Evolution of Competition in Telecom Oligopoly – A Systematic Analysis in Post-Privatization Era

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Abstract

The purpose of this paper is to examine the thematic landscape of the transition from monopoly to oligopoly in the Telecommunications industry in the post-privatization era literature. The study utilizes a systematic literature review method extended with bibliometric and network analysis. The paper also presents a thorough content analysis of the 56 selected articles (spanning from 1990 – 2020) on oligopolistic competition in the Telecommunications industry. The study extracts nine major themes from the corpus, with market competition as the most prominent feature. It summarizes the insights with a schematic framework presenting the inter-relations of the significant features of the market competition. It also lists the gaps and future scopes for further research in the area.

Keywords: Competition, Oligopoly, Telecommunications, Market Structure, SLR

JEL Classification: L96, L13, D43

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1. Introduction

Telecommunication services are an irreplaceable part of modern society. The technology has evolved in past decades from telegraph to current internet-based services, which can connect users at any part of the globe. From an economic point of view, the telecommunications or telecom sector is of prime interest. It is a unique dynamic capital-intensive industry managed by regulatory bodies. The Industrial Organization (IO) literature states that, in general, the telecom, airlines, and energy sectors follow an oligopolistic structure when deregulated to accommodate private players in the market. Historically, the telecom market had been served by regional or national monopolies (Whinston, 2006). In the post-privatization era, around the latter half 1980s, the markets started to invite non-government entities to serve the market by providing them spectrum licenses. The transition from a monopoly to an oligopoly not only affects the market structure and competition but also the pricing of the services and consumer welfare (Hausman and Taylor, 2013; Whinston, 2006; Yin, 2004).

The Telecom sector has an immense societal impact, especially the mobile telephony services (Gruber, 1999). With the changing dynamics and advanced technologies, the industry continues to evolve in multiple aspects. Undoubtedly, the service providers or mobile network operators (MNOs) definitely play individual roles in serving the market. However, multiple inter-disciplinary factors are to be considered to understand the market from an economic and market research perspective. For example, how do the firms compete in the market? Whether it is based on price, quantity, or quality? Does regulation play a role in maintaining the order of the market? Therefore, to cover the multiple facets of the industry, we conducted a systematic literature review, focusing on the competition in the telecom industry.

This paper systematically reviews selected studies catering to the telecom market in the post-deregulatory era and draws insights from its oligopolistic competition. Our study is expected to contribute in four ways. First, no systematic review of the literature has been synthesized that consolidates the themes of oligopolistic competition in the telecom industry. Second, we review the current state of the market competition literature and provide an in-depth analysis of the contributing factors that were extracted from the selected literature. Third, we identify the gaps and present the scopes for future research. Fourth, the study presents a conceptual framework that demonstrates the contribution of all the extracted themes and their interrelations.

The remainder of the paper is structured as follows. The next section presents the background of our study and elaborates on the review questions. The third and the fourth section delves into the methodology and results of the study, respectively. The former covers detail of the SLR protocol. The output is then presented in the results section. The analysis and the in-depth discussion of the same are revealed in section five. Finally, we present our concluding remarks and limitations in section six.

2. Background

The telecom industry has continued to evolve with technology and regulation since its inception. The transitions have brought about structural changes in the market. Therefore, this industry became a point of interest for researchers from different domains, such as economists, engineering, business management, and consumer behaviour experts, to name a few. The scope of this review study is set from an Economist's perspective. To be more specific, the literature selected for review is aligned with IO research.

This paper is particularly crafted to study the telecom market in the post-privatization era and how it has transformed into an oligopoly from a national/regional monopoly. Since we are analyzing the structural change, we have to take account of the factors that contribute to this structural change.

The origin of the telecom industry began with telegraph services in the early 1800s. It received a more formal regulated structure in 1870s after the invention telephones (commonly termed as fixed line telephony in Economics literature). The telecom market initiated primarily in the developed countries in the west, US and Europe and gradually permeated globally. The markets during this period were state driven monopoly where no private entities were allowed to participate in the industry (Brock, 1981). The market gradually evolved and by 1980s the era of privatization began. This period of telecom industry not only received a structural reformation but also a technological upgradation (The World Bank, 2021). Mobile or cellular telephony services were introduced during this period. The Figure 1 illustrates the development of telecommunication industry in the past decades and its immense growth globally in terms of revenue (USD) (ITU, 2021).



