INTERFACE BETWEEN COMPETITION LAW AND ARTIFICIAL INTELLIGENCE: A CRITICAL ANALYSIS OF PRICING ALGORITHMS OF CAB BOOKING AGENCIES

Thesis Submitted for the Award of the degree of

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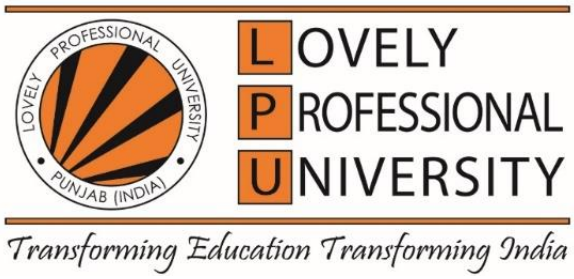

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DECLARATION

I, the undersigned, hereby declare that the research work on the topic titled, **"INTERFACE BETWEEN COMPETITION LAW AND ARTIFICIAL INTELLIGENCE: A CRITICAL ANALYSIS OF PRICING ALGORITHMS OF CAB BOOKING AGENCIES",** is done by me under the guidance of **Dr. Varinder Kaur,** Assistant Professor in the School of Law, Lovely Professional University, Phagwara Punjab. The findings and conclusions drawn in the thesis are based on data and other relevant information collected by the researcher during the period of the research study for the award of Ph.D. Degree in the Faculty of Law, Lovely Professional University, Phagwara Punjab. I, further declare that the research submitted on this topic is my original research work. Neither the work published in any journal or anywhere else and has not formed the basis for the award of any degree, diploma, associate ship, fellowship, titles in this or any other University of Institution of higher learning. All the material and data obtained from all other sources have been properly acknowledged in the thesis.

Place: Phagwara

Date: 2nd December, 2024

Kulkarni Shrikant Madhav
Researcher

CERTIFICATE

This is to certify that the work contained in the thesis entitled **"Interface between Competition Law and Artificial Intelligence: A Critical Analysis of Pricing Algorithms of Cab Booking Agencies",** submitted by **Mr. Kulkarni Shrikant Madhav** Registered Number 41800717 for the award of the degree of Ph.D. to the Lovely Professional University Phagwara, Punjab is a record of bona fide research work carried out by her under my direct supervision and guidance. I considered that the thesis has reached the standards and fulfilled the requirements of the rules and regulations relating to the nature of the degree. The contents embodied in the thesis has not been submitted for the award of any other degree or diploma in this or any other university.

Date: Phagwara

Place: 2nd December, 2024

Signature of Supervisor
Dr. Varinder Kaur

ABSTRACT

The integration of artificial intelligence (AI) in digital markets has gained significant traction worldwide. Pricing software, powered by complex algorithms, has revolutionized digital commerce by automating business transactions and introducing systematic and multifaceted processes. This technological evolution is reshaping traditional market dynamics and presenting unprecedented challenges for competition law.

In India, digitalization has permeated various sectors, including grocery retail, transportation, and more. However, the use of AI for pricing decisions in digital markets raises critical concerns. These markets generate vast amounts of big data, which in turn create issues related to data dominance, monopolistic practices, market information asymmetry, and predictive supply-demand capabilities. Such data dominance facilitates the creation and maintenance of cartels, often unintentionally, and erects entry barriers for new market players lacking access to robust data collection systems. These threats have been recognized by competition scholars globally.

To address these challenges, India's national AI strategy emphasizes algorithmic explainability and recommends adopting models like those developed by the U.S. Congress. The Defense Advanced Research Projects Agency (DARPA) in the United States is pioneering Explainable Artificial Intelligence (XAI) to make AI-driven decision-making processes comprehensible to human experts. This focus on transparency has direct implications for competition law, which is central to regulating fair competition, reallocating resources, and maintaining industrial balance. However, the rise of algorithm-driven markets, particularly pricing algorithms, poses significant challenges. These algorithms enable practices such as perfect price discrimination, where prices are tailored to individual characteristics, and tacit collusion, where competitors align pricing strategies without explicit communication. The inherent complexity of these algorithms makes detecting and proving anti-competitive behavior increasingly difficult.

A notable example illustrating these challenges occurred on Amazon, where an algorithmic price war between two sellers resulted in the book *The Making of a Fly* being priced at an exorbitant $23,698,655.96. Such incidents underscore the urgent need for research into the unchecked impact of algorithms on pricing decisions.

Key research gaps identified include insufficient scrutiny of pricing software's features—such as personalized pricing and deep discounting—and their potential for abuse under competition law. Additionally, there is a lack of clarity in assigning liability for anti-competitive practices stemming from algorithmic behavior. The research also highlights the absence of a consumer-centric perspective, particularly regarding responses to algorithmic collusion and available countermeasures.

This study explores algorithmic collusion enabled by automated pricing algorithms, a phenomenon that threatens stakeholders including competition regulators, economists, and market participants. The research provides practical guidelines for market investigations, proposes surveillance systems to counter digital cartels, and presents empirical evidence underscoring these threats' implications for consumer welfare.

The study's objectives include analyzing the evolution of AI and competition law, examining the role of algorithms in fostering anti-competitive behavior, critically evaluating existing legal frameworks, investigating anti-competitive practices in Uber's business model, conducting empirical analyses of pricing algorithms in Ola and Uber, and proposing actionable legislative reforms.

Hypotheses focus on emerging challenges such as pricing algorithms' autonomous learning of collusion, their impact on consumer welfare, and their exploitation of drivers and traditional taxi services. The empirical study, conducted from October 2022 to January 2023 using questionnaires targeting passengers, Ola/Uber drivers, and traditional taxi drivers in Pune, Mumbai, and Nagpur, employed a convenience sampling method.

The research delves into algorithmic collusion scenarios like messenger, hub-and-spoke, predictable agent, and digital eye, drawing on foundations in computer science

and applied mathematics. It references Robert Axelrod's *Axelrod Tournament* and simulation experiments from the University of Bologna to illustrate how automated pricing algorithms learn collusion without explicit input.

Further analysis reveals strategies employed by Ola and Uber, such as deep discounting, discriminatory pricing, predatory pricing, and price parallelism. These practices reduce consumer surplus, driver income, and traditional taxi industry revenue, highlighting the need for market intervention by competition regulators.

The study concludes with recommendations for competition regulators to address emerging challenges and regulate digital competition effectively. It suggests policy reforms, judicial reinterpretations, legislative amendments to the Competition Act, and structural and behavioral changes in enforcement. Additionally, it advocates liberalizing data access to foster algorithmic consumer culture while restricting non-public data in pricing decisions to facilitate market entry.

ACKNOWLEDGEMENT

The Lovely Professional University is a centre of excellence in multidisciplinary research opportunities in India. The coursework with diverse disciplines colleagues helps me to develop new interdisciplinary research ideas. I am very thankful for the splendid exposure with the multidisciplinary group during PhD coursework. I am also grateful to my supervisor Dr Varinder Kaur for granting me an opportunity for this ambitious interdisciplinary research project. In social science research, the researcher's freedom is vital in maintaining novel ideas and needs careful handling of liberty. I feel incredibly fortunate for the space arranged by my supervisor. With such space and freedom, interdisciplinary research in social sciences is possible. I thank the supervisor for her continuous and restless motivation throughout my research journey. I am also thankful for her guidance.

I am also thankful to **Adv. Siddharth Dubey** practising in various High Courts and Supreme Court in India, moulds my research to solve real-life problems of Indian society through the study. He also helps me to develop epistemic and doxastic logic for studying the interface between artificial intelligence and competition law I am also thankful to **Adv. Vidyashree Nayaka** and **Adv. Shivani Bhore** helps me in research writing and maintaining the flow of English.

My deepest gratitude goes to all the lawyers, students, and faculty from private and government universities. The work I am currently working on with them is complete and possible. I am humbled and grateful to everyone who helped me as a research participant.

TABLE OF CASES

Sr. No.	PARTICULARS OF THE CASE	CITATION
1.	United States v. Airline Tariff Publishing	Co., 836 F. Supp. 9 (D.D.C. 1993).
2.	Eturas v. Lithuanian Competition Council	(2016), Case C-74/14
3.	White v. R.M. Packer Co.	United States Court of Appeals, First Circuit, 635 F.3d 571 (1st Cir. 2011)
4.	Samir Agrawal v. ANI Technologies Pvt. Ltd.	Case No. 37 of 2018 decided on 06.12.2018
5.	United States v. Addyston Pipe & Steel Co	1898, 175 U.S. 211, 20 S. Ct. 96; 44 L. Ed. 136; 1899 U.S. Lexis 1559
6.	TELCO v. Registrar of Restrictive Trade Agreements	1977 AIR 973, 1977 SCR (2) 685
7.	Competition Commission of India v. against M/S Puja Enterprises & Ors	Case No.1 of 2012 by DG (S&D) against on decided on 06.08.2013
8.	Bundesverband der Arzneimittel-Importeure ev and commission of the European Communities v. Bayer AG	Cases C-2/01 and C-3/01, EU:C:2004:2
9.	Suiker Unie v. European Union Commission	Cases 40-48, 50, 54-56, 111, 113-114/73, [1975] ECR 1663, EU:C:1975:174
10.	Imperial Chemical Industries Ltd. v. Commission	Case 48/69, EU:C:1972:70
11.	Ahlström Osakeyhtiö v. Commission	Cases C-89, 104, 114, 116-117, 125-129/85, EU:C:1993:120
12.	Ahlström Osakeyhtiö v. Commission	Cases C-89, 104, 114, 116-117, 125-129/85, EU:C:1993:120
13.	Rajasthan Cylinders and Containers v. Union of India,	AIR 2019 SC (SUPP) 801.
14.	Shri Nirmal Kumar Manshani v Ruchi Soya Industries Ltd,	CCI Case No. 76 of 2012,
15.	Standard Oil Co. of New Jersey v. United States	221 U.S. 1, 1911

16.	Meru Travel Solutions v. ANI Technologies and ors	(Case No. 25, 26, 27 & 28 of 2017 decided on 20.06.2018)
17.	Uber India Systems Pvt. Ltd. v. Competition Commission of India & Ors.	CIVIL APPEAL NO. 641 OF 2017
18.	Samir Agrawal v. Competition Commission of India & Ors	CIVIL APPEAL NO. 3100 OF 2020
19.	Spencer Meyer v. Travis Kalanick,	1:15 Civ. 9796
20.	Asociación Profesional Élite Taxi (APET) v. Uber Systems Spain	434/15, CLI:EU:C:2017:981, 20 December 2017
21.	United States of America v. Donell Alfred Hopkins	No. 15-CR-00201 (N.D. Cal. 2015)
22.	Spencer Meyer v. Kalanick	174 F. Supp. 3d 817 (S.D.N.Y. 2016)
23.	United States v. Airline Tariff Publishing Co.	836 F. Supp. 9 (D.D.C. 1993)
24.	Eturas v. Lithuanian Competition Council	(2016)], Case C-74
25.	Standard Oil Co. of New Jersey v. the United States	221 U.S. 1 (1911), 221 U.S. 1, 31 S. Ct. 502; 55 L. Ed. 619; 1911 U.S. LEXIS 1725

LIST OF ABBREVIATIONS

AAEC	Appreciable Adverse Effect on Competition
AC	Appeal Cases
AI	Artificial Intelligence
All ER	All England Law Reports
AML	Anti-monopoly Law
ANN	Artificial Neural Network
Art.	Article
B.C.	Before Christ
BIS	Business Innovation and Skills
CAT	Competition Appellate Tribunal
CCI	Competition Commission of India
Ch	Chancery
Ch D	Chancery Division
CIA	Competition Impact Assessment
Cir.	Circuit
CMA	Competition Market Authority of United Kingdom
COMPAT	Competition Appellate Tribunal
Ct. App.	Court of Appeals
DG	Director general
DG-COMP	Director General of Competition
DOJ	Department of Justice of United States of America
ECHR	European Court of Human Rights
ECR	European Court Reports
EFTA	European Free Trade Association |
EU	European Union
EUMR	European Union of Merger Regulation
EWCA	England and Wales Court of Appeal
EWHC	England and Wales High Court
F.	Federal Reporter
F.2d	Federal Reporter, Second Series
F.3d	Federal Reporter, Third Series
Fam	Family Division
FDA	Food and Drugs Authority
FDI	Foreign Direct Investment
FEMA	Foreign Exchange Management Act
FERA	Foreign Exchange Regulation Act
FTC	Federal Trade Commission
GATS	General Agreement on Trade in Services
GCR	Global Competition Review
IPR	Intellectual Property Rights
IT	Information Technology
L. Ed.	United States Supreme Court Reports, Lawyers' Edition
M & A	Mergers and Acquisitions

MCA	Ministry of Corporate Affairs
MIC	Monopolies Inquiry Committee
Misc.	Miscellaneous
ML	Machine Learning
MOFCOM	The ministry of Commerce
MRTP	Monopolies and Restrictive trade practices
MTP	Monopolistic Trade Practices
N.E.	North Eastern Reporter
N.W.	North Western Reporter
NCP	National Competition Policy
NCPC	National Competition Policy Council
NDRC	National Development Reform Commission
NITI	National Institute for Transforming India
OECD	Organization for Economic Co-operation and Development
OFT	Office of Fair Trading
PSU	Public Sector Undertaking
QB	Queen's Bench
QBD	Queen's Bench Division
RBI	Reserve Bank of India
RIA	Regulatory Impact Assessment
RTP	Restrictive Trade Practices
S. Ct.	Supreme Court Reporter
S.W.	South Western Reporter
SEBI	Security Exchange Board of India
TEC	Treaty Establishing the European Community
TEU	Treaty of European Union
TFEU	Treaty on the Functioning of the European Union
TRIPS	Trade-Related Aspects of Intellectual Property Rights
U.S.	United States
U.S.C.	United States Code
U.S.C.A.	United States Code Annotated
U.S.C.S.	United States Code Service
U.S.P.Q.	United States Patent Quarterly
UK	United Kingdom
UKHL	United Kingdom House of Lords
UKPC	United Kingdom Privy Council
UKSC	United Kingdom Supreme Court
UNCTAD	United Nations Conference on Trade and Development
USA	United States of America
UTP	Unfair Trade Practices
WTO	World Trade Organization

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

1. BACKGROUND

In recent times digital commerce has increased rapidly. The Gartner study estimated that up to 2020, 30% revenue growth of digital commerce was attributable to Artificial Intelligence applications.[1]These applications are transforming the nature of society and industry globally. Each stratum of the community well accepts this transformation due to the eagerness to lessen dependency upon the efforts of human beings and reduce the cost of using human resources. In the coming days, it is usual that Artificial Intelligence will compete with human resources toughly and attain a significant portion of world economic growth. However, at the initial level of Artificial Intelligence, rapid growth will be perceived by the industry's reliance upon Artificial Intelligence. Klaus Schwab says that Artificial Intelligence is base of the "fourth industrial revolution"[2]. This industrial reliance became sensible since the features of the machines advanced in terms of the ability to perform cognitive tasks. Stuart Russell described "the range of definitions into a 2 x 2 matrix of four approaches – thinking humanly, thinking rationally, acting humanly and acting rationally"[3]Gartner predicts that 85 per cent of Artificial Intelligence projects in 2022 will produce erroneous results due to biases in data, algorithms, or the teams managing them.[4] The Gartner prediction compels us to think about the regulatory model of Artificial Intelligence necessary to develop simultaneously.

The national strategy for artificial intelligence in India discussed algorithmic explainability and advised the government to adopt a model from U.S. Congress, like Defence Advanced Research Projects Agency (DARPA). DARPA was ruining the

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1 Gartner, "Artificial Intelligence Set to Transform Digital Marketing"*Criteo* 03 (2017) available at: https://www.gartner.com/imagesrv/media-products/pdf/Criteo/Criteo-1-43VKFYC.pdf(last visited on January 2, 2020).

2 Klaus Schwab, *The Fourth Industrial Revolution* 11 (World Economic Forum, Switzerland 2017).

3 Stuart Russell and Peter Nerving, *Artificial Intelligence: A Modern Approach* 2 (Prentice Hall, New Jersey, 2010).

4 Gartner, "Nearly Half of CIOs Are Planning to Deploy Artificial Intelligence"*Criteo* (2018), available at: https://www.gartner.com/en/newsroom/press-releases/2018-02-13-gartner-says-nearly-half-of-cios-are-planning-to-deploy-artificial-intelligence (last visited on January 2, 2020).

project like XAI, i.e. Explainable Artificial Intelligence. "Explainable Artificial Intelligence (XAI) refers to methods and techniques in the application of artificial intelligence technology (AI) such that human experts can understand the results of the solution. It contrasts with the "black box" concept in machine learning, where even their designers cannot explain why the Artificial Intelligence arrived at a specific decision" This explainability has straight concern towards Competition Laws.[5]

Competition law is an essential piece of social welfare legislation; it regulates fair competition for reallocating resources and its balance within industrial society. However, although competition law does not prohibit the possession of monopoly power, it may be permissive to interfere with that power through relatively specific actions or attempts to achieve it.[6] The utility of algorithms is rapidly increasing in digital marketing. This exercise in algorithms is a displacement of the Competition law. Pricing algorithms can be described as computational codes that are used by marketers or sellers to automatically set prices to increase profits.[7]"The implementation of algorithms in digital markets has also been argued to facilitate first degree or 'perfect' price discrimination, by allowing companies to price consumers based on their location, browsing history, previous purchases and other private information"[8] In addition, maintaining an oligopoly state of competition is also one feature of an algorithmic advantage; this tacit nature creates many challenges to the Competition law regime. Richard Posner noted remarkable opinion concerning to oligopoly of algorithmic is as follows:

"In some circumstances competing sellers might be able to coordinate their pricing without conspiring in the usual sense of the term – that is, without any overt or detectable acts of communication. This is the phenomenon that lawyers call 'conscious parallelism' and some economists term 'oligopolistic interdependence',

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5 Ian Sample, "Computer Says No: why making AIs fair, accountable and transparent is crucial"*The Guardian*, Nov. 5, 2017.

6 Kumar Jayant and Abir Roy, *Competition Law in India* 176 (Eastern Law House, Kolkata, 2008).

7 N.V. Chawla, K.W. Bowyer, et.al. (eds.), "Synthetic minority over-sampling technique" 16 *Journal of Artificial Intelligence Research* 328 (2002).

8 Organisation for Economic Co-operation and Development, "Algorithms and Collusion: Competition Policy in the Digital Age" available at:https://www.oecd.org/competition/algorithms-collusion-competition-policy-in-the-digital-age.htm (last visited on January 20, 2020).

but which I prefer to call tacit collusion in contrast to explicit collusion of the formal cartel or its underground counterpart"[9]

This pricing algorithm encourages sellers to facilitate the execution of a collusive arrangement to exploit the advantages of competition. These pricing algorithms also have an advantage in challenging figuring out evidence of anti-competitive behaviour due to their complex structure. Finally, algorithms can become competitive restraints for fair competition. For example, algorithms' capacity to limit pricing and create entry barriers in the market through collusive equilibria.[10]

The United States Department of Justice charged Aston, Hopkins, and other unidentified entities with conspiracy to agree to use specific pricing algorithms and software for the collusive dynamic price.These collusive dynamic prices shopper put thereby competitive disadvantage and resultantly the end of price Competition among the sellers. Department of Justice called this instance a "first online marketplace prosecution"[11]

In the Indian context, this problem is also foreseen by the chairperson of the Competition regulator. Many Artificial Intelligence Airline industry companies were involved in collusive surge pricing. This remarkable observation was inspired by the sudden surge pricing Chandigarh-Delhi tickets right after the Jat community struck for reservation in May 2018.

Finally, the above discussion has revealed a conflict between the Competition law and Artificial Intelligence sponsored applications and algorithms. Artificial intelligence creates hidden tools for monopolies, whereas Competition law resists with consistent efforts of monopolies.[12] This research journey will study conflicts between Artificial Intelligence produced applications and algorithms and find the

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9 Richard A. Posner, *Antitrust Law*, 35 (University of Chicago Press, Chicago, 2001).

10 Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition: the promise and perils of the algorithm-driven economy* 85 (Harvard University Press, Cambridge, 2016).

11 The United States Department of Justice through the Office of Public Affairs, "Former E-Commerce Executive Charged with Price Fixing in the Antitrust Division's First Online Marketplace Prosecution" *Press release* 6 April, 2015 available at: https://www.justice.gov/opa/pr/former-e-commerce-executive-charged-price-fixing-antitrust-divisions-first-online-marketplace (last visited on January 22, 2020).

12 Kumar Jayant and Abir Roy, *Competition Law in India* 176 (Eastern Law House, Kolkata, 2008).

answer to whether the Indian Competition law framework is sufficiently flexible for novel Competition of autonomous algorithms. In addition to that researcher also desires to do a comparative analysis of judicial pronouncement in various countries of the world. The conclusion will suggest the regulatory framework for the digital era of Competition law policy.

1.1. LITERATURE REVIEW

1.1.1. Books

Joan Robinson's (1933) author argued that perfect competition is not a real-world phenomenon based on the assumption that competitors are competing for price. Instead, the author suggests that small companies with market power to influence and control supply dominate a number of sectors. The first part provides the theoretical framework for understanding the behaviour of firms in imperfect competition. It also introduces the concept of monopsony power, which states that the single-capacity buyer limits and controls the market prices. The author applies a theoretical framework to various industries like electricity and transportation and suggests a policy to improve competition and efficiency based on assumptions of the behaviour of firms in imperfect competition.[13]

Rene Joliet (1967) provides a detailed analysis of the basic principles of the rule of reason doctrine. It also explains the tests -competitive practices based on qualifying parameters such as reasonableness and public interest. There is no such exhaustive list of anti-competitive practices and conduct of firms. However, interpretations that flow from the fundamental doctrine of the rule of reason enable regulators to detect anti-competitive practices based on qualifying parameters like reasonableness, public interest, and restraint of trade. The author also explains the position of the rule of reason doctrine in various jurisdictions and legal documents and provides an elaborative understanding of the rule of reason. The author suggests that more flexibility is required in the rule of reason to improve better effectiveness of competition.[14]

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13 Joan Robinson, *The Economics of Imperfect Competition* (Palgrave Macmillan London, 1933).

14 Rene Joliet, *The Rule of Reason in Antitrust law* (Springer Science Business Media, Switzerland 1967).

Robert Axelrod (1984) researched the mathematical understanding of cooperative behaviour in humans and also explains the evolution of this cooperation behaviour. The book offers a unique perspective on the evolution of cooperation in various contexts, such as prisoners' dilemmas, social dilemmas, and international cooperation. The book uses the game theory of mathematics to explain human behaviour in strategic situations. The authors arranged the tournament and invited academicians to devise their computers to participate in the competition. The experiment findings give a novel approach to applications of game theory. The experiments and simulations were conducted for various strategies of competitors to cooperate and achieve mutual benefits. The experiment and simulation findings developed the strategy to the effectiveness of various strategies such as tit for tat, do not envoy, do not defeat first, and forgiveness while competing to achieve better mutual benefits. The author also explained the game theory and its logic behind the development of the cold war in the world. The strength of this book is its relevance in the development of pricing software in the field of algorithmic trading. The findings of this book are at the high implication in various fields in the development of strategies like politics, international relations, human behaviour, economics and especially in computer science. The book offers foundational insights for developing pricing algorithms for collusion and avoiding competition for better mutual benefits.[15]

Ariel Ezrachi and Maurice Stucke (2016) explored the use of artificial intelligence-based tools in the market and their impact on the economy and consumer welfare. The authors provided a balanced understanding of pro-competitive and anticompetitive features of pricing software. The discussion starts with how AI-based algorithms are prevalent in various industries such as airline, finance, retail, healthcare, and transport. The authors also explain the features of pricing algorithms like price optimization, dynamic and personalized pricing, personalized advertisements and consumer behaviour. It further pointed out how the market conditions were changed due to using pricing algorithms and their pro-competitive effects, such as reducing search costs, availing unlimited choices, increasing price transparency, and

[15] Robert Axelrod, *The Evolution of Cooperation* (Basic books Publication, New York 1984).

personalized pricing. The authors also valued advantages like improving efficiency and lowering costs. However, the authors also highlighted the potential risks of collusion between discriminatory and legal issues. The authors explored the four central scenarios of algorithmic collusions. The author perceived Hub and Spoke Conspiracy, Messenger Scenario, Predicable Agent, and Digital eye types of collusion. This literature is further reiterated in various government documents of various countries in the world. The authors explored the advantages and risks of using pricing algorithms in the economy without proposing legislative changes in competition rules. The authors provide an insightful understanding of the interface of artificial intelligence and antitrust laws in changing market conditions. The authors suggest that more than the existing legal framework is needed to address the issues of artificial intelligence and competition laws.[16]

Allen P. Grunes (2016) had presented the impact of big data on competition law in detail. The book's first part provides the fundamentals of big data, its sources, and its effect on competition policy. It also provides an idea for traditional competition regulators to be implemented for challenges posed by big data analytics. The book's second part provides an overview of data-driven mergers of big companies like Facebook and WhatsApp. The book's third part points out the gap in big data and competition regulation, provides case studies on how big data impacts competition in industries, and recommends policy changes accordingly. The book also introduced different stakes of big data and competition policy such as innovation, consumer privacy and traditional industries. The vital strength of the book is that it provides actual recommendations for regulating big data in the competition sphere.[17]

Soumendra Mohanty (2018) the author provides insights for developing various strategies for implementing humans and machines in business affairs. The book connects the latest development of artificial intelligence with business affairs. The book offers various business changes based on AI developments and the advantages and limitations of using AI applications in businesses. The author describes various

[16] Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition: the promise and perils of the algorithm-driven economy* (Harvard University Press, Cambridge, 2016).

[17] Maurice E. Stucke and Allen P. Grunes, *Big Data and Competition Policy* (Oxford University Press, Oxford 2016).

aspects of using AI applications in business such as cybersecurity, ethics, Internet of things.[18]

Richard Whish (2018) the author explored contemporary development in fundamentals competition law. It provides basic competition law principles, such as cartels, abuse of dominance, and anti-competitive agreements. The book also explored the power of competition authorities and the court's role in enforcing competition law. The intervention through competition authorities and courts is necessary to justify carefully. Without such justification, intervention may impact adversely. The author also explored industry-wise competition regulations in telecommunications and energy.[19]

Ariel Ezrachi and Maurice Stucke (2018) the authors explained that competition regulation must be justified in the market; otherwise, regulation adversely affects the market conditions such as reducing consumer surplus, the rise of monopoly and oligopoly, the manipulation of information flow, control of supply. The authors also highlighted cases where cooperation and collaboration between firms could benefit customers and public interests more. The author also explained how big firms could manipulate and distort competition, reducing consumer surplus.[20]

Neha Vyas (2018) Author provides comprehensive introduction to competition law; it explains key concepts of competition law, mergers and acquisitions, and abuse of dominant position along with landmark judgments of Indian supreme courts and competition commission. The author also discusses various schools of competition law theories and debates like classical and neo-classical theories, features of perfect competition, and theories of Harvard and Chicago schools' theories. The book also provides a comparative analysis of fundamental doctrines of the rule of reason and rule per se. The author also highlighted the interface of competition law with intellectual property rights and digital platforms.[21]

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18 Soumendra Mohanty, *How to Compete in the Age of Artificial Intelligence* (Apress Springer Nature Company, Netherlands, 2018).

19 Richard Whish, *Competition law* (Oxford University Press, Oxford 2018).

20 Ariel Ezrachi, Maurice Stucke, *Competition Overdose* (Harvard Business Review, Harvard 2018).

21 Neha Vyas, *Competition Law* (Eastern Book Company, New Delhi 2018).

Purvi Pokhariyal (2020) described the policy implications of artificial intelligence in various fields of law. The book provided a detailed analysis of the ongoing development of artificial intelligence and its impact on law and society. It highlighted the need for a legal and regulatory framework to regulate the development and use of artificial intelligence. The author also discussed the policy implication for an issue related to privacy, security, and law enforcement. This policy discussion is based on interdisciplinary disciplines of artificial intelligence, law, commerce, economy, technology, philosophy and ethics, providing comprehensive ideas about the impact of developments in artificial intelligence. The book's balanced approach also acknowledges the potential benefits of using artificial intelligence.[22]

Karim R. Lakhani (2020) the book explains how AI is transforming the competition in business and how technology can help to gain competitive advantages over the traditional market. The author provides an example of how photography's invention distorted the traditional painting businesses. The author mainly argues that artificial intelligence built new software which not just provides the technology, in addition, they also create ways to the way of doing business. For example, the author describes how AI can improve demand-supply management and consumer analysis, accelerating innovation. The book also addresses the ethical and social considerations of AI. It argues that businesses should ensure the use of AI ethically.[23]

Ariel Ezrachi and Maurice Stucke (2022) explored how big companies' dominance in the market discourages innovation and non-price competition. The authors focussed on the dominance of big companies like Apple, Amazon, Google, and Facebook and their approaches to maintaining dominance in the market. The authors stressed the importance of innovation in the competition law sphere. They discussed how these big companies, by using their market, acquire potential competitors from the market and discourage innovation and competition in the market. Authors pointed out that big companies using their wealth and influence acquire smaller companies through restrictive and exclusive agreements. The book finally suggests policy perspectives

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22 Purvi Pokhariyal, "Artificial Intelligence: Law and Policy Implications" 11 *Journal of Advanced Research in Law and Economics*, 141 (2020).

23 Karim R. Lakhani, "Competing in the age of AI"*Harvard Business Review Press, Boston,* (2020).

for competition regulators to deal with this issue. It suggests using wealth and dominance to prevent large companies from acquiring potential competitors.[24]

1.1.2. Articles

Salil k. Mehra (2015) The author pointed out why and how the pricing algorithms led to collusion in the market and that using algorithmic pricing reduces the consumer surplus. The author focused on various features of pricing algorithms' speed and algorithms' learning capacity that helped stabilize the cartel in the market. The high reaction speed to changing market conditions allows algorithms to punish deviations from conscious parallelism and promptly sustain cartels in the market. The author used the term Robo-Seller and provided an understanding based on the mathematical doctrine of Nash equilibrium.[25]

Le Chen (2016) the author offers empirical evidence collected from amazon's price inventory. He analyses four months' data from more than 500 sellers and concludes that pricing algorithms make a complex experience for customers. Further, it is also challenging for non-algorithmic sellers to compete with robo-seller. The author used the sell inventory data of 1641 products and finds that there are no intentional and unintentional market distortions in the market.[26]

Bruno Salcedo (2016) the author describes how joint profits equate the monopolistic profit. The implications of game theory in algorithmic collusion are highlighted. It further describes algorithms facilitating the collusion and inevitable in this environment. Competing by decoding competitors' strategies in high dynamic pricing is not worth, and competitors' strategy is also highly dynamic in nature; therefore, compete and sustaining without cooperation is difficult in this situation thus author argues that collusion is inevitable. There is a strong mechanism for punishment to

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[24] Ariel Ezrachi, "How Big-Tech Barons Smash Innovation—and How to Strike Back"*Harper Business,* (2022).

[25] Salil K. Mehra, "Antitrust and the Robo-Seller: Competition in the Time of Algorithms", *Minnesota Law Review,* 100 *Temple University Legal Studies Research Paper* (2015), available at: https://ssrn.com/abstract=2576341 (last visited on March 31, 2022).

[26] Le Chen and Alan Mislove, "An empirical analysis of algorithmic pricing on amazon marketplace"*Proceedings of the 25th international conference on World Wide Web* (2016) available at: https://mislove.org/publications/Amazon-WWW.pdf (last visited on March 31, 2022).

deviation from Nash equilibrium which makes difficult to destabilize the cartel in algorithmic trading.[27]

Ashwin Ittoo and Nicolas Petit (2017) the author describe the relevance of technological advancements in the field of artificial intelligence, which enables robot-seller to tacit collusion. It explains how reinforcement algorithms and deep learning technologies lead to coordination for better performance. It also poses the risk of algorithmic collusion, which is difficult to detect due to its complex deep-learning tools. It also explains theoretically how single-agent Q-learning and multi-agent Q-learning agents interact in the market for collusion.[28]

Maureen K. Ohlhausen (2017) author highlighted that price signaling algorithms are complex and challenging to detect their coordination signaling. However, it also highlighted that algorithmic hub and spoke conspiracy can be subject to existing competition rules. The author also explains the difference between interdependence and collusion. The main difference between interdependence and collusion is a method of price setting when prices are set together and fall under the scope of collusion. Prices set independently fall under interdependence.

Kühn and Tadelis (2017) author pointed out that the communication between algorithms for pricing without explicit programming is impossible. The other authors ignored this notion. Sharing mechanism of algorithms leads to coordination issues. The author pointed out that the important notion of sharing algorithms and explicit programming for communications are important and valuable considerations for antitrust policy debate.[29]

Jan Blockx (2017) the author explained the possibility of algorithmic collusion and tools in European Union jurisprudence to prevent it. It also pointed out due to algorithmic seller ability to monitor prices and relate it with consumer behavior

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[27] Bruno Salcedo, "Pricing Algorithms and Tacit Collusion" *Pennsylvania State University* (2016), available at: https://brunosalcedo.com/docs/collusion.pdf (last visited on March 31, 2022).

[28] Ashwin Ittoo and Nicolas Petit, "Algorithmic Pricing Agents and Tacit Collusion: A Technological Perspective"*L'intelligence artificielle et le droit,* 245 available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3046405 (last visited on March 30, 2022).

[29] Kühn and Tadelis, "Algorithmic collusion"*CRESSE* (2017) available at: https://www.cresse.info/wp-content/uploads/2020/02/2017_sps5_pr2_Algorithmic-Collusion.pdf (last visited on March 25, 2022).

placed in advantageous position than consumer which facilitates the exploitation of consumer. However, humans cannot explain the pricing decision of algorithms. therefore, the cartel detection becomes difficult and depends on presumptions, leading to irrationality.[30]

Dylan I. Ballard & Amar S. Naik (2017) The authors pointed out algorithms collude independently and unilaterally are not under the shield of competition law, whilst their joint conduct is directly meant for the competition enforcer. In addition, this article raised the question of "How will enforcers approach such conduct, much less disrupt or prevent it? What duties should we impose on human beings to ensure their bots behave, and what guilt should they have when their bots go astray?"[31]

Sims, Ayman Guirguis (2017) expressed satisfaction that Australia's changed competition rulesframed by the Australian competition commission to combat algorithm-enabled anticompetitive conduct. These changes also adopted by Australian Parliament in October 2017 to amend Australia's competition rules as per the 2015 Harper Report. The amendments expanded the prohibition on the abuse of market power to prevent any undertaking from joining in the concerted practice of lessening competition. The amended abuse of market provision permits Australian competition commission to address any algorithms that significantly reduce competition by focusing only on the e effects of the conduct. This broad-based provision could capture both explicit and overt algorithmic collusion. Sims also suggested that if these laws are not met, Sims would suggest that rules could be changed to address algorithmic anti-competitive conduct.[32]

OECD (2017) EU pointed out that companies involved in illegal competition practices are exempted from liability as their algorithm acted independently. A firm's "direction of control" means that an algorithm is still under the control of an

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30 Jan Blockx , "Antitrust in digital markets in the EU: policing price bots" 9 *Radboud Economic Law Conference* 135 (2017), available at: https://www.researchgate.net/publication/317616145_ Antitrust_in_digital_markets_in_the_EU_policing_price_bots (last visited on March 31, 2022).

31 Dylan I. Ballard and Amar S. Naik, "Algorithms, Artificial Intelligence, and Joint Conduct'' *Competition Policy International* (2017), available at: https://www.sheppardmullin.com/ media/ article/1649_CPI%20-%20Ballard-Naik.pdf (last visited on November 10, 2021).

32 Ayman Guirguis, Jessica Mandla, *et.al.*, "Harper Amendments to Australia's Competition Laws Passed: ACCC Heralds a 'new era' in Competition Law" *K&L Gates* (2017), available at: https:// www.klgates.com/epc/getStdDoc.aspx?MediaID=49085 (last visited on May 10, 2022).

employee, agent or third party. The algorithm will remain under the firm's supervision so that the firm will be responsible for its actions.[33]

Margrethe Vestager (2017) said that the transparency of pricing algorithms could be maintained by "compliance by design". the businesses need to explain the decision of pricing algorithms and be responsible for determining pricing algorithms. Under the compliance by design approach, companies are asked to develop and use such algorithms that would not participate in the collusion.[34]

Competition Market Authority (2018) The report explores the features of pricing algorithms which holds potential to lead to competition law concerns. The Competition Market Authority (CMA), the competition regulator in the United Kingdom, pointed out research gaps and regulations in existing contexts to face challenges related to pricing algorithms. The report also mainly focused on features and pricing algorithms' ability to create competition law problems by personalised pricing and collusion.[35]

Francisco Beneke (2018) the author pointed out the use of pricing algorithms is potential risk to consumer welfare and use of artificial neural network makes it difficult to detect the collusion as well as exploitation of consumer. It also pointed out that the complexity of pricing decision is not critical as such the pricing software professionals are capable to explain and decode the pricing algorithms.[36]

Ai Deng (2018) the author pointed out important notion of pricing software that without explicit input for collusive outcome cannot reach the collusion. The author

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33 OECD, "Directorate for Financial and Enterprise Affairs – Competition Comm., Algorithms and Collusion – Note from The European Union" 85 (2017) available at: https://one.oecd.org/document/DAF/COMP/WD(2017)12/en/pdf (last visited on May 10, 2022).

34 Margrethe Vestager, "Remarks Before the Bundeskartellamt 18th Conference on Competition"*European Commission, Berlin* (2017), available at: https://ec.europa.eu/commission/commissioners/ 2019-2024_en (last visited on May 10, 2021).

35 Competition Markets Authority, "Pricing Algorithms Economic working paper on the use of algorithms to facilitate collusion and personalized pricing" 40 (2022) available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746353/Algorithms_econ_report.pdf (last visited on May 10, 2021).

36 Francisco Beneke and Mark-Oliver Mackenrodt, "Artificial Intelligence and Collusion" *International Review of Intellectual Property and Competition Law*, available at: https://link.springer.com/article/10.1007/s40319-018-00773-x#citeas (last visited on March 28, 2022).

relies on informal reasoning that the algorithms need unrealistic time to learn collusion. Various experiments and theoretical framework supported it.[37]

Nan Zhou (2018) author provides the theoretical and experimental evidence for algorithmic collusion. It explains that how human-algorithms interactions algorithms learn to collude slowly and in algorithm-algorithm interaction learn to collude faster. These empirical evidences confirm the ability of algorithms. It also noticed that in human-algorithms interaction algorithms earn more profit than humans. Therefore, the author concludes that the use of pricing algorithms potential harm to social welfare.[38]

Barbara D. Underwood (2018) author pointed out that increased use of algorithmic pricing software raises complex antitrust issues that invoke in-depth investigation. The behaviours and design of such pricing software leads to collusion in the market. It also facilitates supra-competitive prices which adversely impacts the production and consumer surplus. To sustain such collusion in market algorithms, develop their learning for more effective price discrimination and price-targeting, which substantially reduces the consumer surplus. This concern could be magnified by the transparency concerns regarding how an algorithmic software reaches its conclusion.[39]

Emilio Calvano (2019) the author analyses the replacement of humans by AI-sponsored pricing algorithms in the digital market. The author made an intense observation that algorithms continuously and independently learn to set anti-competitive price points by observing gradual company profit changes. He further describes how reinforcement algorithms will lead to anti-competitive pricing. It also explains how the Q-learning method in Artificial Intelligence used to develop pricing algorithms learns to collude with each other on the digital platform. However, they

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37 Ai Deng, "What Do We Know About Algorithmic Tacit Collusion?" 33 *Antitrust* (2021) available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3171315 (last visited on March 10, 2022).

38 Nan Zhou, "Algorithmic Collusion in Cournot Duopoly Market: Evidence from Experimental Economics"*Cornell University* (2020) available at: https://arxiv.org/abs/1802.08061 (last visited on June 10, 2022).

39 State of New York Office of The Attorney General, Barbara D. Underwood"Competition and Consumer Protection in the 21st Century, Hearing Project No. P1812011, Antitrust/Competition Issue"*US Government* available at: https://oag.ca.gov/system/files/attachments/press-docs/10. 10. 2018-multistate-ag-letter-ftc-re-hearings.pdf (last visited on May 10, 2022).

were not designed for collusion. The article gives an alarming call to the regulator for pricing algorithms.

Solarczyk Krausová (2019) The author shows how pricing algorithms harm the consumer, and the risks businesses may involve in understanding advertisements and unfair trade practices to harm the consumer. It briefly summarizes the major problems in AI, antitrust, competition law, and consumer protection. It also includes additional findings illustrating the European Union's competition law issues.[40]

German Oscar Johannsen (2020) describes various hypothetical contexts based on price discrimination or personalised pricing. This work concludes that price discrimination or personalised pricing significantly impacts oligopoly behaviour. This helping hand of algorithms is explained through various observations and lessons. Finally, end with a valuable remark that parallel pricing behaviour is a relevant element in alleging abuse of dominance.[41]

1.1.3. Reports

OECD (2017)

According to some academics, deep learning algorithms can create additional problems for competition regulators. Some competition scholars have suggested that deep learning algorithms could lead to market actors not understanding how or why an algorithm produces the outputs. These algorithms would act autonomously in search of potentially anti-competitive outcomes.[42]

Indonesia Government Report (2017)

The report "The Digital Economy in Indonesia" was released by "Komisi Pengawas Persaingan Usaha" in December (2017), The report explains that algorithmic pricing

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40 Solarczyk Krausová and Alžběta, "EU Competition Law and Artificial Intelligence: Reflections on Antitrust and Consumer Protection Issues"*Research Gate* 84 (2019) available at :https://www.researchgate.net/publication/340004851_EU_Competition_Law_and_Artificial_Intelligence_Reflections_on_Anti t r u st _and_Consumer_Protection_Issues (last visited on November 10, 2021).

41 Johannsen and Germán Oscar, "Conscious Parallelism and Price Discrimination in the Era of Algorithms: A Case of Collective Abuse of Dominance?"*MIPLC Master Thesis Series* (2019) available at:https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3203292(last assessed on January 23, 2020).

42 OECD, "Algorithms And Collusion: Competition Policy In The Digital Age" 28 (2017), available at:https://www.oecd.org/daf/competition/Algorithms-and-colllusion-competition-policy-in-the-digital-age.pdf (last visited on January 23, 2020).

is becoming more common for digital intermediatory such as cab booking agencies. Competition, similar to collusion, can produce similar prices for products and services on the market. This presents an analytical challenge.[43] The competition regulators of Indonesia posed the risk and competition concerns due to pricing software used in digital platform. The report also highlighted the complexity of algorithmic decisions thinned the competition sphere strongly.

Government Report of the United Kingdom (2017)

The United Kingdom's competition authorities have begun using algorithm-based tools to detect anti-competitive behaviour. The CMA's cartel screening tool has been developed to assist competition regulators and others involved in procurement. The digital cartel tool allows authorities in particular, to check their tender price inputs for detection of cartel behaviour by looking at several factors, such as text data and the bids price inputs.[44]Regulators may also use algorithms for cartel detection to improve their economic modelling of potential merger effects. The assessment of the data driven merger is also one of the important features of cartel screening tool. The tool can determine how merging competitors interact with pricing and how it impacts on merging players and consumer and third parties. In virtue of preservation of non-price competition by assessing non-price effect of the transaction on quality, privacy, and innovation for consumers. Therefore, competing players must ensure to regulators through compliances for the tools are correctly used.

1.1.4. Case Study

***United States of America v. Donell Alfred Hopkins*(2015)**

Aston, Hopkins, and other unnamed entities were charged by the United States Department of Justice with conspiring to use specific pricing algorithms and computer software to collude dynamic prices. DoJ claims that Aston, Hopkins and other unnamed conspirators agreed to use specific pricing algorithms and computer

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43 Komisi Pengawas Persaingan Usaha, "The Digital Economy In Indonesia"*KPPU* 8 (2017), available at :https://eng.kppu.go.id/wp-content/uploads/REPORT_Digital_Economy_27-December-2017-FINAL. docx.pdf(last visited on February 13, 2022).

44 Competition Market Authority, "Guidance About Cartel, Screening Tool"*CMA* (2017) available at :https://www.gov.uk/government/publications/screening-for-cartels-tool-for-procurers/about-the-cartel-screening-tool#using-the-tool (last visited on February 13, 2022).

software to coordinate price changes. This meant that shoppers were charged the same price for identical products, regardless of which seller they selected, eliminating any price competition between sellers. This collusive dynamic price shopper put thereby competitive disadvantage and resultantly the end of price Competition among the sellers. Department of Justice termed this instance as a "first online marketplace prosecution",[45]Then department of justice further emphasized that: "Using complex pricing algorithms will not tolerate anti-competitive conduct, whether in a smoke-filled room or over the Internet. American consumers have the right to a free and fair marketplace online and in brick-and-mortar businesses"[46]Private plaintiffs and the DOJ have brought price-fixing cases using algorithmic or non-traditional electronic tools. DOJ accused David Hopkins and co-conspirators of using pricing algorithms to set collusive prices for posters sold on Amazon Marketplace. This was the first criminal antitrust e-commerce prosecution. Hopkins and his co-conspirators pleaded guilty, particularly to collusion under Section 1 of Sherman Act. They also consented to pay $20,000 in criminal fines.[47]

Anita Banicevic (2018) The article also provides practical guidelines for developing new compliance programs in the context of pricing algorithms. This report covers antitrust compliance of algorithms in countries like Canada, Australia, the United Kingdom, Japan, Singapore, and Indonesia. This article is significant in terms of the classification of algorithms and another basic idea of digital commerce. This article also discusses the anti-competitive and effects of algorithmic algorithms. The research paper also highlighted the problem of tacit algorithmic collaboration. Many scholars believe algorithms may facilitate collusion without coordination or communication between market players. For example, dynamic pricing algorithms can change the prices for thousands of products and services within milliseconds toresponse the

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45 The United States through the Office of Public Affairs, "Former E-Commerce Executive Charged with Price Fixing in the Antitrust Division's First Online Marketplace Prosecution"*US Government* (2015) available at: https://www.justice.gov/opa/pr/former-e-commerce-executive-charged-price-fixing-antitrust-divisions-first-online-marketplace(last visited on January 22, 2020).

46 Richard Whish, *Competition law* (Oxford University Press, Oxford 2018).

47 *United States of America, V. Donell Alfred Hopkins,* (2015)No. CR14-0120, Northern District Iowa, available at: https://casetext.com/case/united-states-v-hopkins-97 (last visited on January 22, 2020).

competitor's price. Firms might not discount services or products if they see the benefits as temporary, which is a concern to competition law.[48]

***Spencer Meyer v. Kalanick*(2016)**

The Private plaintiffs claimed that Uber drivers had agreed to the same fares. Drivers and Uber were, therefore, not competing. Further, they claimed that Uber's pricing algorithm facilitates this agreement and all drivers were agreed for the same. Further complainant claimed that arrangement was a hub-and-spoke conspiracy in violation of Section 1.4 of the agreement Uber moved for arbitration after the court denied the motion to dismiss the defendant.[49] Uber relied on argument that Uber did not set the price; the algorithms set the price in response to market conditions.[50]

United States v. Airline Tariff Publishing Co. (1993)

The legal unilateral conduct can be distinguished from anti-competitive signalling, which could amount to tacit collusion. Signalling is when two or more competitors share information that "signals" their output or price plans to one another as part of a collusion agreement to limit the output. Although most signalling cases establish through making public announcements. Anti-competitive signalling was demonstrated in the 1993 Airline Tariff Publishing case, where several airlines shared asell inventory to maintain transparency and uniformity of fare changes or discounts.[51]

***Eturas v. Lithuanian Competition Council* (2019)**

Eturas, the European Court of Justice (ECJ), examined to what extent price fixing parameters can be applied to transactions between users of a platform and administrators. Thirty-three Lithuanian travel agencies used ETURAS, an online booking platform that was shared by all of them. The director of Eturas sent out an

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48 Anita Banicevic, Gabrielle *et.al*., "Algorithms: Challenges And Opportunities For Antitrust Compliance" (American Bar Association through Antitrust Law Section, Chicago, 2018), available at: https://awards.concurrences.com/en/awards/2019/business-articles/algorithms-challenges-and-opportunities-for-antitrust-compliance (last visited on January 23, 2020).

49 *SpencerMeyer v. Kalanick*, (2016) 174 F. Supp. 3d 817 United States District Court, available at :https://casetext.com/case/meyer-v-kalanick (last visited on January 23, 2020).

50 Jill Priluck "When Bots Collude"*The New Yorker* April 25, 2015 (2015) available at:https://www.newyorker.com/business/currency/when-bots-collude (last visited June 24, 2018).

51 *United States v. Airline Tariff Publishing Co*., (1993) 836 F. Supp. 9, D.D.C. (1st November 1993) available at :https://law.justia.com/cases/federal/district-courts/FSupp/836/9/1948676/ (last visited on March 12, 2020).

email on 25 August 2009 to several travel agencies asking for their opinions on whether it was appropriate to lower the discount rate online from 4% to between 0 to 3%. Natural made unilateral technical changes to the system. This did not prevent travel agencies from offering discounts to clients greater than 3 per cent, but hopes to follow and make appropriate technical changes in system to adopt new discount policies. The restriction of discounts via algorithms using the E-TURAS system raised questions about whether it had enabled a hub and spoke arrangement among market player to lower their discount rates. Court further observed that market players must take their pricing decisions independently. They should not be makingany direct or indirect contact with competing market players.

However, the ECJ determined that proof of Alturas's message being sent to travel agencies was necessary for liability to be established. The ECJ noted that a travel agency could counter any presumption of being tacitly implicated by publicly distancing themselves or presenting other evidence. The European Court raised this case to the Lithuanian Supreme Court for further investigation. The EU court issued the investigation guidance to administrative court to examine whether competing player were aware of the concerted practice. It also discussed to what extent competing player insisted to the practice. Based on the suggestion gathered from the Lithuanian Competition Council, the LSAC divided each competing player into groups: "(1) those who knew about Eturas' imposed restriction but did not oppose it; (2) those who knew about Eturas' restriction and opposed it; (3) those companies that had insufficient evidence to determine if they knew about Eturas. Only the agencies belonging to the first category could have participated in a coordinated practice, according to the LSAC"[52] However, the evidence was insufficient to prove that the third and fourth categories of travel agencies had engaged in anti-competitive practices. Alturas and all the competing player of the first category were penalized for their activities.[53]

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[52] *Eturas v. Lithuanian Competition Council*, (2014) Case C-74/14, 10, Supreme Administrative Court, Lithuania, available at: https://curia.europa.eu/juris/document/document.jsf;jsessionid=B37C92A6481C0F236E4A01525916729F?text=&docid=173680&pa%20geIndex=0&doclang=EN&mode=lst&dir=&occ=first&part=1&cid=2173601. (Last visited on June 2, 2021).

[53] *Ibid.*

The Making of a Fly Book Story

John Sutter (2011) The most famous example is the price war between two algorithms used copy of 'The Making of a Fly', which was traded on Amazon. The Making of a Fly was sold by two sellers who used an algorithm to determine the price.

The price of the first seller for book at x = 1.27059 *y

The price of the second seller for book is y = 0.9983 * 4

The algorithms began to interact with one another. Each time one adjusted the price, the other did the same. After ten days of this price war the final price reached $23,698,655.96. This outrageous price is an example of how algorithms can be left to do whatever they please and pricing decisions get out of control. It was funny if it wasn't tragic, but still a coincidence. It raises the question: What dangers could algorithms pose if not checked? Worse still, they could actively be used to destabilize markets.[54]

1.2. RESEARCH GAPS

1. The important features of pricing software's such as personalised pricing and deep discounting scrutinized in the context of abuse of dominance in competition law, the same has not explored in context of anti-competitive agreements.
2. There is lack of clarity in jurisprudence and legislation in setting liability for the anti-competitive behaviour of pricing algorithms.
3. The important stake of Competition law is the consumer; from that perspective, it is not answered whether consumers are helpless to respond to such algorithmic collusion and unable to put any countermeasure in front of algorithmic sellers like asking for secrete offers or discounting in the context of personalised pricing. In addition to study of consumer welfare perspective in the context of use of pricing algorithm not addressed in existing studies.

[54] John Sutter, "Amazon Seller Lists Book at $23,698,655.93 – Plus Shipping"*CNN* Apr. 25, 2011 available at: http://edition.cnn.com/2011/TECH/web/04/25/amazon.price.algorithm/index.html (last visited on June 30, 2018).

1.3. SIGNIFICANCE OF RESEARCH

This research strives to highlight the working nuances of conscious parallelism operating through the device of an automated pricing algorithm. The emergence and device of such a threat are prevailing globally amongst the major stakeholders such as Competition Enforcers, Economists and Competition players encompassing in the field. This research contributesin evolving practical guidelines relating to market investigation tools and further develops the existing surveillance system model to check digital cartels and combat the vicious threat of algorithmic tacit collusion. And provides the empirical evidences in support of such threat based on the consumer welfare.

In addition, the work is also facilitatinga better understanding and clarity in the notion of legality of algorithmic tacit collusion in the context of pricing software's, thereby paving the way for new Competition policy in the era of rising Artificial Intelligence. This research work aspires to find its place in the minds of Competition enforcers while effectuating policy decisions concerning automated pricing algorithms to achieve better goal of protection of consumer welfare.

