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Stability and Competition in the Indian Telecom Sector Analysing the anamolous behavior of Jio

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ABSTRACT: Post the liberalization and privatization reforms of 1991, the telecom industry shifted its nature from that of a monopoly to that of an industry fuelled by competition. Fast forward to today, and in the October of 2015, India hit the billion mark for its mobile phone subscriber base, according to the data given by the Telecom Regulatory Authority of India. The aim of this study is to present a systematic and complete agenda to study the extent of stability, competition, collusion and profits in the Indian Telecom industry. This agenda not only allows us to understand the landscape of the Telecom industry in India but also aims to understand how the oligopolistic structure of the industry allows each marketer to make decent profits and yet present the customer with a variety of choices for each category of good. The study makes use of various brands of information, such as financial statements and annual reports of the various companies present in the Telecom industry. It also makes use of market share of each firm for the year 2016. The data set for the same is already available as a part of public resource. The study also makes use of data obtained from the TRAI Analytics portal and the MIS Portal. This study attempts to provide a game theoretic approach towards the dynamic structure of the Indian Telecom sector. It provides the reader with a basic dynamic game model which measures the pay off from cooperation and defection. It analyses the anomalous behavior of Jio, in order to guage how the predatory pricing by the entrant has impacted the telecom market. The goal is to understand the scope of competition in a highly homogenous industry where the scope of product differentiation is very less and where the only basis to compete is operating costs. The study aims to determine the equilibrium in such an environment and attempts to establish the adequacy of the Game Theory models in explaining the same.

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I. INTRODUCTION

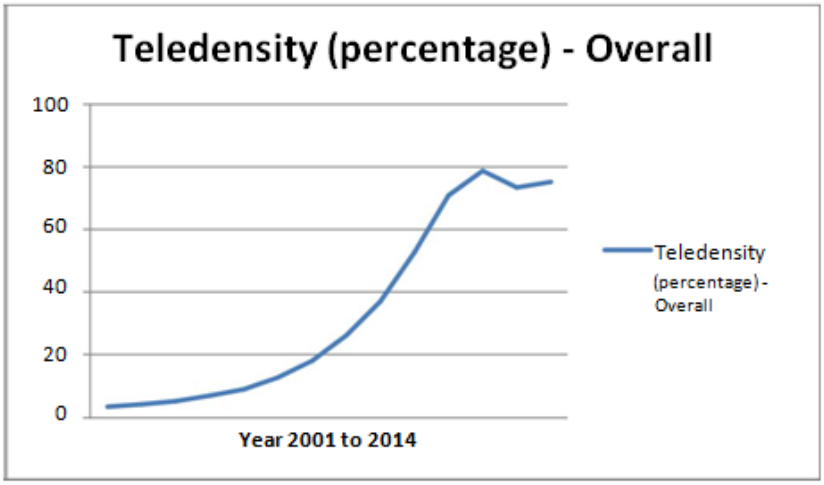
1.1 Contet And Motivation Of The Study

Standing at 1.252 billion people, India displays a lucrative land for the sale, marketing and distribution of a wide array of products and services.

The current teledensity, which is defined as the total subscriber base of wireless and wire line connections per 100 persons, stands at 86.25. This has only increased over the years. From 2001,

Where the teledensity stood at 3.58, we‘ve come a long way.

Fig 1: Overall Teledensity of the India



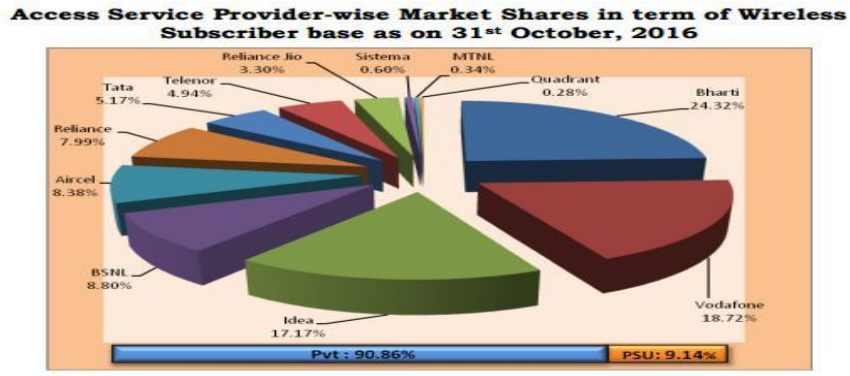
Source: Telecom regulator Authority of India, Performance Indicators

Thus, it can be rightly said that the telecommunication industry is an indispensable part of the Indian Economy. The total subscriber base for telecom connections within the country, in 2017, stood at 1102.94 million.
It is expected that in the year 2020, the contribution of the telecom sector to the GDP would rise to 8.2%. Currently, the industry‘s contribution to the GDP is 6.5%.

The Telecom sector of the country is dominated by a few key players in the wireline and the wireless segment. In the wireline segment, there are two key players – Bharat Sanchar Nigam Limited (BSNL) and Mahanagar Telephone Nigam Limited (MTNL), which are both public sector undertakings. It is a known fact that pre 1991, Telecommunication industry was a monopoly. The Government took slow and gradual steps towards the privatization and liberalization of the sector. Initially, only BSNL and MTNL were allowed to operate in this sector. Where BSNL operated throughout the country; MTNL operated only in Mumbai and Delhi. Videsh Sanchar Nigam Limited (VSNL) was later instituted with the intention of facilitating international calls.

A rise in demand and a rising population, however, proved to be too much for a three player market. Taking into account the bureaucratic and general inefficiencies of the public sector enterprises, the Government recognized the need to open the sector to private players -domestic as well as international players. At present, the FDI cap in this sector has been raised to 100%, a welcome change. The telecom sector differentiates itself from other sector in terms of the various segments it operates on. The sector can be divided into Wireless, Wire line and Broadband services. However, not all players operate in all the three segments. Therefore, in order to maintain parity, this research concentrates solely on the wireless sector. The competition given by the other three segments have been discussed in the later parts of the study.

Fig 2: Market share of Indian Telecom Sector



Source: TRAI Press Release, 2017

The major players in the wireless segment are namely, Reliance, Reliance JIO, Aircel, BSNL, Idea, MTNL, Vodafone, Bharti Airtel, Quadrant, Sistema, Telenor and Tata. The three key major players in the industry, at present, are Idea, Vodafone and Bharti with a market share of 17.17%, 18.72% and 24.32% respectively. Whereas private players hold 90.86% of the market share; the PSUs - BSNL and MTNL only hold 9.14% of the market share.

The market has a strong barrier to entry. We could attribute this to the huge Capital Expenditure (CAPEX) and Operating Expenditure (OPEX) costs that determine the foundation of every Firm in the industry. The CAPEX cost includes costs for infrastructure, setting up of machinery, obtaining licenses and other fees paid. The industry incumbents are at the moment confused about how to solve their CAPEX problems. These costs are sunk costs in nature – they are huge outlays that do not provide adequate returns once spend and cannot be recovered once spent either. OPEX costs of the industry, in terms of the Indian market, are the costs incurred on advertising, telecom tax, corporate tax and maintenance charges paid along with other operational and administrative costs.

The telecom sector has a fierce competition model and the competitors not only compete on the basis of prices but also on the basis of volume, i.e. quantity. Moreover, after going through the structure and the functioning of the market, one cannot say that the Firms in the market act independently. Contrarily, these Firms are interdependent and act only after taking each other‘s actions into account. The industry gives _First Mover‘s Advantage‘ to the Firm who wishes to pursue a new methodology of functioning. Eventually, after assessing the benefits the Firm has derived from its relatively new course of action; other Firms may pursue the same course of action in a time period of less than a month.

These are the characteristics of an Oligopoly Market. An Oligopoly market is one where the market is filled a small number of players. Oligopolies set prices rather than take them. A stable oligopoly is the one where there is a price setter and the other Firms in the market are the price followers. Due to a limited competition and a huge market share, there are also chances of collusion and formation of cartels in the industry. In most countries however, these collusions and cartels are strongly condemned. Tacit collusion is also a type of collusion, however a little harder to determine the presence of. Thus, the rest of the research undertaken in the present study is divided in the following sections, namely a review of literature in the regard of oligopolies and the international and national telecom sector; an empirical determination of the presence of oligopoly in the industry; a comparison of collusion, cooperation and non cooperation models given in Economic thought and an analysis of the Strengths, Weaknesses, Opportunities and Threats facing the industry along with certain policy implications.

1.2 Research Objectives:

The fundamental aim of this study is to remark on the presence of Oligopoly in the Indian Telecom Sector and determine the most appropriate model for collusion, cooperation and competition in the industry. The study also aims to conclude and remark on the present dynamic scenario of the industry causing, specifically on the _destructive innovation' driving the industry and provide policy implications of the same.

The Telecommunication Industry in India has been through a dynamic phase with incumbent firms allowing free entry and exit of new firms who could compete with the existent price levels. The industry consisting of nine major competitive firms with regards to voice services, data/broadband services and other add on services, operate in a market whose demand is varying and extremely responsive to price fluctuations. In the light of the given scenario, this thesis attempts to answer the following questions:

1. Is the Indian Telecom Industry an Oligopoly? This identification will be done through the Concentration Test and Herfindahl-Hirschman Index.
2. If the Telecom Industry operates in an oligopolistic framework, what oligopoly game theory strategy is adopted by each player to maximize individual player profit?

3. Studying the anomalous behaviour of Jio and if cartelization is feasible and stable amongst telecom players as a response to Jio's price competition?

The thesis also aims at designing a plausible game theory strategy and determining the rationality of a credible threat by means of cartelization to keep Jio out of the market.

Jio being a fairly new entrant does not provide data that is accessible on public forums. While history has been witness to telecom players waging price wars against one and another to attain market monopoly, Jio with its unique _mass reach out' strategy has created a wave of sensationalism in its users and a fear of losses in its competitors. Literature review conducted in Chapter 2 elucidates the research gap to justify the rationale of the study.

1.3 Rationale Of The Study:

The Indian Telecom industry is a filled with corporate giants who demand the business of more than 1.5 billion citizens of the world. Each corporate imbibes certain qualities and features that allow its customer to have a strong preference for it over another.