Figure 1. Development and trend in telecommunications industry

Telecom research literature dates back as far as 1970s where the core objective was to seek potential utility of telecommunications in the society, identify its benefits or threats to other sectors, estimate the demand of the long distance telephony services (Caudill, 1985; Coates, 1977). The interest gradually took turn from demand-supply dynamics, regulatory involvement in determining tariff structure to evaluating suitable economic mode of transition from state owned monopoly to oligopoly. Researchers then were focused on understanding the modification of competitive structure and its policy implications (Brock, 1998). Involvement of multiple players introduced new dynamics of competition in telecom (MacAvoy, 1995; Picard, 1996). Most papers, during this period, studied the operations of telecom industry in the context of a single country. The timeline of our paper focuses on the attributes observed post-deregulation. Our paper covers a fairly long observation period 1990 – 2020 to study the structural and technological changes in telecommunication market. Our findings augment the available literature with newer insights related to (1) transition of telecom industry into oligopoly globally, (2) cross-country comparison of regulatory and auction mechanism, (3) price vs quantity competition, (4) shift from fixed line telephony to mobile telephony, and (5) behavioural aspect of firm-consumer interaction. The understanding of these facets of telecommunication industry aided us to answer the review questions that are discussed in latter part of this section. Our systematic review adds in the methodological soundness and ensures replicability compared to generic approach to literature review.

The deregulatory movement in the telecom sector across nations invited the entry of private players into the market. We are interested in the outcome of this structural change in the market. In many cases, the market continued to have both public (remnant of the previous monopoly) and private firms. Regulatory bodies have been put in place to moderate the market interactions between firms and between other stakeholders. The policy designs were required to be revamped according to technology standards (for example, GSM) and respective constraints (Fuentelsaz et al., 2008; Gruber and Verboven, 2001b). Due to the presence of multiple players, the current price is expected to deviate from the monopoly price (Cyert et al., 1995). We are interested in studying whether the firm in the oligopoly competes in price or quantity (in terms of spectrum licenses)? Or do they consider service quality for product differentiation? Also, does the price-setting activity act as a signal for collusion?

This study not only considers the firm's perspective but also the consumers' response to the market. Following the current trend of behavioural economic theories, some studies try to link consumer behaviour to the economic models studied (Spiegler, 2011). Consumer actions to the market offerings signal the firms about the consumer preferences and potential threats to their business.

It is not easy to evaluate all the plausible factors of structural change in-depth in a single study. Therefore, from our domain knowledge, we set our scope and map them to our review questions. The schematic representation of the scope of this study is shown in the Figure 2.



Figure 2. Scope of the review

The scope is set within the oligopoly market of telecoms. We have mapped our scope to 4 interrelated prominent themes. We expect to find out the directions of the interlinkages through our review in the subsequent sections. The objectives of this study can be summarized in the form of the following 4 review questions:

RQ1 What is the current status of research on (oligopolistic) market competition in the Telecom sector?

RQ2 What are the features of competition in this kind of market?

RQ3 What are the gaps in the current literature?

RQ4 What are the thematic areas of research extracted in the area? And, how are they interrelated?

The review questions act as a guide to capture a holistic view of the oligopolistic competition in the telecom market. From there, we proceed with a much-focused analysis of the most prominent themes across the selected studies.

3. Research Method

It is evident from our review questions that the relevant literature would be multi-disciplinary in nature. In order to maintain methodological rigour and ensure replicability and validity of our review, we undertook a systematic review approach. For this purpose, we followed the guidelines of conducting systematic reviews (Tranfield et al., 2003) of management literature (Briner and Denyer, 2012; Denyer and Tranfield, 2009; Rousseau et al., 2008).

The idea behind systematic reviews is to search for relevant literature from academic databases like SCOPUS or EBSCO, followed by meticulous screening and analysis of the same. We needed to find suitable keywords to extract relevant literature that would aid in answering our review questions. The detailed search strategy is as shown in the following Figure 3.

| | | Selected Databa | ases | | | | | | | | | | |
|-----------------------------|----------------------|---|------|------------|-----------------|---------------------|------|-------|-------------------------------|-----------------|----------|------------|-------|
| | SCOPUS Emerald EBSCO | | | Tay Fra | /lor & ancis | Sa | ge | Wile | ey | Scienc Direc | Springer | | |
| SCOPUS Emerald Insight | | | | | | Taylor & Francis | Sage | Wiley | ey Science Springer Direct | | | | Total |
| | | Extracted | 40 | 63 | 3 | 1 | 11 | 145 | 9 | 717 | - | Subtracted | 989 |
| | | 1. Article Type & Language (Non-English) | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 599 | - | 619 | 370 |
| | rocess | 2. Duplicates | 0 | 0 | 1 | 1 | 0 | 1 | 3 | 3 | - | 9 | 361 |
| | ening P | 3. Journal Ranking | 3 | 42 | 0 | 0 | 1 | 3 | 3 | 19 | - | 71 | 290 |
| | Scree | 4. Title and Abstract Screening | 9 | 15 | 2 | 0 | 10 | 110 | 2 | 75 | - | 223 | 67 |
| | | 5. Full Text Screening | 10 | 5 | 0 | 0 | 0 | 5 | 0 | 7 | - | 27 | 40 |
| | i | Backward Snowball | 6 | 0 | 0 | 1 | 0 | 1 | 7 | 0 | 1 | Added: 16 | FINAL |
| Extracted and Screened = 48 | | | | | | | | | | | | | 56 |