1.4. OBJECTIVES OF RESEARCH

1. To study the evolution of Artificial Intelligence and Competition Law.
2. To examine the role of Algorithms in sustaining Anti-competitive behavior.
3. To critically analyze existing Artificial Intelligence and competitive Laws.
4. To appraise the Anti-competitive practices and legal complications in Uber's business model.
5. To analyze the pricing algorithm in the digital era competition through empirical study of Ola and Uber Cab booking agencies with special reference to the State of Maharashtra.
6. To suggest actionable measures for legislative development.

1.5. HYPOTHESIS

New challenges are emerging for Competition law in an era of Artificial Intelligence, and present tools need to be improved to solve them. Further hypothesis finds out three main components such as:

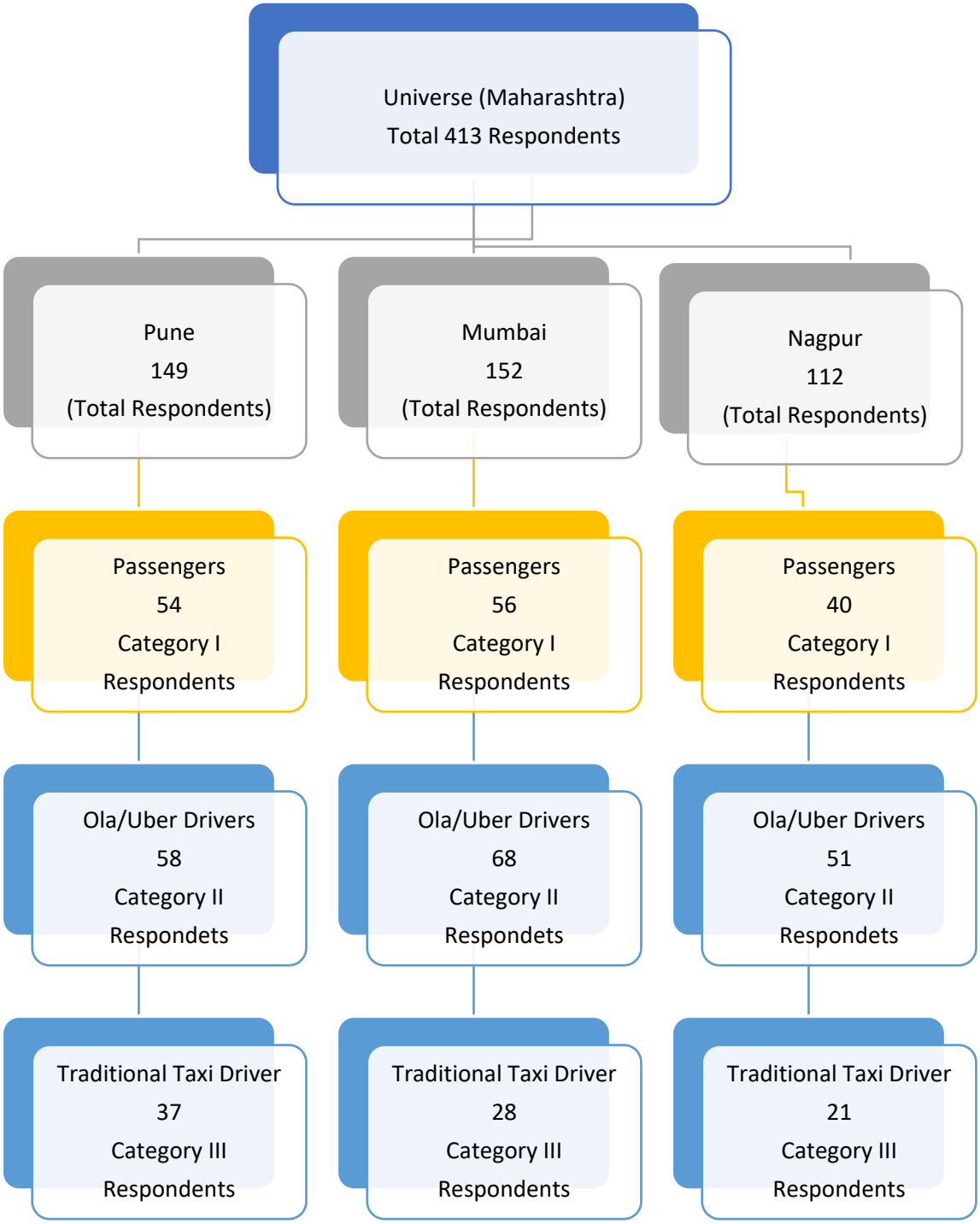
a) The pricing algorithms automatically learn to collude in the market without any explicit design or input of collusion for price optimization and profit maximization.

b) The use of pricing algorithms reduces consumer welfare by using technologically advanced and market-disruptive technologies.

c) Using pricing algorithms in cab booking agencies exploits their drivers and harms traditional taxi drivers, leading to competition concerns.

1.6. DATA COLLECTION

To analyse the experience and perceptions of cab booking agencies business model among stakeholders through the empirical study, the primary data is collected with the help of a interview schedule method. The universe of the study is the state of Maharashtra. An empirical study is conducted based on the insights collected from the research and issues raised in various lawsuits across the globe against cab booking agencies. The three interview schedules are used to collect data from passengers, Ola/Uber Drivers and traditional taxi service providers. For the study, three cities, namely Pune, Mumbai and Nagpur chose for data collection due to heavy and continuous protests of Traditional taxis and Ola/Uber drivers for their rights against the cab booking agencies' business model. The data collected for the empirical study comprises 413 respondents from three cities. A total of 149 samples have been taken from Pune city, 152 samples have been collected from Mumbai city, and 112 samples have been gathered from Nagpur. Each city has consisted of three groups of respondents: passengers, Ola/Uber drivers, and traditional taxi drivers.


Universe (Maharashtra)
Total 413 Respondents
Pune
149
(Total Respondents)
Mumbai
152
(Total Respondents)
Nagpur
112
(Total Respondents)
Passengers
54
Category I
Respondents
Passengers
56
Category I
Respondents
Passengers
40
Category I
Respondents
Ola/Uber Drivers
58
Category II
Respondets
Ola/Uber Drivers
68
Category II
Respondets
Ola/Uber Drivers
51
Category II
Respondets
Traditional Taxi Driver
37
Category III
Respondents
Traditional Taxi Driver
28
Category III
Respondents
Traditional Taxi Driver
21
Category III
Respondents

1.7. METHOD OF DATA COLLECTION

The data is collected by using three questionnaires addressing passengers, Ola/Uber Drivers, and Traditional taxi drivers of Pune, Mumbai and Nagpur taxi drivers. The data is collected between October 2022 to January 2023. The researcher manually collects and records the data—a questionnaire schedule is prepared for data collection. The convenient sampling method is used to collect data from three cities.

1.8. RESEARCH QUESTIONS

1.8.1. Specific Research Question

Will the use of an automated pricing algorithm result in conscious parallelism and thereby disturb the competition law landscape?

1.8.2. General Research Questions for Chapter Inquiry

1) What are the Anti-competitive effects of the algorithm?

2) How are algorithms autonomously substituting tools for making unfair monopolistic profits from the traditional way of arrangements?

3) What actions can be taken to neutralize the adverse effects of anti-competitive algorithms?

4) What are the tools for the legal domain to handle the investigation of algorithmic pricing adversely affecting the sphere of competition?

1.9. LIMITATIONS OF THE STUDY

The research involves interdisciplinary problems and solutions based on the recent development of artificial intelligence and competition law. The legal domain needs to become more familiar with the business models of cab booking agencies. The legal scrutiny of these business models and pricing software recently started in various jurisdictions.

a) Limited Geographic Scope: The researcher collected primary data from three metropolitan cities in Maharashtra - Pune, Mumbai, and Nagpur. It is difficult to generalize the findings. While these three cities are indeed representative of

the population to some extent, it's important to note that this representation is inherently limited in scope.

b) Sampling Limitation- The researcher selected only Ola and Uber companies to collect primary data; other companies are also operating in the market as digital intermediaries in the transport sector. Thus, it may not fully represent the population.

c) Time Constraints- The study is conducted in a limited time-bound manner. The limited time affects the size of the data. Some more in-depth analysis is possible with time extension.

d) Resources Constraints- The study is limited by budget and other resources, such as human resources, to collect more data. It limits the number of respondents as well as cities.

e) Complexity of the Topic: The intersection of artificial intelligence and competition law is a complex and evolving field. The study's ability to comprehensively cover all aspects of this multifaceted subject might be limited.

1.10. CHAPTERS SUMMARY

Chapter 1: Introduction

The Introduction chapter explains the topic of the thesis. It also contains background statements, motivation, objectives, the scope of research, utility, hypothesis, and general and specific research questions. It also includes the research methodology along with limitations of the study in detail.

Chapter 2: Evolution of Artificial Intelligence and Competition Law

This chapter analysed the evolutions of Artificial Intelligence and Competition law through the historical investigation of various instances and recent technological developments in digital commerce. It also discusses the interface between artificial intelligence and competition law. The study of evolution and interface of both artificial intelligence and competition law domains provides necessary insights for interdisciplinary research and helps in develop solutions based on the interface of

these domains. The chapter also provides overview of problems produced by AI advancements in the field of competition law. It also highlights the change in market conditions and their implications for competition law.

Chapter 3: The Role of Algorithms in Sustaining Anti-Competitive Behaviour

This chapter explainsthe features pricing algorithms which play a role in diluting competition law. Furthermore, the chapter addressed the nuances of a tacitly colluded digital cartel devised automatically through the interaction of reinforcement algorithms. This chapter enable us to conceptualize the underlying problems of pricing algorithms in relation to emerging concerns of artificial intelligence that require the immediate attention of the Competition enforcement bodies in the global platform. It highlights various features of pricing algorithms which enables them to learn collusion. This chapter described the scenarios of algorithmic collusions and provides supported theoretical and experimental evidences for algorithmic collusion. It also explains the theoretical framework behind pricing algorithms which helps to them for evolve cooperation and avoid the competition.

Chapter 4: Global Judicial Views on Algorithmic Collusion

This chapter analysed the effectiveness of existing legislative provisions on the subject of Artificial Intelligence and Competition law, to facilitate and evolve remedial measures to fill the existing insufficiencies that exist in addressing the cause & effect of Anti-competitive algorithms.This chapter provides the understanding of rule of reason for punishment of algorithmic collusion. It further explored the notion of concerted actions, meaning of agreement, meeting of minds, need of actual working pan for collusionand overlay these concepts ondigital market conditions.

Chapter 5:Comparative Study of Taxi Regulations

This chapter researched global trends developed through judicial pronouncements and various legislations in Artificial intelligence and Competition Law domains. It explored the recent judicial pronouncement globally to point out unclaimed arguments in this judicial proceeding for business models of cab booking agencies.It furtherdiscussed the Indian perspective on developing solutions to regulate competition in the digital era in the world. With the help of an empirical study of Cab

Booking Agencies' business model, this chapter aims to assess ground-level competition problems in cab booking agencies. It also compares Indian jurisdiction with another world.

Chapter 6.Competing In the Digital Era: An Empirical Study of Cab Booking Agencies in Maharashtra

This chapter analysed data collected from Interviews with consumers, drivers, traditional taxi drivers and other relevant stakeholders of cab booking agencies to figure out problems concerning competition law. This empirical study desires to figure out hidden key competition law issues at the ground level.

Chapter 7.Conclusions and Suggestions

This chapter outlines how competition regulators can address the future challenges in Competition policy and hoard the development of an artificial intelligence-driven marketplace. Also provides the suggestions for regulation of digital competition.

CHAPTER 2

EVOLUTION OF ARTIFICIAL INTELLIGENCE AND COMPETITION LAW

2. INTRODUCTION

In June 2020, the Global Partnership on Artificial Intelligence (GPAI) launched by the fifteen countries. It aimed to provide multidisciplinary platform for research through international alliance. GPAI framework facilitates member countries to develop trustworthy and commonly adopted solutions on AI issues. In order to achieve uniformity among the reference point for AI subjects. India along with other fifteen major countries launched this global initiative to navigate AI development and avoid duplication and achieve uniformity in adoption of legal rules on AI subjects.[1] The use of AI applications become popular in every dimension of the society. On the other side the trade and commerce also transforming rapidly due to use of AI applications. In such situation the role of State taking new form in the society, state functioning imploring from mere police state to socio-welfare state. The scientific advancements imploring the state functioning for comprehensive welfare of society. Nearly all sectors of the society impacted from of machine and deep learning developed by the artificial intelligence. The impact of idea of replacing human intelligence through AI certainly enormous on various fields of law and policy. The use of AI based applications for various purposes of businesses modify and replaces the market condition along with replacing humans. The interplay of law and anthropology getting new shape due to evolution of artificial intelligence. The anthropological attributes of human behaviour like intent, object reflected in machines through the artificial intelligence. The certain set of legal norms become outdated due to such anthropological attributes of machines. The competition law also relies on the human intent for punishing cartels, predating intent and formation of agreement for collusion. But the development in AI unsettled these concepts and may perceived as outdated in certain circumstances. Therefore, this chapter provides the understanding

[1] Global Partnership on Artificial Intelligence, "Our Mission"*GPAI* (2020) available at:https://gpai .ai/about/ (last visited on June 21, 2021).

of evolution in competition law and AI. Further this study explored intersection of competition law and Artificial intelligence.

2.1. GLOBAL COMPETITION LAW HISTORY

The Lex Julia de Annona is the first instance of competition law's ancestors. It was enacted around 50 BC during the Roman empire. The history of modern competition law after the Magna Carta was an attempt of the government to regulate the market to protect to liberty of free trade leading to competition or anti-trust laws around the world. Our earliest history can be traced back to Roman legislation, which attempted to regulate price fluctuations for goods and services. King and queens tried to eradicate monopolies in the market throughout the Middle Ages.This theory, in a later stage adopted by the USA anti-trust legislation. This common law doctrine later reflected various legislations after the second world war. The earliest formation of antitrust rules was imposing tariffs to attain stability of prices and protect the local industry. In 18 century, Adams smith's book on "Wealth of Nations" described various aspects like the concentration of economic power in later stages. This work contributed to the development of different competition legislation in the world. Adam Smith's result is an essential milestone in developing competition law in the global history of competition law. Adam Smith pointed out in the Wealth of Nations in 1776 noted:

"To expect indeed that freedom of trade should ever be entirely restored in Great Britain is as absurd as to expect that Oceana or Utopia should ever be established in it. Not only the prejudices of the public, but what is more unconquerable, the private interests of many individuals irresistibly oppose it. The Member of Parliament who supports any proposal for strengthening this monopoly is seen to acquire not only the reputation for understanding trade, but great popularity and influence with an order of men whose members and wealth render them of great importance"[23]

However, this chapter will attempt to provide a brief overview of the evolution of competition law in India, the USA, UK. The Lex Julia de Annona is the earliest

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2 Adam Smith, *An Enquiry into the Wealth of Nations* (*W. Strahan and T. Cadell*, Oxford 1776).

3 John E., and Lawrence J. White, *The Antitrust Revolution: Economics, Competition, and Policy* (Oxford University Press, 2018).

example of modern competition law as it was written during the Roman Republic. Numerous attempts were made to create a new concept of competition policy. However, all these attempts were reflected in modern competition laws. The list of attempts is as follows:

S.No.	Nature of Statute/ Regulation	Period of the statute	Purpose of Statute/Regulation
1)	The Lex Julia de Annona was enacted around 50 BC. It is the example of competition law ancestors.[4]	50 BC in Roman Republic.	This legislation aimed to regulate the corn trade; heavy fines used as market corrections directly, deliberately and insidiously stopping supply ships.[5]
2)	Diocletian empire was a Roman emperor from 284 to 305. Passed regulation "Edict on maximum prices"	310 A. D	The empire begins the practice of awarding the death penalty for violation, like, concealment or contriving the shortage of everyday goods.[6]
3)	Constitution of Zeno in British Colony	483 A D	To punish price fixing in clothes, fishes, sea urchins etc., with perpetual exile, usually to Britain, then a colony.[7]
4)	3rdKing Edward During black death, i.e., due to plague: The Ordinance of Labourers 1349	1377 Middle Ages	It imposed price controls and fixed wages; required all people under 60 years old to work; prohibited the enticing or hiring servants of others; and provided other terms.[8]
5)	Henry III, an Act was passed in 1266to "x bread and ale prices in correspondencewith corn prices laid down by the assizes. HenryIII"	In the year 1266 in England.	The Assize of Bread and Ale was 13th-century legislation in high medieval England that, which regulate the production and sale of food in the Country by regulating prices, quality of foods, and bread, beer across the towns and villages.[9]
6)	legislation in Europe includes the constitutions	Between 1283 and	"Condemning combinations

4 Kennedy Sangawe, "Competition origin made by keny"*University of Dar es Salaam* available at: Competition orign made by keny - The history of competition law refers to attempts governments to - Studocu (last visited on March 12, 2021).

5 Pollock and Maitland, *The history of English law before the time of Edward I* 2 (Cambridge University Press, 1895).

6 Pollock and Maitland, *The history of English law before the time of Edward I* 2 (Cambridge University Press, 1895).

7 *Ibid.*

8 Rothstein Liebman, *Employment Law: Cases and Materials* 20 (Foundation Press, 2017).

9 Jean W. Sedlar, *East Central Europe in the Middle Ages* 4 (University of Washington Press, 1994).

S.No.	Nature of Statute/ Regulation	Period of the statute	Purpose of Statute/Regulation
	Juris metallici by Wenceslas IIlegislation in Europe consists of the constitutions Juris metallici byWenceslas II The Wenceslas II king of Bohemia passed legislation in Europe include the "constitutiones juris metallic"	1305	of ore traders increasing prices condemning combinations of ore traders increasing prices This statute was condemning combinations of ore traders increasing prices"[10]
7)	King Henry VIII	The 1553 Year	"It was reintroduced tariffs for foodstuffs, designed to stabilise prices in the face of fluctuations in supply from overseas"[11]
8)	Queen Elizabeth I, in Europe	1561	"A system of Industrial Monopoly Licences, similar to modern patents had been introduced into England. the system was reputedly much abused and merely to preserve privileges, encouraging nothing new in the way of innovation or manufacture"[12]
9)	Statute of Monopolies**,** King Charles I, in Parliament of England.	29 May 1624.	To limit monopolies that arise from patents developed from letters patents issued to the monarch to grant monopolies in particular industries to skilled people with new techniques.[13]
10)	John Sherman introduced the Sherman Antitrust Act of 1890 to the Senate.	Signed by President Benjamin Harrison, 2 July 1890	"The Sherman Act broadly prohibits (1) anticompetitive agreements and (2) unilateral conduct that monopolises or attempts to monopolise the relevant market"
11)	Clayton Antitrust Act, 1914	5 June 1914	The Clayton Act was primarily a substantive and procedural change to federal antitrust rules. The Clayton Act is a practical anticompetitive act that prohibits certain conducts as defined in the Sherman Antitrust Act (1890)..

[10] Tanner, J. R., Previté-Orton, C. W., *et.al.,* (Eds.), *The Cambridge Medieval History: Victory of the Papacy* 440 (Cambridge University Press, 1957).

[11] Pollock and Maitland, *The history of English law before the time of Edward I,* 2 (Cambridge University Press, 1895).

[12] William Holdsworth, *Sir William Searle Holdsworth: A History of English Law* 346 (Sweet & Maxwell Lt, UK 1945).

[13] Wilberforce,*Postage of letters both inland and foreign* 18 (Her Majesty's Stationery Office, London, 1966).

2.1.1. The United States Antitrust Policy

The Sherman Act of 1890 is the first statute that established modern competition law. The argument that "American antitrust law" is more than just "law", but also a socio-political statement about society has been made.[14]Three central legislations in US Antitrust history are the Sherman Act 1890, Clayton Act, 1914, Federal Trade Commission Act, 1914, and Celler- Defauver Act, 1950.

During this period, US economists observed that the growth of a small number of giant corporations accumulated significant wealth in the country. These big corporations were not concerned with the public interest and were demonstrated as dangerous to society. These big corporations later termed a "trust"[15]. These trusts were found to be guilty of suppression of the competition in the market. The anti-trust law regime was adopted to restrain this suppression and protect the public interest. Since the competition law and Anti-trust law were interchangeably used in legislation and literature. The Sherman act had become a significant economic and legal statute. The Sherman Act has two critical sections. Section 1 of the Sherman act deals with the illegality of contracts which restrain trade, and Section 2 deals with criminalising monopolistic behaviour of trust. The central goal of the Sherman enactment was to protect the economy from the evils of restraint of trade. However, the statute's drafting is implicit in discovering every transaction of restraint of trade; therefore, the US judiciary played an essential role in effectuating the true purpose of the legislation. For example, Under Section 2 of the Sherman Statute, achieving a monopoly is not illegal, but an attempt to achieve it is criminalised. The statute not explicitly listed unfair means of achieving trust; the US judiciary captured such unfair means in the judgement of Standard Oil Co.[16] In furtherance of that US, judiciary developed the notable jurisprudence of "Rule of Reason" in the judgment of Addyston Pipe & Steel Co US Department of Justice (DOJ) observed that:

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[14] T. Sullivan, *The Political Economy of the Sherman Act: the first one hundred years* 3 (Oxford University Press, Oxford 1991).

[15] Charles W. Smitherman, *The Future of Global Competition Governance: Lessons from the Transatlantic* (American University International Law Review, 2004).

[16] *Standard Oil Co. of New Jersey v. the United States*, 221 U.S. 1 (1910), available at: https://supreme.justia.com/cases/federal/us/221/1/ (last visited on May 12, 2021).

"No conventional restraint of trade can he enforced unless the covenant embodying it is merely ancillary to the main purpose of the lawful contract, and necessary to protect the covenantee in the enjoyment of the legitimate fruits of the contract or to protect him from the dangers of an unjust use of those fruits by the other party"[17]

The Sherman Act chiefly deals with monopoly and restraint of trade. Still, the US Department of Justice noticed that the provision of merger and acquisition was not in the scope of the act and without that, the domain of Antitrust laws would not effectuate. The Clayton Act, 1914 was passed by the US Congress to avoid this obstruction. The Clayton Act, 1914, which prohibits collusion and monopolisation, also includes predation, closes the three main routes to monopoly.[18]

2.1.2. Clayton Act, 1914

Through the jurisprudence and rule of reason, the US court expands the Sherman Act's scope. Congress amended the Sherman Act in 1914 to limit courts' discretion when deciding what constitutes reasonable restraint. The US court frequently exercised the discretionary power to prohibit practices restraining trade by imposing the Sherman Act of 1890. However, such discretionary powers, which regulates competition in the market seen as unlimited and unrestricted in the groups of business and economist. Therefore, the demand of to specify what exactly constitutes "unreasonable" for the business action. To avoid this ambiguity of the Sherman Act of 1890

One view argues that a bunch of business transactions is too much to specify; therefore, it's difficult to make explicit legislation. This view further suggested establishing a specialised body of experts to clarify the lawfulness of business actions. Furthermore, this view believed that the expert body would understand the impact of business action on competition rather than judges. That view expected that the body of experts would help set rules for the business actions, which would be more predictable and explicit than judges' discretionary power. In the end, congress was satisfied with both these arguments and passed the Clayton Act, 1914 to expand the

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17 *Addyston Pipe and Steel Company et al., Appts., v. United States*, 175 U.S. 211, (1899) available at:https://supreme.justia.com/cases/federal/us/175/211/ (last visited on May 15, 2021).

18 D.P. Mittal, *Competition law* 5 (Bharat Law House, New Delhi, 2003).

scope of the Sherman Act of 1890. The Clayton Act, 1914 provides broader provisions like price discrimination, tying, merger and acquisitions. However, the foundational test for prohibition was "substantially to lessen competition or trade to create a monopoly in any line of business". On the other hand, congress passed the Federal Trade Commission Act, 1914 in light of the demand of experts to explain unlawful business actions.

2.1.3. The Federal Trade Commission Act, 1914

Primary purpose of this legislation is to declare business actions unlawful on the grounds of unfair and deceptive methods and impediments to competition. This act constituted a commission which well recognized as Federal Trade Commission. The commission equips with the power to take necessary actions against anti-trust laws violations, mainly the Sherman Act of 1890 and the Clayton Act of 1914. Celler-Defauver Act, 1950 was passed to expand the scope of the Clayton Act, of 1914 section, which deals with mergers and acquisitions. The Celler-Defauver Act, of 1950 supplemented sections 7 and 11 of the Clayton Act, of 1914 with the novel supplement of prohibition of vertical mergers.

2.2. HISTORY OF COMPETITION LAW IN INDIA

Capitalism has become the universal global norm. It is the economic norm based on liberty of trade, freedom from arbitrary government rulings, and active participation of market forces in determining pricing choice and means of production. However, capitalism has inevitable negative consequences, like the concentration of wealth, social problems like the broadening gap between rich and poor, and monopoly power. To mitigate the adverse effects of capitalism, state intervention through social welfare legislation is essential. However, excess government regulation lessens market forces' economic freedom; therefore, state regulations must be as minimal as possible.[19]

After independence under the leadership of Pandit Nehru, India adopted a mixed economy approach in which neither the capitalist like the USA nor socialist like Russia economic model. This mixed economy model is inspired by the directive

[19] Competition Commission of India, "Guide to Competition Advocacy Booklet"*CCI,* available at:https://www.cci.gov.in/advocacy/publications/advocacy-booklets (last visited on March 30, 2022).

principle of state policy proposing the equal distribution of economic wealth. The object behind the subscription of a mixed economic model for India is to promote social and economic justice and, thereby, the financial inclusion of each stratum of social groups in the economy.[20]

The government reserved some industries to protect the public interest to meet social justice through the economy. The rest of the industries open to private segments were within the scope of the Industrial (Department and Regulation) Act, 1951, further legislation had also empowered to the government to control and regulate private sectors and their investments. This legislation entitled discretionary power to grant industrial licences and thereby regulate private investments.The Planning Commission of India created the Hazari Committee to examine the procedure of the industrial licensing structure as per the Industrial (Development and Regulation) Act, 1951[21] The report was subject to heated debate in India's Parliament. After that, the Government of India appointed Hazari Committee[22] under the Chairmanship of Subimal Dutt[23] to investigate the functioning of India's licensing system (ILPIC). It was also asked to examine India's Financial Structure and licensing.

Despite all these attempts, this mixed economy model failed to achieve economic growth and social justice. The concerned government found that such a mixed economic model is not yielding desired outcomes in terms of a growth rate below 3% and progress in per capita income also below 1.75%; therefore, the government appointed the Mahalanobis Committee.[24] On 13 October 1960, the Planning Commission appointed a nine-member committee, of which P.C. Mahalanobis was to be Chairman. The objective of the committee framed as: "To review the changes in levels of living during the First and Second Five Year Plans; and to study recent

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20 R. Radhakrishna, "Macroeconomics of Poverty Reduction: India Case study"*Indira Gandhi Institute of Development Research Mumbai* (2006) available at: http://www.igidr.ac.in/pdf/publication/PP-057.pdf (last visited on March 30, 2022).

21 Industrial (Development and Regulation) Act, 1951 (Act 37 of 1951).

22 Live law, *Competition Jurisprudence In India - Live Law*, available at :https://www.livelaw.in/columns/competition-commission-in-india-constitution-amendment-act-of-1976-mrtp-act-1969-170997 (last visited on July 12, 2022).

23 *Ibid.*

24 Indian Planning Commission, "Report of the Committee on Distribution of Income and Levels of Living" (February, 1969). available at:https://indianculture.gov.in/report-committee-distribution-income-and-levels-living (last visited on July 12, 2022).

trends in the distribution of income and wealth; and in particular; and to ascertain the extent to which the operation of the economic system has resulted in concentration of wealth and means of production"[25]

Competition means an active desire to attain a better position in the business over others. The race between companies to win customers' businesses over time has been called competition.[26] Competition law in recent years adopted by nearly the entire world. An important portion of the world's population is in India, and China also adopted a Competition regime to strengthen its regulation of economic processes. Recently in 2012, Malaysia adopted the competition law. Apart from the geographical expansion of Competition law, sectorial growth has also become more extensive in scale, like telecommunication, media, transport, broadcast, and postal services have become competition law subjects.

2.2.1. The Mahalanobis Committee Report (1965)

Finding reveals the concentration of fiscal power among big players in the market due to a planned economy. In addition, the committee recommended that it frame a new structure to avoid the concentration of market forces. In response to these recommendations, the Mahalanobis Committee recommended that the government create the Monopolies Inquiry Committee.[27] In 1964, Dr Das Gupta headed a committee to investigate the extent and impact of concentrations of power in India's private sector.[28] In 1965, MIC presented a report seeking to identify factors that lead to concentration and to provide structural solutions to stop monopolistic Behavior. MIC was expected offer a comprehensive solution to the concentration issue and to

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25 Kumar Jayant and Abir Roy, *Competition Law in India* 176 (Eastern Law House, Kolkata, 2008).

26 Competition Market Authority, "The Merger Assessment Guidelines of the UK Office of Fair Trading and Competition Commission"*CMA* (2010) available at:https://www.gov.uk/government/organisations/competition-commission (last visited on March 18, 2020).

27 Gupta, K. C. Das, "Monopolies Inquiry Commission Report, Government of India, Government of India" (1965) available at: https://indianculture.gov.in/reports-proceedings/report-monopolies-inquiry-commission-1965-vol-i-and-ii(last visited on August 15, 2021).

28 Nishith Desai Associates, "Competition Law in India A Report On Jurisprudential Trends and Way Forward Introduction" *Nishith Desai Associates* (2013) available at : http://www.nishithdesai.com/ fileadmin/user_upload/pdfs/Research%20Papers/Competition%20Law%20in%20India.pdf (last visited on August 15, 2021).

suggest legislative solutions with an institutionalised framework.[29] However, the report, economic concentration was statistically demonstrated and limited in the general idea of it. In furtherance, MIC work didn't recheck the public and agriculture sectors. The MIC report observed that 85 % of industrial items were covered under economic concentration shelter.[30] This dominant position allowed the firms to take undue advantage of controlling output and prices. Further, industrial licences seem biased in favour of big business, which affects new business expansion. The government post-dependence does not regulate this centralisation of economic power. The state machinery tools are adequate to restrain this. The MIC report observes that government policy is the leading cause of economic concentration.

"*1) Self-discipline by political parties, i.e., rejection of assistance from business houses;*

2) Removal of Corruption from administration,

3) Liberalisation of licensing since it could not be abolished and preference in favour of small business without the sacrifice of efficiency;

4) Insistence on the proper distribution of goods imported under licenses;

5) Higher imports to stimulate efficiency;

6) Countervailing action by the public sector through public units to prevent monopoly; and

7) Promotion of small industries and preferential government purchases from small units, strong consumer Co-operatives and organised consumer resistance"[31]

Based on MIC non-legislative recommendations and a bill proposed by the Monopolies Inquiry Committee Monopolies and Restrictive Trade Practices Act, 1969 came into operation. The enactment was passed to protect and promote social justice

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[29] T.Ramappa, *Competition law in India Policy Issues and Development (*Oxford University Press, 2016).

[30] Gupta, K. C. Das, "Monopolies Inquiry Commission Report, Government of India" (Government of India, 1965) available at :https://indianculture.gov.in/reports-proceedings/report-monopolies-inquiry-commission-1965-vol-i-and-ii(last visited on August 15, 2021).

[31] *Ibid.*

with economic growth and reduce the growing income inequalities in social groups. This enactment complements directive principles of state policy framed in the Indian constitution. The objects of the act were to prevent the concentration of economic power in the hands of a few Control monopolies and prohibit Monopolistic and Restrictive Trade Practices. The Monopoly Restricted Trade Practice Act, 1969 was based on the global trend of economic order; the act takes necessary inspirations and definitions from various legislation. In this context, it is important to point out the legislation source to interpret the action better. The Monopoly Restricted Trade Practice Act, 1969 incorporated some ideas from international legislation:[32]

Provisions of Monopoly Restricted Trade Practice Act, 1969	**Source of Global legislations**
The conditions on restrictive trade practices, including the resale price maintenance.	United Kingdom legislation and particularly the Restrictive Trade Act, 1956 and the Resale Price Act, 1964
The provisions for Unfair Trade Practice under MRTP Act, 1969	The 1973 United Kingdom Fair Trading Act. Antitrust legislation in the USA includes the Sherman Act and Clayton Acts, as well as the Federal Trade Commission Act and Australian and Canadian legislation.

In the Monopoly Restricted Trade Practice Act, 1969 was passed align with recommendations of Monopoly Inquiry Committee recommendations and enacted with such features to give effect to the decentralisation of economic power and reallocation of resources. This goal is "An Act to provide that the operation of the economic system does not result in the concentration of economic power to the common detriment, for the control of monopolies, for the prohibition of monopolistic and restrictive trade practices and for matters connected therewith or incidental thereto"[33] The MRTP legislation encouraged fair competition in the market and

[32] S.M Dugar, *Commentary on the MRTP Law, Competition Law, and Consumer Protection Law (Law, Practices and Procedure)* 15 (Wadhwa and Company, New-Delhi, 2010).

[33] Monopolies and Restrictive Trade Practices Act, 1969, (Act 54 of 1969), available at: https:// bnblegal.com/bareact/monopolies-restrictive-trade-practices-act-1969/ (last visited on June 12, 2022)..

equipped competition regulators to take essential steps to avoid economic concentration in market. Moreover, another side of the act opens the floor for correcting and prohibiting monopolistic practices. The MRTP commission provides the act as a quasi-judicial body for effective implementation. From an investigation perspective Director General is appointed. MRTP commission is empowered with civil court power like summonsing and granting injunctions.

After a few years of enactment of the MRTP act in 1978 Indian government appointed a committee to explore the MRTP Act, 1969 with complimentary provisions of the Company law under the chairmanship of Justice Shri Rajinder Sachar "to consider and report on what changes are necessary for the Companies Act, 1956, and the Monopoly Restricted Trade Practices Act, 1969, with particular reference to the changes which are required to be made align with of the Companies Act, 1956, and the MRTP Act, 1969, so, as to simplify them and to make them more effective, wherever necessary"[34] This committee deeply investigated the efficiency of the act in terms of procedural and jurisprudential aspects. The committee also gave some advisory guidelines.[35] The Committee recommended that the Director and registrar be combined to create a Director General for trade, with limited civil court and raiding powers. The committee expressed the view on changing the dimension of Unfair Trade Practices and highlighted the scope of consumer protection in this consonance. Concerning company law, the committee recommended that inter-connected proceedings were also part of both legislations, which ought to be supportive and complimentary to each other. The committee also framed the scheme for the concentration of economic power and directed to compulsory registration all enterprises. Such registered enterprises should not make any combinations without the government's approval; this recommendation was reflected in the MRTP Amendment Act, 1984. The MRTP Commission is then supposed to thoroughly investigate the issue and advice to Indian regulator on what would be appropriate practice in context. The government may make any order that effectively eliminates the monopolistic

[34] ICSI, Supplement Executive Programme ICSI, available at: https://www.icsi.edu/media/webmodules/09032022_Supplement_Company_Law_NS_Final.pdf(last visited on June 12, 2021).

[35] Justice Sachar, "Report of The High-Powered Expert Committee On Companies And MRTP Acts" (1976) available at: https://justicesachar.com/1978/08/29/report-of-the-high-powered-expert-committee-on-companies-and-mrtp-acts/ (last visited on June 12, 2021).

trade practice. The amendments made in 1984 gives the Government power to break up an undertaking and even acquire the broken-up shares.[36] Section 36A of the 1984 amendment included provisions regarding unfair trade practices. Because consumers were not protected against misrepresentation and misleading or disparaging advertising, this section dealt with these cases. MRTP Amendment Act, 1984, did the legislative compliance of the Sachar Committee; the however important notion of consumer protection has been incorporated in section 36A of the act by restraining misleading advertisements. The recommendations of the Sachar committee are based on changing dimensions of corporate governance. However, few non-legislative guidelines are reflected in administrative and judicial orders. After this report, the perception of the MRTP Act, 1969 enlarged the scope of free trade instead of higher state regulation. The new trend of free trade with minimal intervention also repairs concentration of fiscal control with the regulatory framework of competition. On the other hand, the rise of intervention of government in investment decisions has been perceived as arbitrary restraint of free trade. To promote an accessible environment and free trade new industrial policy was announced on 24 July 1991with the object of giving the practical implementation to the new policy of LPG (Liberalisation, Privatisation and Globalisation). It enables the private sector to participate in the national economy with global tools of freedom of trade. The policy also opened up foreign investment and foreign technology. Since 1991, foreign investment has gradually evolved through gradual liberalization in a phase-wise fashion.[37][38] The threshold limit for companies subject to the MRTP Act was also increased from Rs 20 crores to Rs 100 crores. One hundred twelve companies were thus exempted from the MRTP Act. Indian officials also exempted 49 industries from the MRTP Act's section 22A.[39] The amendment in 1991 removed the need for institutional approval of new enterprises or their expansion. However, provisions for prior permission for mergers

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36 Monopoly Restricted Trade Practice Amendment Act, 1984, s.36A.

37 Tojo Jose, "What are the features of New industrial policy of 1991?" *Indian Economy*, Oct. 5, 2016 available at: https://www.indianeconomy.net/splclassroom/what-are-the-features-of-new-industrial-policy-of-1991/ (last visited on June 14, 2021).

38 *Ibid.*

39 Monopolies and Restrictive Trade Practices (Amendment) Act, 1991, s.22 available at :https://www.mca.gov.in/Ministry/actsbills/pdf/The_Monopolies_and_Restrictive_Trade_Practices_Act_1969.pdf(last visited on June 2, 2021).

and acquisitions were also removed. Later it was added to the new Competition Act 2002.

2.2.2. Raghavan Committee Report (2000)

Indian government created a high-level competition law committee and policy committee to develop new legislative guidelines and standards in relation to international competition law compliance. The Raghavan committee submitted a report to government. The committee strongly recommended that the position of prior approval for merger and acquisition be necessary to invoke competition policy.[40] Raghavan committee suggest enlarging the scope of the use of the word competition in competition policy, which broadens the understanding of the purpose of the legislation. Earlier MRTP act did not include the definition of cartels which the Raghavan committee suggested defining and incorporating in legislation. However, the committee report also highlighted that the MRTP act is not proving supportive and complimentary to WTO agreements. Raghavan Committee also changes some jurisprudential and administrative changes in competition governance. In terms of consumer protection and protection of public interest, the committee emphasised competition advocacy, i.e. competition regulator arranges training for professionals and the public to promote awareness about competition law and policy and thereby protect interest through class actions of consumers. After the committee report importance of the *"rule of reason"* along with a *"rule of per se"*in some instances

"It is not possible to provide an exhaustive list of agreements that attract the attention of such provision, and the rule of reason needs to be applied to individual cases" An illustrative list would include the following:

"1) Agreements regarding fixing -of purchase or selling prices

2) Agreements limiting quantities, markets, technical development or investment Agreements regarding territories to be served and sources of supply

[40] Amber Darr, "The Role of Institutions in Generating Successful Legal Transplants"*Cambridge University Press*, 68 (2019) available at:https://www.cambridge.org/core/journals/asian-journal-of-comparative-law/article/abs/role-of-institutions-in-generating-successful-legal-transplants-a-comparative-analysis-of-the-adoption-of-competition-laws-in-india-and-pakistan/DD035F8EDD12C13F82 B1B00462ED0F2F (last visited on May 10, 2021).

3) Agreements regarding dissimilar treatment of equivalent transactions with other trading parties that place them at a disadvantage"[41]

This approach was inspired by United States Sherman's act and other countries' competition policies. Due to this novel understanding, the shield of agreements and arrangements not expressly provided in the MRTP Act comes within the new Competition Act. However, the committee also suggests omitting unfair trade practices provisions from the new Competition Act to avoid repetition and overlapping provisions. The committee also restored the position of merger and acquisition, which disappeared since the MRTP Amendment Act, 1991. The threshold limit also figures out for combination in competition law.

CCI can create its own rules and regulations to oversee business, administration, and procedure. It has the authority to issue interim relief orders as well as sentences of imprisonment or fines for those found breaking the Competition Law. Furthermore, it should have the capacity to award damages, recover money damages for abuse of dominance, and compensate victims of other violations. This report contains details on a draft competition law draft for review.[42] The committee also correct the MRTP Act, 1969, for penalties for offences and contempt of the order. For contempt report noted, CCI should be granted powers of contempt for failure to adhere to its orders, but the committee believes that these may not need be included in the Competition Law itself.[43]

2.2.3. National Competition Policy (2011)

To promote competition culture in corporate governance National Competition Policy (NCP) studied various countries' competition policies and noted some remarkable

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41 Editorial, "Chairwoman Maloney Issues Statement on Hatch Act Guidance from the Office of the Special Counsel"*Committee on Oversight and Accountability Democrats*, Aug. 13, 2020, available at:https://oversightdemocrats.house.gov/news/press-releases/chairwoman-maloney-issues-statement-on-hatch-act-guidance-from-the-office-of-the (last visited on May 1, 2021).

42 Justice Sachar, "Report of The High-Powered Expert Committee On Companies And MRTP Acts" (1976) available at: https://justicesachar.com/1978/08/29/report-of-the-high-powered-expert-committee-on-companies-and-mrtp-acts/ (last visited on June 12, 2021).

43 *Ibid.*

opinions under economic democracy.[44] The National Competition Policy, aimed to achieve sustainable economic growth and entrepreneurship. The NCP also appreciate the relevant stake of the consumer in competition policy. The idea behind NCP was to promote comprehensive competition culture in terms of broader stakeholder analysis in competition policy, this organization strives to protect consumer surplus by providing more choices and better value goods and services. However, NCP was attempting to shape the nature of the state by moving its policy towards the social welfare state. NCP proposes that there must be institutional separation for enforcing agency and policy-making agency in light of strengthening competitive culture in the country. The NCP also offers competition neutrality, ensuring equal treatment to government and private undertakings. The NCP also advocated for fairness in deviations from competition policy, which suggests variations from the competition policy must be non-discriminatory to the public and private sectors. In addition, this policy also offers that state governments ensure themselves for their competition impact assessment. In light of the above discussion, the observations made by NCP were comprehensive policies to strengthen the planned economy and competition democracy. These observations are taking the global shape of competition policy.

2.3. EVOLUTION OF ARTIFICIAL INTELLIGENCE

Artificial intelligence is a remarkable cornerstone of modern civilization. In the year 1940, philosophers explained how human thought was based on the mechanical manipulation symbols. But that thinking had inspired when Enigma machines patent was filed by German engineer Arthur Scherbius in 1918 in Germany which combined the electric and mechanical component, it consists 26 letters and highly portable machine used for the purpose to record the messages.[45] It contains the portable battery and some coding to record messages.

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[44] Government of India, "The policy document "Inclusive Growth" (Chapter XI) towards a Competition Policy" available at: http://www.mcrhrdi.gov.in/87fc/policies/Revised_Dra ft_Nation al _Competition_Policy.pdf (last seen on June 15, 2020).

[45] B.J. Copeland (ed.), *Ultra-Encyclopaedia Britannica*(Encyclopaedia Britannica online, 2023) available at: https://www.britannica.com/topic/Ultra-Allied-intelligence-project (last visited on May 19,2022).

Source- Wikipedia[46]

Image shows the mechanical and electric components of the Enigma machine include the reflector and keyboard for recording messages.

During second world war, mathematician Alan M. Turing devised the Bombe machine to decode the messages encoded in Enigma machine.[47] In the year 1943 Warren McCulloch and Walter pits proposed the artificial neuron which replace the biological functioning. This method based on the mathematical model of artificial neurons which mimics the functioning of biological neurons.[48] In 1949 Donald Hebb developed the model for strengthening connection between neurons, which published in the book titled "The Organization of Behavior"[49] This theory inspired from the biological neurons and summarised as "Cells that fire together wire together.[50] Further this postulate popular as cell assembly theory. In 1950 Alan Turing conducted another experiment to collect the evidence of machine intelligence. The experiment aimed to test whether machine can think and make decisions like human intelligence. In the test human interrogator failed to distinguish the answer given by the machines and

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46 Crypto Museum, "History of the Enigma"available at:https://www.cryptomuseum.com/crypto/enigma/hist.htm (last visited on June 21, 2022).

47 Niharika Ayagari, "The Timeline of Artificial Intelligence – From the 1940s"available at :https://verloop.io/blog/the-timeline-of-artificial-intelligence-from-the-1940s/#enigma-was-broken-using-ai-19(last visited on June 21,2022).

48 Akshay L Chandra, "McCulloch-Pitts Neuron — Mankind's First Mathematical Model of A Biological Neuron" available at:https://towardsdatascience.com/mcculloch-pitts-model-5fdf65ac5dd1 (last visited on June 29, 2022).

49 R G Morris, *D.O. Hebb: The Organization of Behavior* (Wiley: New York; 1949) available at: https://pubmed.ncbi.nlm.nih.gov/10643472/(last visited on May 21, 2021).

50 Julija Krupic, Wire together, fire apart, *Science*, available at:https://www.science.org/doi/10.1126/science.aao4159 (last visited on June 29, 2022).

humans. Therefore, machine was passed the test. That instance gives the birth to idea of machine intelligence. The belief of machine intelligence gained the popularity among the computer scientist and mathematicians, the test was published in titled Computing Machinery and Intelligence"[51] Further in 1955, Allen Newell, Herbert A. Simon, and Cliff Shaw develop the first artificial intelligence programme names as Logic Theorist. This programme proved 38 out of 52 mathematics theorem and also find more well-designed proofs for the same.[52] In 1956 John McCarthy proposed the term Artificial Intelligence in Dartmouth conference held at Dartmouth college in Hanover. This conference was the first conference on Artificial Intelligence. After the foundation of Artificial Intelligence, he created Lisp Computer Language which became the popular Artificial Intelligence programming language.

In 1966 Joseph Weizenbaum develop the algorithm based chatbot which named as ELIZA. The chatbot aimed to provide facility to users to experience that they were conversating with real humans. ELIZA was first Artificial Intelligence based conversational programme in history of computers, later in 1994 the Michael Mauldin termed as Chatterbot.[53]LaterMichael Mauldin develop the first Verbot Julia conversational programs. ELIZA was capable to identify the key words and phrases from the input and process it which creates illusion of real human being conversation. ELIZA also provides the motivational strike to current natural language processing. ELIZA chatterbot capable to answer the open-ended questions by processing language and search engines. If you humans say that my mother cooks delicious food, then ELIZA will pick up the word Mother and use it in answering an open-ended question about your family.[54] Later in 1970-73 Japanese scientist developed the first anthropomorphic robot in the world, it consists anthropological features which mimics humans like conversation, vision, limb control mechanism. In addition to that

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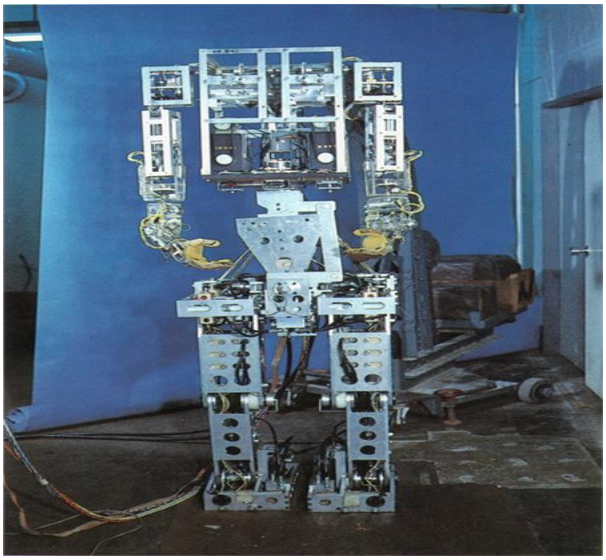
51 Alan Turing, *Computing Machinery and Intelligence* (Sematic Scholar, 1950), available at :https://www.semanticscholar.org/paper/Computing-Machinery-and-Intelligence-Turing/2d5673caa9e6af3a7b82a43f19ee920992db07ad (last visited on June 29, 2022).

52 Pamela McCorduck, *Machines Who Think*, 60 (A. K. Peters, 1940) available at: https://monoskop.org/images/1/1e/McCorduck_Pamela_Machines_Who_Think_2nd_ed.pdf(last visited on June 29, 2022).

53 Manisha Salecha, "Story of ELIZA, the first chatbot developed in 1966" (2016) available at: https://analyticsindiamag.com/story-eliza-first-chatbot-developed-1966/ (last visited on November 18, 2021).

54 *Ibid.*

WABOT-1 capable to walk and carry objects by using artificial hands and limbs. Later this robot get popularity in worldwide.[55]



Source- WABOT-1 Robot Waseda University Japan[56]

Image shows first humanoid robot which consists artificial hands and limbs. It was first anthropomorphic robot developed by Japanese scientists.

This first robot named as WABOT-1, which was capable to speak Japanese and also had judgment of directions, measure distances and also the direction of objects through the external receptors like artificial ears, eyes and mouth.

2.4. AI WINTER (1974-80)

The evolution of Artificial Intelligence slows down during the period of 1974-80, where AI researcher faced the problem of criticism and funding cut offs which further followed by the end of serious research projects. These circumstances termed as first AI winter; this term coined by the analogy of nuclear winter.[57] During 1956 to 1974 AI researcher enjoyed the hike of funding and popularity, it further turns into lack of support and interest. In 1969, AI researcher Marvin Minsky published the book 'Perceptrons'. This book vehemently argued against the limitations of neural network. The US Defense Advanced Research Projects Agency was then influenced and

55 Waseda University, "Wabot-WASEDA Robot" (2014) available at: https://www.humanoid. Waseda.ac.jp/booklet/kato_2.html (last visited on May 10, 2022).

56 *Ibid.*

57 Hague Centre for Strategic Studies, "Artificial Intelligence and The Future of Defense" available at: https://www.humanoid.waseda.ac.jp/booklet/kato_2.html (last visited on June 30, 2021).

reduced funding for the project.[58] The similar instance repeated in United Kingdom due to Lighthill report. It was published by James Lighthill in Artificial Intelligence conference in 1973.[59] This report states that, "In no part of the field have the discoveries made so far produced the major impact that was then promised"[60], it further states that, AI failed to solve any real-world problems. Consequently, the U.K. stopped funding over AI research projects.

2.5. A BOOM OF ARTIFICIAL INTELLIGENCE

Next to AI winter, researcher was experienced the prosperous age of AI technologies. After AI winter researcher developed Expert System, this programme opened the floor for AI based decision making which mimics the ability of human expert. Due to that, the period of 1980-87 perceived as a boom of artificial intelligence. In 1980, American Association of Artificial Intelligence arranged the first national conference at Stanford University.[61]

2.5.1. Invention of Artificial Agents

The deep blue software developed by The IBM supercomputer wins the chess match against Garry Kasparov, the world champion in chess by 3½ -2½ in New York city the year 1997.[62] Later it become subject of documentary titled "Game Over: Kasparov and the Machine" directed Vikram Jayanti.[63] It was revealed that artificial intelligence based deep blue software can predict 200 million moves in second.[64] In 2002, AI

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58 Marvin Minsky and Seymour Papert, *Perceptrons: An Introduction to Computational Geometry* (MIT Press, 1969).

59 James Lighthill, "Artificial Intelligence: A General Survey Artificial Intelligence: A paper symposium" (Science Research Council,1973) available at: https://www.humanoid.waseda.ac.jp/booklet/kato_2.html (last visited on August 18, 2021).

60 *Ibid.*

61 Holloway, "The AI Boom (1980–1987)" available at :https://www.holloway.com/g/making-things-think/sections/the-ai-boom-19801987?utm_source=share_section_link (last visited on November 19, 2021).

62 IBM, "Over view Transforming the World Cultural Impacts the Team in Their Words" available at: https://www.ibm.com/ibm/history/ibm100/us/en/icons/deepblue/ (Last visited on January 05, 2020).

63 Vikram Jayanti, "Garry Kasparov versus Deep Thought Documentary" available at: https://www.youtube.com/watch?v=ke8pq-cpOGk(Last visited on January 1, 2020).

64 Wired (ed.) "Defeated Chess Champ Garry Kasparov Has Made Peace With AI" (1996) available at: https://www.wired.com/story/defeated-chess-champ-garry-kasparov-made-peace-ai/(last visited on September 10, 2021).

based application for automatic cleaning of houses, the trademark was registered in the name of "robovac" or "Roomba". It was programmed to cleaning home and offices by using spinning brushes, mopping, or UV sterilization.[65] Since 2006 social media platforms like Facebook, Tweeter, and other platforms started to use Artificial Intelligence for maintaining community guidelines of content posted on their platforms. By using artificial intelligence these platforms review the illegal content and send them to human review team for confirmation and further action. That content detection based on the artificial intelligence, in recent few years use of AI technology at peak in every notion of civilization.[66]

2.6. EVOLUTION OF DEEP LEARNING, BIG DATA ANALYTICS

In February 2011, Watson computer developed by the IBM win the TV show quiz against the two champions. Watson computer consist software Deep QA. The IBM project aimed to create new generation AI technology that can find answers in unstructured data more effectively than existing search methods.[67] In this quiz Watson answered most tricky questions which demonstrates the natural language processing through AI based technologies.