These features include certain logistic capabilities like network reception, ease of obtaining post sales assistance, schemes and plans for families and corporates among many others. With the introduction of 3G and 4G network services in India, we have seen many Firms engage in even fiercer and competitive tactics to gain ground in the country. These Firms are now not only competing on price and schemes but they are also engaging in persuasive lobbying to bend rules and force customers to use more of their various services. Add to that; the entry of a completely new Firm which has challenged the more or less redundant business model of the industry.

In such a competitive mine field, the present study attempts to understand how these Firms function and co exist, while at the same time making normal profits. The intriguing feature of most of these Firms is the fact - that despite differences in their schemes and pricing, they follow an identical business model and have a limited scope for product differentiation. Each Firm, that is already a player in the industry, is motivated to not only to report high volume of profits but also a high volume of sales. Each Firm in the industry competes not only on the basis of scale of operation but also on the basis of logistics, infrastructure and customer care.

Thus, the present research aims to lay a basis for understanding the challenges faced by the industry and attempts to provide policy implications in this regard.

1.4 Research Methodology:

A sizeable proportion of this study was accomplished through surveys of industry experts, industry veterans, public databases, research articles and other literature in this regard.

- The first objective was attained through a study of the information given by Telecom Regulatory Authority of India, Department of Telecommunication and other public databases.

- The second research objective was attained through a study of collusion, cooperation and competition models present in Economic Thought and modeling of the same to the Indian context. The objective is to establish presence of competition and comment on how it is conducted and suggest an equilibrium solution in the Indian context.
- The third research objective was attained through attainment of recommendations and opinions of the authorities on the subject including industry experts and industry veterans. Focus was also given to secondary databases such as the academic papers, research articles and surveys conducted by third parties, on the industry. Use was also made of information derived from articles, journals, newspapers, company website for the case study on Jio.

The interview used towards this study and its rationale has been enclosed in Appendix (A).

1.5 Limitations Of The Study:

The Indian Telecom sector is the second largest sector in the world. Along with providing the country with significant revenues and employment opportunities, the sector also provides the consumers with a wide array of services for their basic need of communicating with each other.

In order to maintain parity, we have only considered the wire line segment of the Telecom industry as not each player in the market operates in all segments of communication, namely the wireless and the Broadband segments. However, the study makes use of other telecom segments such as the fixed line and broadband just to provide a basis of comparison between the former segment and the latter.

The study could not obtain data on the pricing schemes and plans of the industry players over the course of past few years. Such data is volatile as well as dynamic and keeps changing at a fast pace. Thus, an accurate study of the behavior of players could not be attained and thus limits the scope for understanding the competition in the industry in this regard. We also found a limitation in the scope of data attainment in regards to the revenue earned by _Over The Top (OTT)' service providers, especially for its Indian division. WhatsApp was taken over by Facebook in 2014 and the revenues derived from it are not separately disclosed in Facebooks's annuals operation declarations. Similar is the case for Skype, which was taken over by Microsoft in 2010. Skype now forms a part of Microsoft's Commercial segment along with its other product – bundled as Microsoft Office. Moreover, there are many OTT service providers in the market and it is hard to pinpoint which service commands more market as consumers may have individual preferences.

1.6 Summary:

The motivation behind undertaking a study of the Telecom sector in India is to adjudge how the industry has fared in terms of competition and in the presence of various exogenous and endogenous factors such as high CAPEX and OPEX costs, a retarded growth in innovation and competition for a homogenous product.

Whilst Chapter 2 elucidates on literature in this regard, Chapter 3 provides the reader with an introduction into the steps taken to determine the research objectives and Chapter 4 provides with empirical results of the same. Chapter 5 provides equips the study with concluding policy implications for the Indian Telecom industry.

II. LITERATURE REVIEW

2.1: A Review of the literature on Oligopoly and Cartels

Harold Hotelling in his paper titled _Stability of Competition' observed that all of the purchasers of a commodity; some buy from one seller, some from another, in spite of moderate difference in prices.

The paper finds that existence of incomes not properly belonging to any of the categories usually discussed, results from the discontinuity in the increase in the no. of sellers with demand. It goes on to say that a socially uneconomical system of prices lead to needless shipment of goods and kindred deviations from optimum activities and analyses the undue tendency for competitors to imitate each other in quality of goods, in location and in other substantial ways. The paper observes that all writers since Cournot, except Sraffa and Amorssa seem to hold that even apart from the likelihood of combinations there is an essential instability in duopoly. Edgeworth - Hotelling says, gave a variety of examples but nowhere took account of the stabilizing effect of masses of people placed so as to have a natural preference for one seller over the other. Hotelling uses a line segment to depict the spatial aspect of competition and compares the length of the line to the distance

between the sellers. A consumer has any preference for either seller except on the ground of price plus transport cost. Transportation cost here symbolizes the many reasons that make a buyer prefer one seller over the other.
Stigler attacks the question of success of cartels from a different point of view in his paper titled, _A Theory of Oligopoly‘. Up until his paper, the decision making amongst cartel members was viewed as a static non cooperative game. He, on the other hand, proposes a modification that _…collusion normally involves much more than ―the‖ price. He believed dynamic non cooperative game better represented oligopoly because it could explain the problems in detection of cheating.
Stigler identifies two obstacles for success of a cartel - first, the difficulty in reaching a consensus on terms of co-ordination and second, how to detect cheating by a cartel member.

For the first problem, he makes the argument that even if all products are homogenous, buyers (and thus transactions) are not. This proposes a problem as to how to fix a specific price above the competitive level. Colluding Firms will have to agree to fix different prices corresponding to the different classes of transactions and thus _A complete profit maximizing price structure may have infinitely numerous price classes.‘

Say, this structure is arrived at (Stigler doesn‘t mention how), how would one go about detecting whether the members are cheating? Stigler - in the second part of his paper argues that the behaviour of cartel members is best explained by a dynamic game. This means detection only happens with a lag and by the time the cheating is detected, considerable amount of stealing has happened. Then whether cheating will occur or not will depend on how profitable it will be for the cheating member to depart from the joint-profit maximizing price. Therefore occurrence of cheating will be determined by the hypothetical profits from cheating. According to Stigler, this depends on the normal variability of sales - bigger it is, harder the detection gets.

In the very next year, that is in 2003, Allen and Gale spoke about _Competition and Financial Stability‘ in terms of the banking sector. Herein, they argued that the relationship between competition and financial stability is considerably more complex than the simple ―tradeoff‖ suggests. Taking the example of the banking sector and using data from 79 countries the authors concluded that crises are less likely in more concentrated banking systems. The paper observes a proper balance between competition and financial stability and presupposes a framework in which we can identify the welfare costs and benefits of different levels of competition and financial stability. Sometimes competition decreases stability and sometimes perfect competition is compatible with the socially optimal level of stability.

There should be no presumption that reducing competition in order to increase financial stability is socially desirable. The Firm that makes the best innovation manages to capture the whole market. The equilibrium price equals the difference between the value of the successful Firm‘s product and the value of the second-best product, y. Since competition is generally viewed as being desirable because it leads to allocation efficiency, this perceived trade-off lead to calls for increased regulation of the banking sector to ensure the coexistence of competition and financial stability. The most popular instrument for achieving this end was the imposition of minimum 36 capital requirements on banks. In addition to capital controls, deposit rate controls were also necessary to achieve Pareto efficiency.

Shaked and Sutton in their paper, _Relaxing Price Competition Through Product Differentiation‘, based their analysis on a three stage non-cooperative game. In the first stage, Firms choose whether or not to enter the industry. At the end of the first stage, each Firm observes which Firms have entered, and which have not. In the second stage each Firm chooses the quality of its product. Then, having observed its rivals' qualities, in the final stage of the game, each Firm chooses its price.

This three stage process is intended to capture the notion that the price can in practice be varied at will, but a change in the specification of a product involves modification of the appropriate production facilities; while entry to the industry requires construction of a plant. The paper concludes that competition between the surviving "high quality" products drives their prices down to a point at which not even the poorest consumer prefers the (excluded) low quality products even at price zero. We show that if three or more Firms are present, competition in choice of quality drives all Firms to set the same "top" level of quality permitted while prices, and so profits, become zero. This reflects the fact that no one of the three Firms will now prefer to set its quality lower than that of its two rivals, as it would thereby certainly earn revenue zero at equilibrium. Introducing a small cost of entry E, we deduce that the only Perfect Equilibrium in the three stage game is one in which exactly two Firms enter; in which they produce distinct products, and earn positive profits at equilibrium. Moreover, this equilibrium configuration is independent of e.

In direct contrast to the paper by Hotelling and Porter, _Clusters and the New Economics of Competition‘ suggests that in theory, more open global markets and faster transportation and communication should diminish the role of location in competition. If location matters less, why, then, is it true that the odds of finding a world-class mutual-fund company in Boston are much higher than in most any other place? Today‘s economic map of the world is dominated by what the author calls *clusters:* critical masses – in one place – of unusual competitive success in particular fields.

Although location remains fundamental to competition, its role today differs vastly from a generation ago. Competition in today‘s economy is far more dynamic. Companies can mitigate many input-cost disadvantages through global sourcing, rendering the old notion of comparative advantage less relevant. Instead, competitive advantage rests on making more productive use of inputs, which requires continual innovation.

Taking the examples of a wine making plant in California, Porter lists the various industries, shops and specializations that have developed in and around California owing to the huge mass of wine created in its vineyards. A cluster‘s boundaries are defined by the linkages and complementarities across industries and institutions that are most important to competition. Clusters promote both competition and cooperation. Rivals compete intensely to win and retain customers. Without vigorous competition, a cluster will fail. Yet there is also cooperation, much of it vertical, involving companies in related industries and local institutions. Competition can coexist with cooperation because they occur on different dimensions and among different players. Clusters represent a kind of new spatial organizational form in between arm‘s-length markets on the one hand and hierarchies, or vertical integration, on the other.

In the paper titled, _Price Competition, Quality and Income Disparities‘, researchers Gabszewicz and J.-F consider a market the demand side of which consists of a large number of consumers with identical tastes but different income levels, and the supply side of two Firms selling at no cost products which are relatively close substitutes for each other. Consumers are assumed to make indivisible and mutually exclusive purchases. Accordingly, consumers choice operates on a finite number of ―price-quality‖ alternatives made available to them by the Firms competing in the industry.