Figure 3. Search strategy

Since the focus of our study is the Telecom industry, especially in the context of the post-privatization era, we selected the combination of keywords 'Telecommunications' and 'Oligopoly.' In this period, most of the telecom industries across the globe have evolved into an oligopoly. Therefore, with the expertise of the review committee, we could exclude generic terms as 'competition' or 'market competition' from our search query to restrict our results relevant in the context of our review questions. Also, for the same reason, we focused on studies from 1900 – 2020, as the deregulation process initiated during the 1980s in various countries (Gruber, 1999; Valletti and Cave, 1998). Deregulation altered the competitive structure of the market from local and (sometimes) national monopolies to oligopolies driven by a number of private enterprises. Combining the domain knowledge and the factual information, we prepared our search query. Depending on the databases used for the search, some minor modifications were required. The details of the search query are as shown in Table 1.

| SI No. | Database | Search Query | Extracted | Oldest | Newest |
|--------|------------------|--|-----------|--------|--------|
| | | (TITLE_ARS_KEV (telecomm*_AND_ (objected *)) AND_ (LIMIT- | | | |
| 1 | SCOPUS | TO (SUBIAREA, "BUSI") OR LIMIT-TO (SUBIAREA, "FCON")) AND (LIMIT- | 40 | 1991 | 2019 |
| - | 300103 | TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "i")) | 10 | 1551 | 2015 |
| | | (content-type:article) AND (((title:"telecom*") OR (abstract:"telecom*"))AND | | 1000 | |
| 2 | Emerald Insight | ((title:"oligopol*") OR (oligopol*))) | 63 | 1999 | 2019 |
| 3 | Ebsco | (telecom*) AND (oligopol*) in Keyword | 3 | 2001 | 2011 |
| 4 | Ebsco | (telecom*) AND (oligopol*) in Title | 0 | NA | NA |
| 5 | Taylor & Francis | [Keywords: telecom*] AND [Keywords: oligopol*] AND [All Subjects: Economics, | | 2012 | 2012 |
| 5 | Tuylor & Trancis | Finance, Business & Industry] | 1 | 2012 | 2012 |
| 6 | Sage | [All telecom*] AND [All oligopol*] within Research Article Economics & Development | 11 | 1989 | 2017 |
| - | 1.1.1 | "(telecom*) AND (oligopol*)" anywhere Filters: Business & Management, | | 4070 | 2020 |
| / | wiley | ECONOMICS, Journals | 145 | 1973 | 2020 |
| | | (telecom OR telecommunication) AND (oligopoly OR oligopolistic) Filter: Research | | | |
| 8 | ScienceDirect | articles, In Title, Abstract or Keyword: (telecom OR telecommunication) AND | 9 | 1991 | 2015 |
| | | (oligopoly OR oligopolistic) | | | |
| 9 | Springer | (telecom*) AND (oligopol*)' within English,Economics, Article | 522 | 1970 | 2020 |
| 10 | Springer | (telecom*) AND (oligopol*)' within English, Business and Management, Article | 195 | 1984 | 2020 |
| | | Total number of reaserch articles extracted | 989 | | |

Table 1. Search Query and Databases

Eight databases were considered to extract relevant literature for our review study. The year of publications of the oldest and newest articles of the respective databases are also shown in the table above.

3.1. Literature Search and Results

We retrieved 989 articles from this search string. We have exported the details of the same for the next step of fine-tuning. Since the database search is an automated process, the extraction may yield unusable or duplicate data. To remove redundancies and ensure quality, a multi-step cleaning was conducted on the raw data. We restricted our studies only to peer-reviewed journal articles published in English, which were categorised under the area of Economics and Management (terms vary across the databases). For simplicity of representation, the screening rules as inclusion and exclusion criteria are tabulated in the Table 2.

| Table 2. Ir | nclusion | and | Exclu | sion | Criteria |
|-------------|----------|-----|-------|------|----------|
|-------------|----------|-----|-------|------|----------|

| Criterion | Inclusion | Exclusion | Rationale | | | | |
|----------------------------------|--|---|--|--|--|--|--|
| | | | | | | | |
| Relevance for review question | Relevant | Not relevant | To answer the questions under study | | | | |
| Language | English | Non-English | English is the most language in academic publications | | | | |
| Research field | Economics, Business and Management | Other disciplines | The review questions fall under the selected domain | | | | |
| Type of publication | Peer reviewed journal articles | Non-peer reviewed academic papers Conference papers | To maintain a high quality standard of the study only peer reviewed journal articles are selected | | | | |
| | | Working papers | | | | | |
| | | Older than 1990 | The selected 30 year span is relevant, considering | | | | |
| limeline | 1990 - 2020 | After 2020 | the market, regulatory and technology dynamics associated with the review questions | | | | |
| Paper quality | VHB>=C ABS>=2 JCR>=0.7 ABDC>= B | Any outside inclusion criteria | To ensure inclusion of high quality research contributions as suggested in Tranfield 2003, Bouncken 2015 | | | | |