In 2012, Google popular search engine started new feature to android user namely 'Google Now' which proactively delivered the information to user by predicting their search habits and other factors, the caption used by the google to deliver is information cards. Google Now not used in branding but it was reflected in various app functioning in various google application and tabs.[68]

In 2018, IBM launched 'Project Debater 'the AI based software which enable humans to debate with computer on complex topics and develop their persuasive arguments

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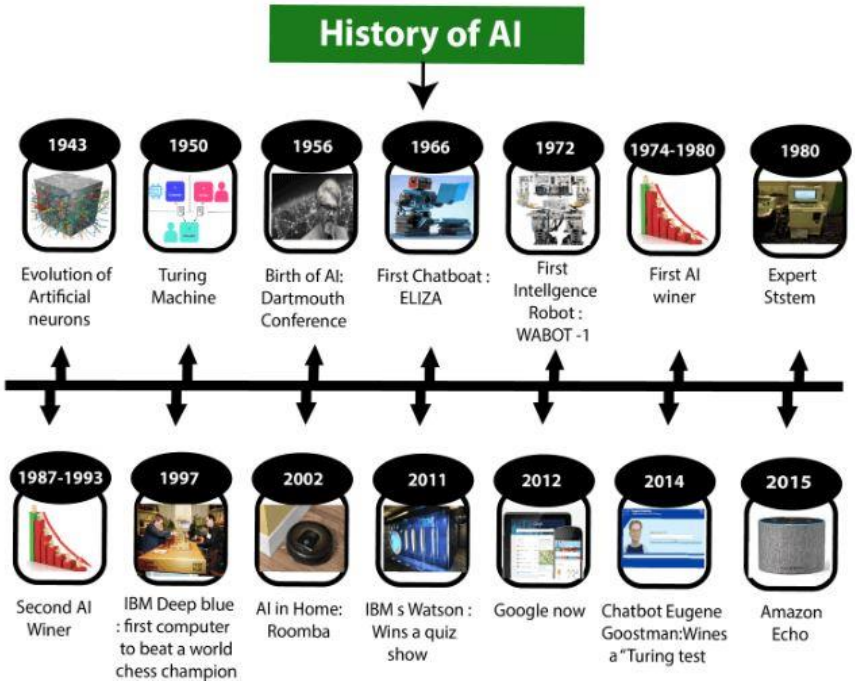
65 Bot Family, "A Brief History of Robot Vacuums" available at: https://www.botfamily.com/articles/a-brief-history-of-robot-vacuums (last visited on October 10, 2021).

66 Bernard Marr, "How Facebook Is Using Artificial Intelligence" (2021) available at: https://bernardmarr.com/how-facebook-is-using-artificial-intelligence/ (last visited on January 15, 2022).

67 IBM 100, "A Computer Called Watson" Icon of Progress, available at: https://www.ibm.com/ibm/history/ibm100/us/en/icons/watson/> (last visited on May 10, 2022).

68 Nick Summers, "Google Now arrives in Chrome Canary with weather, sports scores, traffic and event reminder cards" (2014) available at :https://thenextweb.com/news/google-now-finally-arrives-chrome-canary-weather-sports-traffic-event-reminder-cards?fromcat=all#!sntgc(last visited on June 10, 2021).

with computer.[69] IBM engaged Project Debater in public debates with humans in event at San Francisco. They put proposition "We should subsidize space exploration", project debater made the inaugural assumptions which based on facts including with facts and relevant themes and explained that how space exploration benefits humans. In 2016 Noa Ovadia in Israeli debate champion oppose the statement but project debater heard and replied with rebuttal speech and explains the how government in benefits from space exploration than other spendings. At the end it was observed that project debater enriched its knowledge greater than humans.[70]



Source of Image- Java T Point[71]

Image shows relevant instances of development of artificial intelligence, it began with from evolution of artificial neurons. The image is highly important and makes the history of artificial intelligence from computer history.

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69 IBM, "Project Debater"*IBM* available at: https://research.ibm.com/interactive/project-debater/ (last visited on June 10, 2021).

70 Arvind Krishna, "AI Learns the Art of Debate"*IBM*, available at: https://www.ibm.com/blogs/research/2018/06/ai-debate/ (last visited on May 10, 2021).

71 Sonoo Jaiswal, "History of Artificial Intelligence" available at: https://www.javatpoint.com/history-of-artificial-intelligence (last visited on May 10, 2021).

2.7. INTERPLAY BETWEEN COMPETITION LAW AND ARTIFICIAL INTELLIGENCE

The evolution of Competition law and Artificial Intelligence does not intersect to much up to development of deep and machine learning based applications popular among the businesses. The debate of AI does not only in computer science experts it extends into politics, trade and commerce, ethics, economics, sociology, law enforcement.[72] AI has potential to impact on each aspect of human civilization greater than any other branch of science, due to wider coverage of AI technologies in interdisciplinary domains. Like recent example, AI applications played important role in development of COVID-19 vaccine, researcher used drug discovery tools based on the artificial intelligence technologies to research upon the COVID-19 vaccines.[73] From the competition law perspective, AI based algorithms and its various applications for business models describe the changing dimension of competition in market.[74] At initial stage use of AI applications usually to help by assisting humans for decision, but in contemporary times by using mathematical and technological operations characterized self-learning i.e. machine learning which enables them to mimics the human decision process.[75] The high efficiency of mathematical and technological operation in AI applications can be achieved by simulating the pattern of human brain by using deep learning technique.[76] These technological advancements transform the businesses rapidly which lead to create new challenges to competition law. The changing market condition in context of artificial intelligence

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72 Holland, "Putin: Wer bei KI in Führung geht, wird die Welt beherrschen" available at: https://www.heise.de/newsticker/meldung/Putin-Wer-bei-KI-in-Fuehrung-geht-wird-die-Welt-beherrschen-3821332.html (last visited on May 10, 2021).

73 Floresta G and Zagni C et al., "Artificial Intelligence Technologies for COVID-19 De Novo Drug Design"*International Journal of Molecular Science*, (2022) available at :https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8949797/pdf/ijms-23-03261.pdf(last visited on May 18, 2021).

74 Ariel Ezrachi and Maurice Stucke *et.al.*,"Artificial intelligence & collusion: when computers inhibit competition"*University of Illinois Law Review*, (2017) available at:https://papers.ssrn.com/sol3/ papers.cfm?abstract_id=2591874 (last visited on May 11, 2021).

75 OECD, "Algorithms and collusion – competition policy in the digital age"*OECD* (2017) available at: https://www.oecd.org/daf/competition/Algorithms-and-colllusion-competition-policy-in-the-digital-age.pdf (last visited on May 17, 2021).

76 Jerry Kaplan, "Artificial intelligence – what everyone needs to know" *Oxford University Press* available at: https://global.oup.com/academic/product/artificial-intelligence-9780190602383?cc=us&lang=en& (last visited on May 10, 2021).

challenges the existing notion of relevant market, dominant position, cartels, and predatory pricing and deep discounting.

2.8. THE ERA OF ARTIFICIAL INTELLIGENCE: COMPETITION LAW CHALLENGES

The jurisprudence of competition law developed in accordance with traditional market conditions. And placed utter importance to intent behind conduct of market player. Whether intent and outcome of conduct of market player harms the competition directly can be easily prosecuted in competition rules of illegal per se, otherwise affecting competition indirectly may be prosecuted in interpretation of rule of reason.

2.8.1. Relevant Market and Dominant Position

In traditional market big tech companies worked in defined geographical market and product which enables competition authorities to easy surveillance and regulate competition in the market. But in context of AI companies like Amazon, Flipkart, Uber spread rapidly and their nature of business is highly complex. Uber is working as a cab aggregator/intermediatory between passenger and drivers it creates the liability issues as well as difficulty in describing the relevant geographic and product, services market. If authorities compare with this Ubers business model with traditional taxis the question would certainly arise that whether traditional taxis and Ubers application provides the same services? Uber would rely on defence of dissimilar services because they were just acing like intermediatory. Indian Competition legislation simplifies relevant geographic market, "A market comprising the area in which the conditions of competition for supply of goods or provision of services or demand of goods or services are distinctly homogenous and can be distinguished from the conditions prevailing in the neighbouring areas"[77] The scope of this definition not cover the Uber as a Intermediatory while Authorities compare the same with traditional market due to nature of services, Uber may exempted from the scope because of nature of services. Traditional taxi drivers hire the services personally and Uber acts like just Intermediatory and not a cab service provider.

[77] Competition Act, 2002, s.2(s) available at: https://www.cci.gov.in/legal-framwork/act(last visited on February 12, 2022).

2.8.2. Predatory Pricing and Deep Discounting

The predatory pricing with intent to drive out competitor form market considered as anti-competitive in nature. India Competition Commission launched an investigation against Flipkart and Amazon, the largest online retailer. The main allegations were based on exclusive launches of mobile phones and sellers' preferences. Deep discounts and preferential listing are also included.[78] Similarly Uber was prosecuted for deep discounting in various jurisdiction in the world for predatory pricing. It is noteworthy that deep on digital platform is not simple phenomenon like the traditional market discounting, it is strategy of replace the competition with cooperation. Next chapter will discuss in detail about deep discounting. From consumer perspective the deep discounting looks beneficial but it would certainly harm overall consumer surplus by using technologically advanced tools. At initial stage they drive out traditional taxi drivers and retailers from the market and raise the prices systematically. Thereby it creates the concentration of wealth in economic sphere results in new challenges to Competition law.

It is noteworthy that use of AI applications in trade and commerce impact on competition norms. The market conditions in context of AI technologies getting changed. The interplay of competition law and AI discloses that, use of AI applications in transform the market conditions which unsettles the norms of the existing competition law. The existing understandings of concepts like relevant market, conscious parallelism, control of price, definition of agreement impacted from AI technologies. The point of such interaction become relevant since emergence of big data analytics and machine learning based development of pricing algorithms.

The software by using machine learning methods process large volume of data to analyse market conditions. Further algorithmic pricing software use this processed data for development of market strategies in the market. The use of pricing software's popular nearly in all markets. These pricing software's decreases human dependency for pricing decisions. The pricing software's automatically set the price as well as

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[78] Editorial, "CCI to Probe Amazon, Flipkart for Deep Discounting"*The Times of India*, available at :https://timesofindia.indiatimes.com/business/india-business/cci-to-probe-amazon-flipkart-for-deep-discounting/articleshow/73236541.cms (last visited on June 11, 2022).

develop the strategy in real market like humans and better than humans sometimes. Along with developing price strategies also creates competition issues in market by replacing competition by cooperation. Therefore, the study of evolution and interplay of competition law and AI become significant in regulating AI.

CHAPTER 3

THE ROLE OF ALGORITHMS IN SUSTAINING ANTI-COMPETITIVE BEHAVIOR

"People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices. It is impossible indeed to prevent such meetings, by any law, which either could be executed, or would be consistent with liberty and justice. But though the law cannot hinder people of the same trade from sometimes assembling together, it ought to do nothing to facilitate such assemblies, much less to render them necessary.''[1]

3. INTRODUCTION

We are on the brink of human supremacy and the next Industrial Revolution, marked by human dependence on Artificial Intelligence. The computerized upheaval has prompted a critical development in organizations' capacity to collect, store and process large amount of big data of their clients and rivals to set the prices for their products. With the assistance of big data analytics organizations can follow online prices alter them immediately to undermine price offered by competing rivals; adjust items being offered to buyers; or help sellers to locate the most reduced price to make effective transaction. Several recent antitrust proceedings highlight the fact that competition regulators around the world have started to estimate the risk of automated pricing algorithms. In this situation, the use of pricing algorithms by the sellers poses the legal question of whether such use is within the meaning of the Cartel Agreement as per Section 3 of the Indian Competition Act, of 2002.[2]

In 2018, in a public seminar, the chairman of the Competition Commission of India (CCI) revealed that the CCI is investigating into the possibility of cartelization by airlines and the use of algorithm for pricing of air tickets. Although the exact definition of Algorithm is uncertain, it can be broadly described as the use of artificial

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1 Adam Smith, *An Enquiry into the Wealth of Nations* 35 (*W. Strahan and T. Cadell*, 1776).

2 Vaibhav Chokse, "Why digital cartelisation will be a new challenge for the anti-trust regime", *Financial Express*, Aug. 13, 2018, available at : https://www.financialexpress.com/opinion/why-digital-cartelisation-will-be-a-new-challenge-for-the-anti-trust-regime/1278723/9 (Last visited on January 2, 2022).

intelligence (AI) to generate a sequence or solution.[3]Competition is essential in protecting consumers and the economy by ensuring sellers do not set prices that are too high. Competition Commissions around the World have been actively working to address collusive pricing due to AI-based pricing algorithms.[4] Algorithms have long been used in pricing calculations; however, their increasing prevalence has allowed competitors to manipulate their prices with ease.[5]

Pricing Algorithms analyze and collect data by simplifying and determining the price of products or services. It allows sellers to take over the pricing burden.[6] Learning Algorithms are a recent innovation in this field. They exhibit an affinity for learning by observation and could potentially lead to non-human induced collusive behavior.[7]It is obvious, the use of algorithms to assist human-induced cartels has the same legal liability as cartels executed by humans. such use of algorithms is just a tool to implement the anticompetitive agreement.[8]

3.1. MECHANISM OF ALGORITHMS

The concept of algorithms originates just after the development of the first computer. The algorithms are commonly perceived as software code of computers developed for a certain task to perform. There is no specific definition of algorithms locates in computer history. But as per the todays features of algorithms the definition of Wilson suitable to adopt for the present work. Wilson defined that, "An algorithm is an unambiguous, precise, list of simple operations applied mechanically and systematically to a set of tokens or objects (e.g., configurations of chess pieces, numbers, cake ingredients, etc.). The initial state of the tokens is the input; the final

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3 Francisco Beneke and Mark-Oliver Mackenrodt, "Artificial Intelligence and Collusion" 50 *International Review of Intellectual Property and Competition Law* (2019).

4 Noel Beale and Sandra Mayenda, "Competition law and ecommerce: it wasn't me, it was the algorithm"*Burges Salmon*, Nov. 26, 2018.

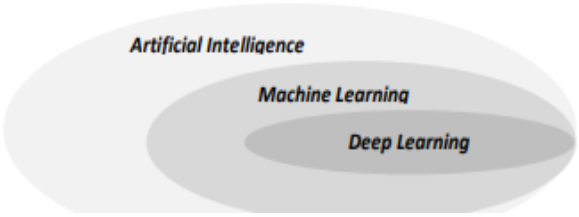
5 Bill Baer Sonia Kuester Pfaffenroth, "Pricing Algorithms: The Antitrust Implications"*Arnold & Porter*, Apr. 17, 2018.

6 *Ibid.*

7 *Ibid.*

8 Vaibhav Chokse, "Why digital cartelisation will be a new challenge for the anti-trust regime" *Financial Express* Aug. 13, 2018, available at : https://www.financialexpress.com/ opinion /why-digital-cartelisation-will-be-a-new-challenge-for-the-anti-trust-regime/1278723/9 (Last visited on January 2, 2022).

state is the output"[9] Initially computers were function as a memory storage like primary functions. These primary functions of the computers were totally depending on the human intelligence. The level of complexity in these primary functions were poor. Since 1943 the evolution of artificial neurons transforms the utility and functioning of the computers. Neurons is biological terminology now connected with non-biological machines. The evolution of artificial neurons enables computer to perform certain functions like mathematical calculations. That functioning of computer perceived as artificial neurons. Warren McCulloch and Walter Pitts in 1943 developed the first artificial neuron.[10] Based on that in 1956 Dartmouth Conference founded the discipline of Artificial Intelligence. The discipline of artificial Intelligence in computer science started study based on the artificial neurons to extent functioning of the computer which perceived as intelligent machine.[11] Artificial neurons developed the functioning of computers extensively. This development in artificial intelligence and neurons transforms the input methods and pattern learning of computers, thereafter it introduced the branch of machine learning.



Source- OECD[12]

Image shows relationship between artificial intelligence, machine learning and deep learning. Deep learning is intrinsic part of machine learning and both fall in the artificial intelligence.

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9 Wilson, Keil *et.al.,* "The MIT Encyclopaedia of the Cognitive Sciences" (MIT Press, 1999), available at: http://web.mit.edu/morrishalle/pubworks/papers/1999_Halle_MIT_Encyclopedia_Cognitive_Sciences-paper.pdf (last visited on June 10, 2022).

10 Warren McCulloch and Walter Pitts, "A logical calculus of the ideas immanent in nervous activity"*Bulletin of Mathematical Biophysics*, 142 (1943).

11 Prakhar Swarup "Artificial Intelligence" 2 *International Journal of Computing and Corporate Research*, 1 (2012), available at: http://www.ijccr.com/july2012/4.pdf.(last visited June 28, 2021).

12 OECD, "Algorithms and Collusion: Competition Policy in the Digital Age" (2017) available at : https://www.oecd.org/daf/competition/Algorithms-and-colllusion-competition-policy-in-the-digital-age.pdf. (last visited on March 5, 2021).

3.2. MACHINE LEARNING AND REINFORCEMENT ALGORITHMS

Artificial intelligence is branch of computer science which study the artificial neurons to perform the complex tasks which mimics the human intelligence. And machine learning is branch of artificial intelligence which deals with learning based on the data. Arthur L. Samuel explains the "computers the ability to learn without being explicitly programmed"[13] The machine learning further classified into three categories based on their method to learn supervised, unsupervised, reinforcement learning.[14] The supervised learning based on the input and output methods used in labeled and organized data and draw the inference and learn accordingly. The unsupervised learning little advanced than supervised learning because algorithms can learn from the unlabeled datasets by recognizing patterns. The third category is actually foundation of automated pricing algorithms, reinforcement algorithms learn from trial and error-based method. The applications of reinforcement algorithms found in pricing algorithms, natural language processing, chess game, automated driving cars. The applications based on the reinforcement learning replace the humans completely through their intelligence developed from learning. The pricing algorithms learn from environment and determine prices based on the demand fluctuations, capacity to supply. In context where pricing software incorporate reinforcement algorithms with just and legally permissible input of profit maximization led them to make and sustain collusion for profit maximization. This learning is purely automated and beyond control of humans. In addition, humans cannot explain the results of this learning. Therefore, it is difficult detect such reinforced pricing algorithms behavior.

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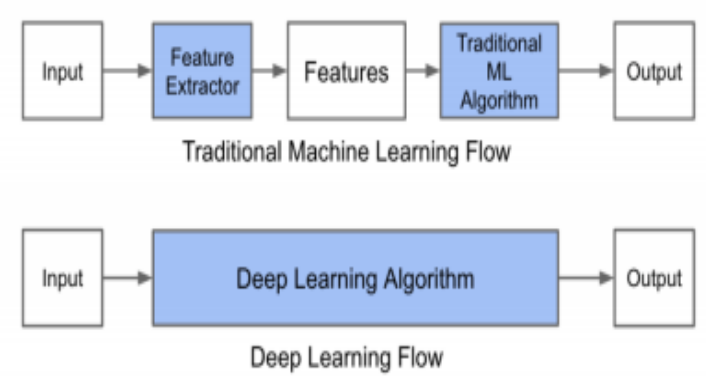
13 Arthur L. Samuel, "Some Studies in Machine Learning Using the Game of Checkers", *IBM Journal of Research and Development*, (1959), available at:https://citeseerx.ist.psu.edu/viewdoc/download? doi=10.1.1.368.2254&rep=rep1&type=pdf(Last visited on March 5, 2021).

14 Andrea Parziale, "Regulating Algorithms in The European Data-Driven Economy: The Role of Competition Law and Civil Liability" 3 *International Journal of Advanced Research in Computer Engineering & Technology*, (2020) available at: https://www.academia.edu/45006412/ Regulating_Algorithms_in_The_European_Data_Driven_Economy_The_Role_of_Competition_Law_and_ Civil_Liability (last visited on March 5, 2021).

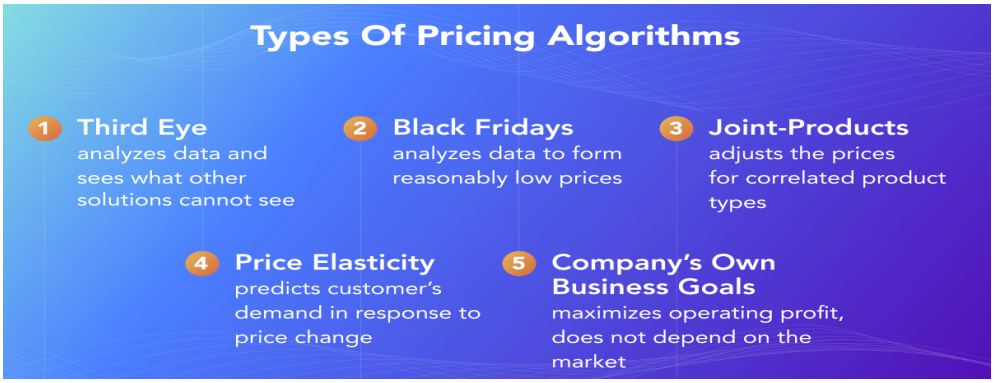


Source- Moujahid[15]

Image explains the difference between traditional machine learning and modern machine learning mechanism.

3.3. DEEP LEARNING AND PRICING ALGORITHMS

The machine learning further includes the deep learning. The deep learning algorithms uses various types of algorithms in their software like signaling, reinforcement, parallel, sorting searching, hashing according to their features. The one and more pricing algorithms consists in pricing software. Deep learning is quite advanced than machine learning in terms of complexity and speed of learning.[16] These deep and reinforcement algorithms called as automated pricing algorithms.



Source- Softengi[17]

The image shows features of pricing algorithms which used in pricing software for different functioning. It helps to replace human intelligence on pricing decisions in marketplaces.

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15 Adil Moujahid, "A Practical Introduction to Deep Learning with Caffe and Python" (2016), available at:http://adilmoujahid.com/posts/2016/06/introduction-deep-learning-python-caffe/ (last visited on June 15, 2021).

16 Ian Goodfellow and Ian Goodfellow, "Deep Learning", *MIT Press*, (2016), available at: http://www.deeplearningbook.org/. (last visited on July 09, 2021).

17 Softengi, "Data Science in E-commerce Use Cases" available at:https://softengi.com/blog/data-science-in-e-commerce-use-cases/ (last visited on July 09, 2021).

3.4. FEATURES OF AUTOMATED PRICING ALGORITHMS

Pricing algorithms used by the sellers to determine the price with view to maximize the profit in business.[18]These pricing algorithms are common in retail, hotel, urban transportation, hotel industry is common. The deep learning methods helps to pricing algorithms to learn from the market conditions. The reinforcement algorithms learn on the basis of trial-and-error method and develop their own strategy to respond the market condition by processing large amount of consumer data and business inventory within least time. It enables them to respond the market change quickly. Due to their automated and quick response feature they can implement continuous price change i.e., commonly known as dynamic pricing/surge pricing. The reinforcement learning method enable pricing algorithms respond quick manner to market change by processing big datasets. In addition, the automated pricing algorithms also analyses the consumer behavior by using parameters like consumer capacity to pay, predict chance to purchase, buying behavior, gender, estimates information asymmetry, and need of consumer by using their private data from various sources like earlier buying history, browser search history, gender, race etc., this feature of pricing algorithms termed as personalized pricing or discriminatory pricing. There are several strategies developed by the automated pricing algorithms through their own learning and some of them are human induced.

The automated pricing algorithm software consists of various types of algorithms for their functioning like Monitoring algorithms to track their competitor's price and point out market change on current time. Parallel adjust their prices as per market change and rivals' price and follow the price leadership. Self-learning algorithms learn and develop strategy to maximize the profit in available information. Apart from these advantages the significant advantage of automated pricing algorithms is replacing humans and speedy than humans, due to that it becomes popular among the businesses. These artificial intelligence-based pricing software can change price of millions of products in milliseconds on Amazon, Flip cart. These significant advantages of automated pricing algorithms have been criticized by traditional non-

[18] Shuchi Chawla and Jason D. Hartline,"Algorithmic Pricing via Virtual Valuations" available at: http://users.eecs.northwestern.edu/~hartline/papers/bayesian-pricing-EC-07.pdf (last visited on July 09, 2021).

algorithmic sellers for difficult to sustain in market for purchase decisions under dynamic pricing.[19]

The personalized pricing based on location, private data consumer behavior, needs, browsing history was argued that it improves efficiency and maintain competition in market, it allows sellers charge prices according to consumer capacity to pay. These are the pro-competitive effects of pricing algorithms, which ensure consumer satisfaction and benefits to price and non-price competition. Some scholars raise the concern personalized pricing harms to overall consumer surplus and some unconstitutional discrimination like gender and race.[20]

3.5. AUTOMATED PRICING ALGORITHMS THROUGH LENS OF COMPETITION LAW

The main objects of competition law are to protection of consumer and ensure trade liberty. In normal market conditions the consumer welfare and freedom trade exist in market which automatically maintain and promote competition in the market. This situation generally called as perfect or identical competition. But in reality, the normal market condition gets diluted by the understanding of the competing players to gain surplus profits than normal market condition. Such understanding prohibited in competition law in the name of anti-competitive agreements which harms to consumer welfare and development of economy.[21] These anti-competitive agreements further classified on the basis of way create agreement express or implied collusion. When collusion is express by way of any communication will attract the liability easily under the competition law. When communication by implied way it's harder to detect and hold liable for anti-competitive practices. In both conditions the intention of competitors to gain more than normal market condition occurs. But, when absence

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19 Organisation for Economic Co-operation and Development, "Algorithms and Collusion: Competition Policy in the Digital Age" (January, 2019), available at: https://www.oecd.org/daf/competition/ Algorith ms-and-colllusion-competition-policy-in-the-digital-age.pdf (last visited on January 5, 2020).

20 Organisation for Economic Co-operation and Development, "Big Data: Bringing Competition Policy to the Digital Era" (April, 2020), available at: https://one.oecd.org/document/DAF/COMP (2016)14/ en/pdf.(last visited on January 5, 2020).

21 O'Sullivan and Arthur *et.al.*,"Economics: Principles in Action. Upper Saddle River" 170 *New Jersey Pearson Prentice Hall*, available at: http://www.sciepub.com/reference/74288. (last visited on January 5, 2020).

of such intention and anti-competitive outcomes occurs, competition law can attract the liability? This question increases weigh in context of automated pricing algorithms. The interpretation of the term agreement for Competition Law is subject to wide variation across jurisdictions. In contemporary situations majority of jurisdictions require strict proof of meeting of minds i.e., the firms are not acted independently. The degree of communication has been changes as per jurisdictions.

3.6. GENERAL IDEA ABOUT ALGORITHMIC COLLUSION

In simple way as like humans automated pricing algorithms automatically learn agree or understand to set higher price in market and not to compete each other. This situation may occur even though the simple and legally valid input of price optimization and maximize price. The predictive pricing based on the deep learning analyses context and set the price equilibrium and other sellers algorithms follows the same price leadership and agree and understand on that high price. In addition, in case any seller's algorithm retaliate the price equilibrium and deviate from the cartel by others and set the lower price then cartel algorithms by using deep discounting punish such deviations systematically. It ensures the sustainability of cartel established by the automated pricing algorithms. The legal questions will open in such situation, whether such automated pricing algorithms can collude automatically? If yes, then, whether such algorithmic collusion violates the existing competition rules? The present chapter deals with possibility of algorithmic collusion and attempts of sustain it, is possible or not? The issue of violation of competition rules needs to revisit detailed inquiry of various jurisdictions for describe variance in interpretation of notion of agreement. Therefore, the next chapter will discuss this question through jurisprudential inquiry with help of functional jurisprudence.

3.7. POSSIBLE CONTEXTS OF ALGORITHMIC COLLUSION

The pricing algorithms software consists several types of algorithms like reinforcement, monitoring, signaling, self-learning, parallel. But as per necessity and market conditions trader may engage various types of algorithms. In purview of algorithmic collusion these four types of algorithms play significant role in terms of form collusion and sustain it in the market efficient manner. The in-depth

understanding of collusion based on the automated algorithms the features of algorithms necessary to consider and role of them in particular for policy guidelines.

3.7.1. Monitoring algorithms

Monitoring algorithms collects the price data of competitors directly through online companies, web scraping tools, data extracting software. They not just collect the data also process it to decode the strategy of competitors. However, the price data of digital market is easily available in public. While processing of data monitoring algorithms: recognize the patterns from collected data and identify the pricing strategy of competitors.[22] After that, they aggregate the strategy of competitors and decide the own policy to trigger competition for price optimization and profit maximization. All this occurs as like traditional normal competitive market. But when several traders apply the same for common objective of price optimization and profit maximization learning of algorithms went wrong and push them into legally objectionable sphere.

3.7.2. Objectionable Scenario of Monitoring Algorithms

In scenario, each algorithmic seller set the default and legally fair input of price optimization and profit maximization. Now monitoring algorithms on similar input develop the strategy to put maximize price in existing market condition, they get learn automatically and naturally instead of enter into price war to maintain price equilibrium is easy and effective to achieve commonly shared goal of price optimization and profit maximization. If we presume any algorithmic seller deviate from common goal price optimization and profit maximization and set the input to capture market share or compete others and enter into price war. In that situation, monitoring algorithms of other seller's detect such devitian quickly and punish such deviation from price equilibrium by using deep discounting method. The deviated seller's algorithms faced loss in two ways one is losing consumer in deep discounting and if execute the order in low level of price war, then loss in profit.

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[22] Organisation for Economic Co-operation and Development, "Algorithms and Collusion: Competition Policy in the Digital Age"*OECD* (2017) available at: https://www.oecd.org/daf/ competition/ Algorithms-and-colllusion-competition-policy-in-the-digital-age.pdf (Last visited on January 05, 2020).

This situation compels to learn that, retaliated algorithmic seller mere capturing market on cost of losing consumer and profit loss not worth strategy. And their retaliated algorithms learnt from the lesson from punishment of deviation and adopt the price equilibrium instead price war and retaliate from price equilibrium.

This capacity and feature of algorithms runs without any communication and any illegal inputs termed as a conscious parallelism. However, price parallelism is not illegal in strict sense of competition rules in traditional market. But the capacity and feature of monitoring algorithms provokes to think on policy change in competition rules.

3.7.3. Parallel Algorithms

In continuation of scenario described in monitoring algorithms once retaliated sellers' algorithms faced the punishment for its deviation from price equilibrium, parallel algorithms cured continuation of loss by enter into price equilibrium and follow the price leadership. Monitoring algorithms develop the strategy for pricing decision and parallel algorithms implement it. Parallel algorithms help to coordinate the parallel behavior developed by conscious parallelism.[23]

In addition, market condition fluctuates the demand and supply continuously, although conscious parallelism ensured and stabled by the monitoring algorithms may disturb in response to fluctuating market conditions. The parallel algorithms help into maintain coordinate parallel behavior and stable the collusive understanding. Parallel algorithms replaced the traditional arrangement of collusion where companies secretly meets or call, emails for renegotiate the price arrangements due to changed market conditions. In the traditional arrangements risks of the detection was high but in parallel algorithms renegotiate automatically and ensure the respond simultaneously.

Alternatively, competing firms may engage common third party to set their pricing algorithms. Direct sharing of pricing algorithms is violation of competition rules because it can be inferred concerted action. To escape from this action competing firms may engage same third-party pricing agency. This scenario described in detail by Ariel Ezrachi and Maurice Stucke in their work, Virtual Competition, they termed

[23] *Ibid.*

to this situation as hub-and -spoke, it refers hub is third party commonly appointed by competing firms i.e., Spokes.[24]

3.7.4. Signalling Algorithms

Justice Richard Posner pointed out that; "If a firm raises price in the expectation that its competitors will do likewise, and they do, the firm's behavior can be conceptualized as the offer of a unilateral contract that the offerees accept by raising their prices"[25] The signaling algorithms send signals by setting high price and monitoring algorithms capture the strategy of competitors and ensures that unilateral offer of raise prices accepted by competitors by raising their price. Once the algorithms ensures that price leadership was followed by the other competitors then conscious parallelism sustain stability in the market. After certain level of stability, the process of punishing deviations would initiate by the monitoring algorithms. It is important to mention that the first algorithmic seller who send signals to raise price is sometime turns into costly, when other competitors not follow the price and remains neutral to these price rising signals then price leader would face loss in terms of loss of consumer. However, some strategies can develop to counter this loss in cost by signaling at midnight would probably save the cost when less probability of execution of orders by consumer.[26]

3.7.5. Self-learning and Reinforcement Algorithms

All the functioning of monitoring, parallel, signaling based on the deep learning mechanism. The developer of pricing software's develops the software to train their algorithms for to achieve goals of price optimization and profit maximization. Upon these inputs now it is turn of deep learning algorithms to learn from trial and error by analyzing collected data from market conditions. Self-learning and reinforcement algorithms play important role in that level and develop the further monitoring,

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24 Ariel Ezrachi and Maurice Stucke, *Virtual Competition-The Promise and Perils of the Algorithm-Driven Economy* (Harvard University Press, 2016).

25 Richard Posner, "Oligopoly and the Antitrust Laws: A Suggested Approach" 21 *Stanford Law Review*, available at: https://chicagounbound.uchicago.edu/cgi/viewcontent.cgi?referer= &httpsredir=1&article=2862&context=journal_articles (last visited on September 12, 2022).

26 Organisation for Economic Co-operation and Development, "Algorithms and Collusion: Competition Policy in the Digital Age"*OECD* (2017) available at: https://www.oecd.org/daf/competition/ Algorithms-and-colllusion-competition-policy-in-the-digital-age.pdf (Last visited on January 05, 2020).

parallel, signaling algorithms to achieve goals. The role of self-learning and reinforcement algorithms is vital in terms of the increase the speed of repricing and prompt response to market conditions. Their learning methods is so complicated even humans cannot understand easily and sometimes not.

The working and mechanism of self-learning algorithms can be adduced by evidence of chess game. The IBM supercomputer's deep blue software won the chess match against Garry Kasparov, the world champion in chess, by 3½ -2½ in New York city the year 1997.[27] Later it become subject of documentary titled "Game Over: Kasparov and the Machine" directed by Vikram Jayanti.[28] It was revealed that artificial intelligence based deep blue software can predict 200 million moves in second.[29]

Human brain cannot understand easily the decisions taken from deep learning algorithms, besides speed of self-learning algorithms is too high. If the software deep blue can predict 200 million moves in second for win game against the world chess champion Garry Kasparov, then to make collusive outcomes for profit maximization and price optimization is comparatively simple task to them. Therefore, their capacity to collude cannot be questioned in the context. It is safe to say that, there is probability that automated pricing algorithms can collude.

3.7.6. Summary on Role of Algorithms

	Role in implementing collusion
Monitoring algorithms	Collect and process information from competitors and eventually punish deviations.
Parallel algorithms	Coordinate parallel behaviour, for instance by programming prices to follow a leader; sharing pricing algorithms; or using the same third party algorithm.
Signalling algorithms	Disclose and disseminate information in order to announce an intention to collude and negotiate the common policy.
Self-learning algorithms	Maximise profits while recognising mutual interdependency and readapting behaviour to the actions of other market players.

Source- OECD (2016)[30]

Image provides lists of various types of algorithms which participates in algorithmic collusion. These algorithms jointly manipulate the price and also maintain the cartels in market.

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27 IBM, "Over view Transforming the World Cultural Impacts the Team in Their Words" *IBM* available at: https://www.ibm.com/ibm/history/ibm100/us/en/icons/deepblue/ (last visited on January 05, 2020).

28 Vikram Jayanti, "Garry Kasparov versus Deep Thought Documentary" available at: https://www.youtube.com/watch?v=ke8pq-cpOGk (last visited on January 05, 2020).

29 Wired (ed.), "Defeated Chess Champ Garry Kasparov Has Made Peace With AI" (1996) available at : https://www.wired.com/story/defeated-chess-champ-garry-kasparov-made-peace-ai/(last visited on January 05, 2020).

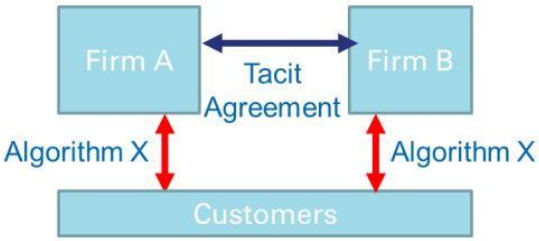
30 Organisation for Economic Co-operation and Development, "Algorithms and Collusion: Competition Policy in the Digital Age" *OECD* (2017) available at: https://www.oecd.org/daf/competition/Algorithms-and-colllusion-competition-policy-in-the-digital-age.pdf (Last visited on January 05, 2020).

3.8. SCENARIOS OF ALGORITHMIC COLLUSION

Ariel Ezrahi and Maurice E. Stucke, explains various scenarios where algorithmic collusion is possible. The use of algorithms is not pro-competitive or anti-competitive in nature its neutral in nature. How firms engage algorithms decides the legality of use of such algorithms. The conventional wisdom of competition law well developed to punish human executed cartels. It also extents to use of algorithms to execute and maintain cartels through human will. Competition regulator can safely infer that algorithm are just intermediatory of human will. But a scenario where automated pricing algorithms collude automatically and without any input of such collusive outcome, the firms would wash their hands by blaming computers. In that situation conventional interpretation of theories of competition law unstable to deal with such situation in various ways. In conventional cartels proofs of human's collusion their meeting, communications, signaling, would help to the regulator to prosecute cartels. And regulator rely on those evidences may adduce the establishment of anti-competitive agreements as a statutory requirement of punish cartels. Nonetheless the scenario in automated algorithms and their formation of cartel; unstable the scope of interpretation in the notion of agreement between competitors. Therefore, it gives the birth of various legal tussles. The further scenarios would explain how the automated algorithms can enter into anti-competitive understanding and resulted in conscious parallelism.

3.8.1. Messenger Scenario

This scenario is easier to prosecute as compare to others. The algorithms used as just intermediatory to execute human will. The firms are agreed in agreement to use of specific type of algorithms to set prices, and also for supervise any deviations of cartel pricing. There is crystal clear agreement between the firms to use specific type of agreement to ensure the stability of cartel as planned. The below figure will demonstrate the messenger scenario.



Source of image- Competition Market Authority of United Kingdom (CMA)[31]

The image provides the mechanism of messenger scenario where two competing forms used to agree share the pricing strategies to determine the price.

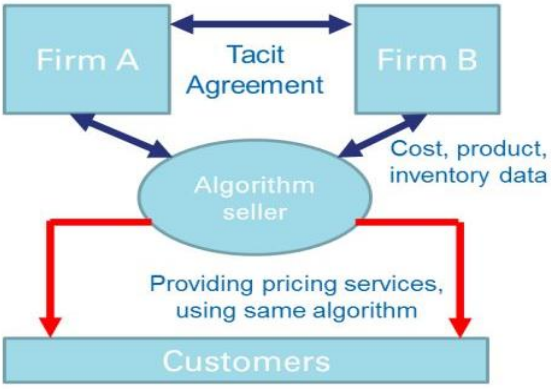
The messenger scenario won't create any legal challenges as far. However, the use of algorithms for collusive outcome makes difficult in investigating such probe due technological advancement. For instance, if firms used the supervise deviations from the price fixed in cartel, then during investigation it is difficult to understand exact mechanism of cartel and role of algorithms in maintaining cartel. David Topkins was sued in the U.S. for conspirators who agreed to use an algorithmic pricing system so they could compare prices more easily. Six airline companies were found using an online booking system that permitted collusion in price setting in 1994. This is known as the messenger scenario, wherein conspirators agree to utilize an algorithm to facilitate collusion.

3.8.2. Hub and Spoke Conspiracy

The hub and spokes conspiracy are not novel to competition regime, even in before the development of digital commerce it exists in market and successfully punished in history of competition law. The general understanding of collusion is that the firms are engaged in direct communication for collusive outcome they arrange the meetings or signals for price fixing at communicate to each cartel participants. The little advance form of such general idea of collusion resulted in hub and spoke conspiracy. The mode of communication and agreement is different than general idea of collusion, the direct communication with all cartel participant replaced by one competitor, instead, of one-to-one contacts, they conspire through one competitor

[31] Competition Market Authority, "Pricing algorithms Economic working paper on the use of algorithms to facilitate collusion and personalized pricing" *CMA* (2020) available at : https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746353/Algorithms_econ_report.pdf (last visited on October 12, 2021).

acting like central of wheel i.e., hub declares the intent to collude and disseminate this idea among the other competitors. And other competitors act like spokes who follow the price settled in cartel and acts upon the disseminated information. The hub by disseminating information facilities collusion among the other competitors i.e., spokes. In the year 1939 U.S. supreme court punished the hub and spoke conspiracy in the case of Interstate Circuit, Inc. v. United States[32] in that case Interstate movie distributor sent the letter to other movie distributors containing the message that other theaters should not charge less than 25 cents for per movie tickets in order to eliminate competition. While some other theaters pries are quite lower than 15 cents. U.S. Supreme court found that Interstate acts like Hub and other movie distributors acts like spokes and guilty for anti-trust laws. It became easier to form such kind of hub and spoke conspiracy in digital platforms. Because the availability of technologically advanced tools. In digital platform hub probably algorithmic pricing platforms who provides the services regarding computerized pricing. If competitors appointed same platform to set their prices for profit maximization, it resulted in higher prices by collective understanding. Where platform acts like Hub and other participants act as spokes and with collective understanding manipulate the prices. The following figure will demonstrate the mechanism of hub and spoke conspiracy.



Source of image- Competition Market Authority of United Kingdom (CMA)[33]
Images shows the mechanism of hub and spoke conspiracy where competing players agree to share the pricing software for price optimization and jointly maximize the profits.

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32 *Interstate Circuit, Inc. v. United States*, U.S. Supreme Court, 306 U.S. 208 (1939), available at: https://supreme.justia.com/cases/federal/us/306/208/ (last visited on June 12, 2021).

33 Competition Market Authority, "Pricing algorithms Economic working paper on the use of algorithms to facilitate collusion and personalized pricing"*CMA* (2019), available at : https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746353/Algorithms_econ_report.pdf (last visited on October 12, 2021).

It directly resulted in anti-competitive agreement; this price arrangement can be declared violative in existing conventional wisdom of competition law. However, some jurisdictions like Indian parliament (Lok Sabha) introduced new Competition (Amendment) Bill, 2022 to extent the scope of anti-competitive agreement and includes the enterprises and persons who facilitate cartels even they are not engaged in identical trade practices.[34] Which helps to prosecute algorithmic price platforms in better way. The hub and spoke conspiracy on digital forms are easier to achieve and equally difficult to detect for regulators. In some recent cases Uber and its drivers prosecuted for hub and spoke conspiracy. In Indian scenario the complaint filed against cab aggregators Ola and Uber, it was alleged that Ola and Uber acting like hub and drivers are the acting like spokes. Competition commission of India denied the allegation stated the reason that all drivers of Ola and Uber were not agreed to conspire by express or implied way, the apex court also confirms the findings of the commission.[35]

3.8.3. Regulatory Challenges of Algorithmic Hub and Spoke Conspiracy

The conventional hub and spoke conspiracies were easy to declare anti-competitive than Algorithmic Hub and Spoke conspiracy. In traditional scenario the intent of collusive outcome would help regulator to prosecute the hub and spoke cartels. Their communications and arrangements disclose the evidences for intent collude. But in algorithmic scenario it difficult to intervene for regulator to prosecute unilateral conduct of competitors to join the digital hub for their pricing, especially when they argue about procompetitive effects of algorithmic pricing. For example, in Indian jurisdiction Supreme court and Competition commission concurrently observed that in the absence of agreement between the Ubers driver to collude the inference of hub and spoke conspiracy not sustainable. The first regulatory challenge will occur in this situation that whether Unilateral conduct would attract liability of hub and spoke conspiracy. Especially when there are procompetitive effects of such conduct also seen. In addition, the scenario of

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[34] Parliament of India (LOK SABHA), The Competition (Amendment) Bill, 2022, Bill No. 185 of 2022, Legislation, Bill Introduced on 5 August 2022, available at: https://loksabhaph.nic.in/ Legislation/billintroduce.aspx (last visited on October 12, 2021).

[35] S*amir Agrawal v. ANI Technologies*, Case No. 37 of 2018, available at: https://indiankanoon.org/ doc/84896048/(last visited on September 12, 2022).

collusive outcome is not intended and just probable. Apart from those other considerable arguments other also grip importance like the firms use the algorithms due to affordability of infrastructure of pricing algorithms. in Uber's case each driver cannot afford the pricing software for their single taxi. The complexity of this questions shifts such analysis from "per se illegal" to jurisprudential standard of "rule of reason". It is difficult to ensure balance of overall consumer welfare and freedom of trade.

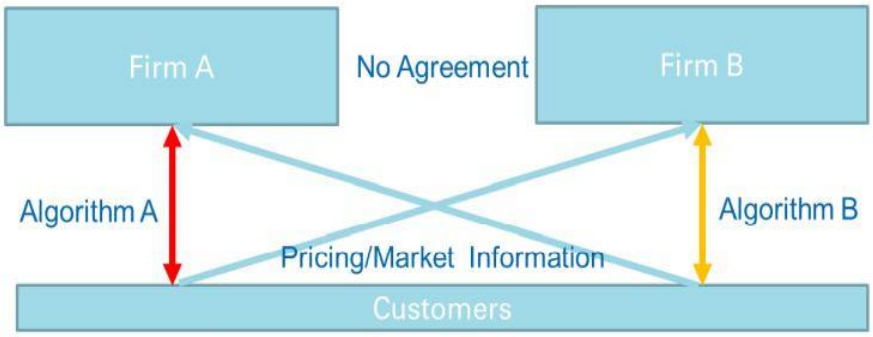
3.8.4. Predictable AgentScenario

This category contains players who create their own pricing algorithms. Unfortunately, they are programmed so that they all react similarly to similar situations - leading to tacit collusion.[36] The human participates in collusion through indirect way by using similar pricing algorithms or appointing same agency for pricing. The level of guilt may be inferred on circumstances by appreciating intention to use of same algorithms and up to certain extent it is possible to regulate it. And another logical argument is sustainable that, ability to forecast of algorithms would produce collusive outcome. But the predictable agent scenario is different from hub and spoke scenario, players develop their pricing strategy independently on fair inputs of price optimization and pricing algorithms. There is complete absence of human will and also manipulation. It was purely generated from computer based of the deep learnings of algorithms. although all competitors set their own strategy for pricing still deep learning evolve the cooperation between them in systematic way. In predictable agent scenario the competitors not make any agreement to use certain specific way of algorithms, rather act independently with own strategy in market. Its deep learning algorithms who systematically to learn collude in market environment. At the end all algorithms stable at parallel price. This situation economist termed as 'conscious parallelism' or tacit collusion which is legal in nature. Because there is unilateral and independent conduct of pricing and the collusive outcome is just incidental.

''Tacit collusion, sometimes called oligopolistic price coordination or conscious parallelism, describes the process, not in itself unlawful, by which firms in a

[36] Madhavi Singh, "Algorithmic Collusion in Flight Pricing in India" 29 *Law School Policy Review*, available at :https://lawschoolpolicyreview.com/2018/11/29/algorithmic-collusion-in-flight-pricing-in-india/ (last visited July 13, 2019).

concentrated market might in effect share monopoly power, setting their prices at a profit-maximizing, supra-competitive level by recognizing their shared economic interests and their interdependence with respect to price and output decisions and subsequently unilaterally set their prices above the competitive level.''[37]



Source of image- Competition Market Authority of United Kingdom (CMA)[38]

Images shows the working of predictable agent scenario where pricing software reached the collusion without any explicit input for the same. Here competing players not guilty for agreement or any concerted actions but still automatically pricing software reach the conclusion of collusion for profit.

If the same outcome and result can be ensured like express collusion and without any communication, then competitors would prefer to collude tacitly to escape from legal liability of express collusion and face heavy penalty for the same. The role of reinforcement learning algorithms is important in to determine the price through the market conditions like demands, stocks, consumer behavior, competitors' price and strategy and find the scope for both price optimization and profit maximization. The deep learning algorithms collectively learn automatically that instead of competing each other better to stable at high cooperative pricing.

3.9. MARTHA'S VINEYARD GASOLINE CASE

In Martha's Vineyard Island nine gasoline sellers alleged for price fixing conspiracy at horizontal level. Iseland residents aggrieved by higher pricing of gasoline as

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37 *Brooke Group Ltd. v. Brown & Williamson Tobacco Corp.*, 509 U.S. 209 (1993), available at: https://supreme.justia.com/cases/federal/us/509/209/.(last visited on October 10, 2021).

38 Competition Market Authority "Pricing algorithms Economic working paper on the use of algorithms to facilitate collusion and personalized pricing"*CMA* (2020), available at : https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/746353/Algorithms_econ_report.pdf (last visited on January 12, 2022).

compare to mainland, about $ 0.56 per gallon which only $ 0.21 was reasonable for transportation cost.[39] In addition, despite oil prices drop the gasoline prices still remain high. Plaintiff fails to prove that the express agreement between parties. Sellers defended that the prices are transparent on island and they unilaterally set their prices. Court of appeal held that its pure conscious parallelism case and naturally happen in transparent market especially when limited number of players in market and homogeneous products. Therefore, court of appeal held that this was not the result of anti-trust agreement between the competitors in market.[40]

3.9.1. Martha's Vineyard Gasoline Case and Algorithmic Predictable Agent

In Martha's Vineyard Island gasoline market consist only nine sellers and selling homogeneous product nearly three times higher than mainland. It was successful without any communication or intermediatory. That one seller chooses to raise the price in highly transparent market and other seller follow its price leadership. It was also observed that their market share was also constant since long time. This was the perfect case of conscious parallelism and it's not illegal although same outcome was achieved like express collusion. But it possible due to high transparency in market where every gas stations know each other prices and ensures no seller dropping down the prices instead of deviate they choose to follow each other prices. This was purely unintentional and without any artificial arrangement for it. The Martha's Vineyard gasoline market was highly transparent and with limited sellers in market for identical goods. It was logically possible to happen. But where large number of sellers with their number of products can achieve the state of conscious parallelism. Its logically not possible in large market and especially when large number of sellers in market. Because it requires continuous watch on competitors' price and adjust their price accordingly its practically not possible to humans. In addition, some retaliations present in market probable capture the market share when others involved in price leadership. And it dilutes the scenario of conscious parallelism. If we replaced the

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39 *White v. R.M. Packer Co., United States Court of Appeals*, First Circuit, 635 (1st Cir. 2011), available at: https://casetext.com/case/white-v-rm-packer-co/case-summaries(last visited on June 18, 2021).

40 *Ibid.*

humans by algorithms for to watch process and adjust accordingly then its easily possible as we discussed earlier. And it's also possible to them to think logically like humans and follow price leaderships. Automated pricing algorithms capable to establish conscious parallelism which results in supra-competitive prices.

3.9.2. Digital Eye Scenario

This is fourth scenario of algorithmic collusion narrated by the Ariel Ezrachi and Maurice Stucke. It was actually hypothetical scenario yet no cases had been reported under this scenario. The artificial intelligence-based algorithms can process high volume of data with high speed and make necessary changes in their responses. Here, in Digital Eye scenario for example Uber's algorithms process the demand, raise in demand also record the live locations of cabs and passenger by using these datasets and big data analytics Uber would get meta clear view of market conditions.

The concern of this context of highly transparent market would resemble the market in under perfect competition but the reality would be reverse to it. And unlike the predictable agent scenario algorithms not just stable the algorithmic cartel but well in advance counter the threat to stable conscious parallelism. Therefore, it also termed as God View.

Hypothetical Proposition- If we assume any cultural fest going in Prestigious University of any city on Sunday. The google maps may predict the upcoming rides by aggregating data from androids' locations. Any person uses their mobile from certain home location usually from his home but today's unusual location can be detected by the algorithms and further concludes that number of unusual android activity in one place would lead the Ubers Business. And may Signals Uber to arrange the more cabs to satisfy the demands. In addition, also detect that these persons would probably book even in higher prices due to lack of information and convenience reason as they were not habitual visitors of that place.

In such situation number of ways and tactics of business would probably exists. But all these apparently looks transparent for competition but in reality, it will give births to new problems. Like in our hypothetical situation google make bias to share the same data with Uber and other companies. If google invest in Uber then results would

be probably bias. However, in number of jurisdictions google fined by the competition regulator for its search bias.

3.10. THEORETICAL FOUNDATIONS FOR ALGORITHMIC COLLUSION

In our literature the learning pattern from prisoner's dilemma in logical science will help us to understand logical behavior of pricing algorithms.

3.10.1. Prisoners Dilemma

It is little uneasy to believe that computers learn to collude without any human input for the same. But prisoner's dilemma will provide understanding of possibilities of the deep learning of algorithms. William Poundstone provides suitable version of prisoner's dilemma in 1993; where two criminals are arrested and kept in isolation and ensure that they can't communicate by any means. The investigation officer admits that they don't enough evidence to convict them. They offer them separately if anyone confess the crime get lesser sentence than other.[41]

Contexts are like:

If X and Y betray each other they both get two-year punishment

If X and Y both remain silent then both of them get one year punishment

If anyone of them betray and other remain silents then betrayed member get free and silent member face the three-year punishment.

William Poundstone explains that independent rational individuals are self-interested therefore they chose to betray each other to satisfy self-interest even in situation of greater reward is probable if remain silent. That is individual rationality prioritize self-interest than relying on uncertainty of collective rationality. Their individual rational choice is depended on sure-thing principle.[42] This individual rationality will also defer in context of public goods. The tragedy of common is example where public goods are subject to over use.[43]But the situation may differ when number of

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41 William Poundstone, *Prisoner's Dilemma* (Anchor Books a Division of Random House, New York, 1993).

