant financial decline for both Vodafone and Airtel following Jio's entry, though the severity differs markedly. Vodafone's mean dropped from a pre-Jio profit of 1,432.11 to a massive post-Jio loss of –28,341.22, reflecting its collapse under intense price wars, subscriber erosion, and mounting AGR liabilities. Its variance surged nearly 742 times, signalling extreme instability linked to debt crises and merger inefficiencies. With a Pearson correlation of just 0.117 and a statistically significant t-value of 3.60 ($p = 0.0088 < 0.01$), the data confirm that Vodafone's performance shifted drastically and unsustainably due to Jio's disruption. Airtel also experienced a substantial but more controlled downturn, with its mean falling from 7,911.77 to –8,965.98, indicating post-Jio losses but far less catastrophic than Vodafone's. Airtel's variance rose 32-fold—from 6,393,525.5 to 204,888,010.3—

yet remained comparatively lower, reflecting stronger financial management amid aggressive 4G expansion and AGR pressures. A moderate Pearson correlation of 0.614 suggests Airtel retained partial structural strength, and the t-test validates the decline as significant ($t = 3.70$, $p = 0.0077 < 0.01$). Overall, while Jio's market entry disrupted both firms, Airtel demonstrated resilience and adaptation, whereas Vodafone's trajectory deteriorated into severe financial distress.

6.6 HHI

The HH Index demonstrates a sharp structural shift: competition increased and concentration declined immediately after Jio's disruptive entry (2016–2019), but by 2024 the HHI has risen above 3,000, indicating a highly concentrated market dominated mainly by Jio and Airtel as Vodafone Idea weakened. This U-shaped trend highlights how technological disruption, capital intensity, and regulatory decisions can rapidly reshape industry competition. While the market appeared fairly competitive around 2015–2017, concentration has surged since 2018, raising concerns over reduced rivalry, stronger pricing power, and the need for stricter antitrust oversight.

The HHI for the telecom sector from 2008 to 2024 is calculated using

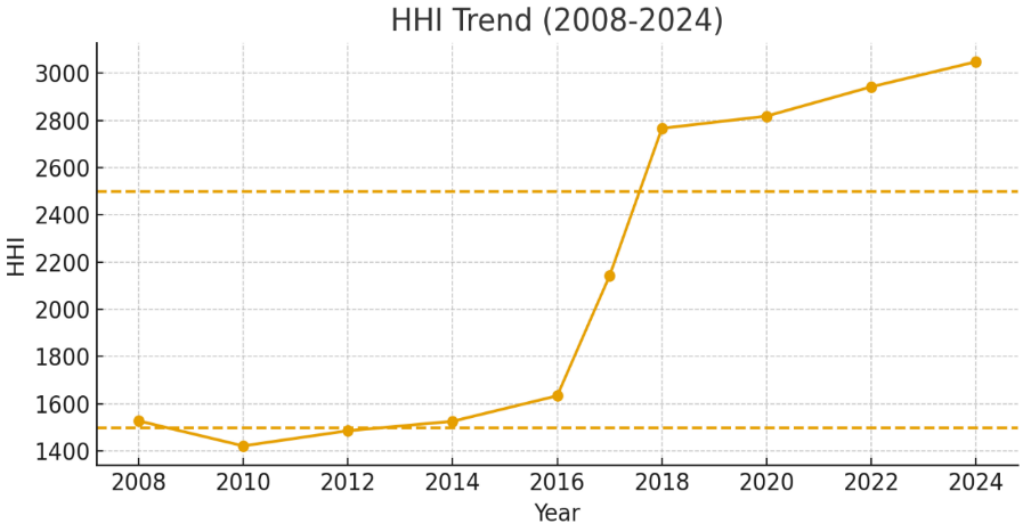
- **Determine the market shares** of all firms in the industry (in percentage form).
- **Square each firm's market share**
- **Sum up all squared values** to get the HHI score.

$$HHI = \sum_{\{i=1\}}^{n} (MarketShare_i)^2 \times 100$$

Year	HHI Score	Market Concentration	Key Changes
2008	1,528	Moderate	Fragmented (12+ operators)
2010	1,422	Competitive	New entrants (Uninor, MTS)
2012	1,486	Competitive	Early consolidation
2014	1,526	Moderate	Price wars intensify
2016	1,634	Moderate	Jio enters (2.1% share)
2017	2,142	Moderate	Jio reaches 11.6% share
2018	2,766	High	Vodafone-Idea merger (35.3%)
2020	2,818	High	Jio (34.6%) overtakes Vi (26.9%)
2022	2,942	High	Jio (37.9%) solidifies lead
2024	3,048	High	Duopoly

Source: Calculated

The graph shows a steady increase in market concentration, with a sharp rise after **2018**, indicating industry consolidation and reduced competition.