As shown above, the data were sorted based on Language, Type, and Timeline of publication. Duplicates were then removed by scanning the unique identifier or DOI. To ensure the quality of the selected articles, we followed the guidelines by Bouncken et al., 2015 and selected articles that met the criteria:

• The German Academic Association for Business Research (VHB) – JOURQUAL 3 with the rating \geq C

OR

• The British Association of Business Schools (ABS) – Academic Journal Quality Guide (2018) with the rating ≥ 2

OR

• The Thomson Reuters Journal Citation Reports (JCR) Impact Factors 2019 with the rating ≥ 0.7

OR

• The Australian Business Deans Council (ABDC) Journal Quality List 2019 with the rating $\geq B$

With these filters, we were left with 290 articles to be taken forward for the next stage of Title and Abstract screening, followed by Full-text screening. The screening process is summarised in the Figure 4.



Figure 4. Screening Process

From the original 989 articles, the list boiled down to 40 articles after the final full-text scan. The review committee suggested 48 other contributions to help answer our review questions. These were proposed based on domain knowledge and cross-referencing the 40 articles selected before. Submitting to the same rigorous scanning as before, we could add only 16 articles from the backward snowball. These 40 + 16 = 56 articles were rigorously studied, and the respective analysis was discussed between the authors. The consolidated output has helped us understand the market structure better and answer our review questions satisfactorily. The results of our synthesis are presented in the subsequent sections.

4. Findings

In this section, we present a descriptive analysis of the curated data. The properties of the selected 56 articles are presented in the Table 3. Initially, we had referred to 8 databases for our data extraction, and the following table shows the count of articles extracted from respective databases.

| SI No. | Databases | Number of selected articles |
|--------|------------------|-----------------------------|
| | | |
| 1 | Emerald Insight | 1 |
| 2 | JSTOR | 1 |
| 3 | Science Direct | 8 |
| 4 | SCOPUS | 24 |
| 5 | Springer | 14 |
| 6 | Taylor & Francis | 1 |
| 7 | Wiley | 7 |
| | Total | 56 |

Table 3. Database Count

We want to point out the addition of the JSTOR database for an article (Miravete and Palacios-Huerta, 2014) suggested from cross-referencing. The timeline of our selected articles spans

from 1990 - 2020, with a peak at six contributions in the year 2014 and 2.24 articles per year on average (refer to Figure. 5 below).



Figure 5. Publications by Year

The articles were scanned as per the Journal quality criteria, and we present the list of Journals referred to and respective count of articles in Table 4. The quality scanning was initiated from the ABDC list, followed by JCR, ABS, and VHB in this order. The scan for each journal was terminated when they qualified at least one rating criteria.

Table 4. Journal Quality and Count



The publications from the journals during the period 1990 - 2020 is presented in the Figure 6.

| | | | | | | | | | | | | Yea | r of Public | ation | | | | | | | | | | | |
|--|------|------|------|------|------|------|------|------|------|------|------|------|-------------|-------|------|------|------|------|------|------|------|------|------|------|------|
| Journal | 1991 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2008 | 2009 | 2011 | 2012 | 2013 | 2014 | 2015 | 2018 | 2019 | 2020 |
| Academy of Management Journal | | | | | | | | | | | | | | | | | | | | | | | | | |
| Annals of Operations Research | | | | | | | | | | | | | | | | | | | | | | | | | |
| Applied Economics | | | | | | | | | | | | | | | | | | | | | | | | | |
| Applied Economics Letters | | | | | | | | | | | | | | | | | | | | | | | | | |
| Asia Pacific Journal of Management | | | | | | | | | | | | | | | | | | | | | | | | | |
| Economic Policy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Empirical Economics | | | | | | | | | | | | | | | | | | | | | | | | | |
| European Economic Review | | | | | | | | | | | | | | | | | | | | | | | | | |
| Growth and Change | | | | | | | | | | | | | | | | | | | | | | | | | |
| Information Economics and Policy | | | | | | | | | | | | | | | | | | | | | | | | | |
| International Journal of Industrial Organization | | | | | | | | | | | | | | | | | | | | | | | | | |
| International Journal of the Economics of Business | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Business Research | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Consumer Affairs | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Economic Behavior and Organization | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Economics | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Economics & Management Strategy | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Industry, Competition and Trade | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of International Business Studies | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Media Economics | | | | | | | | | | | | | | | | | | | | | | | | | |
| Journal of Product & Brand Management | | | | | | | | | | | | | | | | | | | | | | | | | |
| Management International Review | | | | | | | | | | | | | | | | | | | | | | | | | |
| RAND Journal of Economics | | | | | | | | | | | | | | | | | | | | | | | | | |
| Review of Industrial Organization | | | | | | | | | | | | | | | | | | | | | | | | | |
| Service Industries Journal | | | | | | | | | | | | | | | | | | | | | | | | | |
| Small Business Economics | | | | | | | | | | | | | | | | | | | | | _ | | | | |
| Telecommunication Systems | | | | | | | | | _ | | | | | | | | | | | | | | | | |
| Telecommunications Policy | | | | | | | | | | | | | | | | | | | | | | | | | |
| The Review of Economics and Statistics | | | | | | | | | | | | | | | | | | | | | | | | | |
| Thunderbird International Business Review | | | | | | | | | | | | | | | | | | | | | | | | | |

Figure 6. Journal vs. Year

We also searched the country of affiliation of the first authors of the selected papers. Contributions from 16 different countries were assembled from the 56 selected literature shown in the Figure 7 and Table 5.