42 Savage, *The Foundations of Statistics* (John Wiley & Sons, New York 2018).

43 Anatol Rapoport, "Prisoner's Dilemma''*The New Palgrave Dictionary of Economics, London: Palgrave Macmillan UK*, (2016), available at: https://link.springer.com/referenceworkentry/ 10.10 57/ 978-1-349-95121-5_1850-1 (last visited on January 01, 2022).

transaction and you can observe their actions. To strategies this prisoner's dilemma in number of transactions called iterated prisoners dilemma. In iterated prisoner's dilemma players allowed to memorize the previous actions of opponent.

However, the prisoner's dilemma applications are multidisciplinary in nature. Applications may be found in environment, science, psychology philosophy, economy, international polity, and computer science. The scope of our work is to applications of prisoner's dilemma in commerce and computer science.

3.11. AXELROD'S TOURNAMENTS

Apart from other applications we choose to study the model of iterated prisoner's dilemma proposed by Robert Axelrod in their tournament results "The Evolution of Cooperation". They arranged the tournament and invited academicians to device algorithms to compete in iterated prisoner's dilemma (IPD) tournament. The foundation of tournament was to understand the evolution of cooperation and how it establishes in reality. The preface of book wrote by Robert Axelrod opens with this object;

"This project began with a simple question: When should a person cooperate, and when should a person be selfish, in an ongoing interaction with another person? Should a friend keep providing favors to another friend who never reciprocates? Should a business provide prompt service to another business that is about to be bankrupt? How intensely should the United States try to punish the Soviet Union for a particular hostile act, and what pattern of behavior can the United States use to best elicit cooperative behavior from the Soviet Union?"[44]

Iterated prisoner's dilemma (IPD) tournament conducted in five rounds. And every player asks for gain more by mutual cooperation. Another interesting rule of tournament was players that one player can exploit others for his gain. In addition, players can also change their strategy in response to tackle the opponent. Players can also develop their strategy by using previous memory. The participants design their algorithm by different strategies like complexity, retaliation, initial hostility,

[44] Robert Axelrod, *The Evolution of Cooperation* Preface (Basic Books Publishers, New York, 1984).

forgiveness, forgiveness at first instance followed by punishment. Some of them purely rely on greedy strategies of self-interest irrespective of altruism. Some of them designed mimics of others i.e., Tit for Tat.[45] The results for this tournament perfectly matches the collusion of automated algorithmic collusion. The tournament results were declared that which strategy was successfully gain more in long run and way to pave promote cooperation. While declaring the results Robert Axelrod advised to participants which strategies are successful in long run period.

3.11.1. Nice

This strategy is most successful strategy than others which called as optimistic algorithms. This strategy believes that not to defect at first instance. But not blindly rely on the policy on defect. At some instance they retaliate the value offered by the opponents if they previously deviate from sharing of benefits of both. But at first instance or some time more instances they show the attitude of forgiveness to achieve and stable cooperation. It gives the opportunity to learn and react for common goal of more gains. Resultantly successful in gaining more and benefitted by stable cooperation than other. They not purely greedy and defects the opponents. They believe in altruism for overall welfare. In short, they rely on self-interest with altruism. But not purely altruism eventually they punish retaliation.[46]

3.11.2. Tit for Tat

This strategy is also successful in short period but disadvantageous in long run period. They just mimic the opponents' reactions and move accordingly. But the frequent interaction with defect strategies they mutually loose gains. However, they also probably learn to develop their forgiveness for gain.[47]

3.11.3. Forgiveness

This strategy also allows some forgiveness against the defect attitude. But sometimes lose their benefits by subjecting itself for exploitation by others. Resultantly lose their supremacy in gaining. While they react with nice strategy will probably get

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45 Robert Axelrod, *The Evolution of Cooperation* Preface 2 (Basic Books Publishers, New York, 1984).

46 Robert Axelrod, *The Evolution of Cooperation* 219 (Basic Books Publishers, New York, 1984).

47 *Ibid.*

cooperation and get equally gained. But if they randomly react with defect then huge loss would face and subject of exploitation. Therefore, in long run period will probably not suitable and bit risky.[48]

3.11.4. Retaliation/Defects

In this strategy algorithms basically designed for to defect others. At any situation they put disadvantageous position to their rivals. They don't show curtesy to learn common benefits. They are purely greedy and self-interested algorithms. they don't care mutual benefits. At the end game they lose their gains by punishing others. However, this strategy gains more in context than any other strategy against the complete forgiveness opponent.[49]

At the end of tournament Robert Axelrod gives suggestions to how they can update their algorithms to gain more. These suggestions based on the performance of algorithms in tournament.

3.11.5. Don't be envious

The first advise is don't be envious, it explains that tournament success is not depends on zero-sum strategy like chess game. In chess game either white or black wins there is zero-sum strategy works. But in multi-lateral transactions strategy of success is not just to defect the opponent, instead of that co-operation strategy works better for success. The strategy of Tit for Tat did well in tournament because while interacting with different level of strategy they acts depends on opponents' strategy. They sometime retaliate to defect the opponent for their exploiting strategy with intent save themselves instead provokes to defect the opponent. If pure strategy of defect the opponent not possible to success. In such situation it certainly loses the advantages of the cooperation. Therefore, don't design the algorithms to just for defect the opponent. Instead of defecting opponent true strategy would be focus on idea of altruism with Tit for tat.[50]

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48 Robert Axelrod, *The Evolution of Cooperation,* 240 (Basic Books Publishers, New York, 1984).

49 Robert Axelrod, *The Evolution of Cooperation,* 233 (Basic Books Publishers, New York, 1984).

50 Robert Axelrod, *The Evolution of Cooperation* 236 (Basic Books Publishers, New York, 1984).

3.11.6. Don't be the first to defect

The second suggestion was also suggestive to achieve cooperation among the algorithms on competitive platform. The Tit for Tat strategy is best strategy but it requires some advantages in like the method of retaliation. It is not necessary and appropriate to defect at first instance the author called it Tester. In Tester strategy at initial level if opponent defect then immediately Tit for Tat algorithms also defect in same manner. But it is also not suitable for long term gain, because long term gains are not depended on the limited interaction where other Tit for Tat algorithm you met and you faced the same continuous treatment will certainly either loose or share profit. Therefore, instead of Tester parameter the Tranquilizer where algorithms wait for two or dozens of moves of defects to retaliate. The Tester reacts in one move for opponents' defect and Tranquilizer wait for some more moves. At the end due to tranquilizer planned and sophisticated retaliation probably result in cooperation which signals to others to learn cooperation is beneficial than compete. Therefore, along with Tit for Tat some tranquilizer also suggestable to more stable cooperation. At the end of tournament, they found that although the nice strategy with Tit for Tat shows trust and stable but at the end it destroys the environment when its needed for own success.[51]

3.11.7. Reciprocate Both Cooperation and Defection

They also note that Tit for Tat with some strategies Tester and Tranquilizer won the tournament as well as future hypothetical contexts. It simply means the Tit for Tat is best strategy in all dimension, they always won the tournament rounds collectively. The level of reciprocate defect depends on the environment. These strategies usually first not defect but if opponents provoke it then they automatically turn into defect the opponent. They featured with generous forgiveness which protect them from costly exploitation. If they met with the cooperative response automatically both of them perform well and gain more. In short, this suggestion tends to cooperate rather become competitive.

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[51] Robert Axelrod, *The Evolution of Cooperation* 237 (Basic Books Publishers, New York, 1984).

3.11.8. Don't be too clever

It was also noticed in tournament results that; the sophisticated and complex algorithms were unsuccessful than simple Tit for Tat strategies. More sophisticated algorithms usually make inferences about the other players and face the huge loss when it turns wrong. Rather simple Tit for Tat inference on just move and decide where to retaliate or give opportunity to cooperation. It often promotes cooperation than competition which finally results in growth mutual benefits. For example, if too clever strategy of permanent retaliation, then your opponent will use the same and it results in mutual loss of both. In other case if anyone put perfectly random strategy then opponent will discourage to cooperate you instead, they get chance to exploit this strategy continually. Therefore, making complex and too clever strategy not feasible as compare to simple Tit for Tat strategy with tranquilizer for retaliation.[52]

3.12. PRAGMATIC FOUNDATIONS FOR ALGORITHMIC COLLUSION

Apart from the theoretical foundations of Prisoners dilemma and Axelrod's tournament results gives idea about capacity and evolution of cooperation of algorithms. The tournament results also provide guideline to software developer how to develop algorithms to learn and teach cooperation instead of competition. Currently algorithmic trading companies promotes their business with words like Boomerang "put an end to price wars before they even begin"[53] it simple demonstrate that the pricing software designed for to learn and teach cooperation instead of competition. However, conscious parallelism achieved by the algorithms not illegal in competition law. But in virtue of policy change due to new market conditions, its necessary to understand the mechanism of algorithmic cooperation in depth. There are some simulations conducted in computer science laboratory which help us to depth understanding of pricing algorithms.

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52 Robert Axelrod, *The Evolution of Cooperation* 239 (Basic Books Publishers, New York, 1984).

53 Abhijeet Sathe, "How retailers and brands can avoid the race to the bottom in online pricing"(2018) available at:https://www.digitalcommerce360.com/2018/07/09/how-retailers-and-brands-can-avoid-the-race-to-the-bottom-in-online-pricing/ (last visited on November 5, 2022).

3.12.1. Cournot Competition Game

Professors of computer science develop simulation of Linear Extortion to Collusion Algorithm (LECA) their algorithms to compel humans to collude. They arrange the game of human with algorithms, where they compete 600 rounds. And the both players can decide the quantity of produce. But they were not allowed to communicate each otherwise. Humans and algorithms both were unknown to each other strategy. The result of the game is surprising after 300 iterations, human learned that reducing quantity is greater profit. In this human-algorithms duopoly market level of collusion attained 100% in 300 to 400 rounds. They conclude that algorithms-human collusion occurs in nearly 400 iterations and human-human requires to 800 iterations.[54] It was also noted that, algorithms learn to collude in long run period to maximize the profit in long run period. As a result of such overall consumer welfare decline rapidly.

3.12.2. Q learning Algorithms Simulation for Understanding Deep Discounting

On algorithmic platform deep discounting is not result of bargaining transaction. It became the strategy to defeat the opponent by grabbing the consumer from deviating seller. In the traditional market the bargaining was fair output of the competition, but in algorithmic market it became tool to sustain conscious parallelism. The conscious parallelism arose in transparent market is natural phenomenon of competition. The real-time simulation of pricing algorithms provides the understanding of nature and mechanism of self-learning algorithms and their deep discounting. There is uncertainty among the anti-trust scholars in believing sustainability of tacit collusion. The simulation experiment of algorithms will clarify the position of overall sustainability of the cartel. In Q-learning experiment algorithms reach the collusion in more than 60% cases although there are significantly high 100 price levels.[55] And algorithms learn to develop their strategy to sustain the conscious parallelism in the market. Deep discounting is one of the strategies which help to algorithms to replace

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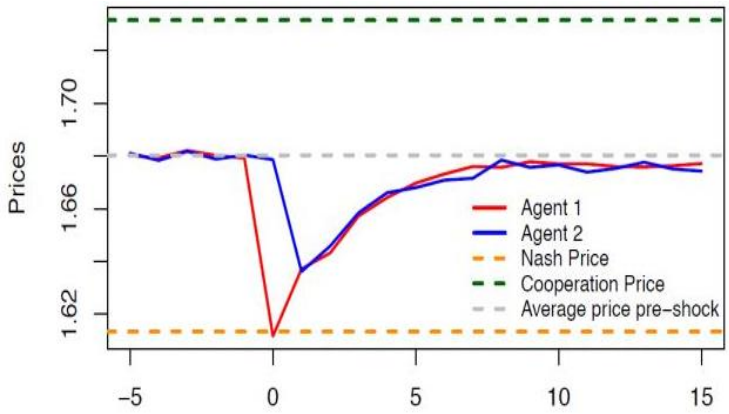
[54] Nan Zhou, Li Zhang, *et.al.*, "Algorithmic Collusion in Cournot Duopoly Market: Evidence from Experimental Economics"*Zhejiang University* available at: https://arxiv.org/pdf/1802.08061.pdf (last visited on November 5, 2021).

[55] Emilio Calvano, Giacomo Calzolari *et.al.*, "Artificial Intelligence, Algorithmic Pricing and Collusion"*SSRN* available at : https://www.ftc.gov/system/files/documents/public_ events/1494697/calzolaricalvanodenicolopastorello.pdf (last visited on November 6, 2022).

the competition from the cooperation. The self-learning algorithms can easily learn from trial-and-error basis like humans understood in transparent Martha's Vineyard Gasoline case. Algorithms also can learn the pattern and implement strategy of conscious parallelism, in order to ensure sustainability of such tacit collusion they often use the method of deep discounting. If any seller offers the price below conscious parallelism i.e., Nash equilibrium the other algorithms put counter offer through the deep discounting, resultantly deviating algorithms would not ensure the profits from the lower price and also loose the consumer at the end deviating algorithms face the huge loss by offering the price below Nash equilibrium. After certain level of reiterated transactions deviating seller get punishment from its deviation and learn to stable at Nash equilibrium price for profit maximization. At the end, conscious parallelism attains the durable sustainability in the market. This deep discounting strategy well captured in simulation experiment conducted by scholars of experimental economics of University of Bologna in Italy. The results of experiment evident of mechanism of deep discounting.



Source- Emilio Calvano, Giacomo Calzolari, in University of Bologna[56]

The image shows how deep discounting used as cartel tool by offering lower prices and induce competitors to learn cooperation and avoid competition.

The Axelrod tournament for theory of cooperation and this Q-learning experiment can describe the clear picture of algorithmic collusion. The changing dimension of conscious parallelism in the era of algorithms pose the legality of deep discounting as systematic act or attempt of limiting price maintain tacit collusion by indirect way.

56 *Ibid.*

Therefore, competition regulators across the globe the investigating probe of deep discounting in various platforms like amazon and flipkart.[57] In Indian jurisdiction Competition Commission of India directed by Supreme Court to investigate Ubers predatory pricing, investigation was completed but the results were not available to public as well as researcher on account of sensitive business information. The probe was challenged in High court of Karnataka and thereafter in Supreme Court of India but both courts refuse to intervention in probe issued by competition commission.[58] Their results are also not available to public on account of protected under the shield of business sensitive information.

The use of automated pricing algorithms transforms the market conditions by replacing parameters like price transparency, speed of price change, deep discounting, preferential sellers. In the traditional markets conscious parallelism usually happens in certain market conditions like homogeneous products, limited number of sellers in market, high price transparency. And all these parameters were rarely present in market, therefore, the demand of competition regulation also not popular as such. The injuries formed by the conscious parallelism in traditional market were limited and in small market it wouldn't cause major harm to overall surplus of consumer and other stakeholders of market and not frequent as such. But the conscious parallelism on digital platform entirely different from traditional in terms of the injuries. The sustainability of conscious parallelism on digital platform is high. The pricing algorithms are well equipped for speedy reaction and understand the strategy of opponent to respond it as per market conditions. These situations enable pricing algorithms to establish and sustain conscious parallelism and make extra profit by maintaining supra competitive price. The other feature like deep discounting helps to develop the cooperation among the sellers which replaces the competitive price. In

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[57] Editor, "CCI to probe Amazon, Flipkart for deep discounting"*The Times of India*Jan. 14, 2020 available at :https://timesofindia.indiatimes.com/business/india-business/cci-to-probe-amazon-flipkart-for-deep-discounting/articleshow/73236541.cms?utm_source= contentofinterest&utm_medium=text&utm_campaign=cppst(last visited on June 13, 2021).

[58] Business Insider, "Supreme Court asks Amazon, Flipkart to volunteer for CCI probe"*Business Insider* Aug. 9, 2021 available at: https://www.businessinsider.in/business/ecommerce/news/supreme-court-asks-amazon-flipkart-to-volunteer-for-cci-probe/articleshow/85173669.cms(last visited on July 12, 2022).

addition, it become more convenient to establish tacit collusion through algorithms and escape from competition penalties. The conscious parallelism in traditional and digital market set different outcomes. The neutrality in regulation towards to traditional not feasible in digital market conditions. The various algorithmic features like deep discounting, personalised pricing disturb the landscape of the competition law. Therefore, straightjacket formula of legality of conscious parallelism used in traditional market would lead to decline in consumer overall surplus and affects distribution of resources in economics. In light of that circumstances the legality of certain features of self-learning algorithms like deep discounting, retaliation of deviations needs to scrutinize in novel approach. The rule of reason and restraint of trade theories might help in such scrutiny, it seems that there is scope to regulate the use of automated pricing algorithms.

CHAPTER 4

GLOBAL JUDICIAL VIEWS ON ALGORITHMIC COLLUSION

4. INTRODUCTION

There is escalating the use of automated pricing algorithms replacing humans for pricing decisions in the digital market. These automated pricing algorithms are commonly perceived as a new threat to Competition law as addressed in third chapter. The probes of investigating deep discounting, surge pricing, personalised pricing becoming popular among the competition regulators. To understand the legal notion of such a threat, we analysed legal contexts of algorithmic collusions. There is an ongoing tussle to impute liability on algorithmic collusion due to certain unanswered philosophical propositions like; to what extent regulators can limit parallel behaviour to adopt their business decisions, and how longer such behaviour outside the scope of Competition law. These propositions enhance their importance in where algorithms systematically penalise their competitor's deviation from supra-competitive price by deep discounting, personalised and surge pricing. In order to impute liability over algorithmic collusion rule of reason has to expand with a new dimension. Therefore, we analyse interplay between algorithmic collusion with the rule of reason.

In Indian context Apex Court and competition commission finds that there is absence of hub and spoke conspiracy in Uber's business model. The reasons of collusion between all drivers of Ola/Uber to set prices through Ola/Uber is necessary to establish a hub and spoke conspiracy. The absence of any agreement on such among the drivers cannot establish Hub and spoke conspiracy.[1] Therefore, this chapter will revisit the basic concepts of section 3 of Competition Act, 2002, notion of the agreement, concerted actions, and attempt to superimpose on Uber' business model in order to address the legislative issues surrounding with it.

[1] *Samir Agrawal v. ANI Technologies Pvt. Ltd. and ors*., Case No. 37/2018 decided on 06.12.2018., Para 15 available at: https://indiankanoon.org/doc/84896048/(last visited on September 12, 2022).

4.1. STRUCTURE OF EXISTING COMPETITION ACT, 2002

Competition laws of various countries prohibit enterprises from agreeing explicitly and implicitly, which causes or is likely to cause an appreciable adverse effect on competition.[2] However, the wording of concept appreciable adverse effect stands highly subjective. Section 3 (1) of Competition Act, prohibits the anti-agreements

"No enterprise or association of enterprises or person or association of persons shall enter into any agreement in respect of production, supply, distribution, storage, acquisition or control of goods or provision of services, which causes or is likely to cause an appreciable adverse effect on competition within India"[3]

This Act only provides the subjective term appreciable adverse effect, enabling the jury to interpret it in context. While functioning as a regulator, section 19 (3) will assist in determining whether agreement within the preview of appreciable adverse effect. Clauses Section 19 (3) of the Competition Act, 2002

"(a) creation of barriers to new entrants in the market;

(b) driving existing competitors out of the market;

(c) foreclosure of competition by hindering entry into the market;

(d) accrual of benefits to consumers;

(e) improvements in production or distribution of goods or provision of services; or

(f) promotion of technical, scientific and economic development by means of production or distribution of goods or provision of services"[4]

Although, the Competition law in sections 3,4 and 19 not provided any exhaustive list of agreements or set of acts and conduct which constitute a violation in the purview of the legislation. Moreover, this situation is nearly identical worldwide because, practically, it is not possible to list out all kinds of anti-competitive transactions. This

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2 Competition Act, 2002, s.3(3).

3 Akruti Gupta, "Appreciable Adverse Effect of the Competition in the Market - Legal Bites"*Legal Bites* (2020) available at: https://www.legalbites.in/appreciable-adverse-effect-competition-market (last visited on July 12, 2022).

4 Competition Act, 2002, s.19(3), available at:https://cci.gov.in/images/legalframeworkact/en/the-competition-act-20021652103427.pdf (last visited on July 11, 2022).

impracticality in categorisation in the traditional method of rule 'per se illegal'. To tackle such impracticality the regulators may rely on rule of reason doctrine, it enables the regulator to prohibit even non-listed transactions. The doctrine of the rule of reason is a tool of interpterion. It provides interpretations based on some theories and objectives of competition law, like protection of the consumer, restraint of trade, and reallocation of resources, play a vital role in interpreting competition law. The jurisprudence of competition law has a remarkable history of norm diffusion of the rule of reason across countries.

4.2. CONTEXTUAL UNDERSTANDING OF RULE OF REASON

US judiciary developed the notable jurisprudence of "Rule of Reason" in the judgment of Addyston Pipe & Steel Co US Department of Justice (DOJ) observed that the power of congress to regulate interstate commerce is limitless; Justice Peckham remarked it is rightly enunciated by William Howard Taft that;

"The power to regulate interstate commerce is, as stated by Chief Justice Marshall, full and complete in Congress, and there is no limitation in the grant of the power which excludes private contracts of the nature in question from the jurisdiction of that body. Nor is any such limitation contained in that other clause of the Constitution which provides that no person shall be deprived of life, liberty or property without due process of law. It has been held that the word "liberty," as used in the Constitution, was not to be confined to the mere liberty of person, but included, among others, a right to enter into certain classes of contracts for the -purpose[5] of enabling the citizen to carry on his business*"*[6]

In this case, the Court enlarged the scope of restraint of trade and included private contracts within the Sherman Act, of 1890. However, in continuation of that "rule of reason" echoed in judgement of *Standard Oil Co. of New Jersey v. United States* court settled that rule of reason is the guiding principle in anti-trust laws and Court found that Standard Oil Co. of New Jersey guilty of monopolising the petroleum industry

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5 *Addyston Pipe and Steel Company et al., Appts., v. United States*, 175 U.S. Supreme Court, 211, (1899).

6 *Ibid.*

through a series of abusive and anti-competitive actions.[78] The Court divided Standard Oil into 34 several geographically separate companies.

In the judgment of *TELCO v. Registrar of Restrictive Trade Agreements Supreme Court of India* pointed out the severed "rule of reason" from "rule per se". While interpreting the definition of the Restrictive Trade Practice Supreme Court applied the "*rule of reason*". Itthat mere agreement allocating particular operation territory to vehicle dealer is not in the scope of the definition of restrictive trade practice in MRTP Act, 1969 is exhaustive and not inclusive and mentioned three essential criteria to measure restrictive trade practice by applying a rule of reason The first is to identify the facts specific to the business where the restraint will be applied. What was the situation before and after restraint was imposed? [9]Third, what are the nature and effects of restraint?[10]

This approach was inspired by United States Sherman's Act and other countries' competition policies. Due to this novel understanding, the shield of agreements and arrangements not expressly provided in the MRTP Act comes within the new Competition Act.

The government of India created a high-level competition law policy and law committee in 1999 to develop new legislative guidelines regarding the international framework compliance and modernize the competition law. Raghavan committee presented a report to the government in May 2000. Raghavan committee report the importance of the *'rule of reason'* along with a *'rule of per se'* in some instances

"It is impossible to provide an exhaustive list of agreements that attract the attention of such provision, and the "rule of reason" needs to be applied to individual cases. An illustrative list would include the following:

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7 *Standard Oil Co. of New Jersey v. the United States*, 221 U.S. Supreme Court, (1910), available at:https://supreme.justia.com/cases/federal/us/221/1/ (last visited on May 13, 2021).

8 Alleid Rescources, "The Politics of Oil and Gas Allied Resource Partners" available at: https://alliedresourcepartners.com/2020/03/the-politics-of-oil-and-gas/(last visited on June 10, 2022).

9 *Mr. R. N. Grover v. M/s. Rawal Apartment.*, Case mine, available at: https://www.casemine.com/judgement/in/587f39414a9326336e216f54 (last visited on June 10, 2022).

10 *TELCO v. Registrar of Restrictive Trade Agreements*, 1977 AIR 973, 1977 SCR (2) 685.

1) Agreements regarding fixing of purchase or selling prices

2) Agreements limiting quantities, markets, technical development or investment Agreements regarding territories to be served and sources of supply

3) Agreements regarding dissimilar treatment of equivalent transactions with other trading parties that place them at a disadvantage"[11]

4.2.1. Notion of Agreement

However, the definition of agreement under Section 2 (b) of the Act,

"Agreement includes any arrangement or understanding or action in concert,

(i) whether or not, such arrangement, understanding or action is formal or in writing; or

(ii) whether or not such arrangement, understanding or action is intended to be enforceable by legal proceedings"[12]

The term agreement is also a broader scope of interpretation. The CCI penalised the undertakings for bid rigging. It drew the inference that putting restrictions on the total maximum quantity to be supplied during rate contract time amounts to a collusive agreement within the extent of the agreement. CCI further observed, the term agreement is more comprehensive in scope and exhaustive in nature; even acts like nod and wink are enough to constitute agreement within the meaning of the Act. Also, clarify that only in rare situations is direct evidence of concerted action required to determine collusion among the parties.[13]Additionally, if there is no explanation for the Act or the conduct of the parties it is sufficient to bring a case under a competition regime. Most cases will require that an anti-competitive agreement or practice be inferred from multiple coincidences and other indicia.[14] Prohibition to participate in the anti-competitive agreement is a broader scope of interpretation in both dimensions

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[11] Government of India, "Raghavan Committee Report"(Ministry of Finance, 1999) available at:https://theindiancompetitionlaw.files.wordpress.com/2013/02/report_of_high_level_committee_on_competition_policy_law_svs_raghavan_committee.pdf(last visited on June 10, 2022).

[12] Competition Act, 2002 s. 2(b), available at:https://cci.gov.in/images/legalframeworkact/en/the-competition-act-20021652103427.pdf (last visited on June 10, 2022).

[13] *Competition Commission of India v. against M/S Puja Enterprises & Ors*, Case No.1 of 2012 by DG (S&D available at:https://indiankanoon.org/doc/172225172/ (last visited on May 10, 2022).

[14] *Ibid.*

of agreement and appreciable adverse effects on market. The *"rule of reason"*doctrine enlarges scope of competition law while dealing with practical contexts.

4.2.2. Definition of Collusion

Collusion is an agreement between two or more people to restrict competition. This agreement can be either an act of explicit, open communication or implicit communication. Collusion refers to a deceitful agreement between two or more rivals in order to limit open competition. It can be misleading, deceiving or defrauding others.[15] The economic effects of collusion and cartels are the same. Therefore, these terms are frequently used as substitutes for each other.

Collusion is not always in the formation of explicit communication between enterprises; sometimes, collusion may attend through implicit communication. In an oligopolistic market, enterprises independently control pricing and output decisions so that to respond to their competitor's strategy, this independent reciprocal response to the competitor's strategy would frame concerted actions of both enterprises, which is without an Act, of explicit or overt communication. Such concerted action is termed tacit collusion. In the absence of communication, consciously responding to a competitor's strategy and acting with parallel actions is called conscious parallelism.[16] Richard Posner clarifies the terminologies that equate each other in their economic effect: conscious parallelism, oligopolistic interdependence, and tacit collusion. Richard Posner prefers to continue with the term tacit collusion.*[17]*"In some circumstances competing sellers might be able to coordinate their pricing without conspiring in the usual sense of the term – that is, without any overt or detectable acts of communication. This is the phenomenon that lawyers call 'conscious parallelism' and some economists term 'oligopolistic interdependence', but which I prefer to call

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15 O'Sullivan, Arthur *et.al. "*Economics: Principles in Action*"Upper Saddle River, New Jersey* (2021) available at: https://www.gbv.de/dms/zbw/640430643.pdf (last visited on May 10, 2022).

16 Routers, "Glossary- Conscious Parallelism" available at:https://ca.practicallaw.thomsonreuters .com/ 5-591-4066?transitionType=Default&contextData=(sc.Default) &firstPage=true(last visited on March 12, 2019).

17 Richard A. Posner, *Antitrust Law* (University of Chicago Press, Chicago 2001).

tacit collusion in contrast to explicit collusion of the formal cartel or its underground counterpart"[18]

The tacit collusion or even pure price parallelism, as well as the enterprise's independent decision to follow price leadership among themselves, is not unlawful. However, any group member's arrangement for price fixing under express delegation, acquiescence, or understanding is unlawful, like an express agreement of joint action.[19]

"Court referred In American jurisprudence. 2d Volume 54, a passage on page 695 reads thus: The Sherman Act, does not out law price uniformity. An accidental or incidental price uniformity or even pure conscious price parallelism, is not itself unlawful. Moreover, a competitor's sole decision to follow price leadership- is not a violation of 15 USC S 1. On the other hand, a price- fixing conspiracy does not necessarily involve an express agreement, oral or written. It is sufficient that a concert of action is contemplated and that the defendants conform to the arrangement. The fixing of prices by one member of a group pursuant to express delegation, acquiescence, or understanding is just as illegal as the fixing of prices by direct joint action. A price-fixing combination is illegal even though the prices are fixed only by one member and without consultation with the others"[20]

Price fixing in any way it may be express or implied Act, of communication is illegal; however, price leadership is legal up to that extent only to follow the price leadership member, but the price fixed by the one member in order signalling others by way of delegation, acquiescence, or understanding in illegal.

4.3. ALGORITHM AS A TOOL OF COLLUSION

The use of algorithms in mathematics for division and calculation since antiquity, like division algorithms, was used in Babylonian mathematicians 2500 BC, and thereafter Egyptian mathematicians circa 1550 BC.[21] There is no universally accepted algorithm

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18 *Ibid.*

19 *Union of India v. Hindustan Development Corporation*, (1993) 3 SCC 499.

20 *Ibid.*

21 Chabert, Jean-Luc *et.al.* (eds.),*A History of Algorithms: From the Pebble to the Microchip* 35 (Springer New York, 1999).

definition due to its evolution and utility in various fields. As of now, we are concerned with the digital market; thus, we will adopt the definition of computer science; an algorithm is a logical input, a specific set of rules given to a computer to perform certain operations for desired output. Algorithms have been widely used in recent years for data processing, calculations, automate decisions, and other tasks.[22]

In recent decades businesses have been taking new dimensions of technology. Using technologically advanced tools in business is no longer a choice instead, it becomes necessary to adopt such technological changes to update within the business sphere. The highly transforming change occur in trading businesses, where enterprises meet their customer on digital platform and sell their products and goods on a digital platform; thus, the idea of brick mortar platform would become older in the coming days. Traditional market pricing decisions were in the hands of humans, whereas in digital market pricing, the software took pricing decisions. The algorithms are used for pricing software, generally called pricing algorithms. These pricing algorithms set and adjust their prices like humans, counter and reciprocal response to rivals' prices and adjust individual prices accordingly. Pricing algorithms become more complex when they use artificial intelligence to make pricing decisions. The use of artificial intelligence offers various tools to algorithms to become self-learning and get automated pricing decisions. This self-learning is mainly based on trial and error. Thus, self-learning automated pricing algorithms capable of setting prices, competing with rivals' prices, adopt new strategies to adjust their prices for profit optimisation.

Consequently, pricing algorithms creates a new challenge to competition regulator for their automated pricing decisions. Emilio Calvano pointed out through research made the intense observation that algorithms constantly and independently learn to charge anti-competitive prices by observing the gradual change in profit to the company. This research describes how reinforcement algorithms will lead to anti-competitive pricing.[23]In a research article, Dylan and Naik pointed out that pricing algorithms collude independently and unilaterally are not under the shield of competition law

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[22] David A. Grossman, *Ophir Frieder, Information Retrieval: Algorithms and Heuristics* (Springer New York, 2016).

[23] Emilio Calvano, Giacomo Calzolari, *et.al.*,"Artificial Intelligence, Algorithmic Pricing and Collusion"*Social Science Research Network* (2018) available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3304991(last visited on January 23, 2020).

whilst their joint conduct directly means for the competition enforcer.[24] Later, Ariel Ezrachi and Maurice E. Stucke described the contexts where the use of pricing algorithms resulted in collusion based on technological development and artificial intelligence.The Messenger scenario uses artificial intelligence to aid humans in the illegal formation of a cartel. In the Hub and Spoke scenario, one algorithm is used by multiple users to determine the price.[25]This practice can lead to higher prices. The Predictable Agent scenario is where different market actors use similar algorithms, but they interact. This results in tacit collusion or conscious parallelism,[26]This leads to higher prices. Digital Eye/God View scenarios use individual algorithms to learn about the market and then "independently decide the best way to maximise profit"[27]

Given the liability of collusion, the messenger and hub and spoke scenario is liable due to colluding behaviour though human intervention is directly liable for their concerted practice. The pricing algorithms are used to implement their understanding of concerted prices. However, in the case of digital eye scenario and predictable agent scenario are difficult to understand their liability due to the lack of human intervention, which is done by the automatic feature of pricing algorithms. However, these automated pricing algorithms undoubtedly learn to collude. The same was affirmed by authors Emilio Calvano and Giacomo Calzolari, who observed that self-learning algorithms could collude even just input price optimisation.[28] Therefore, it becomes necessary to inquire about the liability of automated pricing algorithms for their collusive outcome independently. In order to conduct a such inquiry into the liability of automated pricing

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24 Dylan I. Ballard and Amar S. Naik, "Algorithms, Artificial Intelligence, And Joint Conduct" *Competition Policy International,* (2017) available at :https://www.competitionpolicyinternational.com/algorithms-artificial-intelligence-and-joint-conduct/(last visited on January 23, 2020).

25 Alžběta Krausová, "Discussion Eu Competition Law And Artificial Intelligence: Reflection" available at :https://www.researchgate.net/publication/340004851_EU_Competition_Law_and_Artificial _Intelligence_Reflections_on_Antitrust_and_Consumer_Protection_Issues (last visited on June 12, 2019).

26 *Ibid.*

27 Ariel Ezrachi and Maurice E. Stucke, *Virtual Competition: the promise and perils of the algorithm-driven economy* (Harvard University Press, Cambridge, 2016).

28 Emilio Calvano, Giacomo Calzolari, *et.al.*,"Artificial Intelligence, Algorithmic Pricing and Collusion"*Social Science Research Network 3* (2018) available at: https://ssrn.com/abstract=3304991(last visited on January 23, 2020).

algorithms for their collusive outcome, we need to frame some legal postulates for the same.

Whether The Collusive Outcome of Automated Pricing Algorithms met the Criteria of Agreement?

4.4. REQUISITES TO ESTABLISH AN AGREEMENT

The term agreement defined under Section 2 (b) of the Act,

"agreement" includes any arrangement or understanding or action in concert,

(i) whether or not, such arrangement, understanding or action is formal or in writing; or

(ii) whether or not such arrangement, understanding or action is intended to be enforceable by legal proceedings;"[29]

The term agreement is also the broader scope of interpretation in competition law. The Competition Commission of India penalised the undertakings for bid rigging. It inferred that putting restrictions on the total maximum quantity to be supplied during rate contract time amounts to a collusive agreement within the scope of the term agreement. CCI also observed, the term agreement is more comprehensive in scope and exhaustive in nature, even acts like nod and wink are enough to constitute agreement within the meaning of the Act. Also, clarify that only in rare situations is direct evidence of concerted action required to determine collusion among the parties.[30] Additionally, if there is no explanation for the Act, or the conduct of the parties it is sufficient to bring a case under a competition regime. Most cases will require that an anti-competitive agreement or practice be inferred from multiple coincidences and other indicia.[31] Prohibition to participate in the anti-competitive agreement is a broader scope of interpretation in both dimensions of agreement and appreciable adverse effects in market conditions. The *"rule of reason"* doctrine enlarges the scope of competition law while dealing with practical contexts.

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[29] Competition Act, 2002 s. 2(b), available at:https://cci.gov.in/images/legalframeworkact/en/the-competition-act-20021652103427.pdf (last visited on June 10, 2022).

[30] *Competition Commission of India v. against M/S Puja Enterprises & Ors*, Case No.1 of 2012 by DG (S&D)available at:https://indiankanoon.org/doc/172225172/(last visited on May 10, 2022).

[31] *Ibid.*

4.5. ANALYSIS OF BAYER AG CASE FOR UNDERSTANDING NOTION OF AGREEMENT

4.5.1. Bayer AG case

Bayer AG is the parent company of European chemical and pharmaceutical groups and a leading medical preparation manufacturer, including the active ingredient *nifedipine* for the treatment of cardiovascular diseases.[32] The company commonly trades under the trade name 'Adalat'. In European Union member states, the national health authorities, directly and indirectly, decided the prices of Adalat products. However, in non-member states, the Spanish and French wholesalers alleged that Adalat is pricing lower pricing averagely of up to 40% than the United Kingdom. Therefore, Spanish and French companies started to export Adalat's medical preparations to the United Kingdom; consequently, Adalat lost its revenue; to avoid this revenue loss, they put the restriction of quota demanded by the Spanish and French wholesalers. Spanish and French Wholesaler aggrieved and alleged that limiting quota to import is a trade restriction and is violative of Article 101 TFEU. However, Bayer AG denied that this is not resulting from the agreement, therefore, not within the ambit of Article 101 of TFEU.

The contested issue was whether unilaterally putting a restriction on import quotas would be considered an agreement in Article 101 of TFEU.

The European Court of Justice, Court focussed on the notion of agreement that the existence of an agreement is necessary for violation of Article 101 of TFEU and also observed that unilateral conduct without assistance from other undertakings cannot be inferred as an agreement.[33]European Court of Justice also observed that, while annulling the decision of commission's decision to enter into the scope of agreement within the scope of Article 85(1) of the Treaty of European Union, it requires the presence of concurrence of wills between at least two parties, but how concurrence of wills established equally not relevant. When parties agree to behave in a certain way

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[32] *Bundesverband der Arzneimittel-Importeure ev and commission of the European Communities v. Bayer AG*, , (EU:C:2004:2) available at :https://curia.europa.eu/juris/liste.jsf?language=en&num=C-2/01(last visited on May 10, 2022).

[33] *Bundesverband der Arzneimittel-Importeure ev and commission of the European Communities v. Bayer AG*, , (EU:C:2004:2) available at:https://curia.europa.eu/juris/liste.jsf?language=en&num=C-2/01(last visited on May 10, 2022).

on the market, it is called concurrence of wills.[34]"The Article 85(1) of the Treaty 'centres around the existence of a concurrence of wills between at least two parties, the form in which it is manifested being unimportant so long as it constitutes the faithful expression of the parties' intention'. The Court further recalled, in paragraph 67 of the same judgment, that for there to be an agreement within the meaning of Article 85(1) of the Treaty it is sufficient that the undertakings in question should have expressed their common intention to conduct themselves on the market in a specific way"[35]

Therefore, limiting the export quota would not amount to an agreement within the scope of Article 85(1) of the Treaty of the European Union however, that unilateral conduct is utterly free from the assistance of others; hence, Bayar AG's Conduct was not violative of the treaty.

4.6. NOTION OF CONCERTED ACTION

In order to understand the notion of agreement within the scope of Competition law, the term concerted practice plays a vital role. The definition of the agreement includes any arrangement, understanding or concerted action, either formal or written.

4.6.1. Sugar Cartel Case and Requisite of an Actual Working Plan for Concerted Practice

The Court used the definition of Concert to clarify the notion of 'Concerted Practice' in various cases in European case laws.[36] In the famous sugar cartel case in 1975, multiple sugar producers from three different European countries were found guilty of coordinating their competitive strategy to respond to the overproduction of sugar in Belgium by limiting the national quota and purchase price.[37] The sugar producers

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34 *Ibid.*

35 *Ibid.*

36 *Suiker Unie v. Commission,* (ECR 1663, EU:C:1975:174, 1975) available at:https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A61973CJ0040(last visited on March 13, 2021).

37 De Brandt Pierre and Probst Julie, "Proving concentration in the text of online platforms: a comment on the Eturas case" 75 *European Competition and Regulatory Law Review*, (2017), available at:https://core.lexxion.eu/article/CORE/2017/1/13?_locale=de(last visited on March 15, 2021).

argued that the sugar industry was well-regulated, so it was impossible to coordinate any anti-competitive strategy.[38]

European Court acknowledged that it is legal to enterprises to adopt their competition strategy concerning the conduct of their competitors. However, Court disagreed with the producers' claim that there were no actual working plan essential criteria for violating Article 101 of TFEU. Court further explains that the article strictly prohibits direct or indirect contact with competitors when such contacts by its object or effect influence the competitor's strategy and when such contact shares its competition strategy to adopt it by competitors.[39]

Thus, this decision pointed out that, to establish a concerted practice, there is no requirement of an actual working plan for such contacts by object or effect if it influences competitor's strategy or sharing own conduct to adopt it by them is enough to satisfy the meaning of concert.

4.6.2. Imperial Chemical Industries Ltd. v. Commission EU (Dyestuffs Case)

Pure parallel behaviour is not prohibited in competition laws. The dichotomy of pure parallel behaviour and concerted practice ought to consider in a test of the illegality of similar behaviour of companies. This case provides legal reasoning for differentiating parallelism and concerted actions.[40] However, it is a settled principle that parallel behaviour can establish substantial evidence of concerted actions.

European Commission was prosecuted Imperial Chemical Industries for concerted practice against the nine European manufacturers acting in five different European countries; they all increased their prices in 1964, 1965, and 1967 uniformly and simultaneously. It was considered a price leadership, where one manufacturer announces to increase the prices by a specific percentage as soon as other

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38 Gerard Damien and Fox Eleanor M., *European Competition Law: Cases, Texts and Context* 139 (Edward Elgar Publishing, 2017).

39 De Brandt Pierre and Probst Julie, "Proving concentration in the text of online platforms: a comment on the Eturas case" 75 *European Competition and Regulatory Law Review*, (2017), available at:https://core.lexxion.eu/article/CORE/2017/1/13?_locale=de(last visited on March 15, 2021).

40 *Imperial Chemical Industries Ltd. V. Commission of the European Communities*,ECLI:EU:C:1972:70, (1972) available at :https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri= CELEX: 6196 9CJ0048&from=EN (last visited on March 13, 2021).

manufacturers raise their prices uniformly. The commission alleged that this was concerted practice between manufacturers, impeding competition in the relevant market by its object and effect, therefore violative of Art. 85 of the Treaty of Rome (Currently Art. 101 of TFEU).[41] Court affirmed that the commission's allegation that the competitors increase their prices simultaneously in the same market and the same range of products would amount to the result of parallel behaviour, which was evidence of concerted practice. Thus, the Court held that such concerted practice violated Art. 85 of the Treaty of Rome (Currently Art. 101 of TFEU).

4.6.3. Wood Pulp Case

It is an important decision of the European Court which sets essential parameters to establish the guilt of concerted practice without evidence of prior contact between the competitors.[42]

European Commission held guilty 40 wood pulp-producing companies and their trade associations for their behaviour of concerted practice. Commissions rely on the conduct of companies that make quarterly price announcements; such announcements are sometimes simultaneous and uniform. Therefore, the commission held that this amounted to concerted practice within the meaning of article 101 of TFEU.

European Court annulled this decision on the ground that these quarterly price announcements. However, uniform and simultaneous, nevertheless, such behaviour was not adequate to lessen the uncertainty of the future conduct of competing companies. Therefore, a system of simultaneous price announcements was not within the ambit of concerted practice under art. 101 of TFEU.[43] However, Court also explains in support of his decision, parallel behaviour would be evidence of concerted

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41 Molitor and Charles, "The rise of pricing software: does algorithmic collusion fall under European competition law?"*University of Louvain*, (2021) available at :https://dial.uclouvain.be/downloader/downloader.php?pid=thesis%3A32841&datastream=PDF_01&cover=cover-mem (last visited on March 13, 2021).

42 *Ahlström Osakeyhtiö and others v Commission of the European Communities*,EU:C:1993:120, Para 63-65, Case number = C-89/85, available at:https://curia.europa.eu/juris/liste.jsf?num=C-89/85&language=en(last visited on January 12, 2021).

43 *Ahlström Osakeyhtiö and others v Commission of the European Communities*,EU:C:1993:120, para 48-52, Case number = C-89/85, available at:https://curia.europa.eu/juris/liste.jsf?num=C-89/85&language=en(last visited on January 16, 2021).

practice if concentration is the only possible explanation for their competitor's parallel conduct.[44]

4.6.4. Rajasthan Cylinders and Containers Case in India

Supreme Court observed that the Indian gas cylinders market condition was reached at oligopsony in nature; therefore, identical bidding was apparent output, but still, it would not be sufficient to make an inference of concerted practice,[45]The Supreme Court refers to the guidelines on the application of Article 101 of the Treaty on the Functioning of the European Union for horizontal agreements.[46]

CCI also noted range of decisions that it has been challenging to find a cartel based on the mere exchange of price-sensitive information because it did not lead to evidence of price fixation. In Ruchi Soya's decision, CCI observed that competitors agreed to raise the price of some commodity items in India; it did not constitute a concerted practice because there was no fixation on price and limitation to supply.[47]

4.7. INTERPLAY OF ALGORITHMIC COLLUSION AND CONCERTED PRACTICE

In their research work, Dylan I. Ballard and Amar S. Naik clearly pointed out that algorithms collude independently and unilaterally are not under the shield of competition law.[48]Emilio Calvano (2017) observed that algorithms consistently and independently learn to charge anti-competitive prices by observing gradual company profit changes. This research describes how reinforcement algorithms will lead to

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44 *Ibid.*

45 *Rajasthan Cylinders and Containers v. Union of India*, AIR 2019 SC (SUPP) 801.

46 European Union, "Guidelines on the applicability of Article 101 of the Treaty on the Functioning of the European Union to horizontal cooperation agreements" available at:https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011XC0114(04)&from=EN (last visited on June 10, 2021).

47 *Shri Nirmal Kumar Manshani v Ruchi Soya Industries Ltd*, CCI Case No. 76 of 2012, available at:https://indiankanoon.org/doc/181199102/ (last visited on 13 may 2021).

48 Dylan I. Ballard and Amar S. Naik, "Algorithms, Artificial Intelligence, and Joint Conduct'' available at: https://www.sheppardmullin.com/media/article/1649_CPI%20-%20Ballard-Naik.pdf (last visited on November 10, 2021).

anti-competitive pricing.[49] The concern about the anti-competitive behaviour of automated pricing algorithms was not common in all contexts of the digital market. Indeed, there are many numerous strategies for establishing anti-competitive outcomes. Some anti-competitive strategies might be developed by the developer and some by self-learning algorithms through their deep learning features. It is challenging for anti-trust enforcement agencies to find out such strategies and prosecute them due to their complex nature and insufficient tools for investigation agencies in all jurisdictions.

To establish guilt in competition law, we must mainly qualify two criteria: agreement or concerted practice. To qualify the criteria of agreement or concerted action, communication stands quintessential factor. However, this research will explore the insufficiency of the traditional understanding of the agreement, especially in Indian jurisdiction, compared to USA and EU jurisdictions. It is noteworthy that both jurisdictions highly impacted Indian competition law. However, this impact on provisions would not satisfy the hunger for interpretations in judgments. We are re-considering the scope of interpretations of agreement, concerted practice the context of self-learning algorithms in Indian jurisdiction especially estimate to find out nuances in interpretations in word agreement and concerted actions in the environment of self-learning algorithms.

Self-learning algorithms may use to report and combat rival's deviation from supra-competitive prices. Conscious parallelism would be sustained in the market like a traditional market, with self-learning algorithms capable of predicting rival's reactions and, through repeated transactions, help to learn and decode competitor's strategies. In order to maintain the environment of supra-competitive prices, it requires an independent mechanism for retaliating deviations through deep discounting or deviations from collusive equilibrium.[50] EC guideline also explains that "retaliation

[49] Calvano Emilio and Calzolari, *et.al.*,"Artificial Intelligence, Algorithmic Pricing and Collusion" available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3304991 (last visited on May 10, 2022).

[50] European Commission, "Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings" available at:https://eur-

that manifests itself after some significant time lag, or is not certain to be activated, is less likely to be sufficient to offset the benefits from deviating. For example, if a market is characterised by infrequent, large volume orders, it may be difficult to establish a sufficiently severe deterrent mechanism, since the gain from deviating at the right time may be large, certain and immediate, whereas the losses from being punished may be small and uncertain and only materialise after some time. The speed with which deterrent mechanisms can be implemented is related to the issue of transparency. If firms are only able to observe their competitors' actions after a substantial delay, then retaliation will be similarly delayed and this may influence whether it is sufficient to deter deviation"[51] In the algorithmic collusion context, Professor Mehra[52] Research work notes "that they may be better at recognising deviations from the tacitly collusive outcome and trigger punishment strategies. That eliminates the upside of deviating from a tacitly collusive outcome as such attempts would be detected with a high probability and very quickly, and thus gains would be short-lived. Robo-sellers would be less tempted than their human counterparts by short-run gains"[53] In sum, self-learning algorithms can retaliate deviations from supra-competitive price equilibrium by using several moves and counter moves within a short time.[54]

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lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52004XC0205%2802%29 (last visited on June 10,2022).

51 European Commission, "Guidelines on the assessment of horizontal mergers under the Council Regulation on the control of concentrations between undertakings" available at:https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX%3A52004XC0205%2802%29(last visited on June 10, 2022).

52 Mehra, "Antitrust and the Robo-Seller: Competition in the Time of Algorithms"*Minnesota Law Review,* 100, Forthcoming, available at: http://ssrn.com/abstract=2576341 (last visited on June 10, 2022).

53 Dot Econ Study for the Competition Commission of Singapore, "E-commerce and its impact on competition policy and law in Singapore" 83 Final Report, (Oct. 2015), available at :https://www.dotecon.com/assets/images/DotEcon-Ecommerce-Final-Report.pdf (last visited on June 10, 2022).

54 Jill Priluck, "When Bots Collude"*New Yorker* (2015), available at: http://www.newyorker.com/ business/currency/when-bots-collude [https://perma.cc/35D6-CMB4]. (Last visited on June, 10 2022).

4.8. CASES SUMMARY

Serial Number	Case Name	Findings	Implications in Uber's Business Model.
1)	Bayer AG Case	Unilaterally putting limit on import quota, conduct without assistance from other undertakings cannot be inferred as an agreement.	The requirement of concurrence of will goes in favour of Uber's business model, because drivers of Uber not agree and intend to limit the price.
2)	Sugar Cartel Case	There is no requirement of an actual working plan for such contacts by object or effect if it influences competitor's strategy or sharing own conduct to adopt it by them is enough to satisfy the meaning of concert.	The price leadership which influences competition strategy even without intent, or any plan may consider as concerted action; therefore, it minimizes the requirement of Ubers agreement with driver and make inference of hub and spoke conspiracy.
3)	Dyestuffs Case	The commission's allegation that the competitors increase their prices simultaneously in the same market and the same range of products would amount to the result of parallel behaviour, which was evidence of concerted practice.	The price parallelism is not blindly legal which can be inferred as concerted practice if it happens simultaneously with homogeneous product and market; therefore, Uber's business model may infer as anti-competitive prices on that ground.
4)	Wood Pulp Case	Parallel behaviour would be evidence of concerted practice if concertation is the only possible explanation for their competitor's parallel conduct.	In Uber's business model drivers entered into platform with other intent possibly not for just pricing strategies therefore it helps to escape from guilt of hub and spoke conspiracy.
5)	Rajasthan Cylinders Case	The identical bidding was apparent output, but still, it would not be sufficient to make an inference of concerted practice.	Although price of Ubers ride is similar in nature it is not sufficient to infer about to concerted action of Ubers driver.

Serial Number	Case Name	Findings	Implications in Uber's Business Model.
6)	Ruchi Soya Case	The competitors agreed to raise the price of some commodity items in India; it did not constitute a concerted practice because there was no fixation on price and limitation to supply.	Uber's driver may rely on the argument that there is no such limitation of supply and no fixation of price. It may just result of surge pricing to satisfy the demand of market during peak demands.
7)	M/S Puja Enterprises India	The commission observed that the term agreement is more comprehensive in scope and exhaustive in nature; even acts like nod and wink are enough to constitute agreement within the meaning of the Act.	It minimizes the standards of establishment of agreement within competition laws.

4.9. ANALYSIS OF CASES

The analysis of the cases shows that mere price parallelism between Uber and drivers not amount to violation of competition rules, in other hand the notion of agreement actual working plan for collusion is also not required to establish to prove concerted action. it further supported by rule of reason for meet objectives of competition in market. The rule of reason may further require to test whether Uber's business model causes to market failure or not. If it is satisfying that Ubers business model causing market failure and thereby defeating the purpose of competition in market.in such situation intervention through the rule of reason may justify in market.

The summary demonstrated the mixed outputs and implications of jurisprudence in Uber's business model. If we apply Sugar Cartel and Dyestuff cases Uber's business model then, court may reach the conclusion that the price parallelism of drivers in Uber's business model need not actually plan to limit the prices at high level. Consequently, by relying on such arguments court may pronounce the judgment against Uber's business model for hub and spoke conspiracy. This stance also supported by the Indian case of M/S Puja Enterprises which also minimize the

standards of agreement up to mere wink and nod, it helps to infer the hub and spoke conspiracy flows from the Uber's business model. To strengthen the stance of hub and spoke conspiracy the application of rule of reason needs to test on various parameters. To justify intervention in use of pricing algorithms needs novel approach of rule of reason based on the competition law theories. This approach would become more strengthen by support of objectives of competition legislations such as protection of consumer, distribution of resources etc.