Doing so, we try to capture an important fact of real life: in many economic decisions, it seems that the quality component of the choice bears as much on the outcome of the choice as its quantity component. Indeed, by contrast with Hotelling‘s contribution, no undercutting strategy exists in our case: When price is moved down, the customers move gradually from one competitor to the other. Of course, this ―smoothness‖ directly follows from the fact that the income distribution itself is smooth. Moreover as long as the problem of existence remains unsolved, it seems of little interest to discuss the issues of uniqueness and stability.

Ronsen sketches a model of product differentiation based on the hedonic hypothesis that goods are valued on their utility bearing attributes in the paper titled _Hedonic Prices and Implicit Markets: Product differentiation in pure competition‘.

When goods can be treated as tied packages of characteristics, observed market prices are also comparable to this term. Price differences are generally equalizing on the margin and not on the average. The authors anticipate that the basic conceptual framework outlined above will have a variety of applications to many practical problems involving equilibrium in cross sectional data. The essential spatial context means that substitution and income effects must be more carefully distinguished than others. A generalization will generally incorporate the case of monopolistic competition and observed distances between differentiated goods will be endogenously determined.

Coming to the determination of competition in an industry, there are namely two ways of approaching the same. The Herfindahl-Hirschman Index (HHI) is used for analysing industrial concentration in the oligopoly market but according to Watt and Quinto strict reliance upon the HHI index can indeed lead to incorrect policy concerning anti-trust issues, if the true objective of the policy is social welfare. Watt in his paper quoted, that mergers in an oligopoly market will lead to great changes in the market, but questions whether the market should allow such mergers or not.

It has been suggested that a merger that keeps the HHI value less than 1000 must be allowed, more than 1800 must be opposed and those who lie between 1000-1800 must be opposed only if the HHI value increases by 100 points. However, taking these kind of inferences from HHI Index may not be correct because increases in HHI index or merger in oligopoly may lead to increase in variance. Two small Firms can also merge in an oligopoly market and in that case the HHI value would increase but the variance would decrease and will lead to social welfare.

According to Antwi, Gaynor, and Vogt in their paper titled _A Competition Index for Differentiated Products Oligopoly with an Application to Hospital Markets‘, 2006, the concentration in a market has a direct impact on prices of the products or services it provides. In this paper, the authors have taken the example of hospital market in California and according to their analysis a standard merger between two Firms in a 5 Firm market each with equal market share - will lead to an increase in HHI value from 2000 to 2800 which will ultimately increase the price of their services by 5%.

In the report given by the Competition commission of India, the cement industry in India is an Oligopolistic market as top 12 Firms among at least 100 Firms is capturing 70% of the market. Through this data, we can see that concentration is high which ultimately leads us to comment on the various characteristics of the oligopoly market that are as follows :

1) Entry barriers: As cement industry has been present for a long time, it has high capital investment and economies to scale which leads to entry barriers

2) Buyer power: As the Firms have high concentration in the market, the buyers have low control over price setting.
3) Inter- Dependence: As the production and supply are in the hands of few major Firms, they are interdependent. A change in the strategy of one can affect the whole market.

Singh suggests that through the CCI report, it can be concluded that oligopolistic markets exist within our system. Hauge & Jamison said perfect competition leads to efficient utilization of resources and as the market concentration increases, perfect competition starts changing into oligopoly and therein, Firms exercise their market power which reduces economic efficiency that comes from misallocation of resources done through restricting the output to increase the profit. Some believe that loss of efficiency is determined by the market power concentration. Quoting the example of the telecom sector, if there is monopoly in telecom sector then the suppliers can restrict its customer base by charging very high price and thus increases the profit and reduces efficiency. Hence, completion is very important.

Pehlivanoglu and Tiftikçigil proved in 2013 that the market structure of iron and steel industry in Turkey is not oligopoly in nature but rather, monopolistic. This was suggested on the findings that the HHI values were below 1500 and the concentration ratio of four Firms was 30 to 50 which meets monopolistic characteristics. However it moved away from monopoly and towards oligopoly during financial crisis of 2008. Many Firms closed down and the market concentration increased in that period of time.

According to Obayemi, during the colonial and pre- Independent period the telecommunication industry of Nigeria was a monopoly but due to the establishment of GATS and WTO in 1997 and democratic government returning to power led to establishment of Nigerian Communication Act which liberalised the telecom industry and thus the market structure changed to oligopoly.

A number of studies have been done using these two models of measurement (The Ross- Panzar (P-R) reduced form revenue model and The Brenahan and Lau (1982) mark-up model) to find out about the competition in the financial sector, especially in the banking sector. Mugume‘s study rejects both perfect competition and perfect collusion and leans more towards monopolistic competition.

Next, looking at the Real Estate industry, we can say that the Real Estate Industry may be leaning towards an oligopoly. ―Firms involved in both land and building development functions are usually large Firms which signal towards high concentration. The developers concentrate a lot on product branding which is a strategy used by producers in an oligopoly.

Under the Irban Research Program of 2006, studies found that mergers are quite prevalent in this industry where Firms take over other Firms to increase market share. The industry is divided into sub-markets and the developers occupy these sub markets which helps them in exerting some degree of monopoly power. This gives them specific targets in their own markets as various exogenous and endogenous barriers make it difficult for them to move effortlessly between sub-markets. Entry concentration- Even though there are no accreditation process or pre-requisite skills necessary for entering the industry other than access to land and other resources, it is slowly moving towards a more professional field. This implies that it is moving from being a more or less contestable area to a more monopoly to oligopoly characterised sector.

2.2: An Overall View of the Telecom Industry

Fink, Carsten, Mattoo, Aaditya, Rathindran, Randeep found in 2001 that despite moving away from traditional public monopolies in the telecom sector, most Asian governments are still quite hesitant to allow entry without restrictions, eliminate limits on private and foreign ownership, and establish strong independent regulators.

Through their research they find that the 1990s was characterized by countries such as China, India, and Korea, for example, introducing competition in selected fixed-line market segments, while the incumbent operator was under full public ownership.

Others first privatized their state-owned monopolies and postponed the introduction of competition to a future date — sometimes through explicit exclusivity periods granted to private investors. Some of the countries that formed a part of this cluster were Hong Kong, Indonesia, Malaysia, Pakistan, and Singapore.

While some countries undertook the task of liberalization and privatization head on; at a fast pace, others adopted slow and gradual steps towards the same.

India segregated its markets into separate circles and admitted one private operator in each to compete with the incumbent Department of Telecommunications (DOT). The DOT maintained its monopoly on inter-circle long distance telephony whereas, new entrants were allowed to offer intra-circle long distance services.

In the mid1990s, that is post liberalization, a poorly managed licensing process and institutional conflicts within the bureaucratic bodies caused significant delays in the introduction of competitive local services and have adversely affected the confidence of private investors.

In today‘s day and age, we see a picture of managed competition standing before us. While the Government has given up on the monopoly powers it possessed before, it seems reluctant to let go completely. It still prefers to stay in the market and manage the whole operation discreetly.

The paper also discusses the benefits and the brickbats of competition. On one hand competition improves the allocative efficiency of the resources; on the other hand, in particular to the telecom sector - it could lead to the threat of duplication of network.

Presenting a counter argument, technological advances have significantly lowered network costs, and vertical separation has widened the scope for competitive entry. Furthermore, it has also been argued that inefficiencies introduced by duplication of networks may be small compared to operational inefficiencies that can result from a lack of competitive pressure. Thus Governments prefer to liberalize the mobile segment over the fixed line segment as in the mobile segment, there is no incumbent to protect.

The paper also elaborates on the role of the regulator and suggests that the problems of determining interconnection rates which adequately reward the incumbent for the creation and the maintenance of the network while ensuring that use of the network by rivals is not foreclosed. The agreement on the regulator‘s role with regard to consumer prices and output decisions fares lower than the reasonable consensus about the desirability of regulatory oversight of the terms of interconnection.

It would seem that at least at an intermediate stage, where public ownership and control have ended but truly competitive conditions have not yet been created, the regulator may well need to defend the interests of consumers. Regarding the investor sentiment, the paper suggests that if there is significant uncertainty about policy, there will be fewer investments and service providers will demand a premium to their returns on capital. If policy can be influenced, there exists the possibility of lobbying endeavors. Competition are beneficial to the Government because they reduce the extent to which the Governments are obligated to a single operator, playing the monopolist in the industry.

The paper highlights on the difficult task of proving a balance between providing incentives to the telecom companies and at the same time limiting excessive profit making. This situation has to be navigated in the presence of asymmetric variable such as costs. In conclusion, the paper highlights the positive contribution of liberal policy to the performance of telecommunications services in Asian developing countries. Where there is domestic resistance, the wave of a multilateral wand sometimes creates only an illusion of reform.

In 2014, researchers Nelson and Malerba wrote about at economic development as a process of catching up where countries aim to imitate and come to par with the models of those in developed nations. It also asks the following question, do the industry structure, institutions and policies that characterize a national innovation system fit better some sectoral systems than others? However, exact imitation is not possible and attempts to be at the same level as others, only get viably close. Thus, there is divergence in the process. Modifications are required in order to match local practices. In this process the practices being brought in are certainly not new to the world, but they are new to the country, and bringing them in involves considerable risk, and requires a lot of trial and error learning to be effective. In order to catch up the country requires various capacities in the likes of capabilities to access complementary assets, absorptive capabilities and innovation capabilities. Catching up also requires support from various institutions and support channels such as financial systems, primary and secondary education, universities, the public research system and government programs. The paper suggests that in any sector, Firms are the key actors in catch-up.

The paper claims that Firms‘ specific learning processes, competences and organizations, as well as beliefs, expectations, and goals, are highly affected by the specific sectoral system they are in. The network, that is, the interaction between the actors and the institutions is of prominence too.

Due to the inherent conditions present in different countries, certain sectoral systems could nurture and grow far more over the others. New forms of equipment and instrumentation created by Firms outside the industry may facilitate innovation by Firms in the industry.

The study goes on to say, ―Catch-up is inherently a dynamic process. Because sectors differ and the elements of a sectoral system are more or less closely connected, it follows that their change over time often results in sector specific co-evolutionary processes. This process of sectoral catching-up involves the actors, knowledge base and institutions of the sector, and the operative government policies and programs.‖ In this dynamic setting, the individual capacity of the domestic Firms is pivotal.

The first stage of capability building for the production of modern products or processes can be associated with the beginning of exports or sales on the domestic market or both. Innovation here is not of the radical type. Rather, it is an adaptation or incremental change of existing products.