Figure 7. Country Map

Table 5. Country Count

| SI No. | Country of affiliation of first author | Count of articles Country-wise | | Percentage |
|--------|---|-----------------------------------|----|------------|
| | | | | |
| 1 | Australia | | 3 | 5% |
| 2 | Finland | | 3 | 5% |
| 3 | France | | 3 | 5% |
| 4 | Germany | | 3 | 5% |
| 5 | Ireland | | 1 | 2% |
| 6 | Italy | | 3 | 5% |
| 7 | Japan | | 1 | 2% |
| 8 | Luxembourg | | 3 | 5% |
| 9 | Netherlands | | 2 | 4% |
| 10 | Norway | | 1 | 2% |
| 11 | Portugal | | 1 | 2% |
| 12 | South Korea | | 4 | 7% |
| 13 | Spain | | 1 | 2% |
| 14 | Sweden | | 1 | 2% |
| 15 | United Kingdom | : | 10 | 18% |
| 16 | United States | : | 16 | 29% |
| | | | | |
| | Total | | 56 | 100% |

The United States tops the chart contributing approximately 29% of the selected literature. The following Figure 8 lists nine authors with \geq 2 publications (includes single-authored and co-authored papers).



Figure 8. Authors

The highest number of contributions is from Tommaso M. Valletti, followed by Frank Verboven and Harald Gruber.

To have an overview of the contents, we studied the keywords and JEL classifications provided by the authors. Analyzing the WordCloud prepared from the keywords (Figure 9), we could observe the prominence of the terms associated with unique features of the mobile telephony market. On the other hand, from the Journal of Economic Literature, more commonly known as JEL classification codes from the American Economic Association, we identified the dominant area of Economic literature that had contributed to our study and provided directions for further search Figure 10.



Figure 9. WordCloud of Keywords



Figure 10. JEL Classifications

Since keywords and JEL classifications were not available for all the articles, we have attempted to assign a broad theme and a sub-theme. Due to the interdisciplinary nature of the studies, there were a lot of overlaps in the themes. The panel reviewed and discussed the themes and assigned them in 9 broad categories: Consumer behaviour, Internationalization, Market competition, Market entry and accommodation, Market structure, Nature of competition, Spectrum Licensing, Strategic behaviour, and lastly, Technology. These themes are further sub-divided into multiple sub-themes. The details of the thematic segregation is presented as Table 6 in the GitHub¹ project repository.

¹Link to supplementary materials in GitHub project repository

It can be observed that an article can have themes that may fall under two different categories of inter-related themes. A network analysis of the selected articles was conducted based on the themes to understand them better. Primarily we have clustered the articles based on the a forementioned nine thematic groups. Then we observed the involvement of the articles across the network Figure 11.



Figure 11. Thematic Network Analysis

It is found that all the clusters except two are linked with the concept of market competition through some of the literature. While the consumer behaviour and spectrum licensing form 2 separate, distinct clusters with two articles in each.

From the JEL classifications, it is evident that most of the articles are from Industrial Organization (IO) domain. This discipline is inherently theoretical, primarily due to the unavailability of suitable data for empirical analysis (Tirole, 1988). Therefore, the focus was mostly on mathematical representation or simulation of market models. With the advent of game theory in IO, the attention shifted towards game-theoretic models. The alternative to empirical evidence was mostly case studies relevant to particular types of industry or controlled experiments in laboratories. In modern times with the availability of curated data (albeit with some proxies), the new empirical school of the Industrial Organization has enriched the literature with economic analysis on real-world data. We have analyzed the methods undertaken in each of the selected articles. The different

https://github.com/BarshaSaha/SLR_Telecom_IJBE/blob/main/Supplementary_material_IJBE.docx

methodologies are studies in depth and were also analyzed with respect to time of publications. The year wise tabulation and methodological details are listed as Table 7 and Table 8 respectively in our GitHub repository.

The methodology section elaborates on the different types of empirical models that have been used in the selected articles. We also came across a good number of traditional theoretical modelling papers as well as exploratory market evaluation styles of contributions.

The next section will present our synthesis from the selected literature and answer the review questions.

5. Analysis and Discussion

The primary purpose of conducting a systematic literature review is to ingrain a structure to the entire review process. This process ensures the replicability and validity of the study.

The review can be split into two parts. The first section deals with the review protocol and the search along with the descriptive analysis. The second part is the review or the synthesis. It is a qualitative component of the review that requires human intervention and subject expertise. The expected outcome from such a review is to find the gap in the literature for future studies and also to obtain the answers to the questions at hand.