4.10. CONSTITUTIONAL PROVISION FOR COMPETITION LAW

Indian constitution does not have any specific provisions for the competition law but regulators may rely on existing provisions of the constitution which reflects the objectives of the competition legislation. The objectives of the competition legislation reflect some constitutional norm such as distributive justice which directs state to remove economic inequalities in society.[55]

"Article 39- Certain principles of policy to be followed by the State: The State shall, in particular, direct its policy towards securing-

(a) that the citizens, men and women equally, have the right to an adequate means to livelihood;

(b) that the ownership and control of the material resources of the community are so distributed as best to subserve the common good;

(c) that the operation of the economic system does not result in the concentration of wealth and means of production to the common detriment;

(d) that there is equal pay for equal work for both men and women;

(e) that the health and strength of workers, men and women, and the tender age of children are not abused and that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength;

(f) that children are given opportunities and facilities to develop in a healthy manner and in conditions of freedom and dignity and that childhood and youth

[55] The Constitution of India, art. 39.

are protected against exploitation and against moral and material abandonment."[56]

Article 39 provides guideline to law makers of India. The basic principle enumerated in Article 39 (b) is foundational principle of Competition Act, 2002. According to that state must ensure the reallocation of material resources among the society for common good. The concentration of wealth would lead the injustice in community. The objective of competition legislation reflects this in recital of statute in addition to that section 54 of Competition Act, 2002 also empowers competition regulator to pass suitable order in the favour public interest. In addition to that distributive justice is important features of Indian constitution.

The recital of competition law reflects the same idea through the redistribution of wealth in society with view to remove inequalities and promote the competition in market. The fair competition without such distributive justice remains notional in the sense.

The right to trade also important provision of constitution also secured by the important doctrine of restraint of trade. However, the right to trade can be easily sustain the interpretation of restraint of trade.[57]

"Article 19. Protection of certain rights regarding freedom of speech etc.

(1) All citizens shall have the right

(a) to freedom of speech and expression;

(b) to assemble peaceably and without arms;

(c) to form associations or unions;

(d) to move freely throughout the territory of India;

(e) to reside and settle in any part of the territory of India; and

(f) omitted

(g) to practice any profession, or to carry on any occupation, trade or business

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56 *Ibid.*

57 The Constitution of India Act, 1950 art. 19(1)(g), 19(6).

(6) Nothing in sub clause (g) of the said clause shall affect the operation of any existing law in so far as it imposes, or prevent the State from making any law imposing, in the interests of the general public, reasonable restrictions on the exercise of the right conferred by the said sub clause, and, in particular, nothing in the said sub clause shall affect the operation of any existing law in so far as it relates to, or prevent the State from making any law relating to,

(i) the professional or technical qualifications necessary for practicing any profession or carrying on any occupation, trade or business, or

(ii) the carrying on by the State, or by a corporation owned or controlled by the State, of any trade, business, industry or service, whether to the exclusion, complete or partial, of citizens or otherwise"[58]

Freedom of trade is fundamental right to Indian citizens also applies to individual and artificial person such as company, institutions etc. The state machineries cannot unsettle this fundamental right by any means rather they have positive duty of protect it. The legislative framework of competition law is also part of this fundamental right. It ensures the free market and promote competition by removing entry barriers, anything which cause appreciable adverse effect of the competition.

4.11. DIGITAL COMPETITION BILL, 2022

The parliamentary committee on Finance recommended the need for new legislation to regulate big companies like Apple, Google, Facebook, and Amazon.[59] The committee highlighted these big companies' data dominance and business models in the market. The committee suggested a new term for these big companies' business models SIDI (Systematically Important Digital Intermediaries). The big companies collected massive amounts of data from customers through various channels, and by using such data, these companies established a natural monopoly in the market, and this monopoly grew over time. This situation creates natural and artificial entry barriers to new entrants in the market, which dilute the competition sphere. The new

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58 *Ibid.*

59 Report of the Parliamentary Standing Committee on Finance on "Anti-Competitive Practices by Big-Tech Companies" (Ministry of Corporate Affairs, 2022) available at: https://loksabhadocs .nic.in/lsscommittee/Finance/17_Finance_53.pdf (last retrieved on August, 10 2023).

legislation aimed to regulate these natural monopolies to promote competition in the market, thereby enabling competition regulators to channel the market conditions before market failure. Proposed legislations enable the regulators to regulate the market by ex-ante regulatory actions against the big companies. The committee discussed the major issues of anti-steering provisions, platform neutrality, exclusive tie-up, self-preferencing, search and ranking preferencing, and deep discounting.[60]

4.11.1. Loopholes For Algorithmic Collusion in Digital Competition Bill, 2022

The committee recommended the transparency norm for deep discounting. But the committee not considered deep discounting as a tool for digital cartels and violative of existing competition laws.[61] The SIDI companies like Uber consistently offer deep discounting without any economic rationale, which badly affects the consumer surplus and traditional taxi industry in India. The rebellion voice of stakeholder's expressed through the various strikes, but the government failed to provide satisfactory solutions. The issue of deep discounting unsettles the perception regulators in terms of consumer welfare. In this instance, it seems beneficial to consumer welfare, but when used as a cartel tool, it becomes a serious and complex threat to competition law. Mere transparency norms in the digital age cannot resolve the issue of deep discounting. Therefore, the new legislation should consider this novel problem with higher importance.

4.12. ROLE OF JUDICIARY IN ALGORITHMIC COLLUSION

The objectionable feature of the automated pricing algorithms leads to algorithmic collusion which is basically without any human intervention. The conventional understanding of collusion is based on the prosecution without a human will. The collusion in the digital era of competition is gating new market conditions and fully equipped from the artificial intelligence-based software; therefore, algorithmic collusions in digital platforms create new challenges to the conventional understanding of collusions. It also reiterates the need for change in judicial interpretation, which deems the fit for the digital markets. These new judicial interpretations must be aligned with the objectives of the competition law. Theories

60 *Ibid.*

61 *Ibid.*

like restraint trade, reallocation of recourses, and consumer protection will access to support the new judicial interpretation of the important doctrine of the rule of the reason that may apply to consumer protection and the promotion of competition in the digital market. These judicial interpretations would relax the criterion of actual working plans for consulted actions and relax the requirement of meeting minds in agreements, enabling competition regulators to prosecute algorithmic collusion in the digital market. Protecting consumer choices on digital platforms also plays an important role to strengthen these judicial interpretations.

CHAPTER 5

COMPARATIVE STUDY OF TAXI REGULATIONS

5. INTRODUCTION

This chapter thoroughly examines different competition concerns by evaluating them within the framework of current laws and pending legislation in the parliament. The initial section of the chapter focuses on contrasting the regulatory approaches applied to Uber's business models and conventional taxi services. This comparison is conducted to unearth the core competition-related problems. Moving forward, the second segment explores into a comprehensive investigation of Uber's business model, elucidating the legal dynamics governing the interactions between Uber, customers, and drivers, encompassing rights and legal obligations. Lastly, the third part of the chapter engages in an in-depth analysis of India's emerging digital competition bill, exploring its potential implications and contributions to the competition landscape. Uber's business model managed to avoid allegations of a conspiracy by sidestepping the hub-and-spoke framework, mainly due to the lack of an agreement between drivers and Uber for price fixing. However, there were additional concerns that remained unchallenged in previous cases involving Uber's business model. These concerns encompassed practices like constraining prices through extensive discounting and implementing personalized and surge pricing methods that could potentially exploit consumers. These issues present a unique dimension within the realm of competition law literature and contemporary legal scenarios.

Therefore, to address this unchallenged competition concern, we need to address this empirical evidence in support, which strengthens the conclusions of the third chapter. To figure out such uncontested competition concerns in Uber's business model, this chapter will study Uber's business model with the help of doctrinal research methodology. And finally generates insights for empirical work. To check Uber's business model, the history and growth of Uber's business model, traditional taxi; and radios taxi was considered.

Taxi or Taxicab and just Cabs are the common words for vehicles hired by passengers or groups of passengers. A passenger often hires such a vehicle to move from one location to another in the city. Nearly every city in the world has this system of taxi hiring for transportation. Hackney carriage services firstly provided the taxi hiring service in London in 1605.[1] Later similar services were started in Paris in the year 1637.[2] After that, they were hiring taxi services became famous worldwide as trade and commerce became a significant part of globalisation. In order to regulate the affairs of taxi services in London, the parliament passed the Hackney Carriage Act, of 1635; under this legislation, the first carriage licence was granted to hackney carriage services in 1662.[3] Before the internet age, taxis were usually booked from their stops by communication of address and fare. Nevertheless, in recent days since mobiles and the internet have grown, the mode of taxi booking has changed. We can book a taxi through voice call or a mobile application developed by cab booking agencies. These cab booking agencies make revolutionary changes in the Taxi hiring industry. Cab booking agencies are a highly organised industry that provides passengers with the facility to hire a taxi through mobile applications. Neeraj Gupta established the well-organised Meru Cabs company for hailing taxis in 2006.[4] Currently, this company has been acquired by the Mahindra Group of companies. However, a radical change occurred in the company when mobile-based cab-hailing companies entered the market after 2010. These companies share the GPS location and ride information with drivers and decide fares accordingly through the mobile-based application. In short, these online cab booking agencies have replaced the communication of passengers with taxi drivers for choice of location, fare, the starting point of the ride, and the passenger's location. The intermediatory of these online cab booking agencies transform the taxi-hailing services in the country. The significant impact of this

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1 Gilbey, "Early Carriages and Roads" 29 *Vinton Walter London* 125 (1903).

2 lire aussi, "Les taxis : 378 ans d'histoires et d'engueulades" available at: https://blog.francetvinfo.fr/deja-vu/2015/06/14/les-taxis-378-ans-dhistoires-et-dengueulades.html (Last visited on June 14, 2015).

3 Firth, C.H., Rait, R.S., (eds.), "June 1654: An Ordinance for the Regulation of Hackney-Coachmen in London and the places adjacent" *Acts and Ordinances of the Interregnum, 1642–1660*, London (1911) available at:https://www.british-history.ac.uk/ (last visited on June 16, 2015).

4 Supraja Srinivasan, "Taxi operator Meru Cabs looks to turn to B2B clients" *The Economic Times,* Apr. 9, 2018, available at:https://economictimes.indiatimes.com/topic/uber-care/news/6 (last visited on June 16, 2015).

transformation was seen in the traditional taxi services industry in terms of profit share, loss of business, competition concerns, loss of profits, and labour market. However, this transformation impacted the general public, too, by providing convenient cab booking, loss of bargaining, pre-time booking, GPS tracking of cars, fair pricing, choice of vehicle, public safety and insurance. Several companies in India provide online cab booking through mobile applications. However, the leading players, Ola and Uber, cover a top portion of the market share. These are the few companies in India.

5.1. COVERAGE OF TERM UBERS BUSINESS MODEL

Uber is a leading multinational company that operates in various countries like USA and India and holds a larger market share. Therefore, for brevity, reference Uber's business model in general, which represents a similar kind of cab booking agency that provides an online application-based cab booking facility. Their pricing decision is also based on pricing algorithm software, like Ola, Meru, Lyft, and Sidecar. It also includes their parent and subsidiary companies. We termed Uber's business model in general.

5.1.1. Ola

Ola is registered in India and is now operating in Australia, New Zealand,[5] UK international level. Ola was established in 2010 by Bhavish Aggarwal and Ankit Bhati, with headquarters in Bangalore, Karnataka. It is important to note that Ola was criticised for surge pricing. The Indian government said that Ola inflates the prices to old customers and intends to harm competition by lowering the price initially and then hiking up the price in accord with the dependency of the customer to eliminate competitors from the market.[6]

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5 Reuters, "India's Ola forays into New Zealand in latest overseas push" available at: https://www.reuters.com/article/us-india-ola-newzealand-idUSKCN1LY0H4(last Visited on March 22, 2022).

6 Saurabh Jain, "Indian government accuses Ola, Uber and other aggregators of inflating cab prices for older customers"*Business Insider* available at: https://www.businessinsider.in/ business/news /indian-government-accuses-ola-uber-and-other-aggregators-of-inflating-cab-prices-for-older-customers/articleshow/91488894.cms (last Visited on March 22, 2022).

5.1.2. Uber

Uber is American based multinational company established in March 2009 by Garrett Camp and Travis Kalanick. Uber provides services in nearly 72 countries and 10,500 cities in the world.[7] Uber does not own any vehicle to hire but acts as an intermediatory between passengers and cab drivers and shares the commission for the same.[8]

5.1.3. Meru

The well-organised Meru Cabs company for hailing taxis was established by Neeraj Gupta in 2006.[9] Currently, this company has been acquired by the Mahindra Group of companies. Meru alleged that Uber for abuse of dominance; such a complaint was dismissed by the Competition Commission of India.

5.1.4. Savaari

Savaari is a private limited company that provides online cab booking for intercity travel. The services are available in nearly 98 cities in India. Gaurav Agrawal established the company in the year of 2006.[10]

5.1.5. Bharat Taxi

The company provides a platform for affordable cabs. Customers can book cabs for various purposes online or by calling.[11]

5.1.6. Gozo Cabs

the company was established in 2015 and expanding its business in India. It provides intercity and multiple-city cabs through online booking basis.[12]

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7 United States Securities and Exchange Commission, "Form" available at:https://www.sec.gov/ix?doc=/Archives/edgar/data/1543151/000154315122000008/uber-20211231.htm(last visited on June 12, 2022).

8 Uber, "Uber's upfront pricing, explained" available at:https://www.uber.com/us/en/ride/how-it-works/upfront-pricing/ (last visited on July 23, 2022).

9 Supraja Srinivasan, "Taxi operator Meru Cabs looks to turn to B2B clients" *The Economic Times*, Apr. 9, 2018, available at:https://economictimes.indiatimes.com/topic/uber-care/news/6 (last visited on June 16, 2015).

10 Savaari, *About us*, available at:https://www.savaari.com/aboutus(last visited on June 16, 2015).

11 Bharat Taxi, *Services*, available at:https://www.bharattaxi.com/services (last visited on June 16, 2015).

12 Gozo Cab, *Services* available at:https://www.gozocabs.com/ (last visited on June 16, 2015).

5.1.7. Spice Cabs

The company was established in 2009, and its headquarters at Delhi, India. This company also provides online booking of cabs.[13]

These are the Companies operating in India. Apart from this, some multinational companies like Ola, Uber, Lyft, and Sidecar operate globally. Nowadays, Uber, Lyft, and Sidecar are the leading players in the transportation of taxi industry. They collectively hold a larger partition of the market. In India, Ola and Uber are the big players in the market, and they also have aggressive competition strategies. Apart from that, the technologically advanced mechanism supported by venture capital enables them to capture market share. Previously they allowed booking through calls and websites, but now they restrict their booking only to mobile applications. Earlier, they acted as an intermediatory between passengers and drivers, they did not have their cars, but now they have started to buy cars and Lessing them to drivers to ensure a continuous supply as per demand. This aggressive competition strategy ensures a rise in market share for these mega players. These companies engaged in aggressive market strategies using customer data to capture maximum market share. They analyse the rival's price and update accordingly by discounting free rides. Resultantly, Uber became a mega player in the market, valued at 68 billion US$ in 2017, and raised up to 120 billion US$. In the Indian scenario, Ola raised their revenue up to 2222 crore rupees in the financial year of 2018. It is important to note that growth fell from 90%, 57%, and 20% in the year between 2016 to 2018, the reason behind its aggressive competition strategy of surge pricing. It is noteworthy that around 18,000 cars were seized for non-payment of loan instalments due to an imbalance between drivers' income and expenditure due to surge pricing.[14]

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13 Spice Cabs, *About us*, available at: https://www.spicecabs.com/(last visited on June 16, 2015).

14 Alisha Sachdev and Mugdha Variyar, "Ola, Uber face severe shortfall of drivers and cars"*CNBC* Nov. 19, 2019 available at: https://www.cnbctv18.com/economy/ola-uber-supply-crunch-drivers-sees-vehicles-seized-lending-falls-50-4676761.htm(last visited on June 16, 2015).

5.2. DIFFERENCES BETWEEN UBER BUSINESS MODEL, TRADITIONAL TAXIS

Uber is a major multinational corporation with operations in several countries, including the USA, UK, and China, in addition to India and holds a more significant market share. For simplicity, we can refer to Uber's business model, a similar taxi booking service offering an online application-based taxi booking system. Their pricing is driven by software that calculates pricing similar to Ola, Meru, Lyft and Sidecar. They also include their subsidiary and parent businesses. We referred them to Uber's business model broadly. However, the traditional taxis are works without the pricing software they manually determine the price and consumer have opportunity to bargain such price based on their judgment and experience. The vehicle used in the traditional taxis are usually by own or any other individual. In Uber's business model vehicle was owned by the driver or sometimes by company and the Uber acts like just intermediatory platform between clients and cab drivers through mobile application or website. It exchanges the information of price, distance, vehicle number, location of cab and consumer, route to travel. The radio taxis are slightly different from these two types where the route is usually predetermined and fare also determined, consumer may contact through cab drivers through call or ticket stations and travel accordingly. From consumer perspective the Uber's business model seems most convenient and hassle free in terms of fare decision, availability of taxis, professionalism in business and time consuming also. The Uber's business models become popular in short time due to these advantages in the world. But at the end Uber's business model shares an existing resources traditional taxi and just made the platform for consumer and drivers and resulted in profitable giants. The economic rationale behind such huge profits questioned time to time with blaming their aggressive pricing strategies.

5.3. NATURE OF UBER'S BUSINESS MODEL

The traditional taxi booking procedure is free from any devices like mobile. The passenger personally met the driver at the station, discussed the location and fare, and confirmed the ride. However, in Uber's business model, the ride-booking agency is Uber/ Ola through the mobile application. The passenger needs to download the application and on their GPS tracker, and the same is also applicable to the driver;

they confirm the location of the passenger or track through GPS, and the passenger inputs their choice of location, then the application will show the nearby available drivers for the proposed ride with vehicle type. It also shows the estimated time and fare for the ride. Once the passenger confirms the exact details, share them with the driver and confirm with the driver immediately driver details, Vehicle number and contact number are shared with the passenger. After completion, the passenger can pay either through an app of Uber/Ola, any digital mode, or any cash. Uber will deduct the commission fee and deposit the remaining money in the driver's account. In the end, passengers and drivers give feedback to each other for safety, decency, cleanliness, and professionalism; accordingly, Uber decides the drivers' ratings. Upon cancellation of the ride from the passenger side, Uber charges the cancellation fee, which can be deducted from the next ride.[15]

It is noteworthy that the price determination methods between traditional taxis and Uber's business model are entirely different. Uber's business model has equipped with technologically advanced tools like GPS tracking of both passengers and drivers, traffic congestion, and route finder, which enables them to shortest route and avoid traffic and a distance calculator which helps Uber to predict the accurate competitive price for in a fraction of time. Traditional taxi depends on the judgment and skill of the drivers for their price determination, which requires information on location, distance, and experience. On the contrary, Uber's business model relies on the pricing algorithms software for price determination which uses all technologically advanced tools and makes the pricing decision. Uber can usually use various parameters for pricing decisions like a basic tariff, time distance, type of motor vehicle, wait time during signals, booking fee, reservation charges, tolls, and cancellation fee.

It is essential to notice that Uber's business model determines the price through pricing software, which enables them to change the price accordingly per the increased market demands. It was commonly observed that during peak hours like office and school closure times, the price of Uber ride is hiked up to twice or sometimes triple, and during off times, it may be lower than even traditional taxi prices. These features of Uber's business model have commonly termed surge pricing

[15] Uber, *Services* available at: https://www.uber.com/in/en/ (last visited on August 12, 2022).

or dynamic pricing. Uber was criticised for competition concerns arising out of surge pricing. It was alleged that due to surge pricing Uber puts the traditional taxi market into a disadvantageous competitive position. However, Uber defended the same by stating that Uber is just an information service provider and intermediary between passengers and drivers.[16]

5.3.1. Differences and Discrimination Amongst the Traditional Taxi Market and Uber Business Model

Apart from the technologically advanced tools and surge pricing software, the traditional taxi system and Uber's business model also face different law regulations. However, traditional taxi market pricing decisions are well-regulated in the world. In nearly all cases, Uber defended itself as an intermediary between passengers and drivers and information providers in the market. In continuation, that also contended that Uber is not entirely a part of the transportation business and escaped from liability of regulatory compliances. Traditional taxis are already regulated by various legislations like road safety, cleanliness, taximeters to calculate restricted fares, insurance, necessary permits, and liabilities under various tax legislations, driver licenses, strict liability under the motor vehicle act, and third-party insurances, technical and safety standards. In such a context, Uber's business model placed an advantageous position by default against the traditional taxi system.[17] Uber's business model can lower prices than the traditional taxi system that complies with all these necessary compliances.[18] In addition, surge pricing in Uber's business model allows for significantly high prices during higher demands and lowers the prices when the competition context requires eliminating rivals from the market.

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16 Uber, *How surge pricing works* available at: https://www.uber.com/in/en/ (last visited on August 12, 2022).

17 Mishal Ahmed, Johnson *et.al.,* "The impact of Uber and Lyft on taxi service quality: evidence from New York City" *NET Institute Working Paper No. 16* available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3267082. (last visited on March 4, 2022).

18 David Gabel, "Are traditional taxi firms doomed? An answer from the capital market" available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2781319(last Visited on March 16, 2022).

5.3.2. Regulatory Compliances (Public Safety, Insurance, Driver's Licences)

The media reports and cases often observed that Uber's business model faced legal sanctions in various countries during past years.[19] However, in rare cases, only Uber was banned by legal sanctions.[20] In countries like India, Portugal, New Zealand Finland, Denmark, Bulgaria, Germany, Italy, Sweden, Brazil, Netherlands, and others Uber's business model is frequently fined and sanctioned for non-compliances over regulatory issues like licenses, and vehicle permits. The decision of the Asociación Profesional Élite Taxi (APET)v Uber Systems Spain[21] the case is still pending in the Mercantile Court of Barcelona, Spain, for consideration of the nature of Uber's business activity. Court of Justice for the European Union (CJEU) framed the important legal issue: "*Be considered to be merely a transport service or must it be considered to be an electronic intermediary service or an information society service?"*[22]Asociación Profesional Élite Taxi (APET) alleged Uber's business model that Uber is providing transport services and is currently not complying with necessary permissions under the transport laws of Spain. Resultantly, Uber gets a competitive advantage over other taxi providers. Hence, APET raised a complaint before the competition regulator against Uber's business model for seeking relief to cease the activity Uber. On the other hand, Uber opens the defence by stating that Uber is not providing transportation services. However, it is a technologically advanced and innovative business model as an information service provider between drivers and passengers, ultimately leading to benefits for passengers. This case will decide the true nature of Uber's business model and whether this is involved in transportation services or not. If the finding of such is affirmative, then all transportation compliances apply to Uber's business model immediately. The ruling is also essential in other companies based on the digital and sharing economy.

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19 Greg Dickinson, "How the world is going to war with Uber"*The Telegraph portal* available at: https://www.telegraph.co.uk/travel/news/where-is-uber-banned/ (last visited on April 4, 2022).

20 Ryan Craggs "Places around the world where Uber is banned. Oyster portal" (2017) available at: https://www.cntraveler.com/story/where-uber-is-banned-around-the-world (last visited on March 4, 2022).

21 *Asociación Profesional Elite Taxi v. Uber Systems Spain SL*, C-434/15 Spain Supreme Court, (20 Dec. 2017), available at :https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62015CC0434&from=en(last visited August 10, 2022).

22 *Ibid.*

5.4. UBERS STAND OVER REGULATORY COMPLIANCE AND UBERIFICATION

Due to the frequent allegation from customers and other taxi drivers' associations related to surge pricing and other regulatory complaints, Uber decided to wash out its hands of these legal sanctions and declare the policy of White Paper. In 2013 it released the (Uber Policy White Paper 1.0, 2013) policy in its new business model.[23] By publishing this, Uber wants to change its image as a prominent and genuine corporation among the regulator and the public. Thereby Uber decided to follow the idea of "good example" and setting standards for its regulatory compliances and declared the promise to make appropriate compliance through this white paper. Uber also promises to follow the standards related to safety, quality, and statutory insurance compliances as a part of their idea of a good example. As a result of Uber's new business policy and white paper, Uber's business model gets silent approval from the regulators and judicial powers. While declaring the white paper, Uber openly argued that if any new business model is not objected to by court and regulators, then this is the result of its appropriateness. However, such arguments are not affirmed by any regulator.[24] Apart from this white paper ideology, Uber's business model is not aligned with regulatory compliances like drivers' licenses and necessary regulatory permits; as a result, Hungary's government ceased operations of Uber.[25] Similarly, in the city of Buenos Aires criminal court finds that Uber's business model is not in accord with the regulatory framework, which creates a hazard to public safety and security.[26]

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23 Uber, *Uber Policy White Paper 1.0. Ben Edelman portal* available at:https://www.benedelman .org/uber/uber-policy-whitepaper.pdf(last Visited on March 16, 2022).

24 Jasenko Marin, SinišaPetrović *et.al.* (eds.), *Uber Brave New Service or Unfair Competition* (Ius Gentium Comparative Perspectives on Law and Justice, 2020).

25 Krisztina Than, Krisztina Fenyo, *Uber to suspend operations in Hungary due to govt legislation* available at: https://www.reuters.com/article/us-uber-hungary-exit-idUSKCN0ZT0RS (last visited on September 21, 2022).

26 Rebecca Bellan, "The Dangerous Standoff Between Uber and Buenos Aires"*Bloomberg*, available at:https://www.bloomberg.com/news/articles/2019-05-20/inside-the-battle-between-uber-and-buenos-aires(last visited on September 21, 2022).

5.4.1. Relationship of Uber with Driver and Client

It is significant to note that Uber's business model appears to be successful in discharging from regulatory compliances by claiming itself as a digital intermediatory instead transport service provider. The Spanish court's decision is still pending in the case of Asociación Profesional Élite Taxi (APET)v Uber Systems Spain.[27] Which decides the legal distinction of whether Uber's business model is digital intermediatory or information society service for a transport service provider. However, the European Courts consider Uber an ordinary taxi company. Now it is open to all national authorities of the world to take necessary inspiration from this decision of the European Court to regulate Uber's business model.[28]

5.5. OBJECTIVE AND ROLE OF UBER

Upon perusal of the legal documents and Uber's submission to various authorities and incorporation documents in various countries, it was commonly observed that Uber's primary purpose is to provide a digital platform to passengers and drivers to establish a contract of carriage. However, it is essential to note that as Uber Proposed to consider a digital information society, it cannot survive independently from transportation services. That logically means Uber's business model is auxiliary to primary transport services. In the absence of transportation services, Uber Information society cannot survive. It simply denotes that Uber's business model is integral to transport services.[29]

5.5.1. Uber's Relationship with Drivers and User

Uber's set of terms and conditions varyas per the country's legal norms. In a factual position Uber's relationship, with the client is broader in terms of pricing decisions and other related things like deciding the shortest route for the ride. Therefore, Uber is naturally responsible for any damages caused by technical problems. However,

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27 *Asociación Profesional Elite Taxi v. Uber Systems Spain*, SL C-434/15, available at:https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62015CC0434&from=en(last visited August 15, 2022).

28 *Ibid.*

29 Krisztina Than, Krisztina Fenyo, *Uber to suspend operations in Hungary due to govt legislation* available at: https://www.reuters.com/article/us-uber-hungary-exit-idUSKCN0ZT0RS (last visited on September 21, 2022).

Uber's terms and conditions specifically systematically exclude all liabilities. It is important to note that.

Uber also did not guarantee Uber's driver (Third Party) and his ability to a safe drive. In addition to that, Uber's terms and conditions usually exclude liability by captioning "limited liability" and declaring that "Uber shall not be liable for indirect, incidental, special, exemplary, punitive, or consequential damages, including lost profits, lost data, personal injury or property damage related to, in connection with, or otherwise resulting from any use of the services, even if uber has been advised of the possibility of such damages, uber shall not be liable for any damages, liability or losses arising out of: (i) your use of or reliance on the services or your inability to access or use the services; or (ii) any transaction or relationship between you and any third-party provider, even if uber has been advised of the possibility of such damages. Uber shall not be liable for delay or failure in performance resulting from causes beyond Uber's reasonable control"[30]

On the contrary, Uber's indemnity clause was drafted very artistically "You agree to indemnify and hold Uber and its officers, directors, employees, and agents harmless from any claims, demands, losses, liabilities, and expenses (including attorneys' fees) arising out of or in connection with: (i) your use of the Services or services or goods obtained through your use of the Services; (ii) your breach or violation of any of these Terms; (iii) Uber's use of your User Content; or (iv) your violation of the rights of any third party, including Third Party Providers"[31]

From the perusal of Uber's legal terms and conditions and sections"limited liability", "indemnity", Uber systematically washed out its hands of liability and from the driver's ability. On the contrary, allocate the indemnity to Uber's users for damages caused to Uber irrespective of consideration of losses to Uber drivers. It establishes Uber's relationship with the client is too limited at inception, but the functional

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30 Uber, *Ubers Legal Terms and Conditions Limited Liability* available at:https://www.uber.com/ legal/en/ document/?name=general-terms-of-use&country=india&lang=en(last visited August 12, 2022).

31 Uber, *Ubers Legal Terms and Conditions, Indemnity* available at :https://www.uber.com/legal/ en/document/?name=general-terms-of-use&country=india&lang=en(last visited on August 29, 2022).

jurisprudence and tortious liability of strict liability arising out of the statutory norms cannot be waived by mutual agreement between parties.

5.6. DISCRIMINATION IN REGULATION OF FARES TRADITIONAL AND UBER TAXIS

The real discrimination between traditional and Uber taxis is the legal permissibility of surge pricing. It creates a natural monopoly on Uber's business model and also like similar companies. Besides that, it puts traditional taxis' disadvantageous competitive position over Uber's. The traditional taxi market is highly regulated in terms of the portion of fare and freights limited by statutory provisions. In India, the State government decides the portion of fares and freights within maximum and minimum limits. The Motor Vehicle Act, 1988 also sets the norms for prices and other regulations like safety, environmental, and other requisite permissions under the statute for the carriage of travellers' and things in public. Under section 66 of the Motor Vehicle Act, 1988, transport vehicles (passenger or goods) should take permission from the regional or state authorities and renew accordingly. In case of failure to obtain such necessary permission section 192A of the Motor Vehicle Act, 1988 provides punishment to both owner and driver.[32] Section 67(1)(d)(i) of the Motor Vehicle Act, 1988 empowers state transport authorities and regional transport authorities to issue necessary directions and control the road transport fares and freights including both maximum and minimum. Moreover, section 84 (c) of the Motor Vehicle Act, 1988 requires charging accordingly. If the permit holder breaches the norms of fare, their permit can be suspended or cancelled by the transport authorities.[33] It simply means that the liability under this statute is cast upon the driver

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[32] The Motor Vehicle Act, 1988 s.66, *"No owner of a motor vehicle shall use or permit the use of the vehicle as a transport vehicle in any public place whether or not such vehicle is actually carrying any passengers or goods save in accordance with the conditions of a permit granted or countersigned by a Regional or State Transport Authority or any prescribed authority authorising him the use of the vehicle in that place in the manner in which the vehicle is being used"*available at; https://legislative.gov.in/sites/default/files/A1988-59.pdf (last visited on June 10, 2022).

[33] The Motor Vehicle Act, 1988 s. 84 (c),*"The following shall be conditions of every permit (c) that any prohibition or restriction imposed and any fares or freight fixed by notification made under section 67 are observed in connection with the vehicle to which the permit relates" And Section 86 (a) provides "Cancellation and suspension of permits (1) The transport authority which granted a permit may cancel the permit or may suspend it for such period as it thinks fit (a) on the breach of any condition specified in section 84 or of any condition contained in the permit"*

and vehicle owner, and through terms and conditions, Uber's business model is exempted from such statutory liability. It is important to note that Uber can get directly punished for their violative pricing decisions from their pricing software. However, the same statute also limits the prices for midnight and during the daytime. If the Motor Vehicle Act, 1988 considers that "Uber's business model is part of transport services" like driver and owner of the vehicle and casts liability over them, then Uber's business model for surge pricing would probably go through the strict scrutiny of this statute in India.

5.7. COMPETITION CONCERNS IN UBER'S BUSINESS MODEL

It charges their price by the pricing algorithms without any regulatory threshold of minimum and maximum price. On the other side, traditional taxis charge their prices through a taximeter; their prices are subject to the statutory regulation of the Motor Vehicle Act, 1988. That scenario puts traditional taxis in a disadvantageous competitive position. Regulatory compliances like strict liability, insurance, necessary permits, and taxes are hurdles to the traditional taxi market. On the other hand, Uber's business model is exempted from all these liabilities so that it can put a lower price to increase its market share and sustain its monopoly over the traditional taxi market. And then higher their price on pick time to gain more profit as monopolistic profit. Apart from that, other competitive issues still occur due to Uber's business model. In 2015 European Parliament conducted a study to enumerate the possible negative impact of Uber's business model at the socio-economic level. The study reported that Uber's business model would lead to natural monopoly, violation of regulations and safety protocols, unfair competition, and discrimination.[34] with passengers, and breach of privacy data of passengers.[35] Moreover, some authors pointed out that Uber's business model can build a de facto monopoly in the market over the

available at:https://legislative.gov.in/sites/default/files/A1988-59.pdf (last visited on August 18, 2022).

[34] Berger T, Chen C *et.al.*,"Drivers of disruption? Estimating the Uber effect", *European Economic Review*, available at: https://ideas.repec.org/a/eee/eecrev/v110y2018icp197-210.html(last visited on August 19, 2022).

[35] Azevedo and Maciejewskii, "Social, economic and legal consequences of Uber and similar transportation network companies (TNCs)"*European Parliament*, (2015)available at :https:// www.europarl.europa.eu/RegData/etudes/BRIE/2015/563398/IPOL_BRI(2015)563398_EN.pdf (last visited on August 22, 2022).

traditional taxi market.[36] The traditional taxi industry faces two-way challenges. One is regulatory and competitive issues due to Uber's business model in Norway.[37]

5.8. LAWSUITS AGAINST UBER ACROSS THE GLOBE

There are several lawsuits against Uber worldwide from drivers, passengers, government authorities, consumer associations, and traditional taxi associations. Some of them ordered sanctions on Uber's business model. The significant and common defence of Uber was that Uber is an information society service based on a digital platform and intermediatory between drivers and passengers.[38] Therefore, Uber is not responsible for acts done by the drivers and also for regulatory compliance. Uber is taking advantage of legal uncertainty present in an existing legal model. We exclude cases other than the competition issue, for the scope of this research work is limited to competition law. The competition cases against Uber involve the issues of regulatory compliances and discrimination against the traditional taxi industry, predatory pricing, abuse of dominance, discriminatory treatment of drivers, surge pricing, and higher pricing.

5.9. INDIAN CASES

5.9.1. Meru Travel Solutions Private Limited v. Uber India Systems Private Limited

The complainant is also a cab booking company that filed a complaint against Uber for abuse of dominance by predatory pricing. Meru alleged that Uber provided reduced tariffs and deep discounts to the customer. It also proved that Uber's net loss of Rs. 204 per trip intends to eliminate competitors. The Competition Commission dismissed the complaint against Uber by pointing out that there was no proof that

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36 Cooper, "How Uber could become a nightmarish monopoly"*The Week portal*, available at : https: //theweek.com/articles/675434/how-uber-could-become-nightmarish-monopoly(last visited on November 14, 2022).

37 Dotterud Leiren, Aarhaug, J, "Taxis and crowd-taxis: sharing as a private activity and public concern" 5 *Internet Policy Review*, 2 (2016) available at: https://policyreview.info/articles/ analysis/taxis-and-crowd-taxis-sharing-private-activity-and-public-concern (last visited on August 10, 2022).

38 Heather Kelly, "Uber's never-ending stream of lawsuits"*CNN Business* available at: https://money.cnn.com/2016/08/11/technology/uber-lawsuits/(last visited on December 15, 2022).

Uber was in a dominant position in the relevant market.[39] The order of commission was reversed by the Appellate tribunal observed that the market share is not the only factor to prove the dominant position; other factors like technology and the consumer are also essential to decide the dominant position. Therefore, issued the probe directed Director-General to initiate an investigation. Uber was aggrieved by such a decision and preferred to appeal to the Supreme court of India. The Supreme Court dismissed the appeal and confirmed the investigation order of the appellate tribunal.[40]

5.9.2. Samir Agrawal v. ANI Technologies Pvt. Ltd. and ors

The Independent consumer filed a complaint against the Indian company Ola and US-based company Uber for Concerted action by colluding prices through algorithms. The complaint states that drivers of Ola and Uber are independent contractors, and Ola and Uber decide prices for them. Ola/Uber acts like Hub, and drivers Act, like Spokes in such price conspiracy. It was vehemently alleged that Ola/Uber's business model colluded prices for their drivers. The conduct of Ola/Uber is to facilitate a cartel. In addition, it was alleged that drivers of Ola/Uber could not charge lower prices than those decided by the algorithms, which fall under the resale price maintenance. The passengers are put in a minor bargaining position. Ola/ Uber is taking advantage of information asymmetry; prices are charged according to a willingness to pay and as per the capacity of the passenger. This resultantly higher prices in the market. Competition Commission finds that the collusion between all drivers of Ola/Uber to set prices through Ola/Uber is necessary to establish a hub and spoke conspiracy. The absence of any agreement on such among the drivers cannot establish Hub and spoke conspiracy.[41] The commission denied the allegation of resale price maintenance on the ground that drivers are not reselling the ride, and there is no floor price agreed upon between drivers and Ola/ Uber.[42] For all these

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39 *Meru Travel Solutions v. ANI Technologies and ors*, Competition Commission of India, No. 25-28 of 2017, (decided on 20.06.2018) available at:https://indiankanoon.org/doc/112127205/(last visited on July 18, 2022).

40 *Uber India Systems Pvt. Ltd. v. Competition Commission Of India & Ors.*, (Civil Appeal No. 641 Of 2017), available at :https://main.sci.gov.in/supremecourt/2017/ 2103/2103_2017_5_ 2_16524_ Judgement_03-Sep-2019.pdf (last visited on September 12, 2022).

41 S*amir Agrawal v. ANI Technologies*, W.P. 37 of 2018, available at: https://indiankanoon.org/doc/ 84896048/(last visited on September 15, 2022).

42 *Ibid.*

terms of judgment, the commission dismisses the complaint. The appeal preferred into Supreme Court also confirms the commission's findings.[43]

5.10. SOUTH AFRICA CASE AGAINST UBER

In 2015 South African drivers' traditional metered taxi association filed a complaint to the South African Competition Authority, alleging that Uber is charging predatory pricing and abuse of dominance. Nevertheless, the commission dropped out all charges against Uber by pointing out that Uber is not in a dominant position; therefore, the issue of predatory pricing was not sustainable.[44]

5.11. UNITED STATES CASE AGAINST UBER

5.11.1. Flywheel Taxi v. Uber

In the US District Court, Northern District of California (San Francisco), Flywheel is a cab booking company that alleged Uber for predatory pricing.[45] Where the court dismisses the complaint by quoting the expert opinion of Mark Lemley that pricing below competitors' price or even below cost is not violative of Anti-trust laws, it would not harm the consumer. Instead, it benefits the consumer. Predatory pricing is the general nature of competition; instead, it seems efficient firms can do it through technological advancements. Predatory pricing would only get an anti-competitive stance when their strategy is to drive out competitors from the market, which also affects the consumer by limiting choices under monopoly behaviour.[46] The court observed that Uber is not in a dominant position and the predatory pricing strategy is not to drive out competitors from the market; instead, it intends to provide efficient services.

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43 *Ibid.*

44 Loretta Adamu, "SA's Competition Commission has dropped all charges brought against Uber by the Metered Taxi Association" *Techcabal* Oct. 21, 2016, available at: https://techcabal.com/2016/10/21/sas-competition-commision-has-dropped-all-charges-brought-against-uber-by-the-metered-taxi-association/ (last visited on August 10, 2022).

45 Jack Morse, "Flywheel Taxi (Née DeSoto) Sues Uber for Predatory Pricing" *Sfirst News*, Nov. 3, 2016, available at: https://sfist.com/2016/11/03/flywheel_taxi_sues_uber_for_predato/(last visited on November 10, 2022).

46 FTC, "Predatory or Below-Cost Pricing" available at:https://www.ftc.gov/advice-guidance /competition-guidance/guide-antitrust-laws/single-firm-conduct/predatory-or-below-cost-pricing (last visited on August 12, 2022).

5.11.2. Spencer Meyer v. Travis Kalanick

The case was not filed directly on Uber, stead it was prosecuted against the CEO of Uber, Travis Kalanick; it was alleged that the respondent developed a business model based on pricing algorithms to collude between drivers of its agency and makes a profit from it. It was also contended that Uber holds 80% of transport network companies. Uber's executives placed reliance on consumer welfare, and technological advancements enabled Uber to charge lower prices.[47] This innovative model is convenient to use and reduces the cost of search and time. However, the complaint was admitted, but the outcome of this case has not yet been decided.[48]

5.12. EUROPEAN UNIONCASES

The decision of the *Asociación Profesional Élite Taxi (APET)v. Uber Systems Spain*[49] the instance was decided in the Mercantile Court of Barcelona, Spain, to consider the nature of Uber's business activity. The "Court of Justice for the European Union (CJEU)" framed the important legal issue: "*Be considered to be merely a transport service or must it be considered to be an electronic intermediary service or an information society service?"*[50]Asociación Profesional Élite Taxi (APET) alleged Uber's business model that Uber is providing transport services and is currently not complying with necessary permissions under the transport laws of Spain. Resultantly, Uber gets a competitive advantage over other taxi providers. Hence, APET raised a complaint before the competition regulator against Uber's business model for seeking relief to cease the activity Uber. Finally, by appreciating the notion of economic involvement in "Uber's business model" in transport business activity, the Courts pronounced the judgment against Uber. They stated that Uber is not just an intermediatory service but should be considered a transport business.

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47 *Spencer Meyer v. Travis Kalanick*, United States District Court, 1:15 Civ. 9796 (JSR), available at : https://law.justia.com/cases/federal/district-courts/new-york/nysdce/1:2015cv09796/451250/37/ (last visited on August 12, 2022).

48 Andrew Arthur Schmidt, "First Amended Complaint" available at: https://s3.amazonaws.com/ pacer-documents/119/451250/127117551855.pdf(last visited on August 12, 2022).

49 *Asociación Profesional Elite Taxi v. Uber Systems Spain SL*, C-434/15 (2017)) available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:62015CC0434&from=en(last visited on November 15, 2022).

50 *Ibid.*

The cases against Uber's business model commonly alleged the abuse of dominance by charging predatory pricing much below the actual cost. Although the economic rationales behind such predatory prices are missing, the competition regulators are not convinced of the need for regulation. The assumption that Uber's business model is just intermediatory was changed in certain jurisdictions, including India, due to continuous protests from stakeholders for Uber's business model. Uber's business model attained a natural monopoly in the market and possesses a large amount of customer data. This natural monopoly was perceived as an exploitation of consumers, drivers, and traditional taxis, resulting in protests and lawsuits worldwide. The existing competition rules do not enable regulators to intervene in the market. But a specific market study conducted by regulators in India, the Competition commission remarked that Uber's business model exploits consumer surplus through surge and personalised pricing. The transport ministry guideline of India further convinced to introduce price ceiling norms on cab aggregators along with other statutory liabilities such as insurance, labour safety, consumer safety, and insurance. In addition, this guideline also decides the proportionate shares of drivers and Uber to stop the exploitation of drivers; it states that 80% of the rent must be allotted to the drivers. However, such measures impliedly addressed the disruptiveness of Uber's business model in market conditions. Although the standards of price ceiling were adopted, it still won't satisfy the other concern of competition laws such as Uber's business model hub and spoke conspiracy led in supra-competitive prices which replace the competition in cooperation. The price ceiling measures sophisticated pricing, enabling Uber's business model to conveniently escape the competition's liabilities. Therefore, it creates the need to substantiate allegations of consumer exploitation with empirical evidence.

CHAPTER 6

COMPETING IN THE DIGITAL ERA: AN EMPIRICAL STUDY OF CAB BOOKING AGENCIES IN MAHARASHTRA

6. INTRODUCTION

The first part of hypothesis is proved by highlighting the features of automated pricing algorithms to establish and sustain cartels on the digital platform. The empirical work analysed Uber's business model to identify competition law concerns involved in such a model. Potential competition issues are surge pricing, predatory pricing, personalised pricing, and higher prices, which harm the consumer surplus and the traditional taxi market. The worldwide cases filed against Uber's business model where the issue of competition was involved. It also discovers that predatory pricing was anti-competitive and the allegation that Uber is not responsible for other regulatory compliances like insurance and necessary permits; therefore, traditional taxis are forcibly placed into a disadvantageous competitive position. As a result of such, Uber can charge lower/predatory pricing. Where Uber regularly defended that Uber is just a cab aggregator and information provider society, not a transport service provider. The outcome of research suggests that automated pricing algorithms collude automatically and set the collusive prices even without the input of such. In addition, it was commonly alleged that Uber charges personalised and higher prices from consumer to consumer due to information asymmetry.

6.1. OBJECTIVES AND GOALS FOR THE EMPIRICAL STUDY

The empirical study aimed to test the insights from the literature and support the understanding through empirical evidence. These are the insights from the research work would test by this empirical study.

a) To investigate whether Uber's business model positions the company competitively advantageously over traditional taxis by examining the perspectives of key stakeholders, including passengers, drivers, and traditional taxi drivers.

b) To analyze whether Uber's business model employs surge pricing and predatory pricing methods which violates the competition laws by reducing consumer surplus.

c) To determine whether Uber's business model employs predatory pricing tactics that could potentially harm passengers by reducing their options and displacing traditional taxis from the market.

d) To assess whether Uber's business model utilizes personalized pricing and collusive pricing practices, and to measure customer perceptions of transparency regarding these pricing strategies.

6.2. DATA COLLECTION

The researcher collected primary data from three categories of respondents are passengers, drivers, and traditional taxi of Ola and Uber companies. These two companies provide similar cab booking services through a mobile application and largely operating in state of Maharashtra. The researcher collected primary data from passengers, drivers, and traditional taxi Drivers through interview schedule method. The universe of the study is state of Maharashtra. And three cities have been selected, Pune, Mumbai and Nagpur from Maharashtra. Respondents for the research are Passengers, Ola/Uber Drivers, and Traditional taxi drivers.

Category of Respondents	Description of Respondents	Total Number of Respondents
Category I	Passengers of Ola/Uber companies.	150
Category II	Drivers of Ola/Uber companies either operating own or company vehicle.	177
Category III	Drivers of traditional taxis.	106

Table- The table shows the category wise respondents.

6.3. JUSTIFICATIONS FOR DATA COLLECTION TECHNIQUE

The chosen data collection technique is substantiated by a following reasons. The three different respondent categories: passengers, drivers associated with Ola and Uber companies and traditional taxi drivers. These categories are selected due to their

significance in the research objectives. These categories are chosen based on their integral roles and experiences within the cab booking mechanism, ensuring a comprehensive exploration of the research objectives.

Ola and Uber, providing analogous cab booking services through mobile applications, are strategically important and has significant market share in the transportation sector, particularly in Maharashtra. The other companies also operating in three cities but these companies are playing leadership role in development of digital intermediatory and using high technologies for pricing strategies. The researcher has been used the interview schedule to collect primary data, comprehensively facilitating in-depth interactions with respondents.

The study is geographically confined to Maharashtra, a strategic decision driven by the region's concentration of relevant transportation services. Within Maharashtra, three key cities are purposively selected for data collection: Pune, Mumbai, and Nagpur. These cities were chosen due to their representative nature, reflecting diverse urban settings and transportation dynamics prevalent within the state. By encompassing a varied geographical spread, the research aims to enhance the applicability and relevance of its findings.

6.4. DATA COLLECTION TECHNIQUE

The interviews are taken in three cities personally by researcher. Researcher personally recorded the data collected from the respondents' passengers, drivers, and traditional taxi drivers. Currently, the taxi industry in India is divided into two major parts: an online cab booking agency and the traditional taxi method, where passengers meet with cab drivers and discuss rides in public places. The interviews of passengers and drivers aimed to understand their perceptions regarding surge, predatory, personalised, and collusive pricing. The interviews also include questions regarding transparency and fairness of the business.

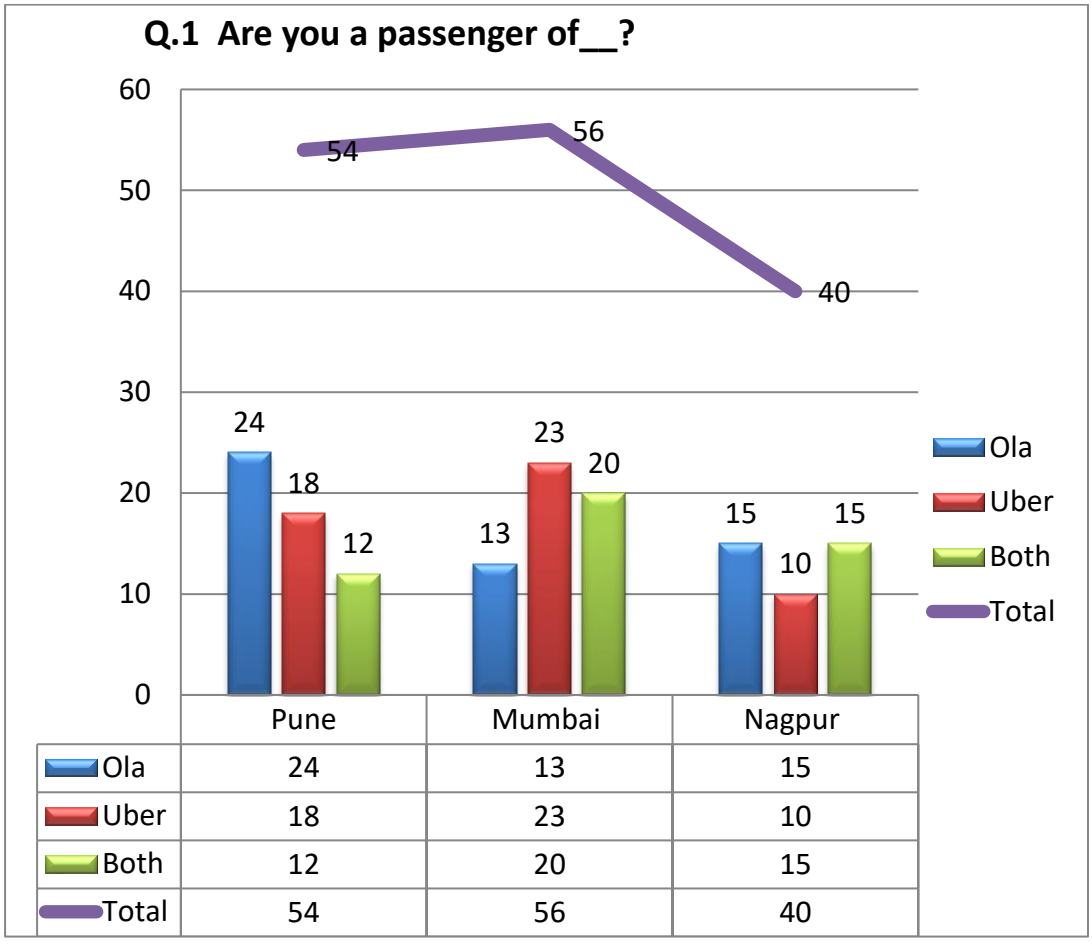
6.5. DATA ANALYSIS OF CATEGORY I RESPONDENTS (PASSENGERS)

The interviews of Category I respondents aimed to understand overall pricing experience regarding surge, personalised, and predatory pricing. The entire population of Category I respondents divides into three main groups between companies, Ola,

Uber, and both further, each group is divided into four sub-groups as per the frequency of ride booking. Then each sub-group respondents are randomly selected. The division is based on the qualitative parameter of the frequency of rides of passengers. The purpose is to analyse the parameters affected by personalised and predatory pricing. By this, it can test the proposition of frequently riding Category I respondents, i.e., high ability to pay to be targeted to high charge or vice versa. The division of Category I respondents into two main groups is for understanding the independent and combined effects of pricing. The total number of Category I respondents are 54 or 56 and 40 data collected from Pune, Mumbai, and Nagpur cities respectively. A total 150 Category I respondent's data was collected from three cities randomly to study of Category I respondents.