A second factor common to all cases of successful catch-up has been access to foreign knowledge. When the access to foreign knowledge has been impaired, so has been the catch up process. An example of this could be given in regards to the telecom sector of India. This is followed by the development of human capital, government policy, research done by universities and institutions and technological and market discontinuities. These links have been especially relevant in the Indian Telecom sector.

Taking the telecom sector into consideration, if knowledge in the sector is cumulative (such as in telecom), a technological and market discontinuity such as mobile phones favors the Firms that in the catching up countries have already accumulated a broad set of competences rather than completely new actors with completely new competences.

Where Korea and China are stellar example of core competencies, countries like India and Brazil are opposites. The former have performed better than the latter in terms of technological discontinuity. These discontinuities, however, provide an opportunity to catch up. Telecoms have also benefited greatly from foreign collaborations in terms of joint venture and partnerships. In 2007, researcher Anderson undertook the task of deriving and lobbying for the investment benefits derived from the rural areas of the world.

The paper suggests that at least 2.7 billion consumers are at the very _base of the economic pyramid', with per capita incomes of less than $1,500. Of that, roughly one sixth of the population, make about $1 per day and even fewer possess a mobile phone. The common sentiment of business remains to cater to the upper and the middle income segment of the world. At times, corporations have ventured into the lower income group through the shared-use model, however the challenges of availability and affordability remain potent.

In the face of falling Average Revenue Per User (ARPUs) and rising CAPEX and OPEX costs, availability which is defined as the process of reaching the poorest or geographically customers; leads to unviable or marginally lower benefits.

The paper cites the case of Reliance Infocomm who saw its share of net advertisements increase from <20% to >50% after introducing its _Monsoon Hungama' offer: a Handset worth $120 for only $10 upfront and $4 per month for 36 months. By partnering with a local finance company to share risk and a local insurance company to take up the indemnity of damage, Reliance launched handsets in the rural segment. The company also restructured dealer incentives, organized a massive marketing effort and constructed an elaborate collections infrastructure to control bad debt. Within an eighteen month period, Reliance saw its market share rise from virtually nothing to up to 20%.

The paper finds that operators are more concerned with the threat of cannibalizing their high-margin A & B segment consumers and are not active enough to act on the ―opportunity‖ of serving the poor through novel tariff and distribution approaches. In India, where prices are lower than $0.02 per minute on most networks where minutes utilized are higher than anywhere else, the aim has now become to reduce margins and to increase volumes. However, this requires a significant investment in CAPEX and also requires efficient distribution of the OPEX. Hence, operators like Bharti have taken up significant strides towards outsourcing.

Reliance Infocomm, on the other hand, has developed a network of direct selling agents called DhirubhaiAmbani Entrepreneurs (DAEs). Most DAEs are small entrepreneurs who work to persuade their family and friends to switch to Reliance's CDMA phones. This provides a significant boost to the company's 40,000 retail outlets, and distribution networks in cities have become more immune to pervasive networks. Also, 2nd tier and 3rd tier cities have been brought under the umbrella of customer base.

The paper also highlights that the rising use of mobile phones in the world does not render the payphones obsolete. If the cost of using payphone remains low, customers would prefer those for outgoing calls and keep mobile phones for mobility.

The paper brings to light two fundamental issues facing the industry, that of motivation and the Need for true business model innovation.

2.3: An Analysis of the Indian Telecom Industry: Policy, Regulation, Business Models

In 2015, Pritish and Saxena undertook an analysis of the dynamic Indian Telecom Industry.

Their research provides an informative timeline of the developments and the coming of age of the telecom sector of India.

In the year 1985, the Department of Telecommunication set base in the country. The objective of the DoT was to navigate the murky waters of telecommunication while at the same time looking after consumer interests.

In order to make the operations of DoT easier, two new Public Sector corporations, namely Mahanagar Telephone Nigam Limited (MTNL) and Videsh Sanchar Nigam Limited (VSNL) were set up under the DoT in 1986. MTNL looked after the operation of basic telephone services in Delhi and Mumbai whereas VSNL provided international telecom services to subscribers in India.

However, in the 1990s, the Government found itself inundated with a heavy demand for telecom from the population of India.

Thus, the private investment in the sector of Value Added Services (VAS) was allowed by the Government and cellular telecom sector was opened up for competition from private investments.

The Government took aid of a few policy instruments to structure, regulate and monitor the telecommunication scenario of the country. These policy instruments were the National Telecommunications Policy of 1994 and 1999. The National Telecommunications Policy (NTP) in 1990. However defined certain objectives, including

availability of telephones on demand, provision of world class services at reasonable prices, improving India‘s competitiveness in global market and promoting exports, attracting FDI and stimulating domestic investments, ensuring India‘s emergence as a major manufacturer of telecom equipment and universal availability of basic telecom services to all villages.
However, by allowing foreign players into the industry the externalities created led to a rising need for independent regulation within the country. This led to the birth of TRAI in 1997.
TRAI‘s mission was to create conditions for the growth of telecommunications in the country in a manner that would enable India to play a leading role in the global information society.
In the year 1999, the NTP 1999 was instituted. It led to Opening up all segments of the telecom industry for private players.
Consequently, in the March of 2002, VSNL‘s monopoly in international telephone services came to an end.
Jumping to the present, we witness a whole new world in regards to the telecom sector. The sector has come to be heavily dominated by competition and taken over legally by the wireless segment. The major operators in the wireless field are Bharti Airtel, Vodafone, Reliance Communications, Idea Cellular, Tata Indicom and BSNL/MTNL Dominated by MTNL and BSNL, fixed telephones are facing stiff competition from mobile phones. TRAI‘s mission was to create conditions for the growth of telecommunications in the country in a manner that would enable India to play a leading role in the global information society.

India at present, operated in two mobile technologies. One is Global System for Mobile (GSM) and the other is Code Division Multiple Access (CDMA). GSM enjoys a larger share of the telecom market in India of about 80%. CDMA occupies only about 20% of the telecom market share. The paper finds that CDMA phones are more focused in rural regions, where people look for affordable schemes and low priced phones rather than smartphones. In rural areas, the purchasing power and users demands aren‘t very high. The number of CDMA operators in India is limited to just Reliance, Tata Teleservices and BSNL.

However, in the event of a rising demand for GSM phone, the demand for CDMA phone has faced a decline in the country.

There is a large disparity between the urban tele-density and rural tele-density. The slow growth in tele-density in the rural areas is due to these areas being less attractive for the telecom service providers to invest in. These areas also demand huge investment from the telecom companies.

According to TRAI‘s annual reports of various years, India‘s tele- density has increased from 18.23% at the end of March 2007 to 78.66% at the end of March 2012. However, tele- density declined from 78.66% at the end of March 2012 to 73.32% at the end of March 2013. This is also indicated in the above graph. The graph also depicts that the Urban Tele- density has decreased from 169.55% at the end of March 2012 to 146.96% at the end of March 2013. Rural Tele-density has increased during this interval.
During August 2013, the Telecom Commission FDI cap has been raised from 74% to 100% in order to encourage foreign investors to invest in the Indian Telecom industry.
The average growth rate of the Indian Telecom industry has been around 35% and thus, beneficial to the country.
Singh Soni, and Kathuria struck a comparison between the NTP policy of 1994 and the NTP policy of 1999.
Telecommunications was not given priority as one of the key infrastructures for rapid economic development during the formative years of the Indian economy. The low levels of investment in this sector have affected the quality, quantity and range of services provided.
NTP 94 spelt out five basic objectives were of availability of telephone on demand and universal service. Two other objectives were to make the country a major manufacturing base and exporter of telecom equipment and to ensure the country's defense and security needs.
There were serious gaps in the policy document as regards provision of a suitable environment for entry of private service provider and on the issue of regulation. The 1994 policy was designed with the same monopolistic POV that services should continue to be provided largely by a strong incumbent that faced little competition.
The opening up of the Internet sector set the background to NTP 99, which is a major attempt to plug the loopholes in the 1994 policy.
Provision of 'Universal Service' (including unconnected and rural areas, re-targeted for year 2002) is sought to be balanced by provision of sophisticated telecom services capable of meeting needs of the country's economy.
The policy also brought in a change from the existing license fee system to one based on one time entry fee combined with revenue share payments.
There were some restrictions such as a limitation on sub-licensing, on transferability of shares for a specified period (i.e. five years), and the licensee being treated as a defaulter when there is a non-compliance of any

license condition. However, it must be noted that the Government continuously endeavors to remove restriction that impairs the performance of the licensee.

Telecommunications reforms policies around the world now encourage many more participants than the incumbent operator in the process of telecommunications network expansion and service development.

In order to contain the anti-competitive behavior that arise from a large market and very few competitors, the TRAI came into being. This paper, in line with other literature in this regards, highlights the importance of a regulator in the formative years of the industry. In India's case, license fees have been identified as source for government revenue. If revenues have to be earned from any sector, it is more efficient to earn it out of the actual earnings rather than to seek them from projected earnings in an uncertain environment. However, at the same time, care must be taken to ensure that these costs do not delay the liberalization process and render most projects unreliable.

The paper concludes that in order to improve the tele-density of the country, any license fees charged should be low, covering for instance contributions to the proposed Universal Service Access levy, the cost of regulation, and some additional amount to meet other objectives such as the creation of a Telecom Fund.

III. RESEARCH METHODOLOGY

3.1introduction:

Reflecting on the literature review in this regards, we get an understanding of the present research gap, especially in regards to the Indian Telecom sector. The current research aims at determining whether the structure of the industry is oligopoly or not and if yes, which model given by popular literature in game theory and economic though best describes the market. The research also aims to get an understanding if cartelization is a stable and feasible strategy to keep Jio out of the telecom industry.

3.2 Data Sources:

The data collected for determination of the presence of oligopoly in the telecom sector, is the market share of all the market participants. The same has been obtained from the TRAI website, which is a public resource. The market share of the industry is quarterly collected and is used to determine the large, medium and smaller level players in the industry. The data has been utilized for conducting two tests which are used to determine the presence of oligopoly in the industry. These are namely the Concentration Ratio and the Herfindahl-Hirschman Index.