This section will present the thematic analysis of our study, drawing from the domain information and the results from the previous section. First, we present the observed gaps in the literature. As mentioned earlier, the area of Industrial Organization is predominantly inclined towards theoretical market models often followed up by simulations. The reflection of the same has been observed in the selected articles. Due to this particular inclination, these papers focus on market competition, as shown in the thematic network analysis. We observed that with time, there had been a progressive interest in empirical studies. National reports (for example, FCC reports in the US, MINTC reports in Finland), surveys from private firms and consulting companies, and notable telecom databases such as Merrill-Lynch's GWM (Global Wireless Matrix) data, GSMA reports, ITU data have been the source of secondary data for the empirical analyses.

In our thematic analysis, we had aggregated the themes into nine broad clusters. The themes represent the focal interest in each study. Therefore, each article is expected to be assigned to one of the 9 clusters. The resultant figure would have nine disjoint clusters of 56 smaller 1:1 nodes (the node has only one edge/link to connect with another node), representing the papers. Also, it has nine larger 1: n nodes (the node can have many edges to connect with many other nodes) representing the clusters. But in our case, we do observe multiple 1: n nodes for the articles, which act as a bridge between the clusters they share an edge with. For some articles, we had to assign a secondary theme besides the primary one. While reviewing, it was found that omitting either of the themes in these cases would limit it to the partial interpretation of their contributions. That, in turn, would result in the loss of the

interlinkages of ideas within the research area. Market competition is the largest and central cluster in our study, which is also the central theme under IO literature. We want to point out that thematically, most of the studies were either directly or indirectly associated with this largest cluster except Spectrum Licensing and Consumer behaviour.

This is particularly true as Spectrum licensing is a niche area within Telecom regulatory literature and is catered to in a different set of literature. Nevertheless, considering the search strategy for this review, only two papers (Hoppe et al., 2006; Klemperer, 2002) were selected. Hoppe et al., 2006 elaborates on the auction format that determines the possibilities of the incumbents to preempt new entry in the market. On the other hand, Klemperer (2002) notes the different auction mechanisms across 9 EU countries during 2000 - 2001 spectrum auctions. The paper evaluates the outcomes in terms of ease of entry and deterrence for collusions.

Similarly, for consumer behaviour, there is ample literature that focuses on consumer preferences, their sources in the form of cognitive biases or social norms. But very few link the effects on the supplier side of the game. Miravete and Palacios-Huerta (2014) conducted an experimental study using the household panel data to segregate the consumer inertia from experiential learning in a repeated decision task. It helped to answer the tariff problem through a behavioural lens. Lunn (2012) presents a behavioural economic analysis of the telecommunications market. The paper presents the unique blend of non-standard characteristics of the mobile telephony market. An extension of these studies would contribute to the behavioural IO literature.

These two smaller clusters can be considered as the gap or rather scopes for further examination in this context. The availability of different research instruments and specialised data sources would surely attract more empirical contributions and advanced theoretical models. The introduction of behavioural perspective might aid in presenting behavioural interventions for the benefit of social welfare from this industry.

The other objective of this study was to seek answers to our review questions. We retrieved satisfactory answers to most of our questions from the selected literature or the 'dataset' upon careful full-text study. Moreover, in few cases, further research is proposed for better insights, which we will discuss soon.

Our study looks at the telecom market in the post-privatization era. The deregulation in the telecom industry invited private players to step into the market, and distinct regulatory bodies were materialized to oversee the market and intervene when necessary. Earlier, the telephony service provider was mainly state-owned or national enterprises. In economic terms, the market was a monopoly. With the introduction of private players, the structure gradually changed (Hausman and Taylor, 2013). Competitive prices in the deregulated market increased consumer welfare (Mixon and Hsing, 1997). In general, in the presence of private firms, the market was gradually being shared by multiple players.

Furthermore, over a period of time, it took the form of an oligopoly of a handful of large firms driving the market. Being a capital-intensive industry that faces rapid technological changes, it naturally has high barriers to entry and similarly high exit costs along with RD and investments (Kim, 2000). Apart from the infrastructural and service-related investments, the firms also had to account for the cost of licenses. From a long-term orientation, many smaller players were forced to merge (Warf, 2003) or opt for a joint venture with foreign subsidiaries to continue in the market (Bohlin and Granstrand, 1991; Park et al., 2014). In the end, repeated interactions of such nature boiled down the market structure from a monopolistic competition with many small firms to an oligopoly of few large firms. Similar transitional behaviour has been observed in the US (Hausman and Taylor, 2013), the UK (Valletti and Cave, 1998), Brazil (Burkart, 2005), Russia (Trubnikov, 2020), and in countries of the European Union (Cave et al., 2019; Fuentelsaz et al., 2008; Genakos et al., 2018; Gruber, 1999; Grzybowski, 2008). Gruber and Verboven, 2001 present a global overview of the same with the data from 140 countries. From a strategic perspective, on many accounts (Bijwaard et al., 2008; Gimeno et al., 2005; Jakopin and Klein, 2012; Sung, 2014), first movers in the market did have a competitive advantage, though it declined over time. There are some overlaps with international business literature, which focuses on internationalization strategies and their effectiveness in similar markets (with similar regulatory structure) (Antonelli, 1995; Laanti et al., 2009; Sarkar et al., 1999). Dike and Rose, 2019 present an interesting contrast to existing literature (Gimeno et al., 2005) through their study on emerging markets of sub-Saharan Africa. The results show that emerging-market multinational enterprises (EMNEs) did not prefer geographically close markets for cross-border expansion. The commonality among the chosen markets was regulatory control over corruption. This preference reversal is clearly attributed to the socio-political structure of the neighbouring nations of these EMNEs.