6.6. DATA ANALYSIS OF CATEGORY I RESPONDENTS (PASSENGERS)

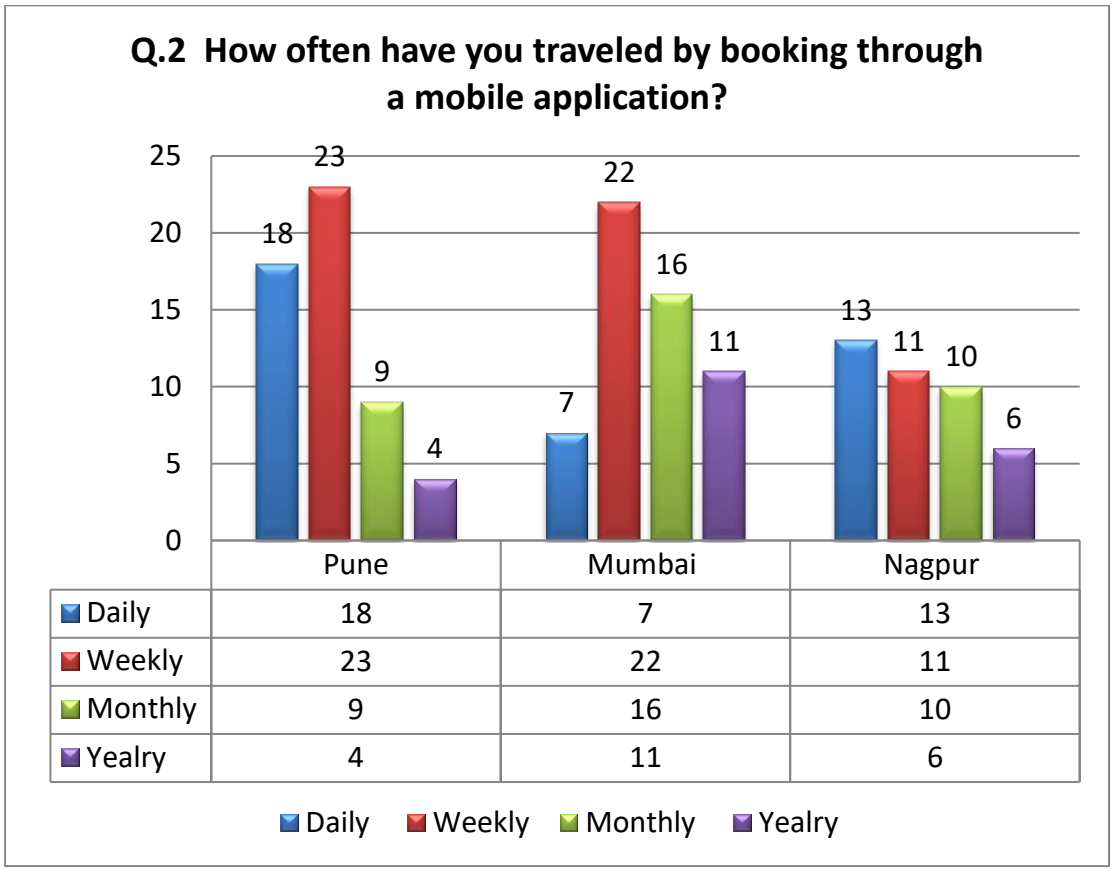
6.6.1. Division of Category I respondents as Per Their Use of Applications



	Pune	Mumbai	Nagpur
Ola	24	13	15
Uber	18	23	10
Both	12	20	15
Total	54	56	40

This graph gives details on the data collection of Category I respondents. The data was collected from Pune, Mumbai, and Nagpur cities. The total number of Category I respondents is 150. The total number of Category I respondents was 54, 56 and 40 from Pune, Mumbai, and Nagpur, respectively. After that, it was divided into three main sub-groups: Ola, Uber, and Both, as per their use of mobile applications. In Pune city, out of 54 respondents, 24 used the Ola application, 18 used the Uber application, and 12 used both Ola and Uber applications. In Mumbai city, out of 56 respondents, 13 used the Ola application, 23 used the Uber application, and 20 used both Ola and Uber applications. In Nagpur city, out of 40 respondents, 15 used the Ola application, 10 used the Uber application, and 15 used both Ola and Uber applications.

6.6.2. Frequency of Use of Applications in Category I respondents



The graph provides information about the frequency traveling of Category I respondents traveling by using mobile applications. This question divides entire respondents into four sub-groups which named as daily, weekly, monthly, and yearly for further analysis of specific perception and their differences.

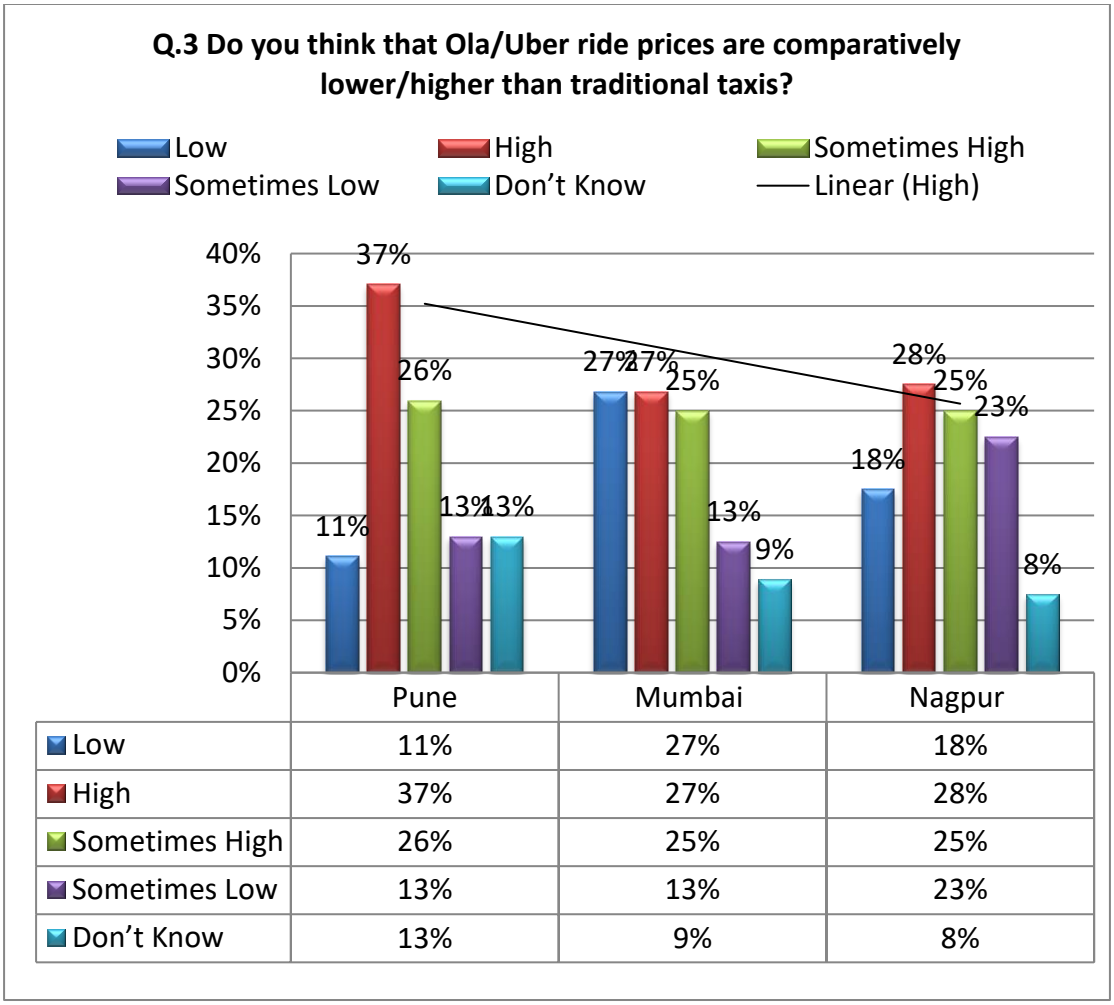
In Pune, 18 respondents travelled daily, 23 respondents who travelled weekly, 9 respondents who travelled monthly, and 4 respondents who travelled yearly.

In Mumbai, there were 7 respondents who travelled daily, 22 respondents who travelled weekly, 16 respondents who travelled monthly, and 11 respondents who travelled yearly.

In Nagpur, there were 13 respondents who travelled daily, 11 respondents who travelled weekly, 10 respondents who travelled monthly, and 6 respondents who travelled yearly.

Overall, there were 54 respondents who travelled daily in the three cities, 66 respondents who travelled weekly, 35 respondents who travelled monthly, and 21 respondents who travelled yearly.

6.6.3. General Experience of Pricing Among the Category I respondents



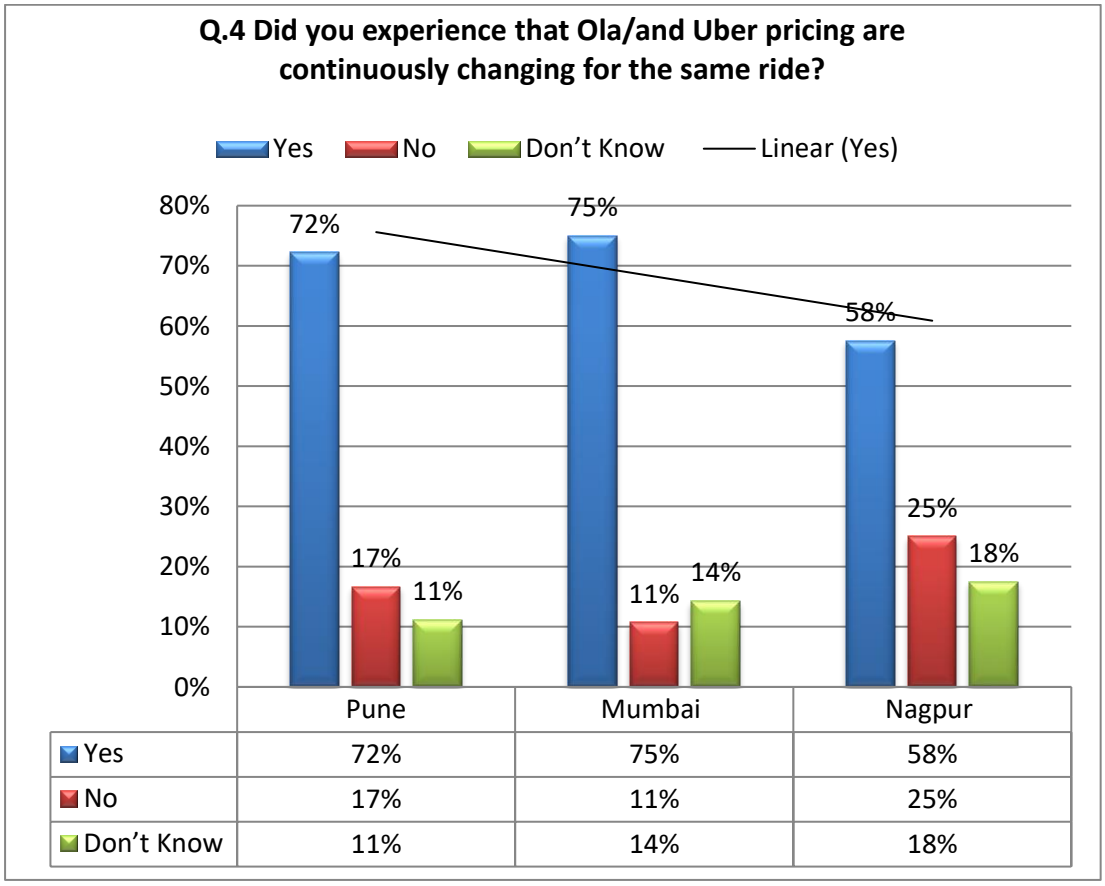
	Pune	Mumbai	Nagpur
Low	11%	27%	18%
High	37%	27%	28%
Sometimes High	26%	25%	25%
Sometimes Low	13%	13%	23%
Don't Know	13%	9%	8%

The graph describes the city-wise perceptions of Category I respondents about Ola and Uber pricing. It was observed that most of the Category I respondents perceive high or sometimes high in three cities, with the exception that Mumbai Category I respondents perceive equally prices as low. In comparison, a smaller percentage of Category I respondents feel they are paying lower or, sometimes lower than those who pay high or sometimes high prices. Also, a smaller proportion of Category I respondents were unaware about pricing.

The data shows that a significant percentage of Category I respondents in Pune, Mumbai, and Nagpur experience high prices. In Pune, 37% of respondents experience high prices, while 26% sometimes experience high prices. In Mumbai, 27% of respondents experience high prices, while 25% sometimes experience high prices. In Nagpur, 37% of respondents experience high prices, while 25% sometimes experience high prices.

This is significantly higher than the proportion of respondents who experience lower prices. In Pune, only 11% of respondents experience lower prices, while 13% sometimes experience lower prices. In Mumbai, 27% of respondents experience lower prices, while 13% sometimes experience lower prices. In Nagpur, 18% of respondents experience lower prices, while 23% sometimes experience lower prices.

6.6.4. Experience of Category I respondents About Dynamic Pricing



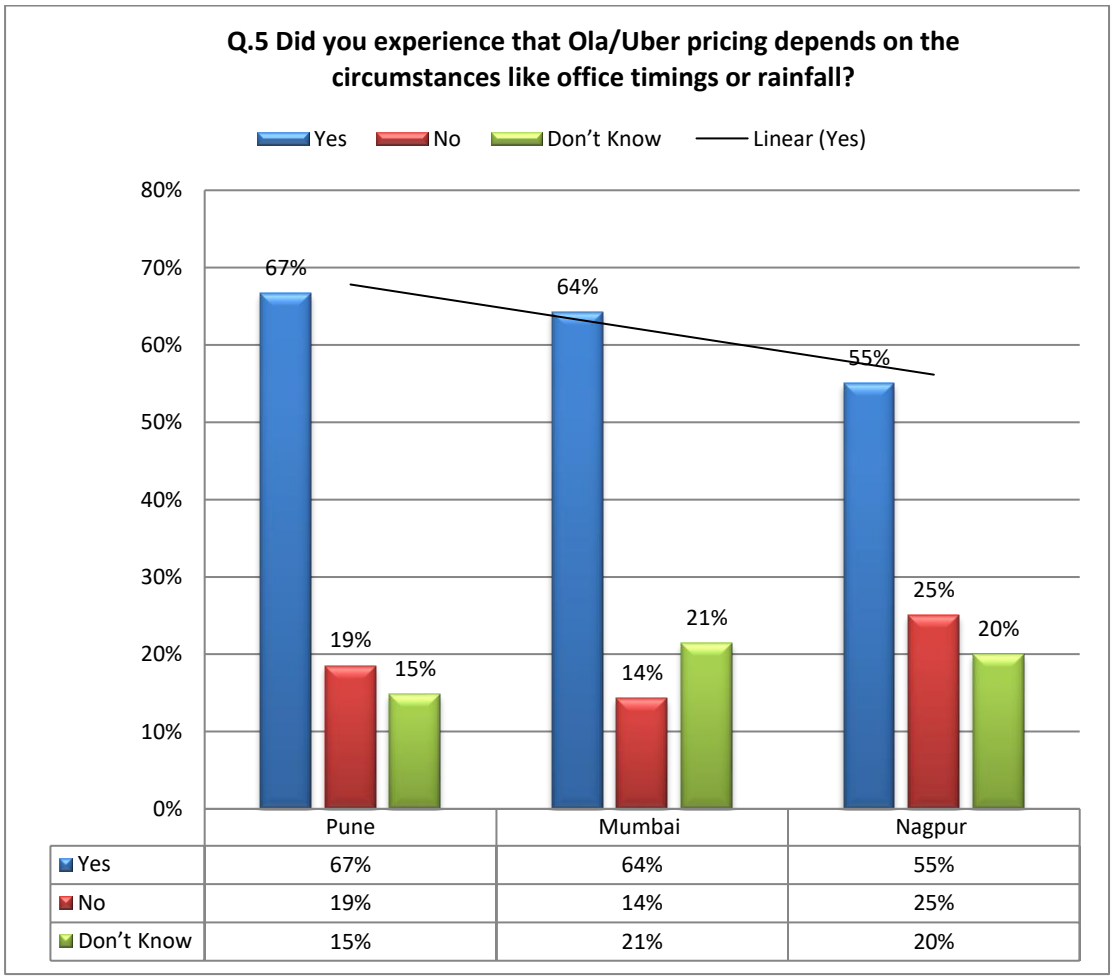
	Pune	Mumbai	Nagpur
Yes	72%	75%	58%
No	17%	11%	25%
Don't Know	11%	14%	18%

This graph highlights the experiences of Category I respondents with dynamic pricing. The trendline indicates the highest proportion of Category I respondents who

have experienced dynamic pricing. Conversely, a smaller percentage were not experiencing, and were not aware of dynamic price. This trend is also evident in all cities. This suggests that a significant number of Category I respondents in these cities are aware of and experience dynamic pricing.

It shows that a significant percentage of Category I respondents in Pune, Mumbai, and Nagpur experience dynamic pricing. In Pune, 72% of respondents experience dynamic pricing, while 17% do not experience it and 11% are unaware of it. In Mumbai, 75% of respondents experience dynamic pricing, while 11% do not experience it and 14% are unaware of it. In Nagpur, 58% of respondents experience dynamic pricing, while 23% do not experience it and 18% are unaware of it.

6.6.5. Analysing Awareness of Circumstance for Surge Pricing



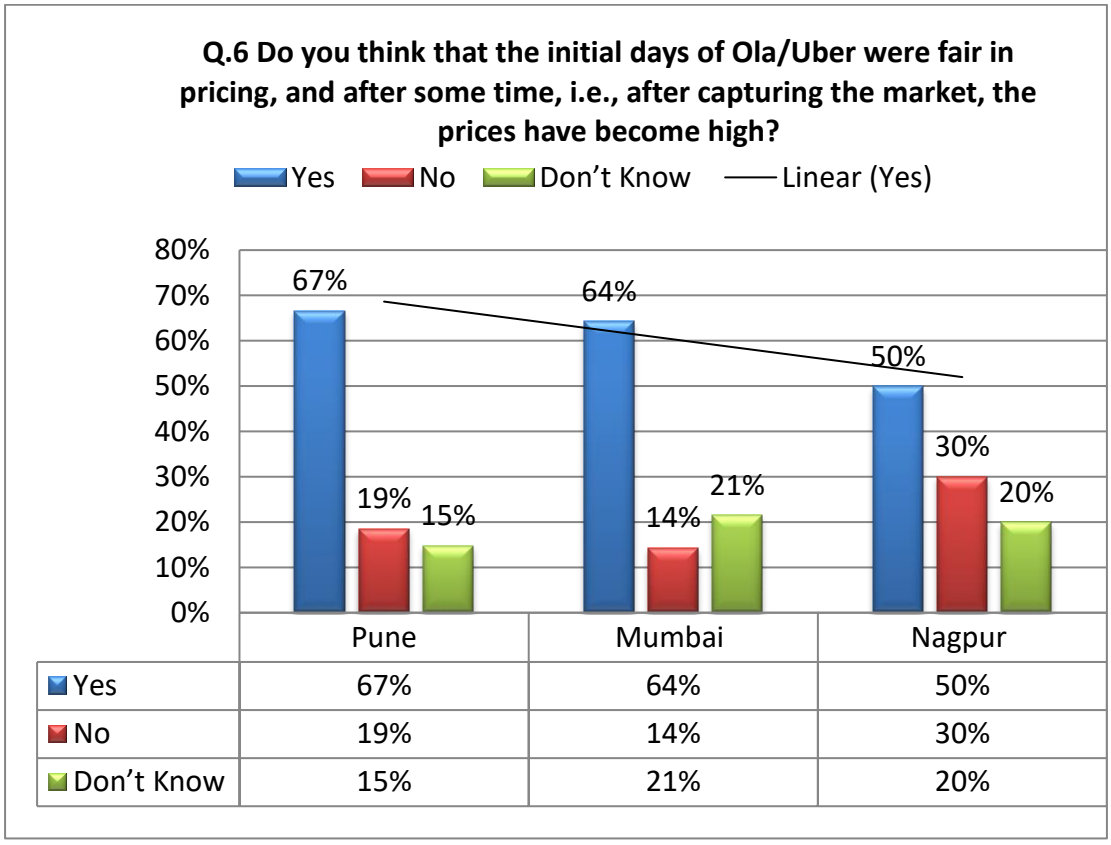
	Pune	Mumbai	Nagpur
Yes	67%	64%	55%
No	19%	14%	25%
Don't Know	15%	21%	20%

This graph shows the level of awareness about circumstance associated with surge pricing. The trendline shows the largest percentage of Category I respondents who

have been aware about circumstances associated with surge pricing, including rain and timings for office work. However, a lower proportion of Category I respondents were not experienced and clueless of the implications of surge pricing. The same trend can be seen across every city.

It shows that a significant percentage of Category I respondents in Pune, Mumbai, and Nagpur are aware of the circumstances associated with surge pricing. In Pune, 67% of respondents are aware of surge pricing, while 19% have not experienced it and 15% are not aware of it. In Mumbai, 64% of respondents are aware of surge pricing, while 14% have not experienced it and 21% are not aware of it. In Nagpur, 55% of respondents are aware of surge pricing, while 25% have not experienced it and 20% are not aware of it.

6.6.6. Analysis of Perception for Pricing Policies

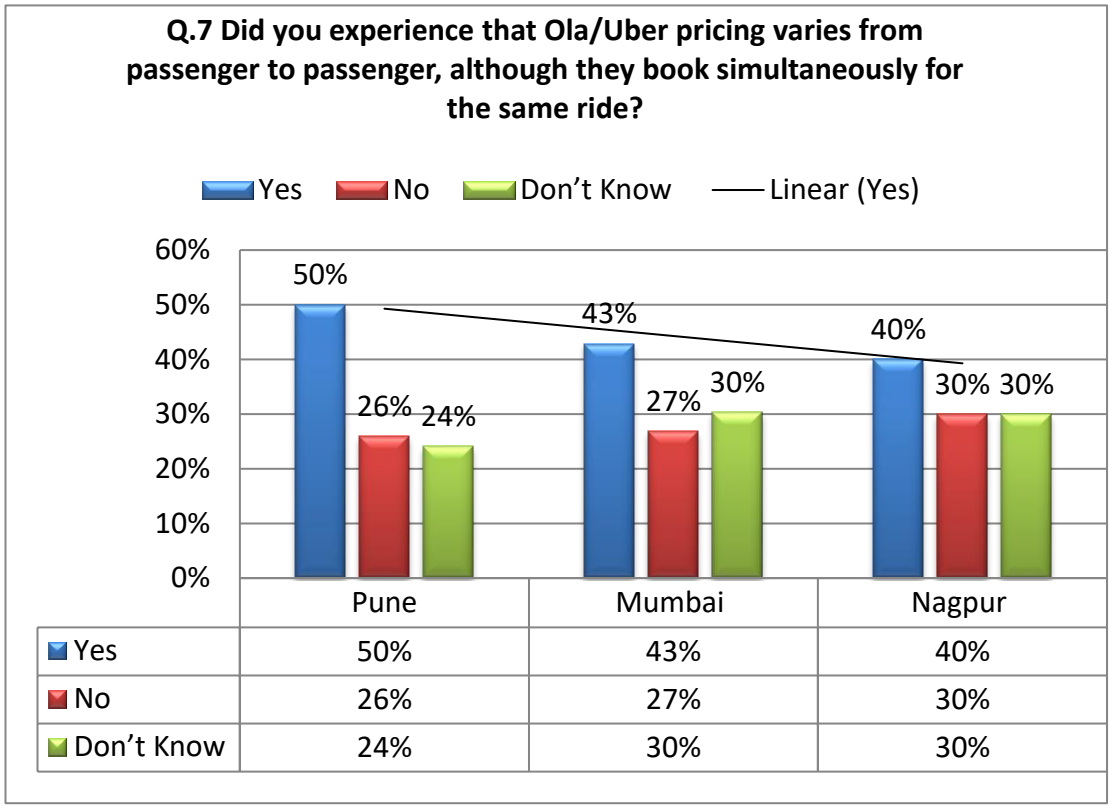


	Pune	Mumbai	Nagpur
Yes	67%	64%	50%
No	19%	14%	30%
Don't Know	15%	21%	20%

This graph illustrates how Category I respondents perceive of the pricing policy of the Ola/Uber Business model. The trendline indicates that the highest proportion of Category I respondents believes that the first few days of Ola/Uber are moderate, and

fair in pricing, but after settling into market, the prices rise. In contrast, a smaller percentage of Category I respondents do not think this pricing strategy and as being ignorant of price policies. This trend is common in Pune, Mumbai, and Nagpur city. Category I respondents who are experiencing about pricing policies are 67% in Pune, 64% in Mumbai, and 50% in Nagpur which is much higher than the proportion of Category I respondents who have not been exposed to similar pricing policies 19% in Pune, 14% in Mumbai, and 30% in Nagpur and those unaware of the pricing policy are 15% in Pune, 21% in Mumbai and 20% in Nagpur cities respectively.

6.6.7. Analysis of Category I respondents Perception about Personalised Pricing



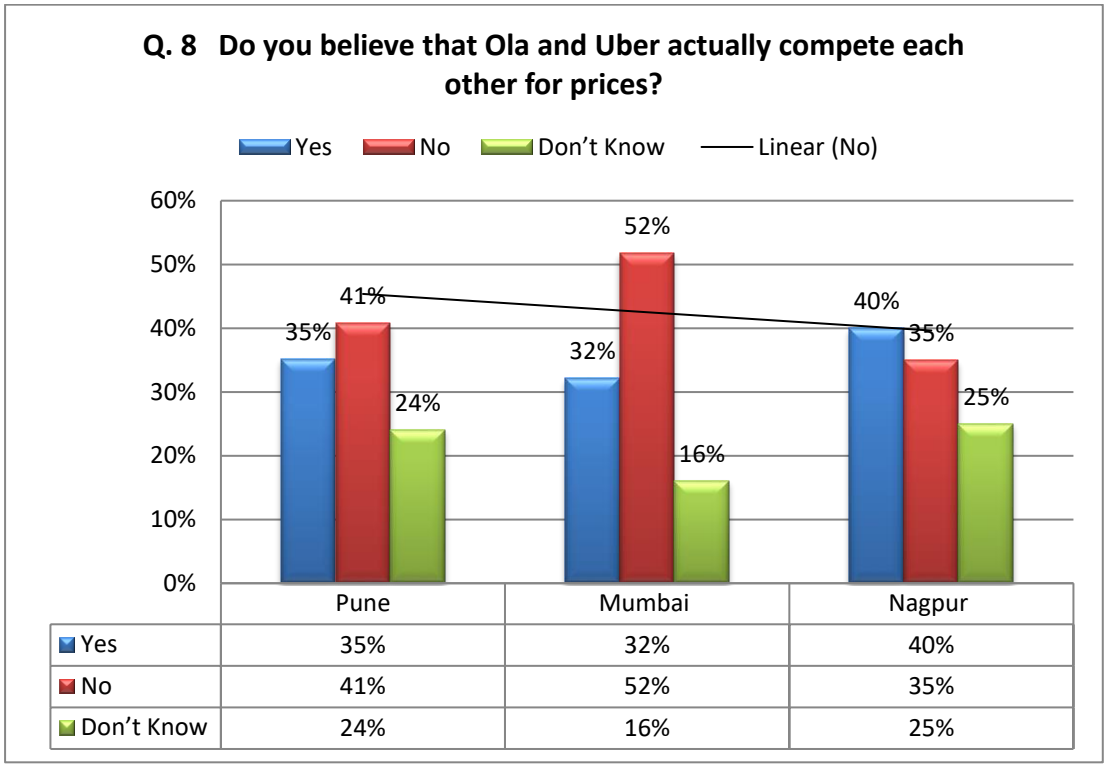
	Pune	Mumbai	Nagpur
Yes	50%	43%	40%
No	26%	27%	30%
Don't Know	24%	30%	30%

This graph shows the percentage of Category I respondents who experience personalised pricing. The trendline indicates that a high proportion of Passenger have experienced personalized pricing. The proportion of Passenger who did not experience personal pricing and were unaware of personalized pricing is less. It shows that a significant percentage of Category I respondents in Pune, Mumbai, and Nagpur have experienced personalized pricing. In Pune, 50% of respondents have experienced personalized pricing, while 26% have not experienced it and 24% are unaware of it. In

Mumbai, 43% of respondents have experienced personalized pricing, while 27% have not experienced it and 30% are unaware of it. In Nagpur, 40% of respondents have experienced personalized pricing, while 20% have not experienced it and 30% are unaware of it.

This suggests that a significant number of Category I respondents in these cities are aware of personalized pricing and have experienced it.

6.6.8. Analysis of Experience About Competition

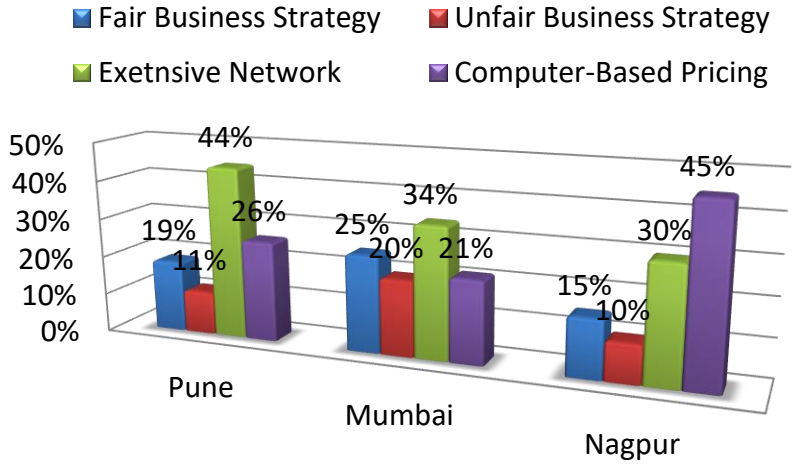


	Pune	Mumbai	Nagpur
Yes	35%	32%	40%
No	41%	52%	35%
Don't Know	24%	16%	25%

This graph illustrates the view of Category I respondents about the competition between Ola and Uber. The proportion of Pune Category I respondents is slightly higher for those who believe in the presence of competition than those who believe in the existence of competition. The proportion of Mumbai Category I respondents is more likely to believe in the absence of competition than that there is competition. This trend is not the case within Nagpur city, where the proportion of respondents who believe presence of competition is slightly higher than those who believe there is no competition. The proportion of Category I respondents unaware of competition is considerably smaller than that of the presence and absence of competition. This trend is prevalent in three different cities. The proportion of Category I respondents who

think there is no competition is 35% in Pune, 32% in Mumbai, and 40 % in Nagpur. It is slightly higher than the proportion of Category I respondents who believe that competition exists, the percentage is 35% in Pune, 32% in Mumbai, and 40% in Nagpur. The percentage of Category I respondents who do not know about the existence or absence of competition is considerably lower than that of Category I respondents who believe there is no existence of competition. It is 24% in Pune, 16% in Mumbai, and 25% in Nagpur.

6.6.9. Assessment of Perception for Economic Rationales



	Pune	Mumbai	Nagpur
Fair Business Strategy	19%	25%	15%
Unfair Business Strategy	11%	20%	10%
Exetnsive Network	44%	34%	30%
Computer-Based Pricing	26%	21%	45%

This graph shows the Category I respondents' perceptions about the most common reasons for the achievements of Ola and Uber. The main reasons are the extensive network and computer-based pricing over fair business strategies and an unfair business strategy. The majority from Pune and Mumbai believe that the extensive network is the reason for their success with Ola and Uber, which is greater than other reasons, like computer-based pricing in Pune and fair business strategies in Mumbai.

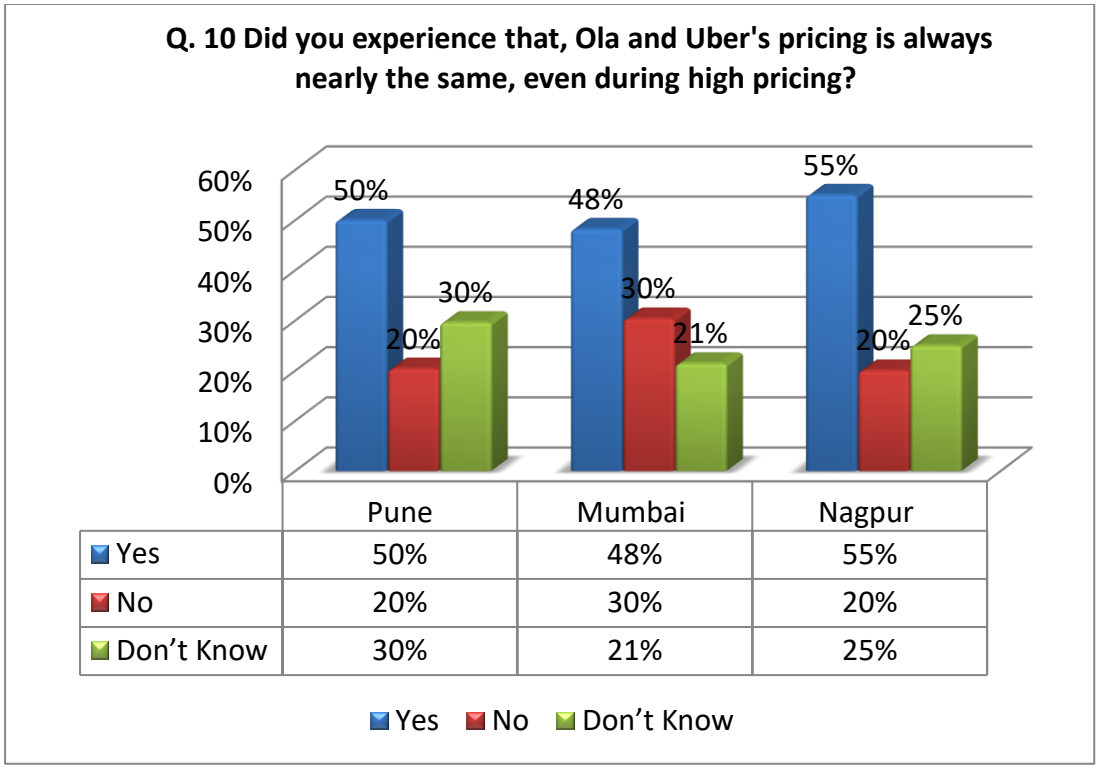
The popular trend in Nagpur city that has led to its success with Ola and Uber is computer-based pricing.

In Pune city, the reasoning behind the achievement of Ola/Uber is 44% for extensive network and 26%, for computer-based pricing, which is greater than 19% for fair and 11 % for unfair business strategy.

In Mumbai city, the reason for how successful Ola/Uber are 34% and 26%, respectively, for the extensive networks and fair strategy for business, respectively which is more than the reasons for 20% and 21% for business strategies that are unfair and computer-based-pricing, respectively.

In Nagpur city, the reasoning behind the growth of Ola/Uber is 40% and 30% for computer-based pricing and an extensive network, respectively, which is greater than the reason for 15% and 10% for fair and unfair business strategies, respectively.

6.6.10. Category I respondent's Experience About Price Parallelism



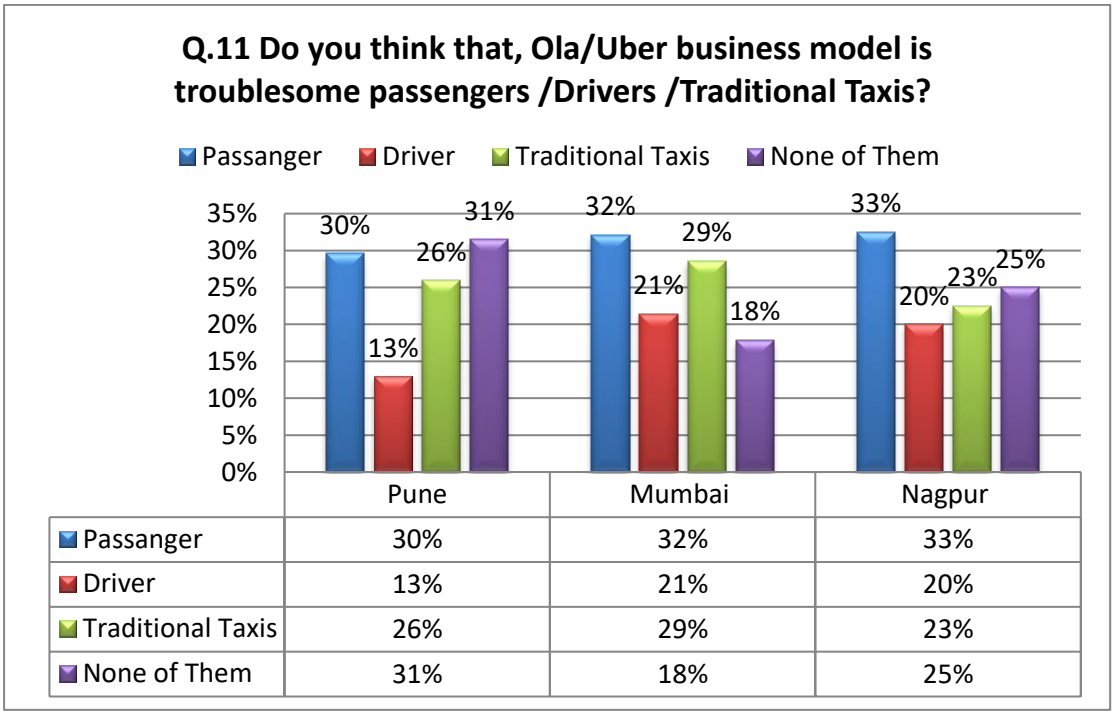
	Pune	Mumbai	Nagpur
Yes	50%	48%	55%
No	20%	30%	20%
Don't Know	30%	21%	25%

The graph shows that the percentage of Category I respondents who experienced the similar prices that Ola and Uber offers is considerably greater than those who did not

experience it and were unaware of price parallelism. This trend is common in Pune, Mumbai, and Nagpur cities.

The percentage of Category I respondents who have experienced similar prices in the case of Ola and Uber is 50%, 48%, and 55%, which is much higher than the percentage who did not experience the same pricing, which are 20%, 30%, and 20% and Those who do not know about the similar pricing are 30%, 21%, and 25% in Pune, Mumbai, and Nagpur, respectively.

6.6.11. Category I respondents Perception to Stakeholders Injury



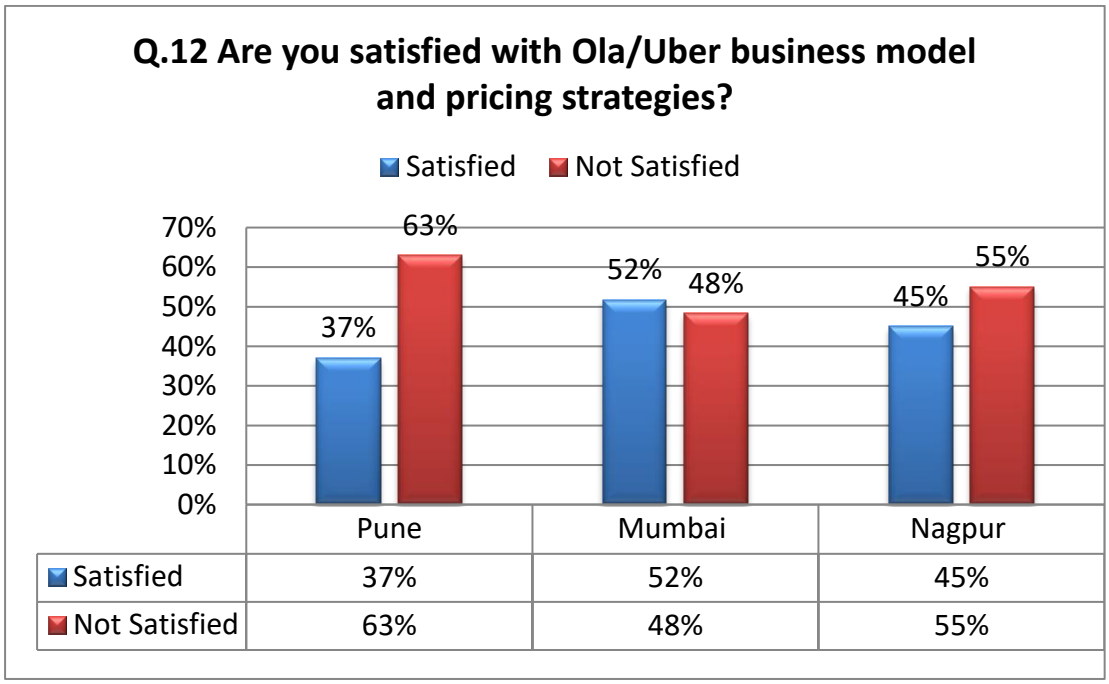
	Pune	Mumbai	Nagpur
Passanger	30%	32%	33%
Driver	13%	21%	20%
Traditional Taxis	26%	29%	23%
None of Them	31%	18%	25%

This graph analyses the perception that Ola and Uber's business models can harm stakeholders within the context. The graph indicates that more Mumbai and Nagpur Category I respondents consider this model a problematic for Category I respondents more than other stakeholders. However, most Pune Category I respondents believe the model isn't harmful to any stakeholder. Moreover, almost all Category I respondents think that the model is harmful to them. The Category I respondents of Mumbai think that it is harmful to them after the model is harmful to traditional taxis.

The proportion that Mumbai and Nagpur Category I respondents who think that Uber's business model causes harmful for them is 32% and 33%, respectively. This

trend is higher than those who believe it is not harmful to any stakeholders. The percentage of respondents who believe that the business model isn't harmful to stakeholder interests is 29% and 25%, respectively. However, the situation is different in Pune and Nagpur, where many Category I respondents in Pune believe this model isn't harmful to any stakeholder. If it is, then it is detrimental to Category I respondents. Then it follows a similar pattern as Mumbai and Nagpur, which believes it harms traditional taxis.

6.6.12. Assessment of Category I respondents Overall Level of Satisfaction

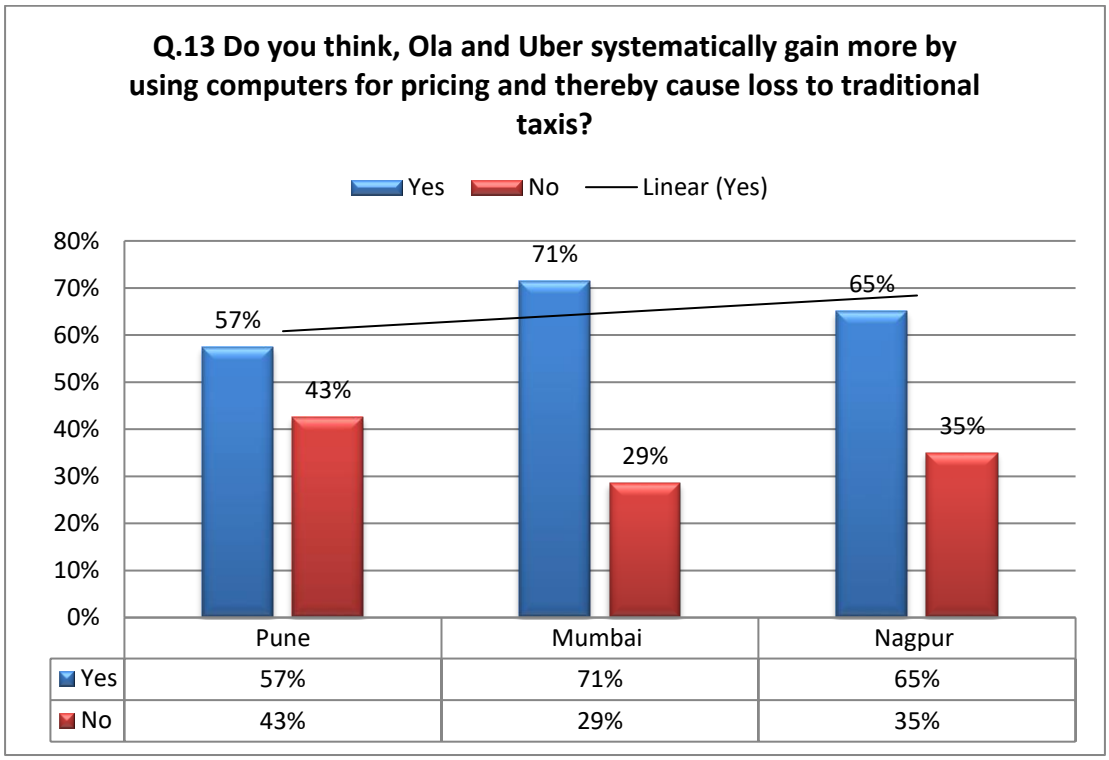


This graph reveals the degree of satisfaction of the Category I respondents, more than half of Category I respondents were dissatisfied with their Ola/Uber business model and pricing. The proportion of passenger is higher among those unhappy with Uber's business model or pricing policy than among those satisfied with their model. However, in Mumbai, the outcome is win-win. The percentage of happy and unsatisfied Category I respondents is almost the same.

The number of Category I respondents unhappy in Pune and Nagpur is 63% and 55%, which is greater than those who are satisfied 37% and 45%, respectively. In Mumbai, the number of Category I respondents who are unhappy with Uber's pricing and

business model is nearly the same as those who were satisfied 52% and 48% of Category I respondents were unhappy.

6.6.13. Assessing Perception of Injury to Traditional Taxis



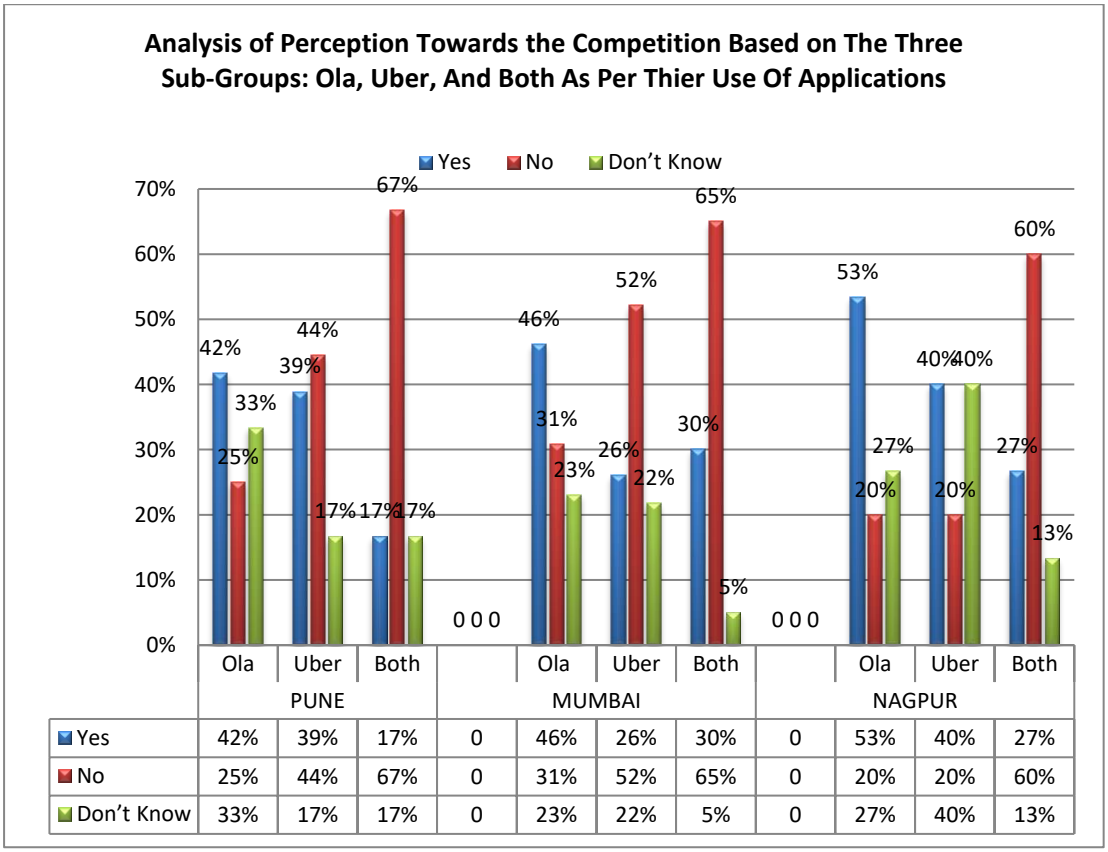
This graph shows how the Category I respondent's perception of computer-based pricing is detrimental to traditional taxis. The trendline clearly shows that a significant percentage of the Category I respondents believes that the pricing based on computers of Ola/Uber is harmful to traditional taxis as opposed to those who do not believe that computer-based pricing causes damage to traditional taxis. This pattern is prevalent in three cities.

The proportion of Passenger who think that computer-based prices such as Ola/Uber cause harm to traditional taxis is 57%, 71%, and 65% higher than those who think that it is not harmful to traditional taxis is 43%,29%, 35%, within Pune, Mumbai, and Nagpur cities respectively.

6.6.14. Examining Difference Between Perception Towards the Competition As per their Use of Applications

Question No. 1Are you a passenger of __?

Question No. 8 Do you believe that Ola and Uber actually compete each other for prices?



	PUNE			MUMBAI				NAGPUR			
	Ola	Uber	Both		Ola	Uber	Both		Ola	Uber	Both
Yes	42%	39%	17%	0	46%	26%	30%	0	53%	40%	27%
No	25%	44%	67%	0	31%	52%	65%	0	20%	20%	60%
Don't Know	33%	17%	17%	0	23%	22%	5%	0	27%	40%	13%

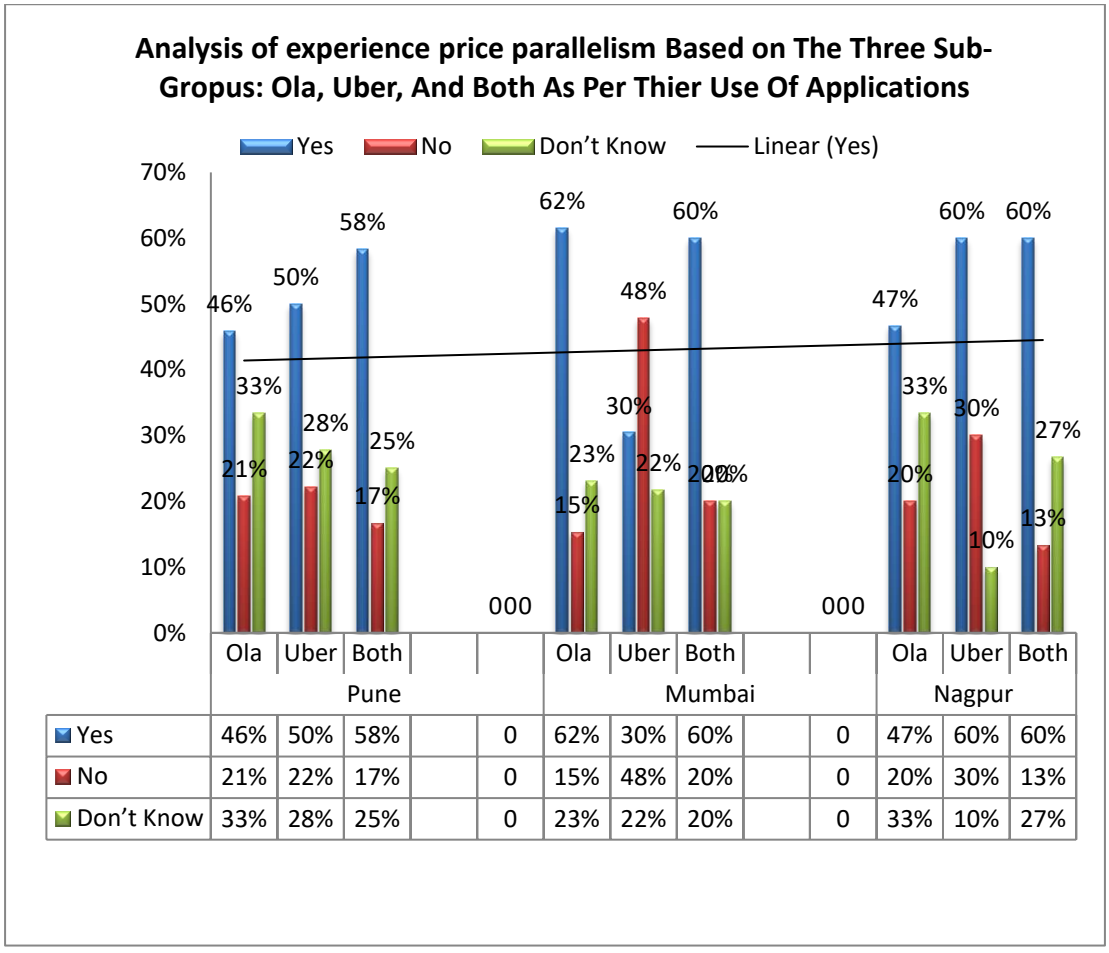
This graph shows that a significantly greater proportion of Category I respondents who use both Ola and Uber apps for their trip bookings perceive no competition between the two companies than those who use a single app. This trend is the case throughout the three cities.

In Pune, 67% of respondents who use both apps believe there is no competition, while 22% believe there is competition. In Mumbai, 65% of respondents who use both apps believe there is no competition, while 23% believe there is competition. In Nagpur, 60% of respondents who use both apps believe there is no competition, while 23% believe there is competition.

6.6.15. Examining Difference Between Perception Towards the Price Parallelism As per their Use of Applications

Question No. 1 Are you a passenger of __?

Question No. 10 Did you experience that, Ola and Uber's pricing is always nearly the same, even during high pricing?



	Pune					Mumbai					Nagpur		
	Ola	Uber	Both		0	Ola	Uber	Both		0	Ola	Uber	Both
Yes	46%	50%	58%		0	62%	30%	60%		0	47%	60%	60%
No	21%	22%	17%		0	15%	48%	20%		0	20%	30%	13%
Don't Know	33%	28%	25%		0	23%	22%	20%		0	33%	10%	27%

This graph offers a comprehensive understanding of price parallelism's experience as per the usage of apps. In Pune, the percentage of Category I respondents who experience price parallelism is more than those using only one application to book their trips. For Mumbai and Nagpur, the proportion of Category I respondents experiencing price parallelism is almost the same as those using one application like Ola in Mumbai or Uber in Nagpur and Uber in Nagpur, respectively. This trend shows that the percentage of passenger who use both apps have experience price parallelism is consistently higher than those using only single applications to book their trips.