The Concentration Ratio test is a fairly easy approach towards determining the presence of oligopoly. Market share is calculated by obtaining the revenue from sales of each player in the market and summing the same. The individual figure of sales is compared to the total sales of the industry and a percentage is obtained. This percentage figure represents the market share of the company in the industry. The Concentration Ratio takes into account the top 3 or 4 or 6 players in the market and sums the market share of each. If the figure for the above three is high then this represents that the market is an Oligopoly.

The HHI on the other hand, squares the market share of each Firm. The sum total of the squares of each Firm‘s market share is then compared to the range of 0 to 10,000. If the market is a monopoly, then the HHI would be 10,000. This would symbolize that the entire market is captured by one single player and that one single player holds the entire market share. The further the HHI is from 10,000 the greater is the chance of more Firms being present in the market.

According to the US Department of Justice, a market with an HHI of less than 1,500 is a competitive marketplace, an HHI of 1,500 to 2,500 symbolizes a moderately concentrated marketplace, and an HHI of 2,500 or greater signifies a highly concentrated marketplace. Thus, according to this parameter, the Indian Telecom Sector is an Oligopoly characterized by a moderately concentrated marketplace. Another part of the objective is to understand how the Firms in the market co exist, sustain market share and establish or reject cooperation. It aims to provide positive advice on the arenas for equal competition between Firms, through opportunities.

The third and the most important section of the research is to validate if cartelization of telecom players is a stable and feasible strategy in response to the price competition as demonstrated by Jio. This objective is achieved from a Game theory framework.

An additional study is conducted to understand the current market scenario, understand strengths, weakness and opportunity in contexts of stability and competition and to suggest a few policy implications for the same. In determination of the same, the study surveyed industry experts, industry veterans and also presents recent updates which establishe comparison between one on of the major market share owner of the market, Airtel and the new stellar entrant who has already outperformed expectations in its first year itself, Reliance Jio. The above have been enclosed in the Appendix Section.

3.3 Framework Of Anlaysis:

In order to obtain the data, we made use of the method of secondary research through the collection of data on market share, ARPU and literature in regards to game theory, The study obtains these key statistical figures and estimates from data sources such as TRAI, DoT, Data of Govt, of India and other public platforms and databases.

In order to understand which models of cooperation, collusion and competition are followed by the industry, we made use of Economic Literature on the subject. For the same, we referred to three popular models of Oligopoly – namely Bertrand, Cournot and the Kinked Demand Curve. A Game theoretic approach is used to specify the merits of cartelization and its efficacy in being able to keep Jio out of the market competition.

In order to assess the strengths, weakness, opportunities and threats of the industry along with providing policy recommendations to the Firms, the study undertakes a survey of industry Firms and industry experts.

3.4 Interview Design:

The interview was majorly based on the current scenario of the Indian Telecom Industry. With the entrance of Jio, giants like Airtel, Idea and Vodafone have suffered losses in the previous year. There are however additional factors too that impact the market.

The personal interview was conducted with the aim of obtaining key observations and insights into the industry‘s business model, revue and costs along with obtaining an insider‘s knowledge opportunities and threats. The personal interview was conducted via personal interaction and over phone and phone.

- An interview was conducted with Dr. Giri Hallur, faculty of Symbiosis Institute of Telecom Management through personal interaction. The interview was aimed at understanding how telecos work in the Indian domain and how they manage their costs, revenue and identify opportunities and threats facing them. Dr Hallur provided the study with an understanding of how the industry can structure itself better in order to face the threats facing it and capitalize on the opportunities lying in front of it.
- An interview was conducted with Dr. Sujata Joshi, faculty of Symbiosis Institute of Telecom Management through personal interaction. The interview was aimed at obtaining the Indian‘s customer perspective and responses towards the changes taking place in the dynamic telecom industry of India. Dr. Joshi highlighted how the Indian audience perceives and views the development of the market. Dr. Joshi works in the advertising field and hence equips this study with the ability to guage the expectations and behavior of the consumer.
- An interview was conducted with Mr Rupam Gupta, an alumnus of Telenor India over telephone. The interview was aimed at obtaining a timeline of events that have transpired in the Indian domain from the period of 2001 to later part of the decade. Mr Gupta provided a basis for understanding how the Indian Telecom industry has moved past its initial bottlenecks and has come to being a trillion dollar industry today. He also provided a timeline for events that have happened over the course of last few years. His insights provide us with a much needed perspective of the key players in the market.
- An interview was conducted with Dr. Tarun Singhal, faculty of Symbiosis Institute of Telecom Management through telephonic conversation. The interview was aimed at understanding the current opportunities and threats that are facing the Indian Telecom industry. Dr TarunSinghal suggested a significant policy implication, which suggests that Telecom companies should establish their own ecosystem which provides the user a lifetime access to the telecos‘ OTT service at competitive prices. He also highlighted the importance of data mining and how the industry can derive benefits out of the same.

3.5 Data Design:

The data was collected and run in excel and the interview data set was complied and organized along with current industry data to obtain the required findings. The data was collected from credible sources like TRAI and DoT along with others such as data.gov.in and ITU. In order to derive data on the models and tests the study made use of common economic thought and literature present in Economics. The models and tests are popular analyses and tools used in regards to competition and cooperation.

IV. FINDINGS AND ANALYSIS

4.1 Introduction:

The data analyses and findings have been attained for two separate objectives. While one aims at competition, the other aims at stability. The competition objective has made use of two types of tests to determine oligopoly along with a use of literature given by Economists such as Bertrand, Cournot and the Kinked Demand curve. The last objective is achieved by a suitable construction of a hypothetical game so as to validate Jio‘s market power and position with regards to its sustainability in the market.

SWOT analysis of the industry along with policy implications of the same is enclosed in the Appendix Section. The SWOT analysis has been arrived at by making use of secondary research based on primary research done by third parties, news articles and the primary data collected in this regard are personal interviews.

4.2 .1 Determination Of Oligopoly:

For our present research objective, the findings were as follows:

1. The Concentration Ratio of the top three players in the market stood at 60.21%. The top three market players at the time of the study were Bharti Airtel, Vodafone and Idea respectively.
2. The 4 Firm Concentration Ratio, which took into account the market share of 4th largest player in the market BSNL, stood at 69.01%.
3. The 6 Firm Concentration Ratio, which took into account the market share of the 5th and the 6th largest players, i.e. Aircel and Reliance Communications respectively, stood at 90.55%.

The analysis and interpretation of these results suggests that the concentration ratio in the industry, of the top three players itself, is quite high. When the top 4 and the top 6 players are considered, this number rises even higher. Thus, according to the Concentration Ratios, the market is Oligopoly in nature.

The results of the HHI for all the players in the market were 1510.7907. This suggests that the market is Oligopoly with a moderate concentration.

It had been cited earlier than an increase of 200 points in the HHI, especially in a highly competitive market could lead to anti competitive behavior in the market especially in an industry which is highly concentrated. In the Indian Context, this is currently true. In face of stiff competition being given by the new entrant Reliance Jio, the incumbent Firms in the market have been woken up to a challenge. Jio offered free voice calls in its first year of operation along with free data services. The industry incumbents were already burdened by the high cost of spectrum, licensing fee and service tax - which stands at 15% on telecom services. The predatory or rather, zero pricing models by Jio, continues to challenge the industry‘s perception about its own antique business model.

In the light of the same, Vodafone and Idea as well as Reliance Communication and Aircel have decided to merge operation (in separate entities) in order to gain in terms of efficiency in costs and infrastructure. Thus, this represents a possible dilemma and significant cause of concern for the Competition Commission of India. It has to look into the mergers and ensure the market ownership does not rise to 49% (should be less than 50%) of the merging Firms. Thus, it is now required to play an active role. Along with the ensuring absence of anti competitive behavior, authorities must also ensure that there are no detrimental effects on welfare.

4.2.2 Game Theory and Oligopoly Models

The Bertrand competition is named after its founder Joseph Louis François Bertrand. The Bertrand competition got recognized for establishing the equilibrium in a duopoly market. In Situation A, the model suggests - in a market, where there are two Firms – Firm 1 will not obtain any profit by setting its price above marginal costs because its competitor will not increase his price and continue to compete at the competitive price. Thus there is no profit in increasing price. On the other hand, if Firm 1 as well as Firm 2 decides to collude and ensure that both will set a price greater than marginal cost, then each Firm will have an incentive to undercut the other Firm‘s price and thus obtain an immediate market share.

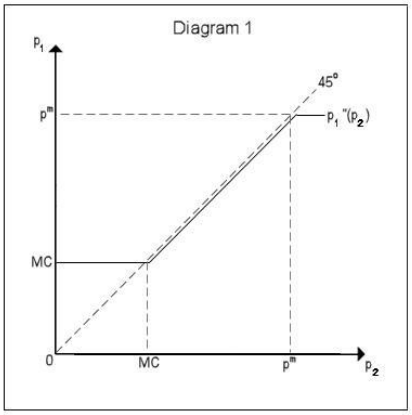


Fig: Situation A (Bertrand)

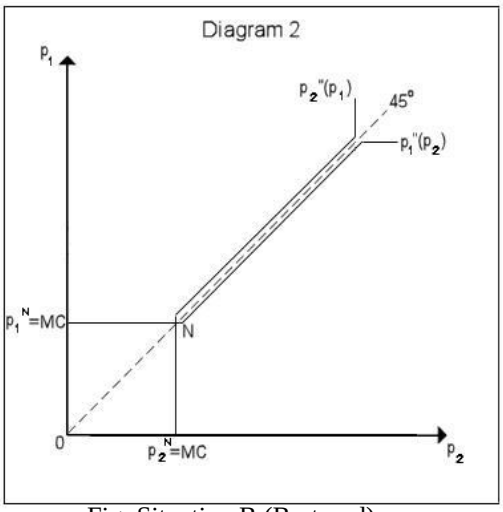


Fig: Situation B (Bertrand)

Source: Rubin and Pindyck, Microeconomics

Tata Docomo was a relatively new Firm in the later part of 2000s. At present, its market share is 4.70%. Before the entry of Tata Docomo, the norm of the industry at that time had been to 60p per minute on voice calls. When Docomo entered the market, it changed the scenario quite dramatically. The entrant charged only 1p per second for voice calls. This was enough to invite the customers to shift their telecom subscriber to Docomo and shift away from their current operator.