The main purpose of the regulatory bodies is to maintain a healthy market competition (Cambini, 2001; Castelli and Leporelli, 1995), which includes prevention of a monopoly structure and preserve social welfare (Choi et al., 2001). They utilize the market concentration indices such as Herfindahl-Hirschman Index and C-N ratio to measure market competition. Bijwaard et al. (2008), Burkart (2005), Cyert et al. (1995), Doh et al. (2004), Noam, (2006) utilize these variables in their study as a proxy for market competitiveness.

The selected articles present interesting market competition models. They are simplified as (differentiated) Bertrand price competition model considering the participating firms have adequate capacity to serve the market (Grzybowski, 2011; Kaimann and Hoyer, 2019; Loertscher and Marx, 2014; Maillé and Tuffin, 2012). Gao et al. (2014), Hsing and Mixon (1994), and Tobin (1993) have specifically considered the pricing strategies for such markets. The pricing-related studies have found that price is a factor contributing to consumer usage and hence adoption. The different tariff rates set by the firms act as strategic complements (Miravete, 2014). Consumers prefer to pay according to their usage instead of a bulk price for the service. From the firms' side of the market game, setting similar prices for their services induces tacit collusion (Busse, 2000). Valletti (1999) includes

coverage and hence the size of the network in the competitive model. Hence, the mobile market can be presented in a two-stage game. The first stage is concerned with setting the capacity (acquiring licenses, establishing communication infrastructure) or quantity as shown in Andini and Cabral (2013). The second stage thereafter deals with the pricing.

With the advancement of technology, cellular service was commercially available for the mass. The portability and ease of usage of cellular service almost replaced fixed-line telephony services. With advanced generations (2G, 3G, ...), additional features such as internet-based services and broadband were introduced. From the supplier side, a different group of service providers termed as Mobile Virtual Network Operators (MVNOs) have joined the market competition. These service providers, by definition, do not own the spectrum license or infrastructure. But instead, they lease it from others (Shin and Bartolacci, 2007). Audestad et al., 2006 present a study on the interactions between a network operator and a virtual operator. Considering the regulatory structure and liberalized market landscape Shin, 2008 shows that the MVNO penetration is slower in Asian countries than in the Western hemisphere. Also, following a common communication standard (e.g., GSM) has aided in cross-border penetration of foreign mobile service providers (Fuentelsaz et al., 2008). Around 1983, mobile phones were commercially available to the public, and gradually they penetrated the market. Gruber and Verboven, 2001b point out that with an increase in capacity of the networks had a major impact on the diffusion of mobile telephony services. The selected literature shows that price is not really a significant factor affecting the diffusion process in a network industry like telecom (Karine et al., 2004). Regulators and consumer choice play a role in the diffusion process (Li and Lyons, 2012). Many authors mention that usage and billing information from the consumer would be useful for efficient pricing and firm-level strategic decisions.

The overall view of the study could be summarized as follows Figure 12.



Figure 12. Framework

The aforementioned factors and facets of the oligopolistic telecom market are incorporated to depict the interrelationships between them. The arrowheads point from the narrower themes to the broader themes. These interlinkages are derived from the selected studies. We have only highlighted the prominent factors that were found out to be essential to answer our review questions. During our study, most literature was focused on the mobile telephony market. The rise of cellular services admittedly hindered the growth of fixed-line telephony. Additionally, with the increasing demand for internet connectivity, broadband has entered as a new segment of telecom services. The core of this framework is the oligopoly market of telecom. The topics with bold outlines denote the major contributing factors to the market competition. A few of these themes were found to be interrelated. The sub-topics marked with dotted lines are the specific topics discussed in the selected articles. These could be interpreted as the distinct variables operationalized in the market models of these research studies.

6. Conclusion and Limitation

The review analyses the oligopolistic telecom market in different aspects. The study undertook the systematic review approach and extracted relevant literature from digital databases. It illustrates the process of conducting a robust systematic literature review step by step accompanied by figures and tables.