The proportion of Category I respondents who utilize both applications and are experiencing price parallelism at 58%,60%, 60% is more than those who use only one app to book their rides (Ola or Uber) (46%,50 %,), (62%,30%), (47%,60%) for Pune, Mumbai, and Nagpur, respectively, with the exception that Ola Category I respondents who are in Mumbai along with Uber in Nagpur tend to feel the price parity.

6.6.16. In Depth Analysis of Pricing Experience as per Frequency of Use of Applications

Question No. 3 How often have you traveled by booking through a mobile application?

Question No. 4 Do you think that Ola/Uber ride prices are comparatively lower/higher than traditional taxis?

This graph gives a more detailed analysis of Category I respondents perceptions regarding the pricing strategies of Ola and Uber. The graph shows clearly that daily and weekly users generally experience higher/sometimes higher prices than monthly and yearly users. Also, monthly and yearly users experience less expensive and, at times, lower prices than those who use weekly and daily.

	Pune			
	Daily	**Weekly**	**Monthly**	**Yearly**
Low	**6%**	**4%**	**22%**	**50%**
High	**44%**	**48%**	**11%**	**0%**
Sometimes High	**28%**	**30%**	**11%**	**25%**
Sometimes Low	**11%**	**4%**	**44%**	**0%**
Don't Know	**11%**	**13%**	**11%**	**25%**

This table shows that proportion of daily and weekly passengers who pay (High and sometimes high) prices (44%,28%) in daily user, (28%,30%) in weekly user is higher than monthly and yearly (11% and 11 %) in monthly user, (0%,25%) in yearly user in

Pune city, a similar trend is seen the same way in Mumbai along with Nagpur city in below tables.

Mumbai

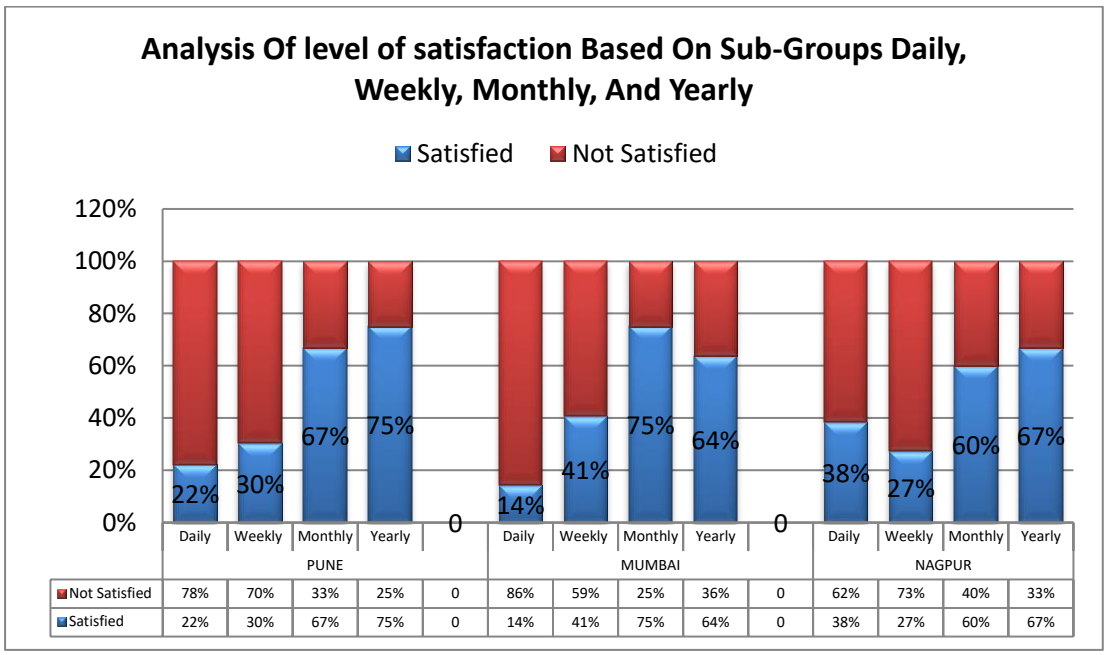
	Daily	Weekly	Monthly	Yearly
Low	**14%**	**9%**	**44%**	**45%**
High	**57%**	**41%**	**6%**	**9%**
Sometimes High	**29%**	**36%**	**6%**	**27%**
Sometimes Low	**0%**	**9%**	**25%**	**9%**
Don't Know	**0%**	**5%**	**19%**	**9%**

Nagpur

	Daily	Weekly	Monthly	Yearly
Low	**8%**	**9%**	**20%**	**50%**
High	**38%**	**27%**	**30%**	**0%**
Sometimes High	**23%**	**45%**	**10%**	**17%**
Sometimes Low	**23%**	**9%**	**30%**	**33%**
Don't Know	**8%**	**9%**	**10%**	**0%**

The experience of high pricing in frequent user shows that Ola/Uber gains the popularity of lower prices and attract the non-frequent customers and exploit them systematically.

6.6.17. In Depth Analysis of Level of Satisfaction as per Frequency of Use of Applications



Question No. 2 How often have you traveled by booking through a mobile application?

Question No. 12 Are you satisfied with Ola/Uber business model and pricing strategies?

This graph provides a clear perception of satisfaction among the daily, weekly, monthly, and yearly use of Ola or Uber for their trip. The proportion of Category I respondents who use daily and weekly are mostly unsatisfied with Ola and Uber than monthly and yearly users. This trend is evident in Pune, Mumbai and Nagpur cities.

The proportion of Category I respondents who use daily and weekly and are unsatisfied with Ola and Uber is 78%, 70% is greater than monthly and yearly 33%,25% users in Pune.

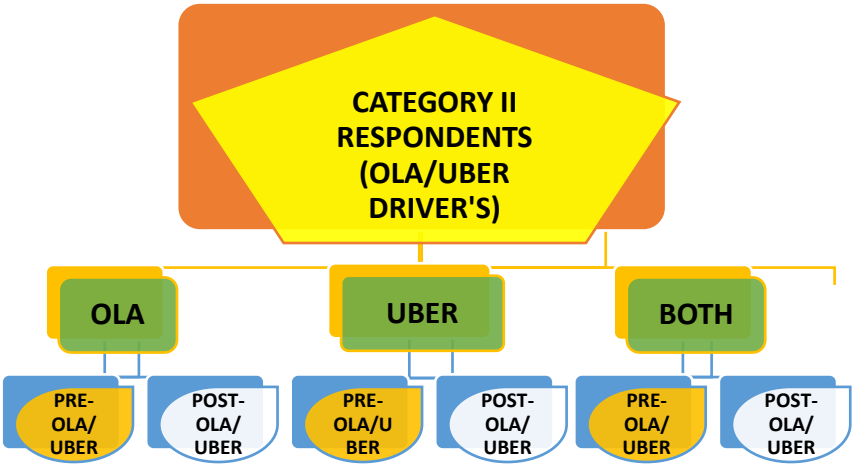
The proportion of Category I respondents who use daily and weekly and are unsatisfied with Ola and Uber is 86%; 59% is greater than monthly and yearly 25%,36% users in Mumbai.

The proportion of Category I respondents who use daily and weekly and are unsatisfied with Ola and Uber is 62%; 73% is greater than monthly and yearly 40%,33% users in Nagpur.

6.7. DATA ANALYSIS OF CATEGORY II RESPONDENTS INTERVIEW SCHEDULE

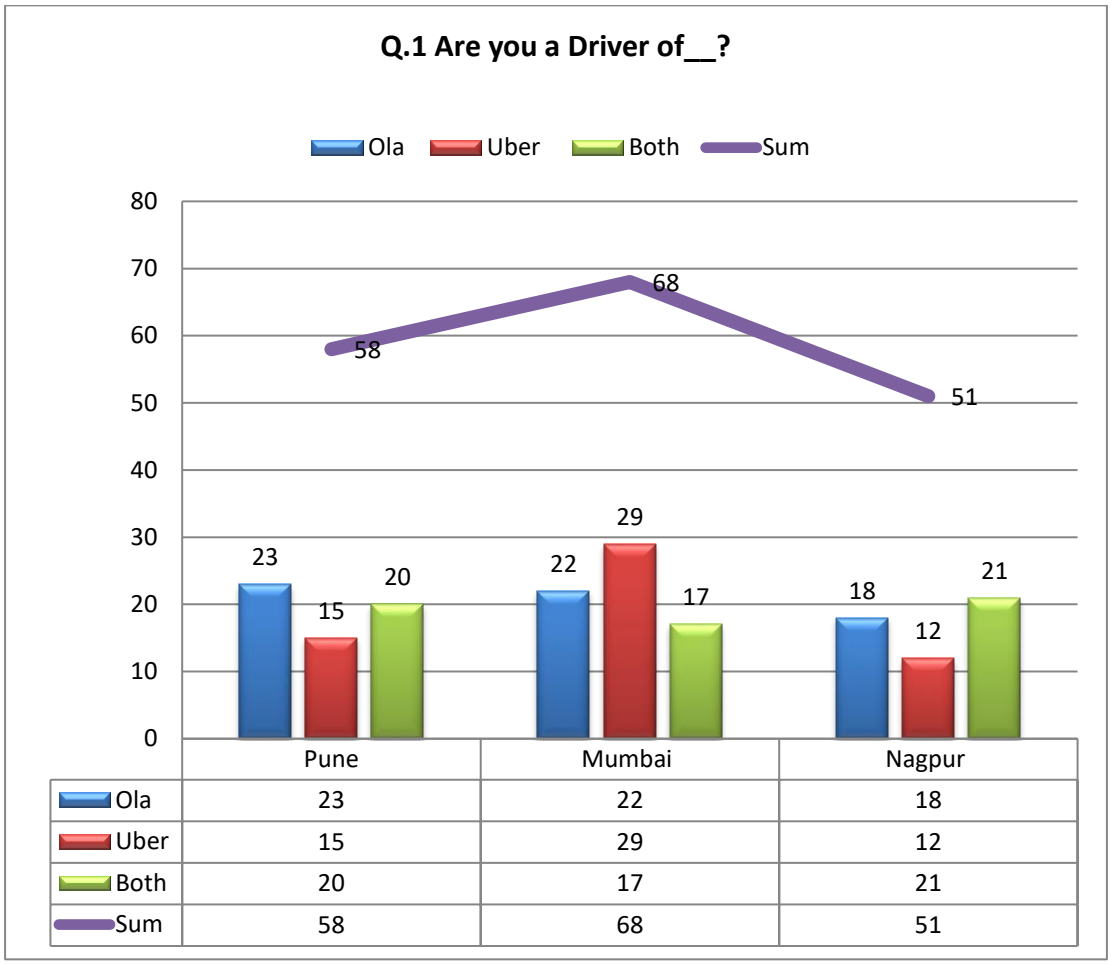
The data of Category II respondents was collected and divided into two groups, Ola and Uber, further divided into sub-groups as per pre-Ola/Uber and Post-Ola/Uber. The division of pre-Ola/Uber and post-Ola/Uber is kept in mind to analyze income and incentive differences between the two periods. And then, data were collected on random basis. The data collection of Category II respondents was conducted to understand the overall pricing experience of both companies in terms of a surge, personalized, predatory, and collusive pricing. And the perception of Category II respondents of both companies regarding the transparency and fairness of the companies' businesses. Judges commonly observed that Ola and Uber discriminate against Category II respondents for allocating rides, fares, and other grounds. Therefore, a questionnaire was designed to address these issues also. The questions regarding their choice of businesses were framed to determine the impact of Ola and Uber on traditional taxis.

The data was collected from Pune, Mumbai, and Nagpur cities, total number of respondents of 58 from Pune, 68 from Mumbai, and 51 from Nagpur were taken. Total 177 respondent's data was collected randomly to study the of Ola/Uber driver's interview schedule.



To clarify the questionnaire, the pre-Ola/Uber period is listed in the range of 10-15 years and above 15 years of driving experience. For post-Ola/Uber, it is from 0 to 5 years and 5 to 10 years of driving experience.

6.7.1. Division of Category II respondents as Per Their Use of Applications



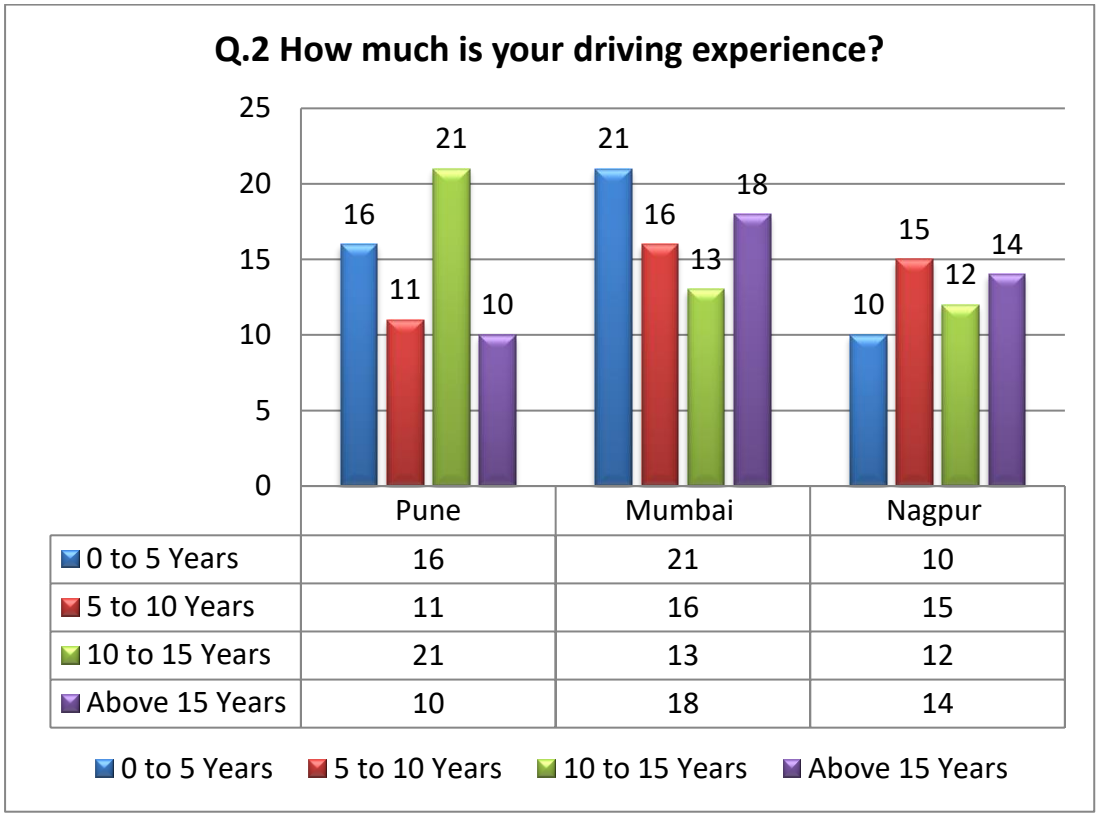
	Pune	Mumbai	Nagpur
Ola	23	22	18
Uber	15	29	12
Both	20	17	21
Sum	58	68	51

This graph gives details on the data collection of category II respondents. The data was collected from Pune, Mumbai, and Nagpur cities, total number of respondents of 58 from Pune, 68 from Mumbai, and 51 from Nagpur were taken. Total 177 respondent's data was collected randomly to study the number of Ola/Uber driver's interview.

After that, it was divided into three main sub-groups: Ola, Uber, and Both, as per they connected to company.

From Pune city 23 Ola, 15 Uber and 20 Both respondent's data were collected. From Mumbai city has 22 Ola, 29 Uber, and 17 both respondent's data were collected. From Nagpur city 18 Ola and 12 Uber, and 21 Both Category II respondents were collected.

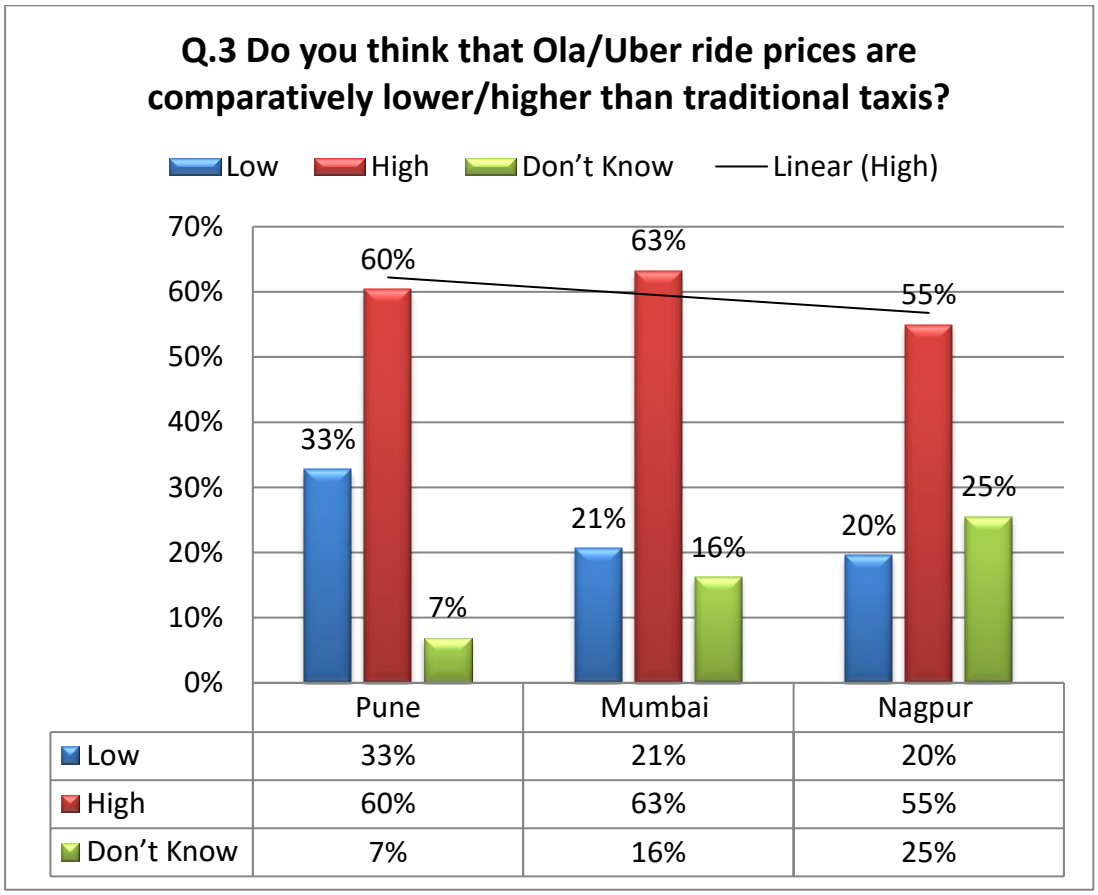
6.7.2. Division of Category II respondents Based on their Driving Experience



	Pune	Mumbai	Nagpur
0 to 5 Years	16	21	10
5 to 10 Years	11	16	15
10 to 15 Years	21	13	12
Above 15 Years	10	18	14

The graph provides information about the experience of driving for companies Ola and Uber. This question divides entire data into four Sub-groups 0 to 5 years, 5 to 10 years, 10 to 15 Years, above 15 Years for further analysis of specific perception and their differences. Further the pre-Ola/Uber period is listed in the range of 10-15 years and above 15 years of driving experience. For post-Ola/Uber, it is from 0 to 5 years and 5 to 10 years of driving experience.

6.7.3. General Experience of Category II respondents About Pricing Policies

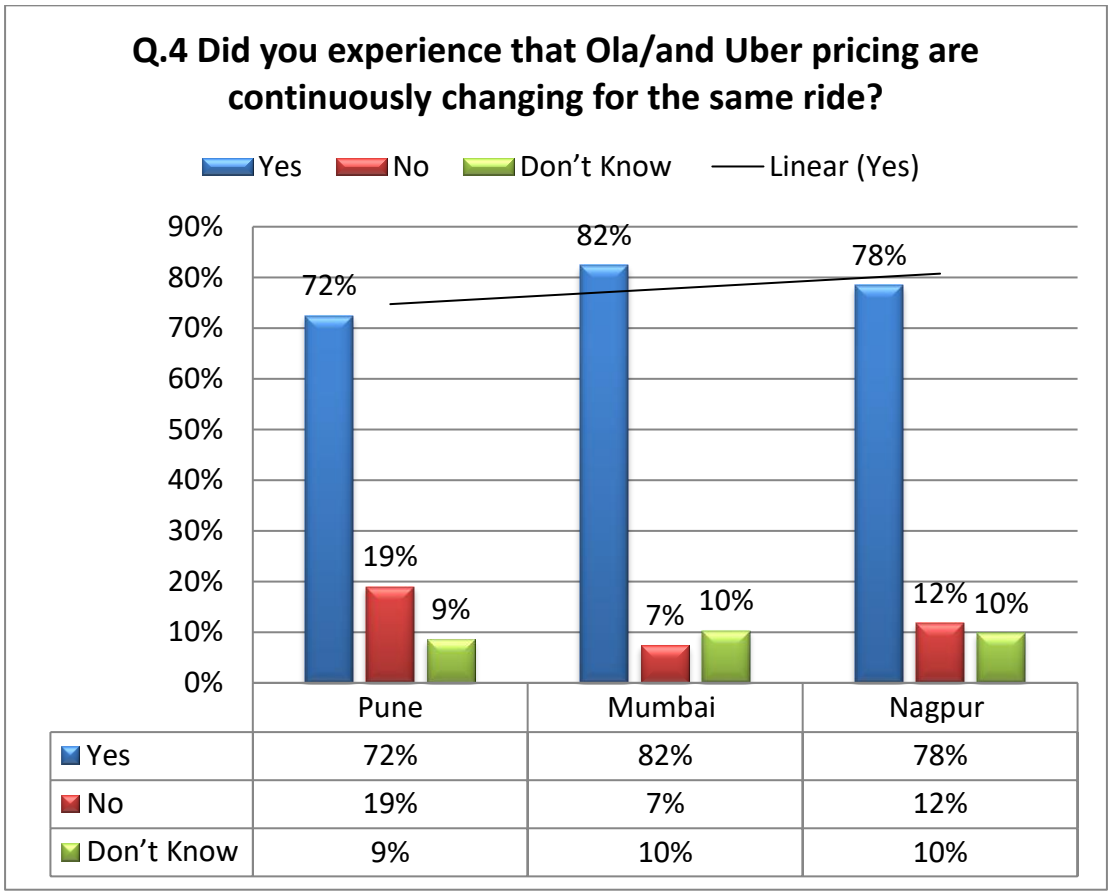


	Pune	Mumbai	Nagpur
Low	33%	21%	20%
High	60%	63%	55%
Don't Know	7%	16%	25%

The table below describes the city-wise perceptions of Category II respondents about Ola and Uber pricing. It was observed that most of the Category II respondents perceive high pricing in three cities. In comparison, a smaller percentage of Category II respondents experience that they are charging lower than those who charge high prices. Also, a smaller proportion of Category II respondents were unaware about pricing.

The parentage of Category II respondents who experience high prices is 60%, 63%, and 55% for Pune, Mumbai and Nagpur cities, is significantly higher than the percentage of Category II respondents who charge lower prices are 33%, 21%, and 20% in Pune, Mumbai, Nagpur cities respectively.

6.7.4. Experience of Category II Respondents About Dynamic Pricing

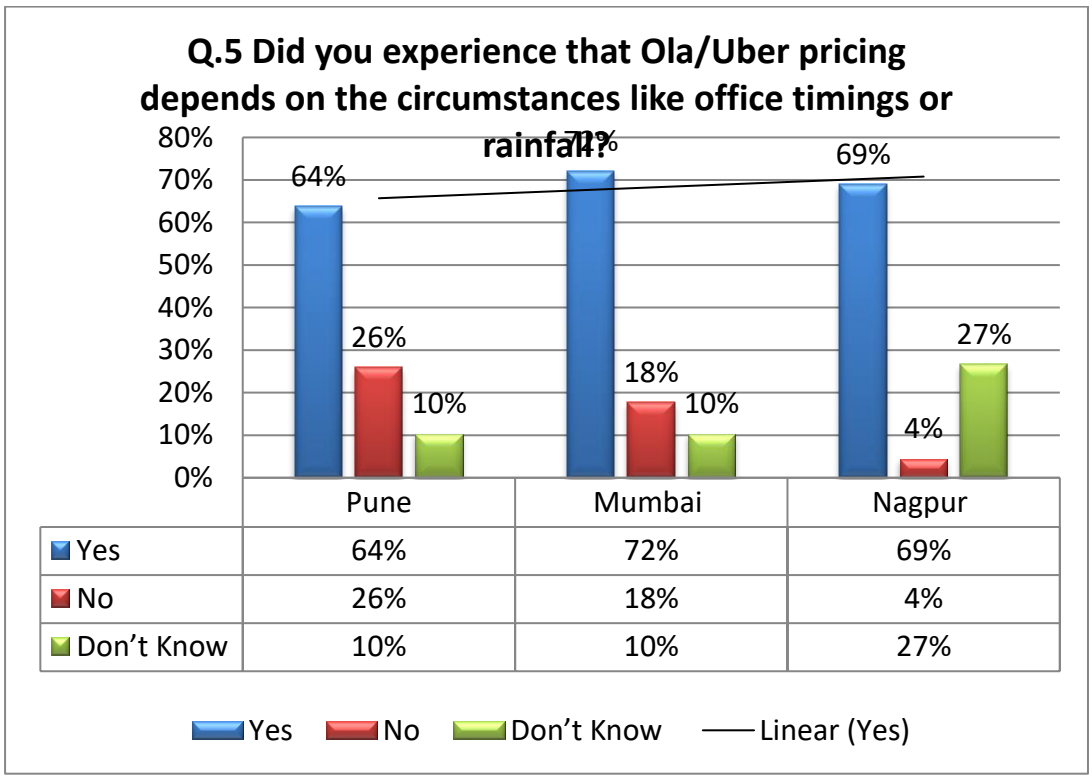


	Pune	Mumbai	Nagpur
Yes	72%	82%	78%
No	19%	7%	12%
Don't Know	9%	10%	10%

This graph highlights the experiences of Category II respondents with dynamic pricing. The trendline indicates the highest proportion of Category II respondents who have experienced dynamic pricing. Conversely, a smaller percentage were not experiencing, and were not aware of dynamic pricing. This trend is also evident in all three cities.

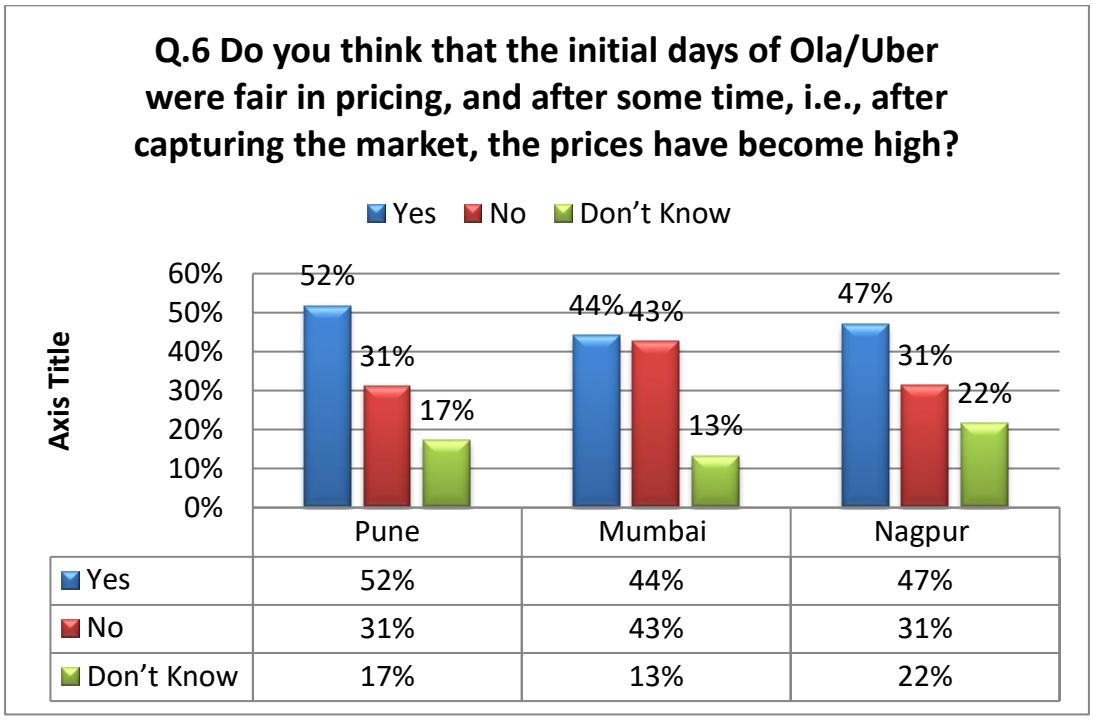
The parentage of Category II respondents who experience dynamic pricing is 72%, 82%, and 78% for Pune, Mumbai and Nagpur cities respectively is significantly higher than the proportion of Category II respondents who are not experiencing dynamic prices 19%, 7%, and 12% respectively, for Pune, Mumbai and Nagpur cities, as well as Category II respondents who are unaware about dynamic prices 9%, 10%, and 10% for Pune, Mumbai and Nagpur cities respectively.

6.7.5. Analysis of Category II respondents Awareness About Circumstances for Surge Pricing



This graph shows the level of awareness about circumstance associated with surge pricing. The trendline shows the largest percentage of Category II respondents who have been aware about circumstances associated with surge pricing, including rain and timings for office work. However, a lower proportion of Category II respondents were not experienced and clueless of the implications of surge pricing. The same trend can be seen across three cities. The Category II respondents of those who are aware of the circumstances are 64%, 72%, and 69% in Pune, Mumbai and Nagpur cities which is much greater than the percentage of Category II respondents who are not experienced the circumstances associated with surge pricing 26%, 18%, and 4%, respectively, in the case of Pune, Mumbai and Nagpur cities and Category II respondents who do not know about the circumstance associated with surge pricing of 10%, 10% and 27% on Pune, Mumbai and Nagpur cities.

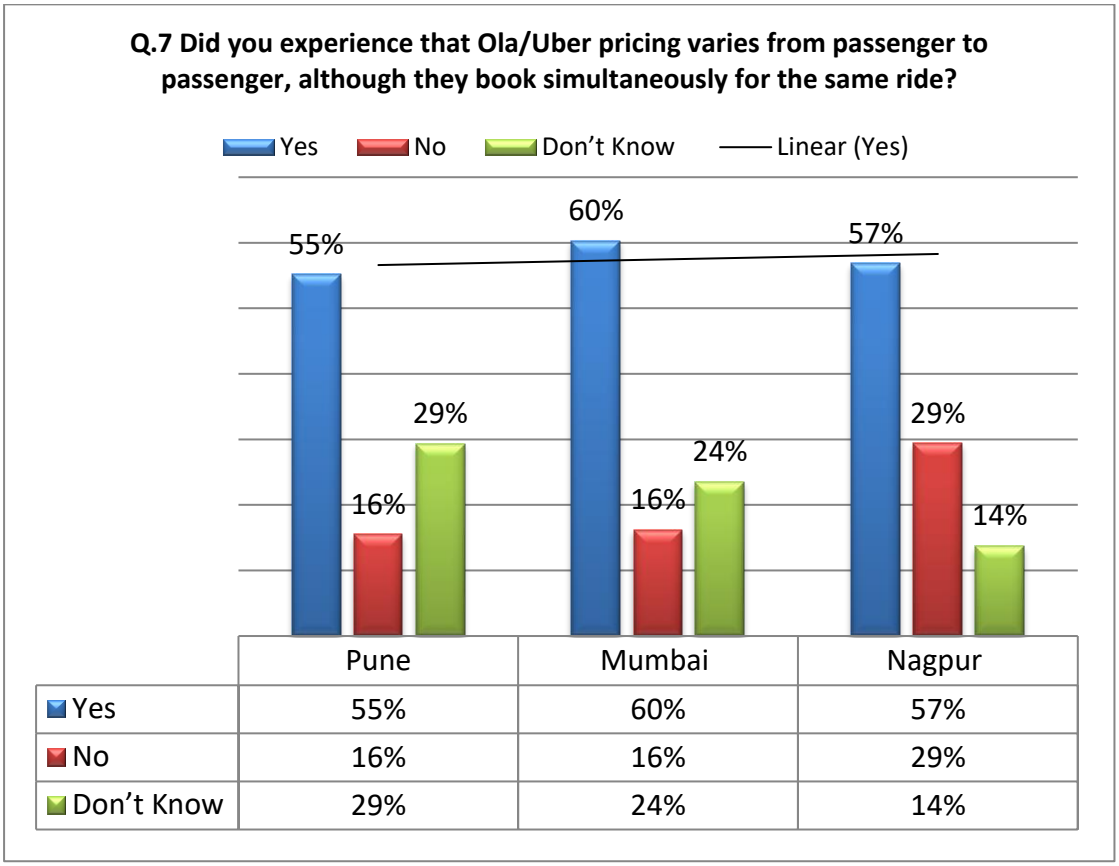
6.7.6. Analysis of Perception Category II respondents of Pricing Policies



	Pune	Mumbai	Nagpur
Yes	52%	44%	47%
No	31%	43%	31%
Don't Know	17%	13%	22%

This graph illustrates how Category II respondents perceive of the pricing policy of the Ola/Uber Business model. The trendline indicates that the highest proportion of Category II respondents believes that the first few days of Ola/Uber are moderate, and fair in pricing, but after settling into market, the prices rise. In contrast, a smaller percentage of Category II respondents do not think this and as being ignorant of price policies. This trend is common in Pune, Mumbai, and Nagpur city. Percentage of Category II respondents who are experiencing such pricing policies are 52%, 44%, and 47% within Pune, Mumbai, and Nagpur cities which is higher than the proportion of Category II respondents who have not been exposed to similar pricing policies 31%, 43%, and 31% for Pune, Mumbai and Nagpur cities, and those unaware of the pricing policy are 17%, 13%, and 22% in Pune, Mumbai and Nagpur cities.

6.7.7. Perception of Category II respondents about Personalised Pricing

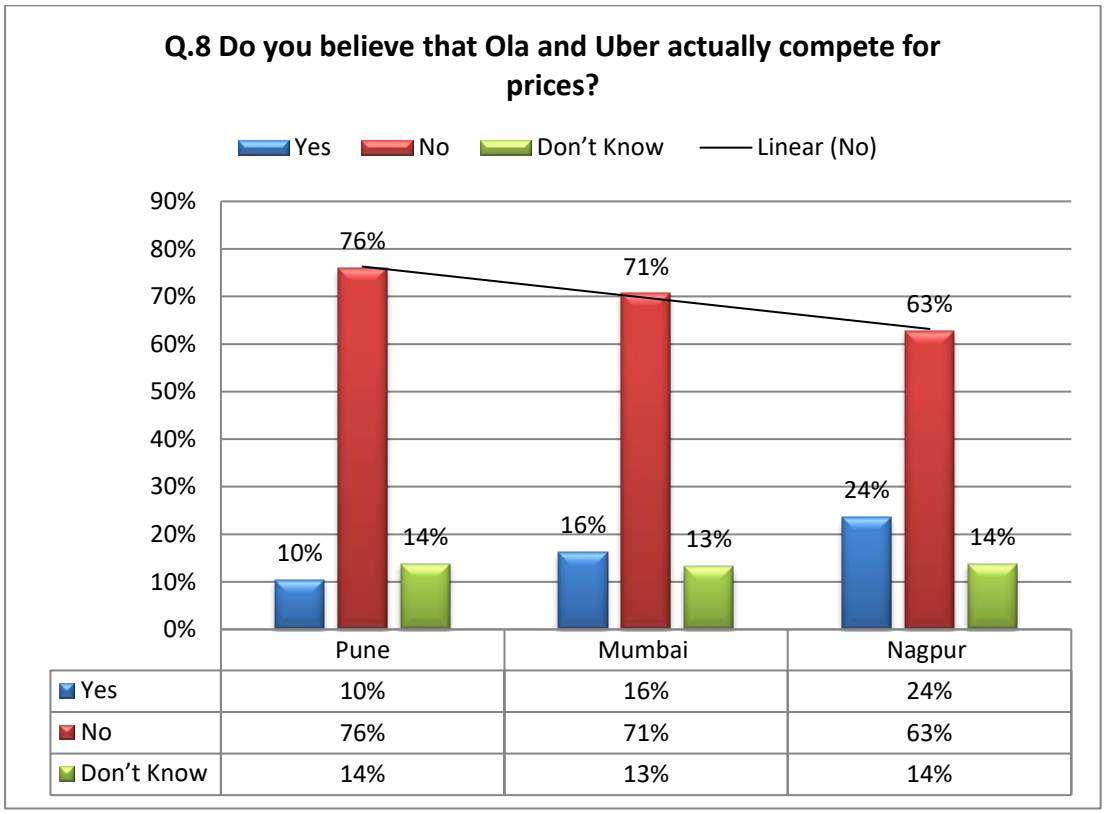


	Pune	Mumbai	Nagpur
Yes	55%	60%	57%
No	16%	16%	29%
Don't Know	29%	24%	14%

This graph shows the percentage of Category II respondents who experience personalised pricing. The trendline indicates that a high proportion of Category II respondents had experienced personalized pricing. The proportion of Category II respondents who did not experience personalised pricing and were unaware of personalized pricing is less.

The percentage of Category II respondents who have experienced personalised pricing is 55%, 60%, and 57% within Pune, Mumbai, and Nagpur, respectively, is greater than the percentage of those who did not experience personalized pricing, which is 16%, 16% 29%, and of those who are unaware regarding the personalised pricing of 29%, 24% and 14% in the respective cities. This trend is a common occurrence in the three cities.

6.7.8. Analysis of Perception About Competition Among Ola/Uber Drivers

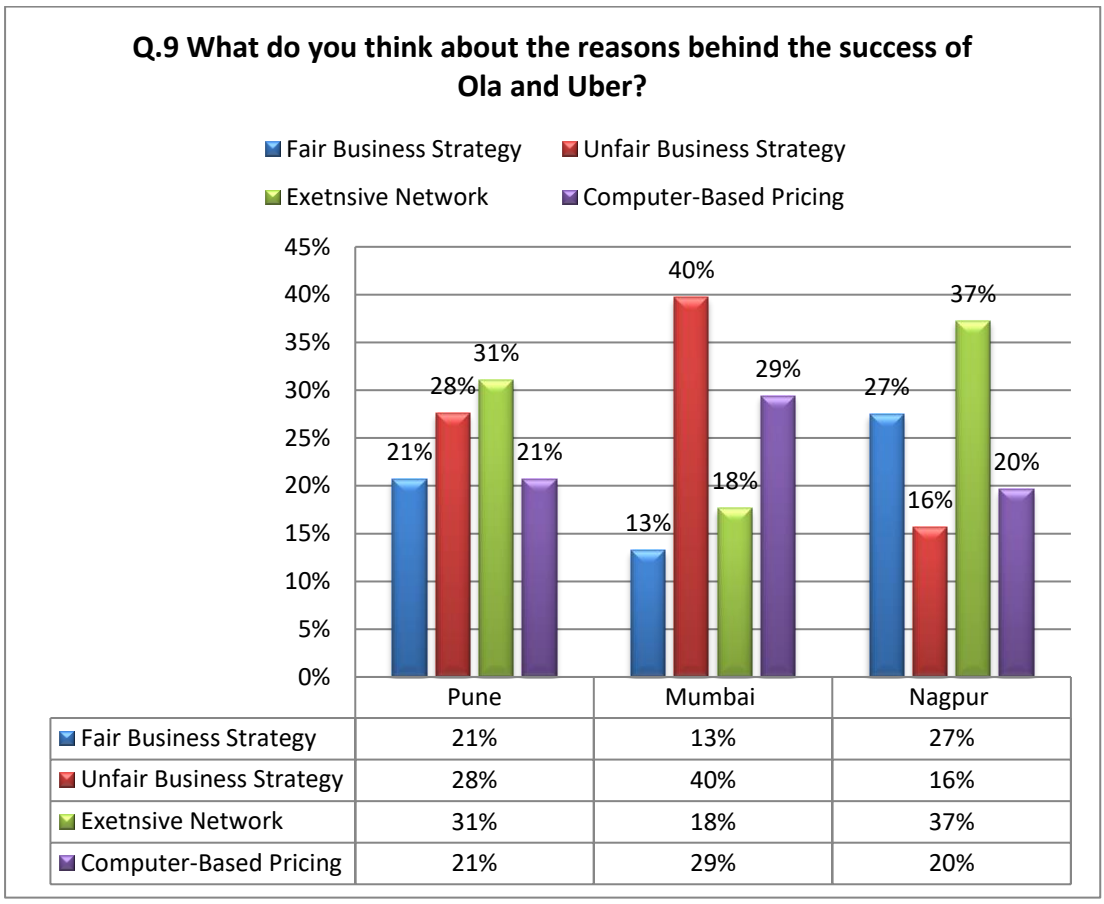


	Pune	Mumbai	Nagpur
Yes	10%	16%	24%
No	76%	71%	63%
Don't Know	14%	13%	14%

This graph illustrates the view of Category II respondents about the competition between Ola and Uber. The proportion of Category II respondents is much higher for those who believe in the absence of competition than those who believe in the presence of competition. The proportion of Category II respondents unaware of competition is considerably smaller than that of the presence and absence of competition. This trend is prevalent in Pune, Mumbai and Nagpur cities.

The proportion of Category II respondents who think there is no competition is 76%, 71%, and 63% Pune, Mumbai, and Nagpur. It is much higher than the proportion of Category II respondents who believe that competition exists, the percentage is 10%, 16%, and 24%. The percentage of Category II respondents who do not know about the presence or absence of competition is considerably lower than that of who believe there is no existence of competition. It is 14%, 13%, and 14% for Pune, Mumbai, and Nagpur, respectively.

6.7.9. Experience of Category II respondents for Economic Rationales of Success



	Pune	Mumbai	Nagpur
Fair Business Strategy	21%	13%	27%
Unfair Business Strategy	28%	40%	16%
Exetnsive Network	31%	18%	37%
Computer-Based Pricing	21%	29%	20%

This graph shows the Category II respondents perceptions about the most common reasons for the achievements of Ola and Uber.

Extensive network: This is the most popular reason for the success of Ola and Uber in all three cities. In Pune, 31% of respondents cited this as the main reason, while in Mumbai and Nagpur, it was cited by 37% and 27% of respondents, respectively.

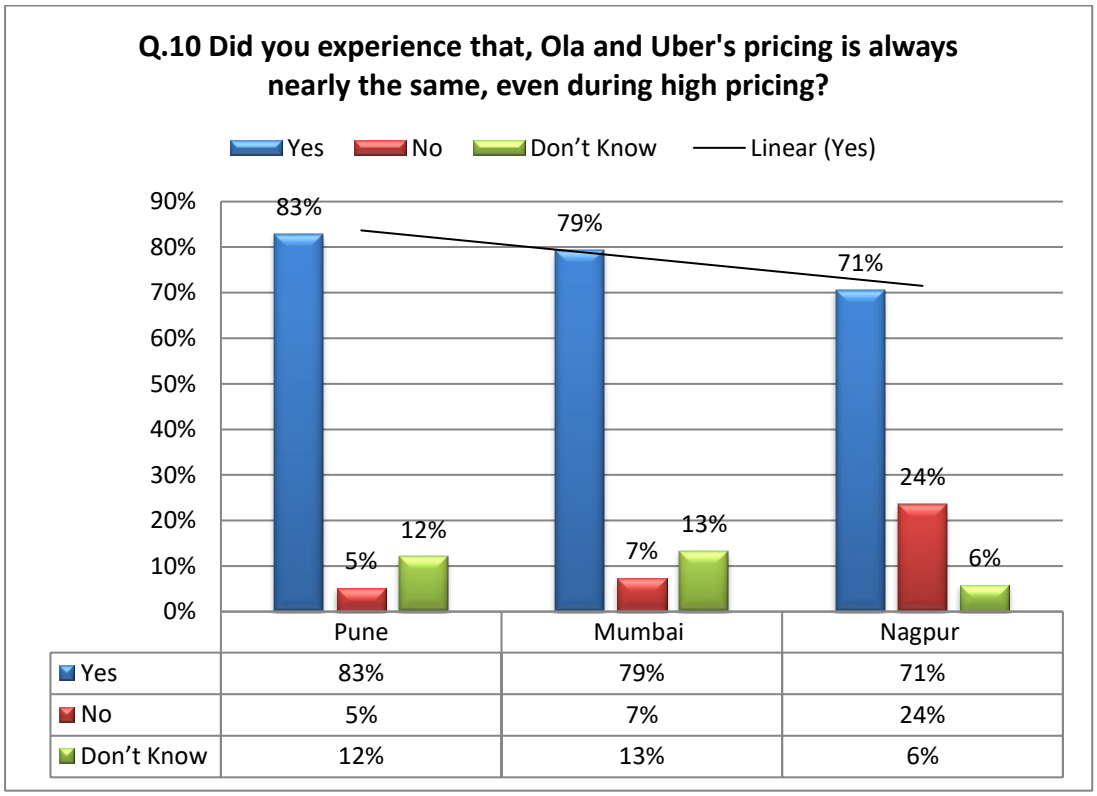
Unfair business strategy: This is the second most popular reason for the success of Ola and Uber in Mumbai. 40% of respondents in Mumbai cited this as the main reason, while in Pune and Nagpur, it was cited by 28% and 16% of respondents, respectively.

Fair business strategy: This is the third most popular reason for the success of Ola and Uber in Nagpur. 27% of respondents in Nagpur cited this as the main reason, while in Pune and Mumbai, it was cited by 21% and 13% of respondents, respectively.

Computer-based pricing: This is the least popular reason for the success of Ola and Uber in all three cities. In Pune, 11% of respondents cited this as the main reason, while in Mumbai and Nagpur, it was cited by 18% and 20% of respondents, respectively.

Overall, the graph shows that the respondents in all three cities believe that the success of Ola and Uber is due to their extensive network and unfair business strategy. However, there are some differences in the reasons cited by respondents in each city. For example, respondents in Mumbai are more likely to cite unfair business strategy as the main reason for the success of Ola and Uber, while respondents in Nagpur are more likely to cite fair business strategy as the main reason.

6.7.10. Assessing an Experience of Price Parallelism

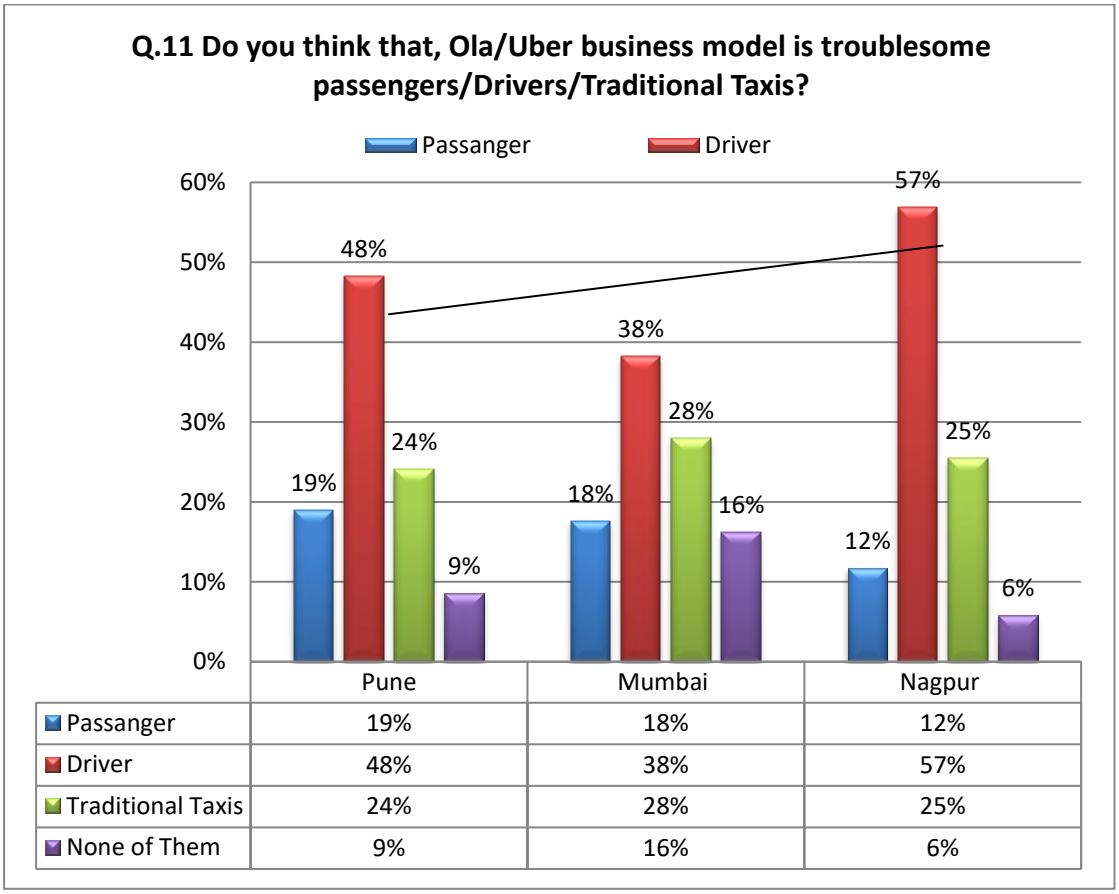


	Pune	Mumbai	Nagpur
Yes	83%	79%	71%
No	5%	7%	24%
Don't Know	12%	13%	6%

The graph shows that the percentage of Category II respondents who experienced the similar prices that Ola or Uber offers is considerably greater than those who did not experience it and were unaware of similarity in pricing. This trend is common in Pune, Mumbai, and Nagpur cities.

The percentage of Category II respondents who have experienced similar prices in the case of Ola and Uber is 83%, 79%, and 71%, which is much higher than the percentage who did not experience the same pricing, which are 5%, 7%, and 24%. Those who do not know about the price comparison are 12%, 13%, and 6% in Pune, Mumbai, and Nagpur, respectively.

6.7.11. Assessing Perception of Injury to Stakeholders



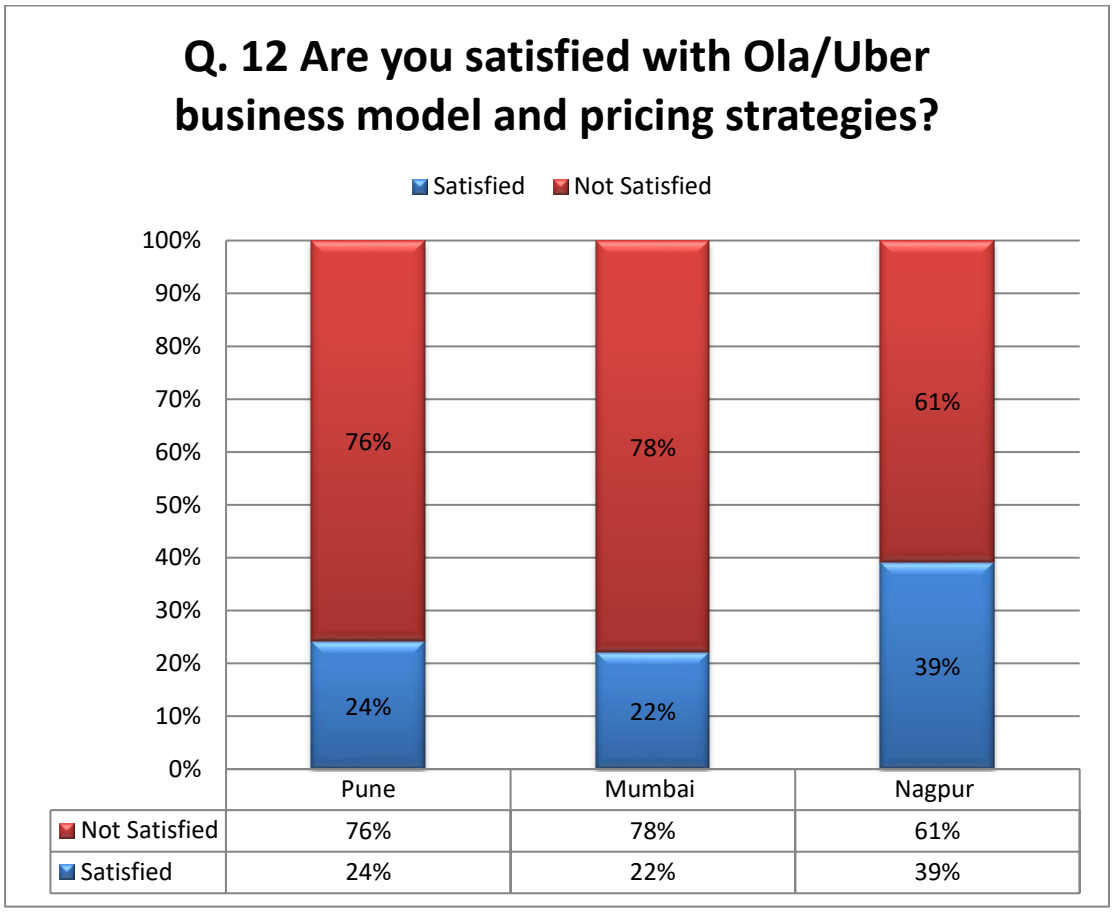
	Pune	Mumbai	Nagpur
Passanger	19%	18%	12%
Driver	48%	38%	57%
Traditional Taxis	24%	28%	25%
None of Them	9%	16%	6%

This graph shows the perception that Ola and Uber's business models can harm stakeholders within the context. The graph indicates that category II respondents consider this model troublesome for themselves more than other stakeholders. Moreover, almost all Category II respondents from Pune, Mumbai, and Nagpur cities think that the model is harmful to themselves thereafter harmful to traditional taxis.