Suppose, a customer were to talk on her phone for a period of 2 minutes and 40 seconds. Under 60p per minute, the customer would have to pay 180p; owing to the fact that the last 40 seconds are counted as a whole minute under this plan. Now under the 1p plan, the customer was required to pay only 160p for the time spent on the phone. This was 20p less than the other plan. This seemingly insignificant difference in costs turned out to be quite lucrative for the customer, Docomo was the originator of this plan and also, its beneficiary.

The entrant entered the industry on the back of a new idea and slowly captured the market with this offer. The new entrant had undercut competitors thoroughly. It was a surprise for not only the incumbents but also for itself. It offered many other packages and goods along with its 1p per second plan, unsure if the 1p scheme alone was enough to lure customers in.

―Tata Docomo‘s scheme led to a fall in ARPU‖, says Mr Rupam Gupta who has worked in the telecom industry from the late 2010, till a little later.

―The first turning point was in the post-2005 years of the industry. At that time, Reliance had entered the market and had started offering phones around Rs 500 in the market, which at that time was quite significant‖. Reliance had also gone to the rural and downtrodden districts of the country and had established a customer base there too. Reliance had schemes as low as Rs 1 per call and it did not charge for the LG CDMA phones it came with. This led to a rise in its customer base and also led to a rise in its market share.

If we map the Bertrand model to the three scenarios depicted above, we can say that setting a higher price is never the right way towards attaining equilibrium in the market of multiple players.

Bertrand goes on to say that equilibrium can only be attained when price of both the Firms equals marginal cost. This is Situation B. The Firms with the higher price will always face the threat of competitive lower prices and thus would do better at a price, where price P is equal to MC, marginal cost. That is the true Nash equilibrium in the market, where both Firms have neither made a profit nor a loss.

Antoine Augustin Cournot, in the 1800s, provided the world with the _Cournot Competition‘ model which provides another way for looking at competition in an oligopoly.

The model describes an industry structure where the competitors compete on quantities and the amount of output they will produce. They decide the same independent of each other and simultaneously.

The model assumes that there is no cooperation or collusion between the Firms. Since each Firm is setting its own price and quantity independently, it does not know of other prices and quantities being set by competitors, and also does not believe that his price can affect the quantity of output produced in the market.

Now, given the quantity of output produced by Firm 1; Firm 2 is left to decide on the price and the quantity for the residual demand it faces from the industry. Since Firm 1 has already produced q1 of output, Firm 2 will produce q2 which will be a function of q1. If we assume that Firm 1 produces half of the demand facing the industry (D1) and Firm 2 produces half of the remaining market demand [(D1-q1)/2], then the there still exists some scope for production in the market. This leads Firm 1 to produce half of the market share not

covered by Firm 2 in the next round of production, i.e, [(D1-q1-q2)/2]. Thus, the game goes on and on until each Firm produces one third of the total market share. And together, they thus cover two thirds of the market share.

The folly of the Firms lies in the fact that they do not realize their interdependence and thus reach the inefficient outcome by capturing only two thirds of the market – eventually leading to inefficient profits. If the Firms realized their interdependence, they would be able to produce half of the market share each and thus, would be able to act as monopolists.

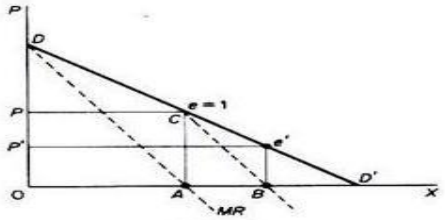


Figure 9.1

Fig: Cournot Model

Source: Rubin and Pindyck, Microeconomics

In the very ending of 2015, the incumbents complained of a loss of revenue from the Over The Top service providers such as Skype, WhatsApp, Viber amongst others. OTT services provide the ability to call and text at zero costs and only use the data provided by the telecom operator. OTT services are substitutes of voice call and SMS through the carrier. The incumbents have complained that since the OTT players provide the same service as the incumbents - they should be charged to the same regulation and costs as the telecom industry, which at present, they are not. They also demanded a share of revenue from the OTT, as these services make use of data provided by the carrier.

However, the rise of the OTT players is not the only threat facing the Indian Telecom industry. Cut to today and Jio has created ripples through out the market with offers as low as the above. Jio entered the market offering absolutely nothing for voice as well as data. With a stellar entry and a strikingly opposite business model, Jio made ripples in the market. Jio at present owns about 5% of the market share and that too, within a one or two years of operation. Relaince Jio‘s entry has yet again, flipped the market.

India has now become the top country in regards to data usage and has consumed 100 crore of Gigabytes per month, according to Reliance Industries. The telecom industry has seen a drastic shift, which was gearing up slowly earlier but has now gained pace.

Bharti Airtel saw its annual profits slump to a 55% low in the end of the financial year of 2016. The Indian ARPU also came down by 6.4% and the ARPU for data services came down by 13% q-o-q. The situation remained same, if not more dreary, for the other three huge players in the market; namely, BSNL, Vodafone and Idea. Due to fierce competition in the industry Vodafone was forced to write down its profit by $5.5 billion.

In light of the _destructive innovation‘ brought in by Jio, Vodafone and Idea have decided to merge. The number two and the number three of the market have agreed to combine operations and thus gain a market share of 35% approx and gain a revenue share of 41% approx. At the same time, Reliance Communications has set the path for a merger with Aircel.

The current scenario of the Indian Telecom Industry represents the Cournot model. Two Firms who operated without cooperation and collusion have now come together to obtain a greater market share, as well as a larger revenue share. The mergers would allow these Firms to take advantage of their cooperative efficiencies and would thus be able to reduce their keys costs of operation and reduce the risk of leverage in the industry.

If the Cournot model could be modeled to the telecom context, we realize that the one modification that exists in this regards is that of quantity. India offers spectrum in 21 circles currently, an each operator has to purchase spectrum in order to provide service in that circle. In face of the same, Cournot can explain the benefits derived from the merger and collaboration of the incumbent Firms; in regards to sharing of the spectrum. Cournot can also describe the cooperation strategies that can be arrived at in sharing of infrastructure. Infrastructure includes building and maintenance of cell phone towers amongst other CAPEX. If the firms do come together, they can arrive at an equilibrium level of spectrum and infrastructure sharing model that will provide allocation efficiency benefits to all the players.

The Kinked Demand curve theory given by Paul M. Sweezy, suggests that there exists price rigidity in the market. It suggests that when a Firm tries to increase the price of his product, he finds that none of the other competitors in the market are willing to raise the price of their products. Thus, there exists price rigidty as many

oligopolists remain reluctant to change prices even if the markets undergo a change. This is especially true for a market that lacks product differentiation. However, the Oligopolist knows that if he reduces his price, all his competitors will follow him.

The demand curve facing an oligopolist, according to the kinked demand curve hypothesis, has a ‗kink' at the level of the prevailing price. The kink is formed at the prevailing price level because the segment of the demand curve above the prevailing price level is highly elastic and the segment of the demand curve below the prevailing price level is inelastic.

Mapping this approach to the Indian Telecom industry, we find the industry in a similar soup too. The lower prices being offered by Jio have challenged the static nature of the prices earlier. The industry has taken note of the fact and knows that lower prices are luring customers to allocate their expenditure in such a way that the ARPU suffers. The Kinked demand curve also suggests that under an oligopoly with undifferentiated product, the possibility for collusion is more. This leads to the industry accepting one player as the market leader and the others following it the price setter. Though, we can't say that the industry has accepted a market leader, in the Indian context – it has definitely started the process for collusions amongst itself. Thus, the Kinked demand curve serves as a relevant literature in regards to the Indian Telecom sector.

The natural question thus arises, what is the prevailing price in the Indian context? The prices being offered by Jio have now become the prevailing price, p. The level above the prevailing price is the elastic part of demand and the segment below it, inelastic. Thus, if the industry wishes to come at par with Jio, it has to reduce its price to that being offered by Jio. Otherwise, it fears losing subscriber base and market share.

The incumbents opine though that they cannot match up to the costs being offered by Jio – because these prices are way below the incumbent's Marginal Cost. Thus if the previous prevailing price in the industry was Rs. 100 and the current is p, and p<mc of the incumbents, the incumbents can only operate at a price slightly higher than p and equal to their marginal costs.

Whereas, market leaders like Bharti Airtel are still charging prices such as1p/second in respect of voice calls and have different schemes and prices for 3G and 4G data services; Reliance Jio has shifted away from the traditional business model and is now charging Rs 300 (approx)/month for Voice, SMS and Data services combined.

The ARPU for 2016 stood at Rs 112. If Reliance Jio were able to convince customer to pay Rs 309 for its monthly services, it individually would make an ARPU of Rs 309. This would be twice the earnings of each market player in the industry.

However, since the scheme was put into effect from 1st April 2017, we do not possess the relevant data to conclude what the appropriate and the actual course of action for the consumer will be. This represents a limitation to our study and we would have to wait to obtain an understanding of the same.

4.2.3is Cartelization A Feasible And Stable Response To Jio's Current Price Competition?-A Game Theoretic Approach

Cartels are a form of collaborative agreement entered into by the firms in an industry. The objective of the cartel is to ensure cooperation amongst the firms operating in that industry. If Firm A were to enter into a cartel agreement with Firms B, C and D – it would have to agree to abide by the rules of the cartel in terms of say price, quantity or other such competitive aspect.

There are benefits to being in the cartel. Foremost, it assures profits to the members by charging a price that exceeds costs. Cartels create a monopoly power for the member firms; the firms present in the cartel function as one. It also creates production efficiency because costs are now shared and allocated between large numbers of member firms. However, cartels don't come without their disadvantages. There exists an inherent fear of instability in cartels. Each firm has an incentive to undercut the prices offered by others and gain a higher market share. Moreover, cartels protect inefficient firms as referenced in the ‗free rider' problem.

Cartels are motivated by certain endogenous and exogenous factors playing in the economy.
Some of them are as follows:

1. The possibility for cartel formation is high in an industry that sells a homogenous product.
2. Cartel formation can take place in an industry, when the benefits derived from cooperation are more than the benefits derived from cheating.
3. In the event of a change in economic structure, there exists motivation for price wars. Consequently, in times of stability, cartel formation can lead to greater profits for the entire industry.
4. In industries where market concentration is high, the possibility for cartel formation is high as well.

Let us suppose the Telecom market is severely affected by Jio's extremely low and competitive prices. Individual players competing singularly with Jio by reducing their prices and providing equivalent services

would not find it feasible as a consequence of high OPEX and CAPEX costs prevalent in the sector. Individual players competing with a single player would reduce them to normal level of profits, thereby providing more monopoly power to Jio.