We have derived several prominent themes from the review and have found out the answers to our review questions. Market competition and competitiveness are undoubtedly the most prominent themes in the study. The mathematical models have heavily discussed several price competition models under different market conditions. On the other hand, the market competitiveness has been attributed to different research areas, namely, the regulation, spectrum auction methods, and business strategies of participating organizations. From the literature, it is evident that first movers definitely gain some competitive advantage in a network industry like telecommunications. The empirical study (Sung, 2014) shows that the first-mover advantage gradually declines with market experience and time. An oligopoly (Valletti, 2003) driven by a handful of players with no firm with absolute advantage would often collude (Busse, 2000; Damania, 1996) by coordinating prices across markets. If the market is competitive in nature, they generally compete in price (Loomis, 1997). Some have hinted at the ownership of the firms in the competition context (Doh et al., 2004; Matsumura and Kanda, 2005; Parker and Roller, 1997). However, it invites detailed studies specific to firm ownership to extract significant insights into the current review landscape. This, in fact, can be considered as a future extension of our study. From a pricing perspective, consumers prefer the cheaper alternative given the similarity of services and ease of access. Otherwise, consumers consider quality services and are willing to pay on a usage basis instead of a bulk price (Lee, 2015). This, in turn, affects the market competition (Roycroft and Garcia-Murrilo, 2000).

We have observed that from a competitive perspective, regulatory frameworks play a significant role. Market entry, ease of business, cross-border expansions (Castelli and Leporelli, 1995; Dike and

Rose, 2019); these parameters can also be studied in depth from an international business and strategic management. Auction mechanisms were an exciting theme that surfaced during our review. In line with Klemperer (2002), further analysis would aid in making the licensing system more robust. It would be interesting to study what are the deciding factors to choose an efficient auction system (ascending versus sealed-bid auction) for a national telecom market.

Another interesting facet was the inclusion of consumer behaviour in studying market behaviour. With growing interest in behavioural aspects of the economic phenomenon, the inclusion of the same in the market model would definitely prove to be helpful in designing efficient market propositions and interventions. These are expected to provide directions to future research scope pertaining to the ever-evolving telecom industry.

In this study we have attempted to cover all the factors that have contributed in shaping the telecom oligopoly post deregulation. Yet, the study has its own limitations. The selection criteria only considered the high-quality research articles published in peer-reviewed journals. It had excluded conference proceedings, practitioner reports, books for the review. Secondly, the search string was the prime database search key to extract the relevant literature. It leaves with a possibility of missing out on some literature. We have tried to curb it by backward and forward snowballing.

To summarize, in this paper, we have consolidated and analyzed the domain knowledge pertaining to oligopolistic competition in the telecommunications industry. The paper studies the prevailing research themes in the area. The market analysis (both empirical and theoretical) brings forth the distinct factors that affect the market competition. The selected articles elucidate on the mechanism of how these factors affect the markets nationally and internationally. The study identifies that the current market is more focused on mobile telephony services than fixed-line services. Analysis of broadband services and the VNO market are the upcoming research areas in Telecom competition literature. As the literature states, the market competes neither purely on quantity (Cournot model) nor price (Bertrand model). However, it is defined as a two-stage game of quantity and price. In the first step, the firms compete for quantity (or capacity). The capacity stands for acquiring operating licenses through national spectrum auctions. Second, the firms compete on service price to acquire consumer base across national and cross-border markets. In comparatively stable markets, the firms do not engage in a price war. They would instead maintain tacit collusion in the pricing structure. The studies have shown that the enterprises prefer to expand to regions similar to domestic markets for cross-border expansion. They also consider the political conditions (regulations, ease of business, corruption) of the target region. The newer studies point out that understanding consumer biases will open another dimension in studying the market behaviour and, hence, aid in optimizing the firms' strategy.

Our paper has a unique take on extracting the theoretical underpinnings of telecommunications literature from an economic point of view. As per our search, there has been no prior attempt to consolidate the contributions in telecom oligopoly and conduct a comprehensive literature review. It

aids the researcher community to better understand the transition and trend in telecom oligopoly in the post-privatization era. The global insights presented in this paper, hold value for the policy makers to understand firm-consumer interaction better and possibly introduce behavioural perspective in designing new regulations. We have also segmented the core areas in the literature and have identified the scope for future contributions. These gaps are useful avenue for the new researchers. These gaps also invite empirical validation and further analysis to contribute in empirical IO area.

Our study shows that consumer behaviour plays a major role in market competition and that their choice relies on a delicate balance of price and quality. The industry can leverage the findings of this study to better design their offering, pricing schema, and consumer reach-out strategies. As a practical implication, our study presents the key factors for firms aiming for a new entry or global expansion in telecom market. Our detailed analysis of the thematic clusters indicates how inherent competitive structure, geo-socio-political framework, ownership structure can affect firm position in the market. These insights provide a pseudo-yardstick for the managers interested in the same or similar markets.

This study has implications for both scholars and practitioners. From an academic point of view, our study contributes to suggesting future research directions specifically in the areas of modelling efficient market and auction mechanisms. For practitioners, it provides practical knowledge about the evolution of the market and the current competitive structure of the industry across the globe. Further research is required for the strategic application of the insights drawn from the study.

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