7. CONCLUSION

The telecommunications industry in India has seen major upturns in the last 10 years. From pretentious bidding to cutthroat price warfare, many small and medium companies have been forced to either shut down or hand over their businesses to the big players. This in turn, has seen the sustained growth of the big 3- Reliance Jio, Bharti Airtel and Vodafone Idea (VI). While the latter two were able to survive the digital revolution in the country, the financials show a different picture. While Airtel has recovered by raising the prices, VI has bled out of the majority of its customer base. This raises concerns about the situation of competition in the telecommunications industry. While in a very short span of 7 years, Jio has established itself as a key player diversifying itself into the space of Broadband, DTH operator, OTT space and multi-Digi services, its competitors have been wiped out or have fallen far behind except for Airtel. Reports estimate the existence of only 2 telecom companies (BSNL excluded) in the long term thus making the industry a private sector duopoly in the near trend and if Airtel faces any financial crunch in the long term, then declaring India under a monopoly in the telecom sector under Jio won't be unseemly.

REFERENCES

- Bresnahan, T. F., & Reiss, P. C. (1991). Entry and competition in concentrated markets. Journal of Political Economy, 99(5), 977–1009. https://doi.org/10.1086/261786
- Chamberlin, E. H. (1947). The theory of monopolistic competition. A re-orientation of the theory of value. Economica, 14(53), 77. https://doi.org/10.2307/2549978

- Dossani, R. (2002). Telecommunications reform in India. India Review, 1(2), 61–90. https://doi.org/10.1080/14736480208404627
- Kalsie, Dr. A. (2015). Survival of Telecom PSU: A Case study of BSNL. IMS Manthan (The Journal of Innovations), 9(1and2). https://doi.org/10.18701/imsmanthan.v9i1and2.5146
- Krishnaswamy, S., & Joshi, D. (2022). THE PHILOSOPHY AND LAW OF INFORMATION REGULATION IN INDIA. https://doi.org/10.54999/2c0l1p0r
- Motwani, H. (2021). Case 3: Reliance jio – from 4G to digital innovation. In Business Innovation (pp. 204–213). Routledge. https://doi.org/10.4324/9781003190837-24
- Musa, I., Magaji, S., & Salisu, A. (2023). ANALYSIS OF MOBILE TELECOMMUNICATION AND ECONOMIC GROWTH: EVIDENCE FROM ARDL MODELING. International Journal of Entrepreneurship, Business and Creative Economy, 3(1). https://doi.org/10.31098/ijebce.v3i1.1226
- Pai, V. S. (2021). Vodafone india ltd: Managing in a turbulent emerging market. Vision: The Journal of Business Perspective, 25(1), 103–117. https://doi.org/10.1177/0972262920984862
- Pawar, V. P., Kunte, B., & Tumuluri, S. (2022). The indian telecom distress. In Indian Business Case Studies Volume II (pp. 121–126). Oxford University PressOxford. https://doi.org/10.1093/oso/9780192869388.003.0014
- Perrakis, S., Baumol, W. J., Panzar, J. C., & Willig, R. D. (1982). Contestable markets and the theory of industry structure. The Canadian Journal of Economics, 15(4), 774. https://doi.org/10.2307/134928
- Rahate, Dr. V., & Shaikh, Prof. P. (2011). Business strategies in Telecom sector: A case of Reliance Jio Infocomm Ltd. Indian Journal of Applied Research, 4(6), 263–266. https://doi.org/10.15373/2249555x/june2014/84
- Tangirala, M. P. (2019). Telecom sector regulation in india. Routledge India. https://doi.org/10.4324/9780429244179
- Telecom market in India. (n.d.). In Market Entry Strategies of Foreign Telecom Companies in India (pp. 63–116). DUV. Retrieved November 24, 2025, from https://doi.org/10.1007/978-3-8350-9453-6_3
- Tripathi, K. (2020). Competition in telecom sector: The jurisdictional tussle between competition commission of india and telecom regulatory authority of india. SSRN Electronic Journal. https://doi.org/10.2139/ssrn.3570496