The next feasible solution in the light of the given problem is the process of _Cartelization'. Industry players could choose to implicitly collude and form cartels to operate as a single unit against Jio. As explained previously, forming cartels increases the cumulative access to brand width and significantly reduces OPEX and CAPEX costs. As a result, firms are now able to share infrastructure costs and maintain profit levels above normal standard. This section analyzes the rationality of a credible threat by means of cartelization to keep Jio out of the market by using a Game Theory matrix of credible threats.

The credible threat in this case is the act of colluding and providing services at prices which are lower than that offered by Jio. In this scenario, Jio being a new entrant could either choose to stay out of the market or could choose to stay in the market by incurring losses depending on the threat being credible or non-credible. Table 1 represents the advantage of individual players joining a cartel to operate against Jio. Table 2 represents a credible threat scenario as posed unanimously by a cartel.

	Strategy	Operate Alone	Enter Cartel
Telecom Player	Operate Alone	(15, 15)	(15, 25)
Telecom Player 2	Enter a Cartel	(25, 15)	(45, 45)

Table 1: Payoffs of Cartelisation

From Table 1 it explicit that (45, 45) i.e. Colluding, is the dominant strategy for each players irrespective of the decision of the other player. Hence colluding would provide an overall higher payoff to both telecom players. This makes the idea of forming cartels stable.

Table 2: Payoffs of Sustaining in the market

		Jio	
	Strategy	Sustain	Leave
Cartel	Maintain Price	(150, 70)	(250, 0)
	Lower Price	(170, 80)	(180, 0)

Table 2, explains a hypothetical scenario of payoff received to both Jio and Cartel, say in terms of profits. As can be seen from the above,

- The Nash equilibrium in this case is to lower prices by the Cartel and to allow Jio to Sustain, by construction of the table.
- When a Cartel chooses to maintain its prices at the same level as Jio, it receives a profit of 150, giving Jio a share of 70 as a consequence of increased market share.
- However if the Cartel threatens to reduce its prices as a unanimous power to wage a price war against Jio, its overall profit increases to 170, as a consequence of greater market share.
- Note that despite the credible threat posed by cartels to reduce prices (as a result of reducing prices, cartels enjoy increased sales due to greater market access and lower costs as a result of colluding), Jio with its inherent strengths will continue to employ increasing returns to scale strategies, such that even at such lower prices, they are able to earn greater levels of profit than earlier.
- From the above table it is also explicit that considering Jio's current market position and creative strategy of _mass reach out', its dominant strategy would be to continue to sustain in the market by using techniques niche to Jio. As a result despite posing a credible threat, the Cartels need to allow Jio to sustain at equilibrium.

Hence given the current market power of Jio and its proceedings with regards to an all-round telecom experience for its users, despite collusion, Jio would continue to sustain in the market. This game when repeated infinitely would render the same result. This strategy, despite making cartels stable as they earn higher profits as

a consequence of cartelization, will not be feasible to keep Jio out of the market. The researcher models this game to provide superior weightage to Jio‘s strategies employed to create a _buzz‘ in the telecom industry.

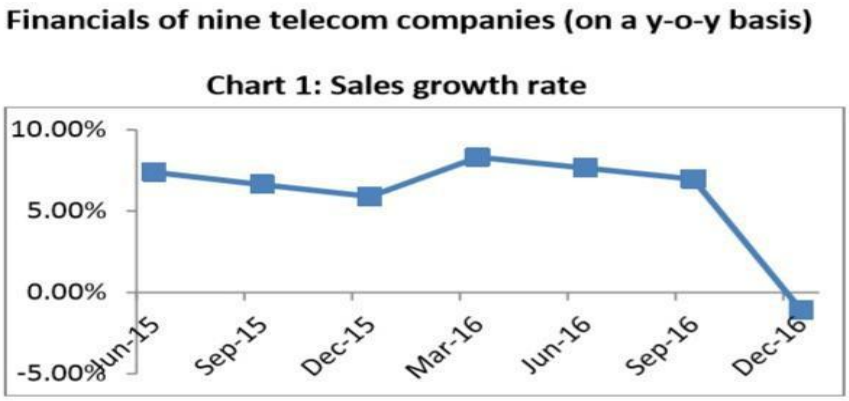
4.2.4 Case Study - Jio and the Rest:

Starting commercial operations in the month of September 2016, Reliance Jio took the telecom industry by storm. The company initiated telecom operations in all 22 telecom circles of India within that month with an aim of making India digital. The company‘s Unique Selling Point was basically providing its customers with a lifetime of voice and data services at strikingly lower prices. The company released a statement saying that the data that will be used to make voice calls will neither be charged nor deducted from the data balance of the customer. The company also promised access to long term evolution services, data and national voice, along with a full package of Jio applications that allowed one with an access to Jio‘s ecosystem. In less than three months after starting operations, Reliance Jio crossed a subscriber base of 50 miilion subscribers. Along with providing the lifetime access to data and voice at cheap rates; Jio along with Bharti Airtel was one of the first propagators of 4G services in India. According to the Press Trust of India, Jio acquired 1000 customers per minute. What Jio acquired in three months, Bharti took 12 years to achieve the same whereas; Idea and Vodafone took 13 years each. However, we can also attribute the success of Jio to the change in demand and consumer behavior that has taken place over the last few years.

Though inititally Jio trailed behind market leader Airtel in terms of the speed of 4g, it soon gained pace owing to the company‘s use of fiber optic cables which had a network of more than 250,000 kms. In addition, Jio introduced _Happy New Year‘ offer to its subscribers that extended the access to calls and data services for free till the 1st of April, 2017. The company then also announced its _Jio Prime‘ offer, which provided prime consumers with a three month extension to the company‘s New Year‘s offer on making a recharge of Rs 303 before the 15th of April 2017. Jio also provided door to door delivery of sim cards to its customers for the same.

Being in a competitive industry comes with its disadvantages. In an industry where the incumbents were already fighting a losing war against services provided by OTT, Jio‘s entry was a game changer. Reliance Jio had singlehandedly pulled down the sale of nine telecos by the end of December 2016. To put this into perspective, this was achieved within three months of operations. According to Care Analytics, the sale of the incumbents had come down by 1%. The profitability of the industry in that quarter remained subdued.

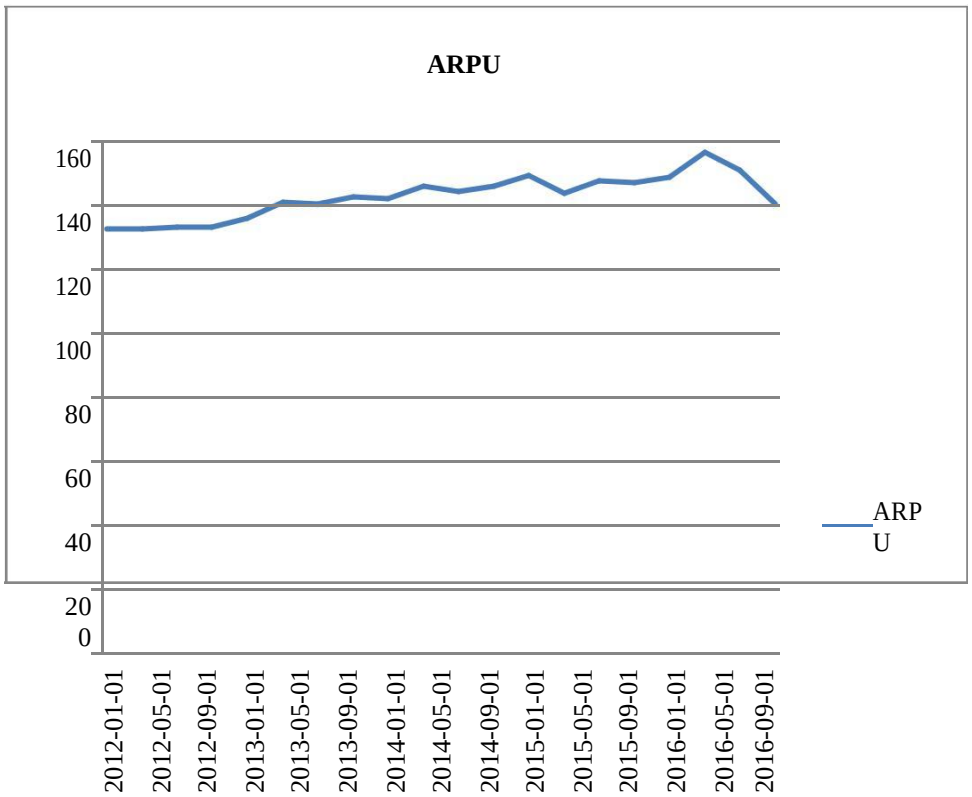
Fig 6: Sales of Indian telecos from Jun 15 to December 2016



Source: Ace Equity

While Bharti Airtel‘s profit dropped by 55%, Idea Cellular reported a consolidated loss of Rs 385.5 crore and the industry altogether, saw a fall in its ARPU.

Fig 7: ARPU of India from Q1 2012 to Q3 2016



Source: Telecom Regulatory Authority of India, Performance Reports

Cut to today, April 2017, and the industry has geared up. Jio recently addressed a letter to TRAI and complained of violation of telecom norms by the incumbents. It said that telecos were offering special tariff plans for special customers in order to retain them. These calls were being made on an individual basis, in order to target and retain key customers. It has asked the regulator to look into the matter. The incumbents have also started imitating Jio in terms of price schemes. They have moved away from the traditional business model and have started providing high amounts of data to its customers at competitive rates. Vodafone for instance, is providing a year of 36GB 4G data to postpaid users and 27GB to prepaid for over 3 months.

The future remains a mystery for the Indian Telecom landscape. In a competitive minefield, the consumers are surely the winners but the telecos are surely unsure of their returns. The game has been changed; for better or for worse. All that remains to be seen, is whether the industry responds effectively to the challenge.

V. CONCLUSION

5.1 Conclusions:

The Indian Telcom sector started its official journey from the era of 1994. Through a comprehensive process of liberalization and privatisation, a sector which was initially a monopoly became an Oligopoly and few firms came to command the business of 1.5 billion citizens in the world.

The Indian Telecom sector is Oligopolistic in nature, as proved by the Concentration Ratio and the H-H Index. The top three firms occupy the 60% of the market share. These firms, as of December 2016, were Bharti Airtel, Vodafone and Idea Cellular. The market is also moderately concentrated with an HIH Index of around 1510. The Indian Telecom sector has undergone tremendous changes over the past few years. It has been threatened by OTT service providers and has found itself dragged into a price war with the entrant Reliance Jio. The possible solution for the incumbents in this regards would be collude and fight the prices being offered by Jio. However, forming a cartel will not sustain in the long term and the incumbents would do well to let Jio sustain whilst, engaging in a healthy competition themselves.

The following concluding section provides a few policy implications for the industry which have been gathered from the interviews of experts.

5.1 Policy Implications:

1) It is suggested that the industry allow for the inclusion of other aspects in its cash flows. This reform could be in the way of data mining undertaken, competing with OTT service providers etc.
2) It is suggested that the industry shift its basic revenue model from that of charge per service to that of subscription. The industry could provide customer access to various services on the basis of yearly, monthly and quarterly plans. This would, at the very minimum, keep the ARPU intact for each firm.
3) It is suggested that in the face of ever increasing CAPEX and OPEX, the industry could reduce its leverage and exposure by sharing infrastructure or by sharing spectrum. Keeping in line with the law - in regards to spectrum allocation and distribution, the industry could also follow the example set by Indus Towers, in terms of infrastructure sharing, and institute a company for the sharing of spectrum.
4) Lastly, the company should focus on innovation. By interacting more with the customers and by a mutual agreement on studying the aspects of consumer‘s behavior; the industry can innovate in those aspects where the consumer feels neglected. This could lead to a win-win situation for both the parties.

The Indian Telecom industry has a huge potential for growth. The industry contributes largely to the employment and the GDP of the country and it also provides the customers with means to fulfill their very basic need for contact.

The entrance of any firm which challenged the status quo should not be seen as a threat, in the opinion of the author of this paper. Every threat could eventually lead to the opportunity to make profit. Thus, if the industry gets back to the grassroots and gets in touch with its customers, it could become well equipped to face the challenges.

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APPENDIX

A) Teledesity of India

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Model 1: OLS, using observations 1-14
Dependent variable: GDP

                      coefficient   std. error   t-ratio   p-value
  ---------------------------------------------------------------
  const                3.02975      0.679584     4.458    0.0008  ***
  Teledensityperce~   -0.00686264   0.0152599   -0.4497   0.6609

Mean dependent var   2.797429   S.D. dependent var   1.600586
Sum squared resid    32.75239   S.E. of regression   1.652079
R-squared            0.016574   Adjusted R-squared  -0.065378
F(1, 12)             0.202244   P-value(F)           0.660931
Log-likelihood      -25.81457   Akaike criterion     55.62914
Schwarz criterion    56.90726   Hannan-Quinn         55.51083
```

B) Concentration Ratios and H-H Index

Company	Market Share	(Market Share^2)
Bharti Airtel	24.32	591.4624
Idea	17.17	294.8089
Vodafone	18.72	350.4384
BSNL	8.8	77.44
Quadrant	0.28	0.0784
MTNL	0.34	0.1156
Sistema	0.6	0.36
Reliance Jio	3.3	10.89
Telenor	4.94	24.4036
Tata	5.17	26.7289
Relaince Communication	7.99	63.8401
Aircel	8.38	70.2244
TOTAL	**100.01**	**1510.7907**

C) Personal Interview:

For Industry Experts:

1. According to the LiveMint Article, ―One, India‘s evolution to a digital economy will depend on smartphone penetration, not fixed line. Two, given the revenue models of telcos, it will not be an easy transition.‖ (almost 75% of telecom companies‘ revenue comes from voice) How do you reckon that Indian Telecom Sector can come out of this apparent dichotomy?
2. ―The telecom pie in India is so large that subscriber base growth for rival telecoms hasn‘t been hit too hard yet by that rapid growth.‖ Considering the case of Reliance Jio, it already has a subscriber base of 72 million subscribers. Do you think that on the basis of this statement, the population of the country somehow cancels the negative externality of predatory pricing? Could Telecom in India be an exception to that rule?
3. Following from above, in your opinion, does merger and acquisition provide a way out for smaller companies? What in your opinion are the strengths and weakness of such a strategy?
4. Could an improvement in infrastructure provide a way out? Considering the industry strong opposition to Net Neutrality, do you believe that it can match up to Reliance Jio‘s services? In this aspect, what do you think the Industry essentially lacks?
5. Could you elaborate on the positive and negative spillover effects of the competition between telcos on other industries? Does this lead to an opportunity for other industries to develop? Such as Netflix? Or the smartphone industry?
6. Do you think there is an element of collusion within the industry? Is this collusion in the aspect of pricing or in the aspect of spectrum bids or in some other aspect all together?
7. Jio has been an accelerating factor in the consolidation of the Indian market, with announcements related to intra-circle roaming (ICR) agreements, site-sharing agreements and intended exit being indicators of the expected level of sector consolidation.
8. In your opinion, is it high time that the sector changes its business model from commoditizing voice to commoditizing data?
9. ―Moreover, the financial distress of operators and continuous pressures on profitability have set-in sector consolidation. The Indian telecoms sector is likely to stabilize to a five to six players in the long term.‖ Do you agree with this statement?
10. ―Customer acquisition cost would increase for operators owing to increased competition.‖ Your thoughts on this statement?
11. Your thoughts and comments on the price war unleashed by Jio? From low usage to about Rs. 300 per month, they would still be charging a lot less than other subscribers. Do you think it's a sustainable business model?
12. Now, in order to sustain and maintain their position in the market, the telcos have to focus on the reduction of data costs. Do you agree? Is that the new big innovation that the industry demands?
13. Do you think that if the industry is not able to meet the data demands the fulcrum will shift away from them towards industries that concentrate solely on data monetisation? Considering the development of m-wallets, e-commerce and mobile entertainment in the country.
14. Do you think in regards to the Indian Telecom industry, innovation could beat price wars? For eg, if Vodafone were to introduce 5G internet services albeit at a higher price, do you think customers would shift from say Jio to Vodafone? Do you think Indian customers are price sensitive in that aspect?

For Industry Veterans:

1. How has segmentation changed in terms of the average customer? As in does the industry now prefer to divide customers as per data usage rather than voice call usage?
2. Do you think that the market could turn tides and become a single player market? Do you think existing firms are doing enough to sustain? If no, what else can be done?
3. Government is making efforts to reduce imports of electronic products and to meet requirement of domestic market through indigenous production. However, the telecom sector is largely services based. Do you think that innovation in terms of electronic equipment is the much needed medicine?
4. Spectrums have become a sunk cost for the firms. Do you think sharing of spectrum is the right way to avoid a huge CAPEX?
5. Reliance Jio‘s entry has made India one of the top countries in mobile data usage with Jio users consuming more than 100 crore GB per month. Do you think that the this is the current threat that the industry faces?

(D) SWOT Analysis of the Industry:

A) Strengths:

The Industry‘s strength lies in the strong demand for its products and services, especially in India.

The mobile cellular subscription base has been increasing ever since the introduction of cell phones in India.

After NTP 1994 and NTP 1999, India witnessed a huge number of private players enter the market and the consumers witnessed an increased dependency on mobile and telecom services. In 1995, the mobile cellular subscription base stood at 68 million subscribers of the entire population of the country. At present, it stands at about 1,127.37 Million subscribers.

Therefore, one can say that the demand for telecom services in India will always be strong. This is a strength for the industry. Dr Sujata Joshi says, ―Voice or any other telecom service is always likely to be an important part of our lives because of a, the large population and b, the basic human need to communicate‖. Beating on the same rhythm, Dr Tarun Singhal suggests that India as a country is so vast that there will always be scope for competition within it. Unless the Govt. decided to make a particular sector a monopoly, every sector will enjoy a healthy level of competition.

B) Weaknesses:

The industry‘s core weaknesses are the high sunk costs and high operating costs it functions on. According to Dr. Giri Hallur of SITM, Pune, the industry should shift towards infrastructure sharing models such as the alternative represented by Indus Towers, which is jointly owned by Vodafone India, Bharti Airtel and Aditya Birla Telecom. According to its website, Indus ‗provides passive infrastructure services to operators in the telecom industry‘. The company provides shared telecom infrastructure to all operators on a non discriminatory basis.

The industry is also required to pay a Telecom Tax (8% of revenue approximately), Corporate Tax (30% of profits approximately), Service Tax (at about 15%) and Spectrum and other license fees as a part of its annual costs. The Indian Telecom industry is a cash guzzling industry and thus needs to reevaluate its plan of action for costs in the current dynamic landscape. Such changes will require huge policy changes and restricting of the industry.

C) Opportunities:

The Indian Telecom Industry has the following three opportunities lying before itself:

- OTT Services: Telecom Operators have been vehemently against the rise of OTT services in the country. They have stated that such services eat into their revenues and have rendered their profits lower. However, there exists scope for partnership in this regards. Dr Tarun Singhal suggests that each operator could initiate their own ecosystem and provide their own OTT services, thus improving customer experience.
- Subscription Model: If the industry aims to improve its loss in ARPU over the past few years and especially in the current year, it too could follow a subscription model like the entrant Reliance Jio. This would ensure that the competitors now compete on monthly/ quarterly or yearly subscription fees and provide lucrative services for its customers at competitive prices.
- Mergers: The Industry has already recognized the benefits it can derive by collaboration and through partnership. Not only will they be able to exert a higher influence on the market, but could also bring their individual leverage and costs to a minimum.

D) Threats:

The Indian Telecom Industry, or for that matter, the world telecom industry has come at an inflection point. According to Dr. Giri, the current scenario demands innovation and demands a new model for operation.

With the entrance of Relaince Jio, we see that the Indian population has become addicted to data and data utilizing applications and portals. In the face of the same, the incumbents of the industry are still focused on following the same old business model of ‗charge per service‘.

The lack of innovation hit the industry hard when India witnessed a rise in Over the Top Service provider‘s revenues. Some examples of such companies are Skype, WhatsApp, Viber, Facebook amongst many others. These services follow an advertising model and thus do not need to charge customers for their services. They collect revenues by selling the behavioral and other key customer database they have collected from its data mining operation. In turn, it displays ads and undertakes marketing for the very same companies by customizing the each user‘s interaction with its services.

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