The proportion that Pune, Mumbai and Nagpur Category II respondents who think that Uber's business model causes harm to Category II respondents is 48%,38% and 57%, respectively. This trend is higher than those who believe harmful to any other

stakeholders. The next to traditional taxis percentage is higher than other stakeholders, 24%,28%, 25% Category II respondents believe that Ola/Uber business strategies harmful to traditional taxis. The percentage of Category II respondents who believe that the business model isn't harmful to any stakeholder 9%, 16%, 6%, is considerably low respectively.

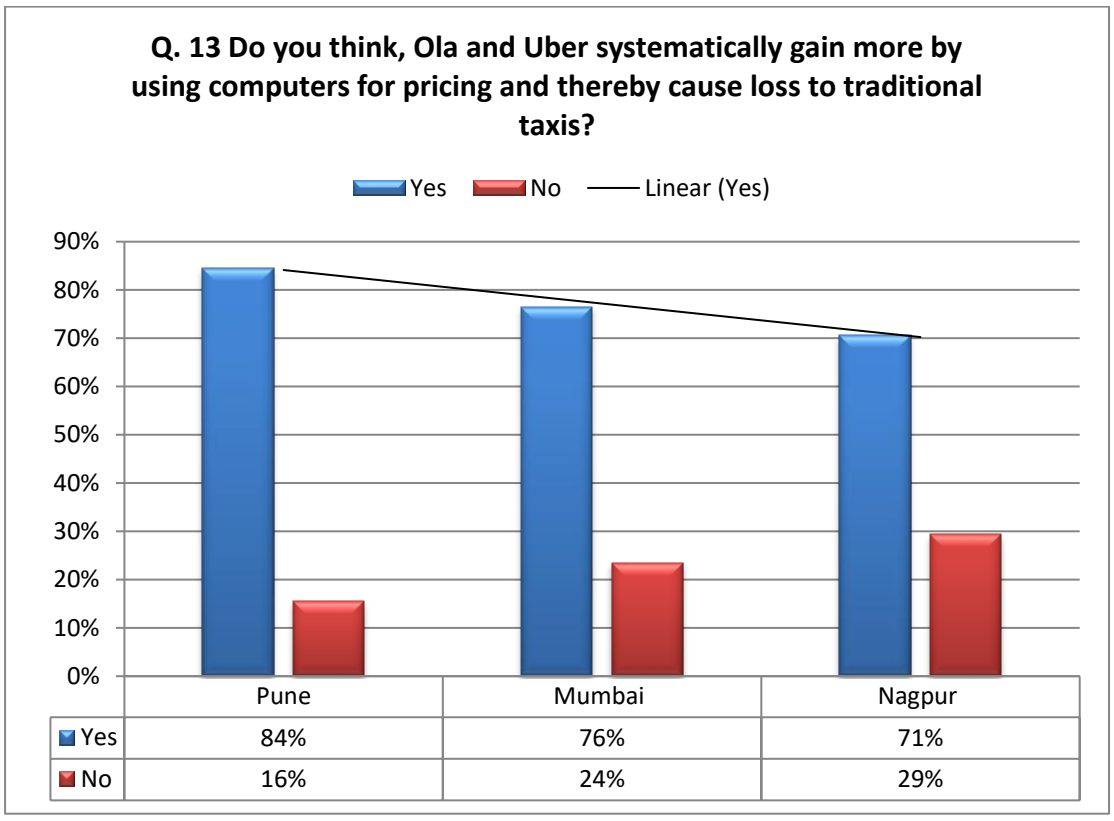
6.7.12. Assessment of Overall level of Satisfaction Among Ola/Uber Drivers



This graph reveals the degree of satisfaction of the Category II respondents, more than half of respondents were dissatisfied with their Ola/Uber business model and pricing policies. The proportion of Category II respondents is higher among those unhappy with Uber's business model or pricing policy than among those satisfied with their model.

The number of Category II respondents unhappy in Pune, Mumbai and Nagpur is 76%, 78%, 61% which is greater than those who are satisfied 24%, 22%, 39% respectively. This trend is evident in three cities.

6.7.13. Assessing Injury to Traditional Taxis Through Perception of Ola/Uber Driver

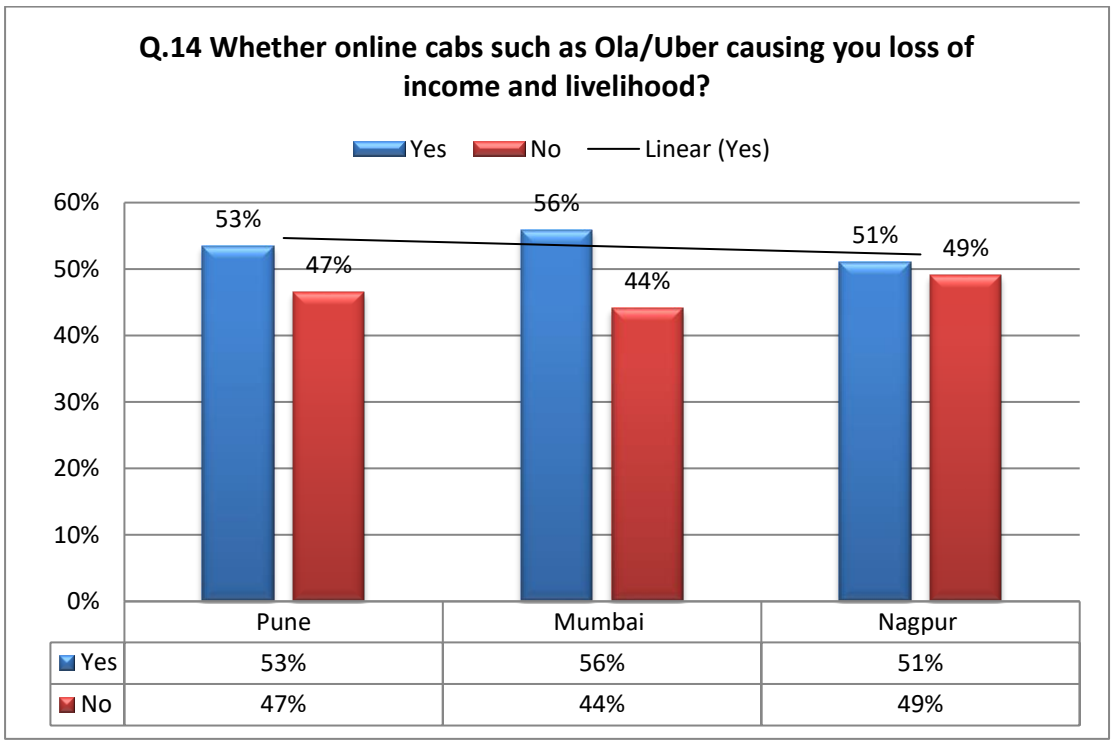


	Pune	Mumbai	Nagpur
Yes	84%	76%	71%
No	16%	24%	29%

This graph shows how the driver's perception of computer-based pricing is harmful to traditional taxis. The trendline clearly shows that a significant percentage of the Category II respondents believes that the pricing based on computers of Ola/Uber is harmful to traditional taxis as opposed to those who do not believe that computer-based pricing causes damage to traditional taxis. This pattern is prevalent in three cities.

The proportion of Category II respondents who think that computer-based prices of Ola and Uber cause harm to traditional taxis is 84%, 76%, and 71% is higher than those who think that it is not harmful to traditional taxis is 16%,24%, 29%, respectively, within Pune, Mumbai, and Nagpur cities.

6.7.14. Assessing Degree of Exploitation of Loss of Income and Livelihood of Ola/Uber Drivers



This graph examines how respondents perceive a loss of income and livelihood. More than half of Category II respondents were unhappy with their Ola/Uber pricing policy and business model. The percentage of dissatisfied Category II respondents is more significant among those who suffer losses of income and livelihoods due to Uber's pricing model or business policy than those who are unaffected.

The number of Category II respondents experiencing losing incomes in Pune, Mumbai, and Nagpur is 53 %, 56 %, and 51%, which is higher than the number of Category II respondents who do not suffer the loss of income of 47 %, 44 %, and 49%, respectively. This is apparent across three cities.

6.7.15. Decoding Logic Behind the Pricing Policy Through In-Depth Analysis of Perceptions

Question No. 6 Do you think that the initial days of Ola/Uber were fair in pricing, and after some time, i.e., after capturing the market, the prices have become high?

Qusetion No. 2 How much is your driving experience?

	Pune			
	0 to 5 Years	5 to 10 Years	10 to 15 Years	Above 15 Years
Yes	19%	36%	71%	80%
No	38%	55%	24%	10%
Don't Know	44%	9%	5%	10%

The graph shows that there is a correlation between driving experience and perception of Ola/Uber pricing policy. Respondents with driving experience of 0 to 5 years and 5 to 10 years are less likely to believe that Ola/Uber prices are fair and moderate in the initial days, but rise after settling into the market. Respondents with driving experience of 10 to 15 years and over 15 years are more likely to believe this.

This is apparent in all three cities: Pune, Mumbai, and Nagpur. In Pune, 19% of respondents with driving experience of 0 to 5 years and 36% of respondents with driving experience of 5 to 10 years believe that Ola/Uber prices are fair and moderate in the initial days, but rise after settling into the market. However, 71% of respondents with driving experience of 10 to 15 years and 80% of respondents with driving experience of over 15 years believe this.

	Mumbai			
	0 to 5 Years	5 to 10 Years	10 to 15 Years	Above 15 Years
Yes	19%	31%	62%	72%
No	67%	56%	31%	11%
Don't Know	14%	13%	8%	17%

The same trend is seen in Mumbai and Nagpur. In Mumbai, 19% of respondents with driving experience of 0 to 5 years and 31% of respondents with driving experience of 5 to 10 years believe that Ola/Uber prices are fair and moderate in the initial days, but rise after settling into the market. However, 62% of respondents with driving experience of 10 to 15 years and 72% of respondents with driving experience of over 15 years believe this.

	Nagpur			
	0 to 5 Years	5 to 10 Years	10 to 15 Years	Above 15 Years
Yes	40%	40%	50%	57%
No	50%	47%	25%	7%
Don't Know	10%	13%	25%	36%

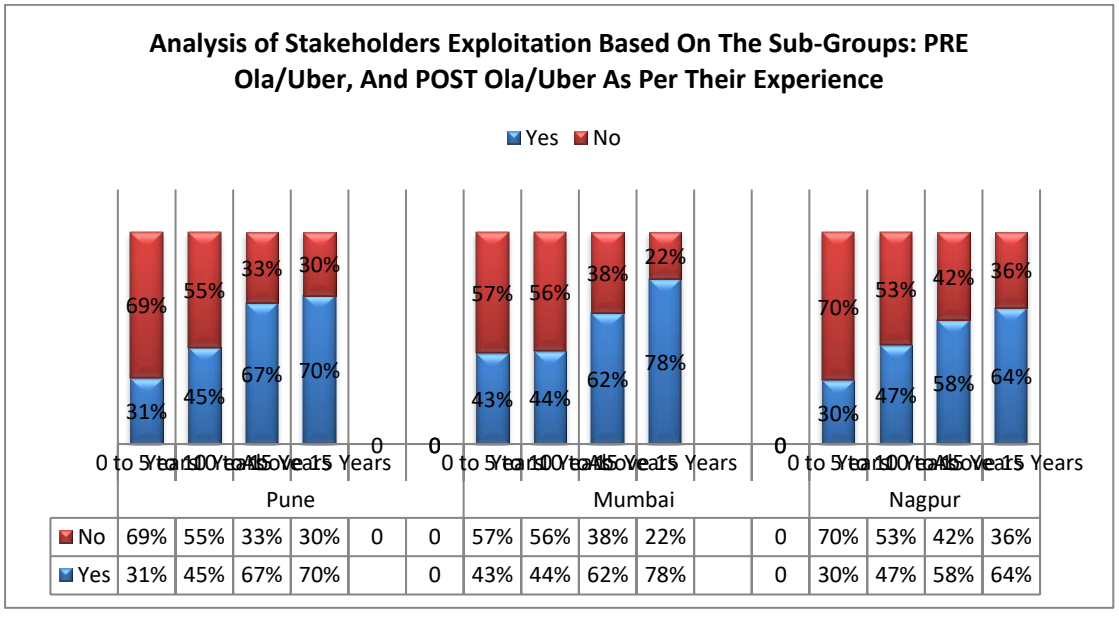
In Nagpur, 40% of respondents with driving experience of 0 to 5 years and 40% of respondents with driving experience of 5 to 10 years believe that Ola/Uber prices are fair and moderate in the initial days, but rise after settling into the market. However, 50% of respondents with driving experience of 10 to 15 years and 57% of respondents with driving experience of over 15 years believe this.

This suggests that respondents with more driving experience are more likely to have seen how Ola/Uber prices have changed over time. As a result, they are more likely to believe that Ola/Uber prices are not fair and moderate in the initial days, but rise after settling into the market.

6.7.16. Analysis of Stakeholders Exploitation

Qusetion No. 2 How much is your driving experience?

Question No. 14 Whether online cabs such as Ola/Uber causing you loss of income and livelihood?



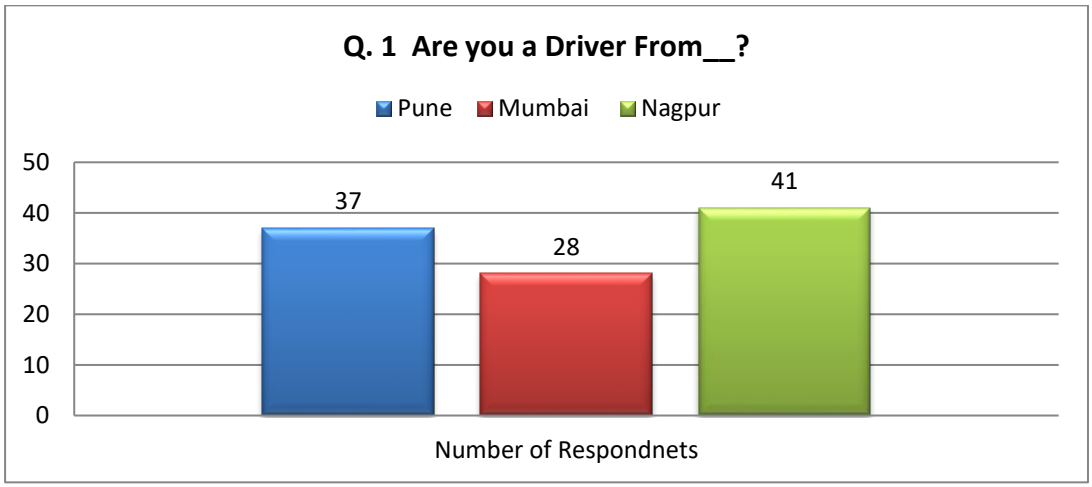
This graph offers a detailed analysis of how Category II respondents experience concerning the loss of income and livelihoods based on their own experiences. The proportion of Category II respondents with driving experience between 0 and 5 years and 5 to 10 years who experience loss of income and the loss of livelihood is lower than those with driving experience of between 10 to 15 years and over 15 years. This is evident within three cities.

It suggests that respondents with more driving experience are more likely to experience loss of income and livelihoods. It exposes the strategy of exploitation of Ola/Uber companies.

6.8. DATA ANALYSIS OF CATEGORY III RESPONDENTS (TRADITIONAL TAXI DRIVRS)

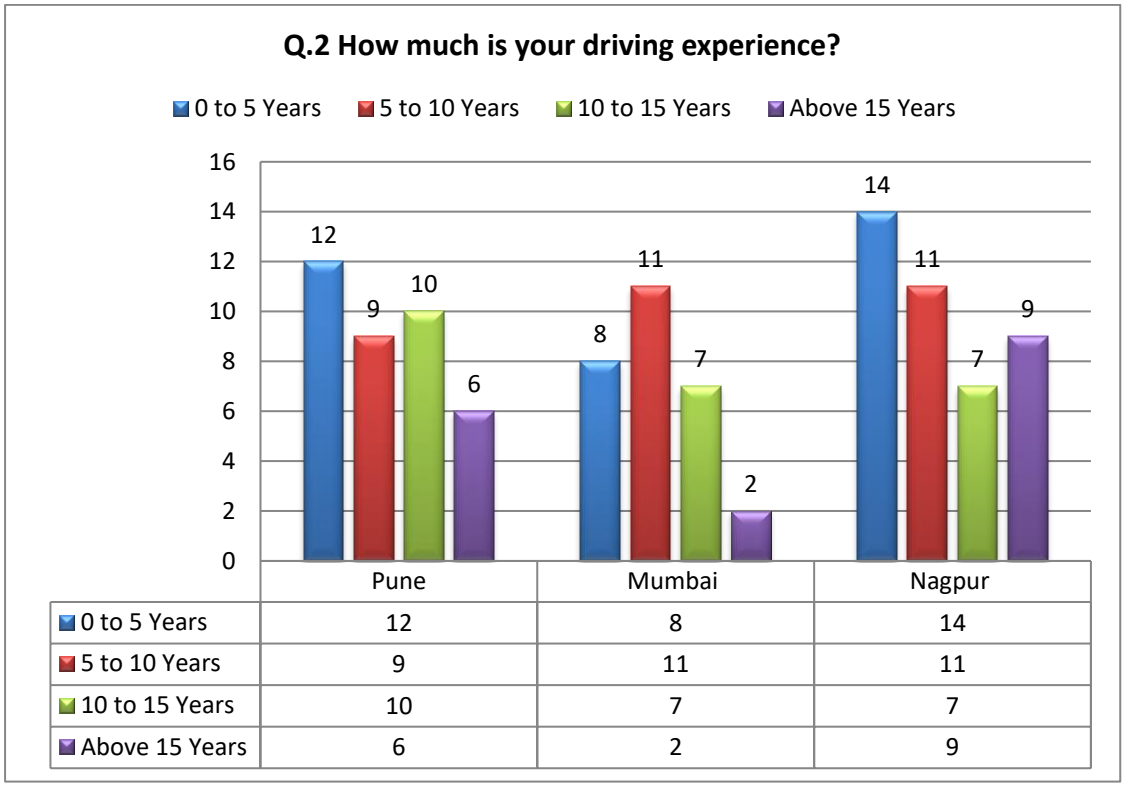
The data collected from Category III respondents (Traditional Taxi Drivers) aimed to assess the impact of Ola and Uber on the traditional taxi industry. It was commonly thought that at the initial stage, Ola/Uber charged their prices below the average cost of rides, i.e., predatory pricing, and once they captured the level of market share and dependency of Category I respondents (Passengers) they started to charge high prices i.e., Supra-competitive prices. The traditional taxi industry faces discriminatory challenges from regulatory authorities. Therefore, it is essential to understand the differences in legal regulations of both traditional and Ola/Uber taxis. And how these differences put the traditional taxi industry competitively disadvantageous position. In addition, that questionnaire was designed to evaluate their perception of transparency, loss of employment, and impact on income. The data collected from Category III respondents was collected in two groups pre-Ola/Uber period and post-Ola/Uber period. Total Number of 37, 28 and 41 were collected respectively. A Total 106 respondent' s data was collected randomly to study the Category III respondents (traditional taxi driver) perception and experience.

6.8.1. Sampling of Traditional Taxi Traditional taxi drivers



This graph shows distribution of number of category III respondents data collected from three cities for the study. Total Number of 37, 28 and 41 respondents' data collected from Pune, Mumbai, Nagpur respectively. A Total of 106 respondents data collected to study the Category III respondent's perception and experience.

6.8.2. Sampling Based on the Duration of Driving Experience



	Pune	Mumbai	Nagpur
0 to 5 Years	12	8	14
5 to 10 Years	9	11	11
10 to 15 Years	10	7	7
Above 15 Years	6	2	9

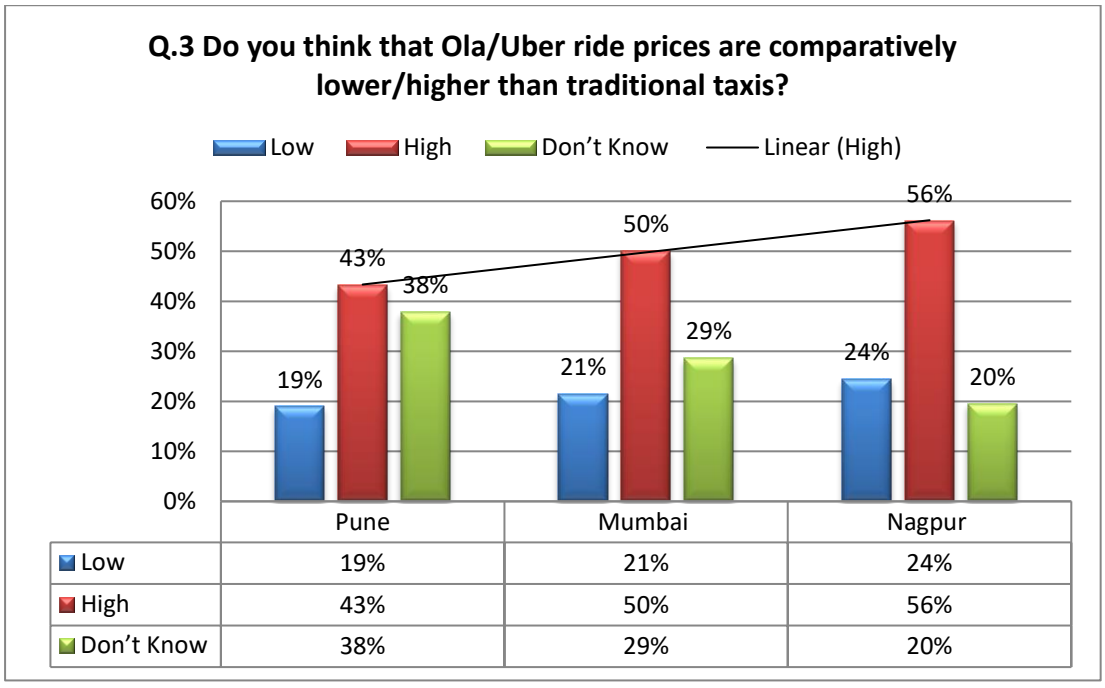
This graph provides information about data distribution of Category II respondents based on their experience. The entire respondents divided into four groups (0 to 5 years), (5 to 10 years), (10 to 15 Years), (above 15 Years) for further analysis of specific perception and their differences.

Pune: 12 respondents with 0 to 5 years of experience, 9 respondents with 5 to 10 years of experience, 10 respondents with 10 to 15 years of experience, and 6 respondents with over 15 years of experience.

Mumbai: 8 respondents with 0 to 5 years of experience, 11 respondents with 5 to 10 years of experience, 7 respondents with 10 to 15 years of experience, and 2 respondents with over 15 years of experience.

Nagpur: 14 respondents with 0 to 5 years of experience, 11 respondents with 5 to 10 years of experience, 7 respondents with 10 to 15 years of experience, and 9 respondents with over 15 years of experience.

6.8.3. General Experience of Pricing Among the Category III Respondents



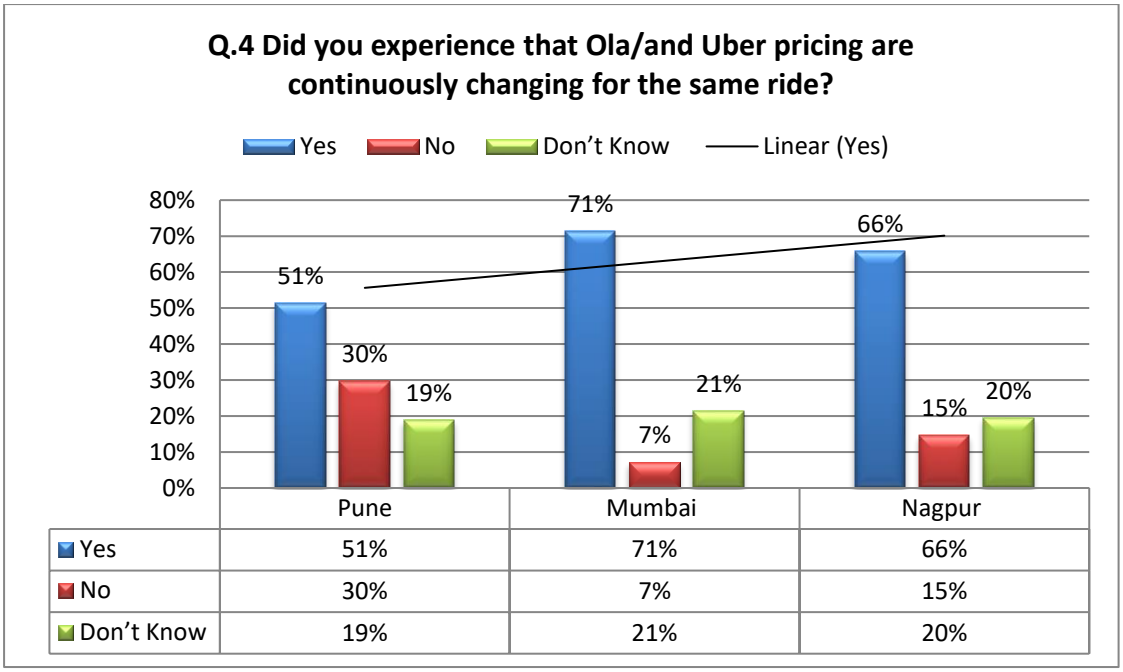
	Pune	Mumbai	Nagpur
Low	19%	21%	24%
High	43%	50%	56%
Don't Know	38%	29%	20%

The table below describes the city-wise perceptions of Category III respondents about Ola and Uber pricing. It was observed that most of the Category III respondents perceive high pricing in three cities. In comparison, a smaller percentage of traditional

taxi Category III respondents feel that they are charging lower than those who believe Ola/Uber charge high prices. Also, a smaller proportion of Category III respondents were unaware about pricing.

The parentage of Category III respondents who experience high prices is 13%, 50%, and 56% for Pune, Mumbai and Nagpur cities, is significantly higher than the percentage of traditional taxi Category II respondents who charge lower prices are 19%, 21%, and 24% in Pune, Mumbai, Nagpur cities.

6.8.4. Experience of Traditional Taxi Category III respondents about Dynamic Pricing

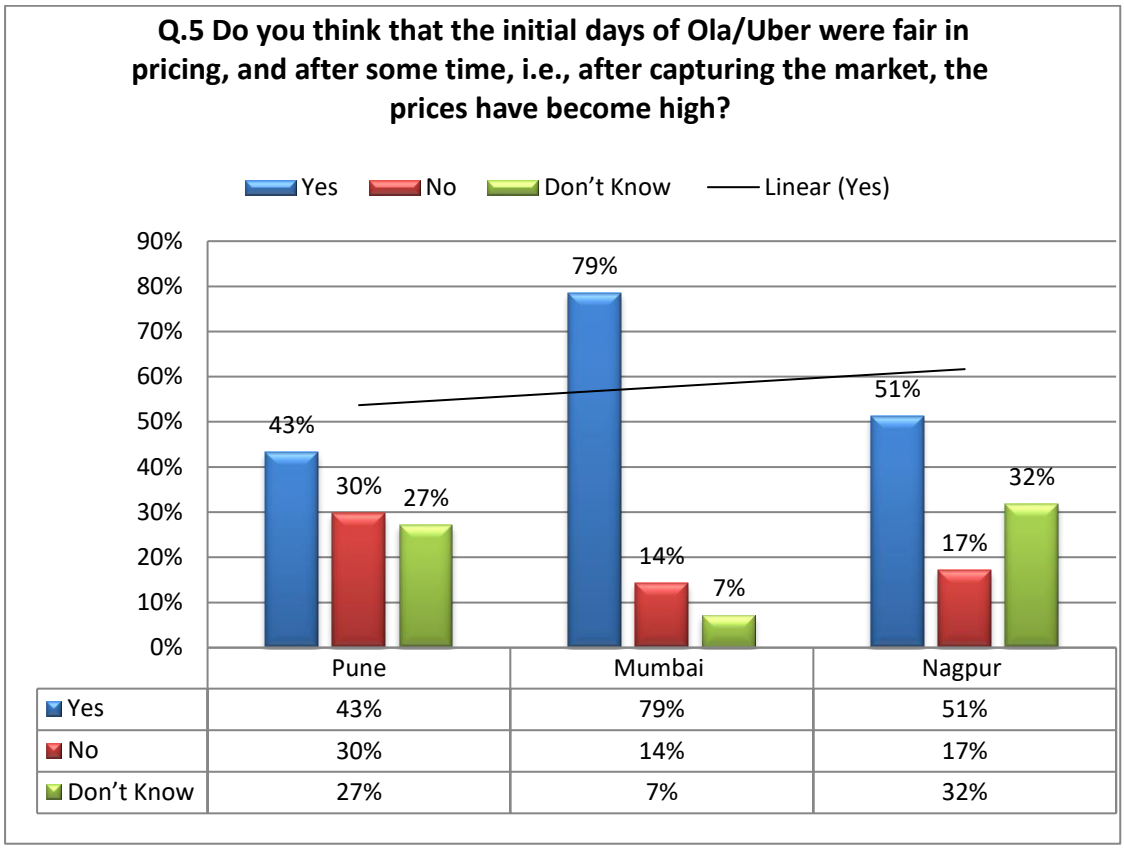


	Pune	Mumbai	Nagpur
Yes	51%	71%	66%
No	30%	7%	15%
Don't Know	19%	21%	20%

This graph highlights the experiences of Category III respondents with dynamic pricing. The trendline indicates the highest proportion of Category III respondents who have experienced dynamic pricing. Conversely, a smaller percentage were not experiencing, and were not aware of the dynamic price. This trend is also evident in all cities. The parentage of Category III respondents who experience dynamic pricing is 51%, 71%, and 66% for Pune, Mumbai and Nagpur cities; this is significantly higher than the proportion who are not experiencing dynamic prices 30%, 7%, and 15% respectively, for Pune, Mumbai and Nagpur cities, as well as who are unaware

about dynamic prices 19%, 21%, and 20% for Pune, Mumbai and Nagpur cities respectively.

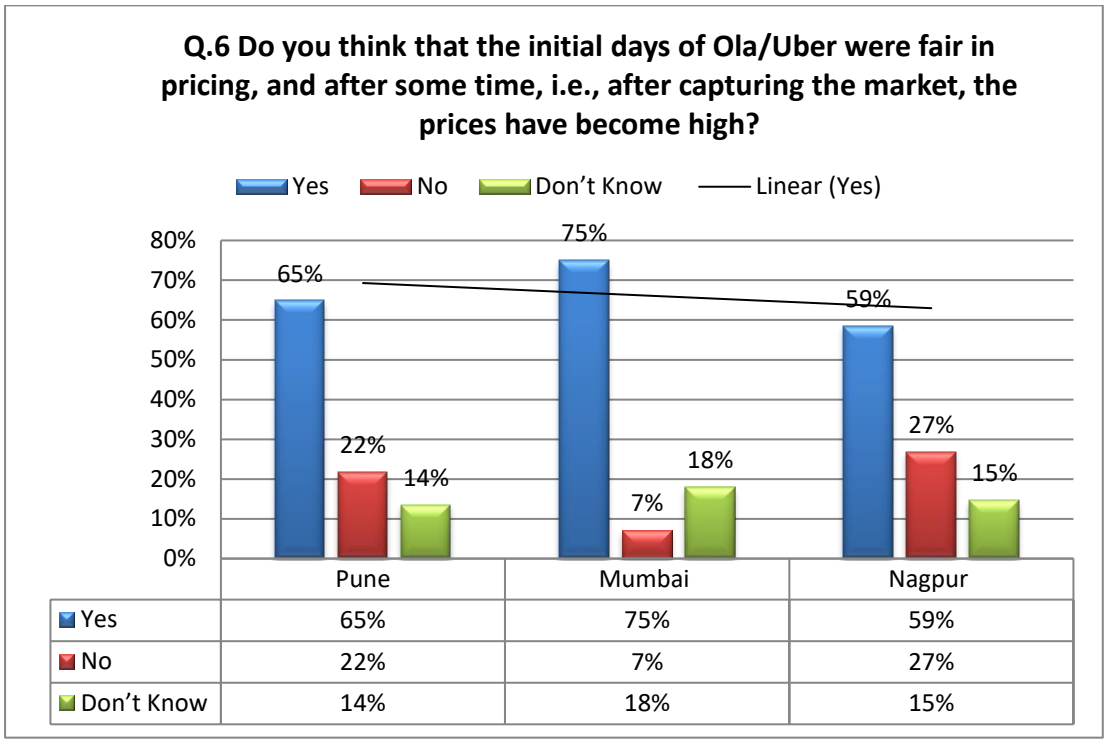
6.8.5. Analysing Awareness of Circumstances for Surge Pricing



	Pune	Mumbai	Nagpur
Yes	43%	79%	51%
No	30%	14%	17%
Don't Know	27%	7%	32%

This graph shows the level of awareness about circumstances associated with surge pricing. The trendline shows the most significant percentage of Traditional taxi Category III respondents who have been aware of the circumstances related to surge pricing, including rain and timings for office work. However, a lower proportion of Category III respondents were not experienced and clueless about the implications of surge pricing. The same trend can be seen across every city. The Category III respondents of those who are aware of the circumstances are 43% 79%, and 51% in Pune, Mumbai and Nagpur cities which is much greater than the percentage of who have not experienced the circumstances associated with the surge pricing 30%, 14%, and 17%, respectively, in the case of Pune, Mumbai and Nagpur cities and who do not know about the circumstance associated with surge pricing of 27%, 7% and 32% on Pune, Mumbai and Nagpur cities respectively.

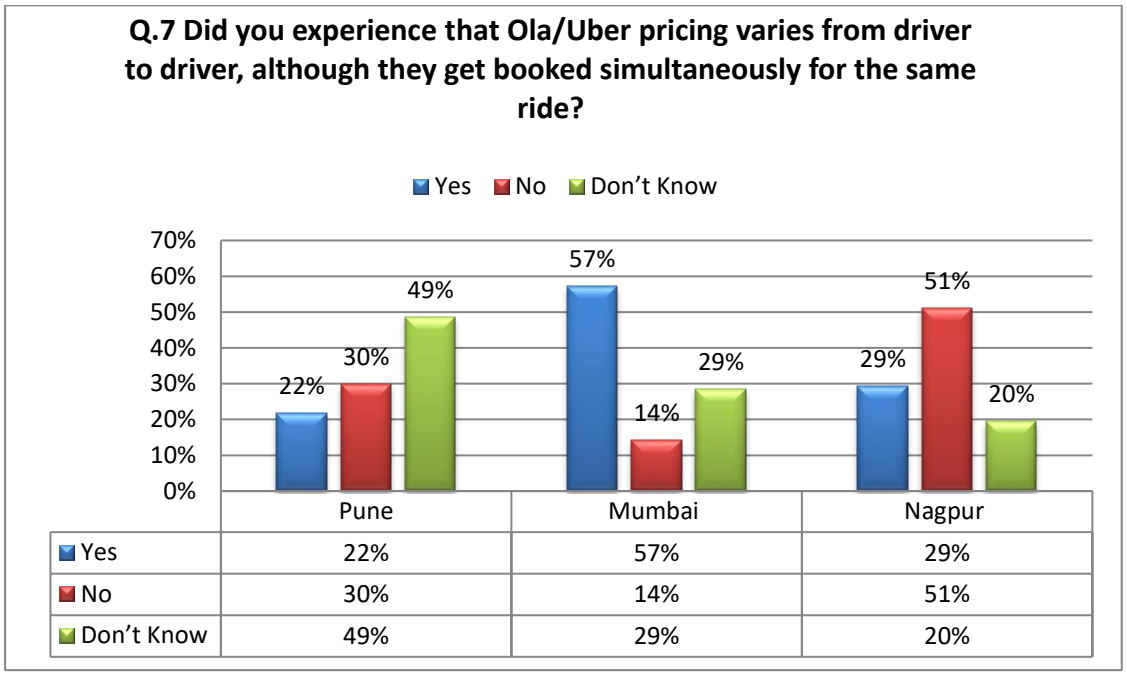
6.8.6. Analysis of Perception for Pricing Policies



	Pune	Mumbai	Nagpur
Yes	65%	75%	59%
No	22%	7%	27%
Don't Know	14%	18%	15%

This graph illustrates how Category III respondents perceive of the pricing policy of the Ola/Uber Business model. The trendline indicates that the highest proportion of Category III respondents believes that the first few days of Ola/Uber are moderate, and fair in pricing, but after settling into market, the prices rise. In contrast, a smaller percentage of Category III respondents do not think this and as being ignorant of price policies. This trend is common in Pune, Mumbai, and Nagpur city. Percentage of Category III respondents who are experiencing such pricing policies are 65%, 75%, and 59% within Pune, Mumbai, and Nagpur cities which is higher than the proportion of Category III respondents who have not been exposed to similar pricing policies 22%, 7%, and 27% for Pune, Mumbai and Nagpur cities, and those unaware of the pricing policy are 14%, 18%, and 15% in Pune, Mumbai and Nagpur cities respectively.

6.8.7. Analysis of Perception About Price Parallelism

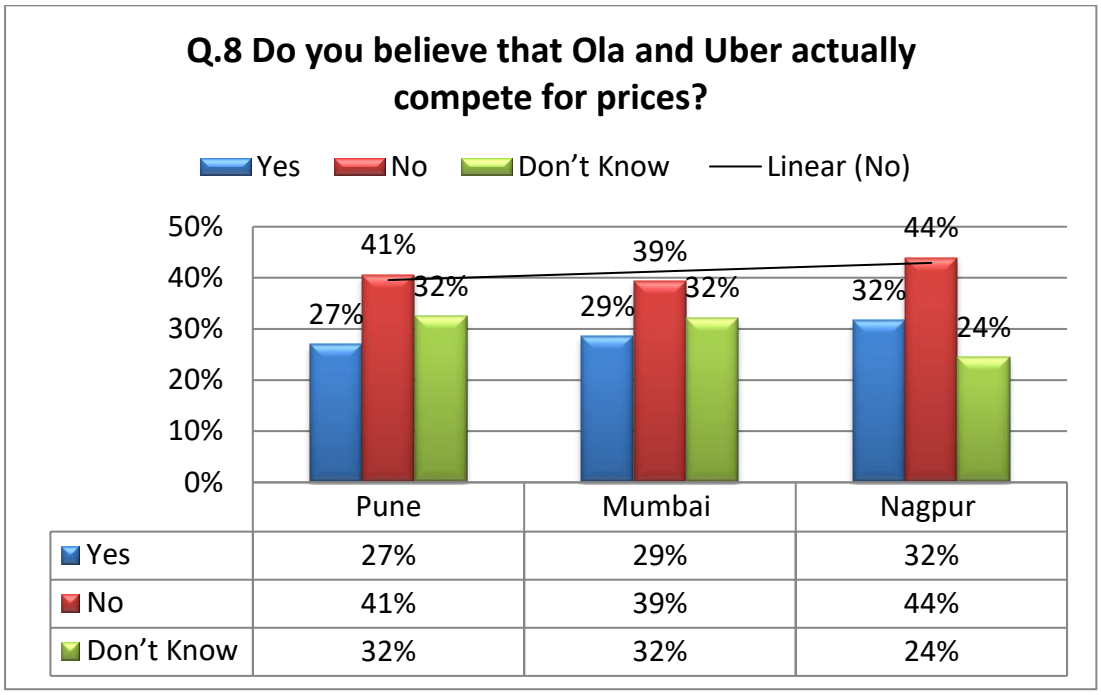


	Pune	Mumbai	Nagpur
Yes	22%	57%	29%
No	30%	14%	51%
Don't Know	49%	29%	20%

This graph shows the proportion of experience of Category III respondents that have personalised pricing. The trendline shows that an undetermined percentage of Traditional taxi operators have had personalised pricing. The percentage of Category III respondents who didn't experience personalized pricing and were unaware of personalized pricing is much lower than those who can experience personalized pricing policies for Mumbai city. This trend isn't being followed by Category III respondents from Pune as well as Nagpur. The respondents from Pune majority are ignorant of the personalized pricing policy for Ola and Uber. In Nagpur city, most of the Category III respondents did not have idea about personalized pricing. The experience and perception of personalized pricing vary based on the city.

The percentage of Category III respondents who have experience of personalized pricing is 22 %, 57%, and 29% in Pune, Mumbai, and Nagpur, as well as the ones who didn't experience individual pricing, which is 30 %, 14%, 51% and of respondents who are not aware of the personal pricing of 49%, 29% and 20% in their cities. The trend is a diverse one in all three cities.

6.8.8. Analysis of Perception about Competition

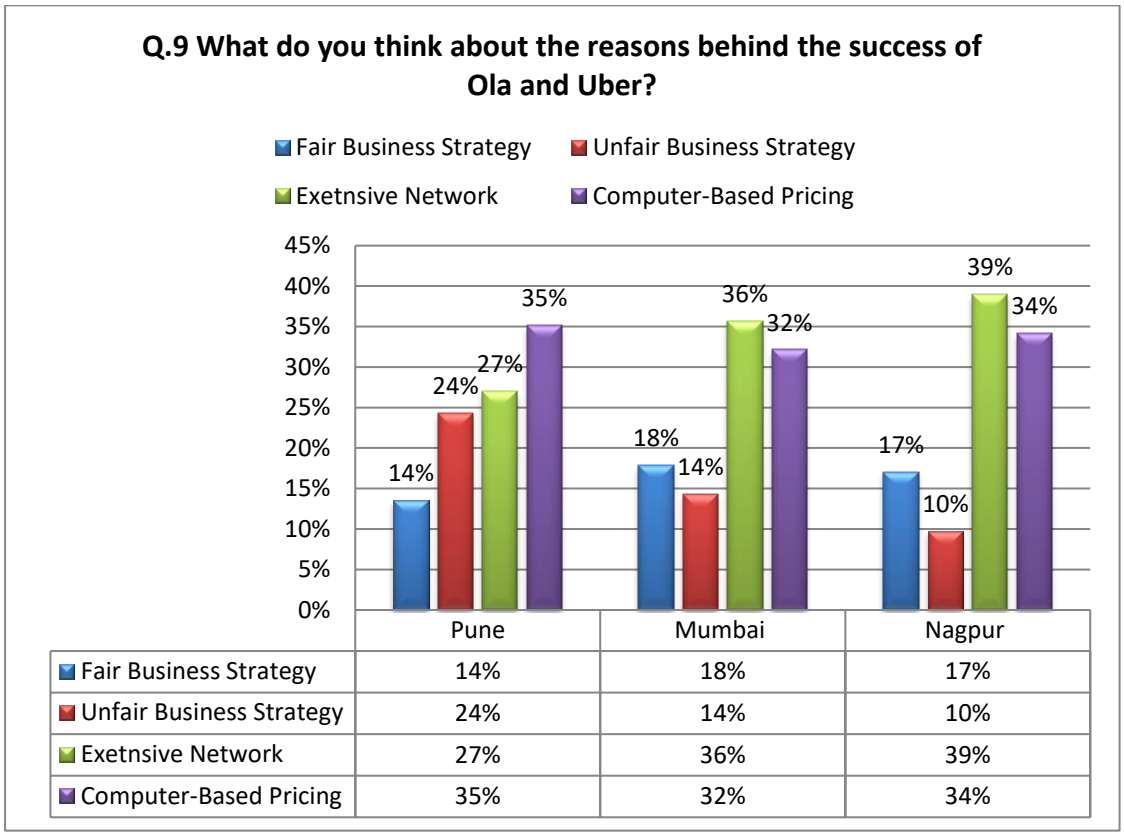


	Pune	Mumbai	Nagpur
Yes	27%	29%	32%
No	41%	39%	44%
Don't Know	32%	32%	24%

This graph describes the view of Category III respondents about the competition between Ola and Uber. The proportion of Category III respondents is slightly higher for those who believe in the absence of competition than those who believe in the presence of competition. The proportion of Category III respondents unaware of competition is considerably smaller than that of the presence and absence of competition. This trend is prevalent in Pune, Mumbai and Nagpur cities.

The proportion of Category III respondents who think there is no competition is 41%, 39%, and 44% Pune, Mumbai, and Nagpur, is higher than who believe that competition exists, the percentage is 27%, 29%, and 32%. The percentage of Category III respondents who do not know about the presence or absence of competition is nearly equal than that of Category III respondents who believe there is no existence of competition. It is 32%, 32%, and 24% for Pune, Mumbai, and Nagpur, respectively.

6.8.9. Assessing Perception for Economic Rationales



	Pune	Mumbai	Nagpur
Fair Business Strategy	14%	18%	17%
Unfair Business Strategy	24%	14%	10%
Exetnsive Network	27%	36%	39%
Computer-Based Pricing	35%	32%	34%

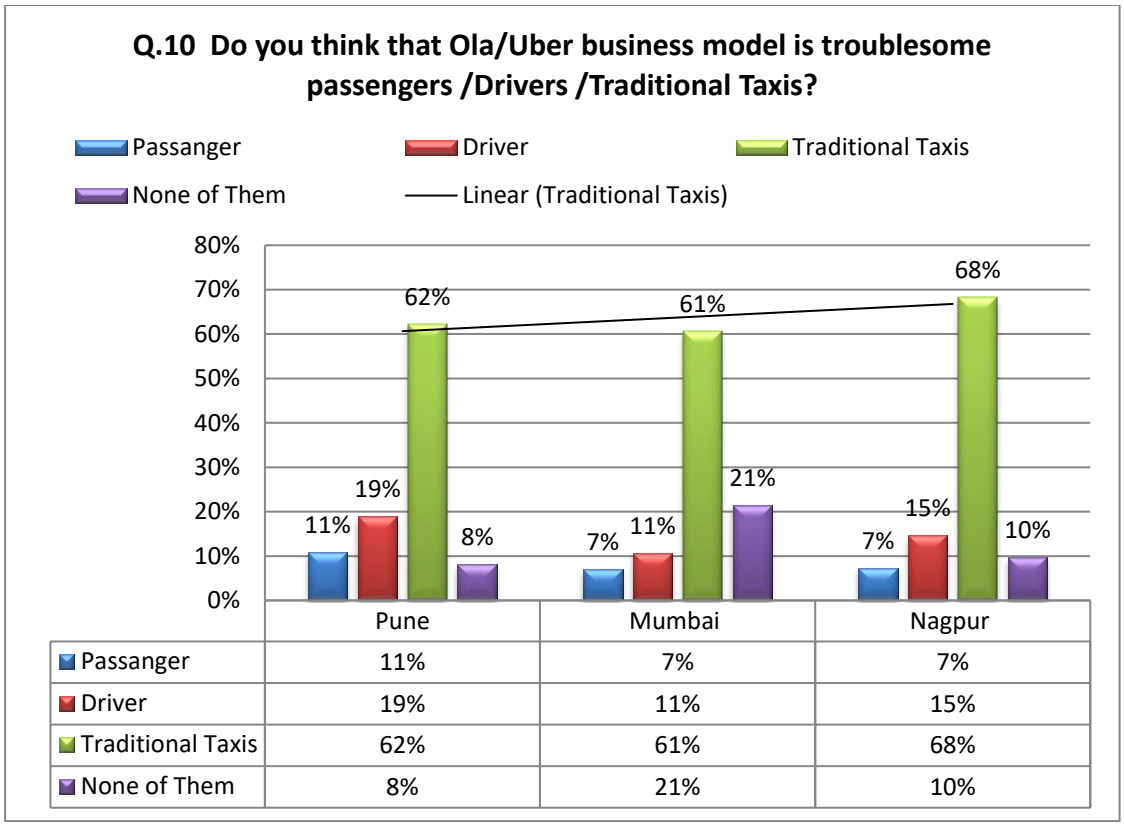
This graph shows the category III respondents perceptions about the most common reasons for the achievements of Ola and Uber. The main reasons are the extensive network and computer-based pricing an over fair business strategies and unfair business strategy. The majority from Mumbai and Nagpur believe that the extensive network is the reason for their success with Ola and Uber, which is greater than other reasons, like Unfair business Strategy. The popular trend in Pune city that has led to its success with Ola and Uber is computer-based pricing.

In Pune city, the reasoning behind the achievement of Ola and Uber is 35% and 27%, respectively, for extensive network and computer-based pricing, which is greater than 24%, and 14 % for unfair and fair business strategy, respectively.

In Mumbai city, the reason for how successful Ola and Uber are 36% and 32%, respectively, for the extensive network and computer-based pricing, respectively which is more than the reasons for 18% and 14% for fair business strategies and unfair business strategies respectively.

In Nagpur city, the reasoning behind the growth of Ola and Uber is 39% and 34% for an extensive network and computer-based pricing, respectively, which is greater than the reason for 17% and 10% fair and unfair business strategies, respectively.

6.8.10. Assessing Perception of Injury to Stakeholders

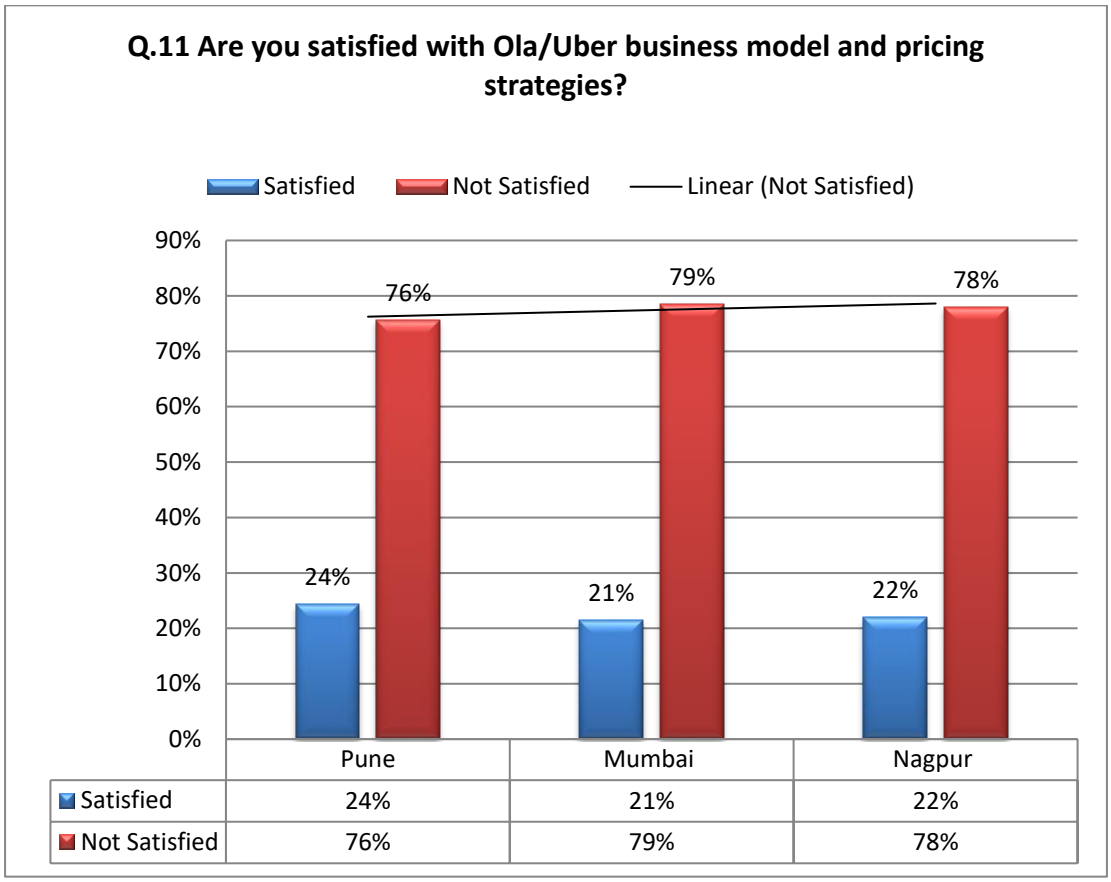


	Pune	Mumbai	Nagpur
Passanger	11%	7%	7%
Driver	19%	11%	15%
Traditional Taxis	62%	61%	68%
None of Them	8%	21%	10%

This graph analyses the experience that Ola and Uber's business models can harm stakeholders within the context. The graph indicates that most of the Category III respondents consider this model is more troublesome to themselves than other stakeholders. Moreover, almost all Category III respondents from three cities think that the model is harmful to themselves.

The proportion that Pune, Mumbai and Nagpur Category III respondents who think that Uber's business model causes harm to them is 62%,61% and 68%, respectively. This trend is higher than those who believe harmful to any other stakeholders. The percentage of Category III respondents who believe that the business model isn't harmful to any stakeholder 8%, 21%, 10%, is low respectively.

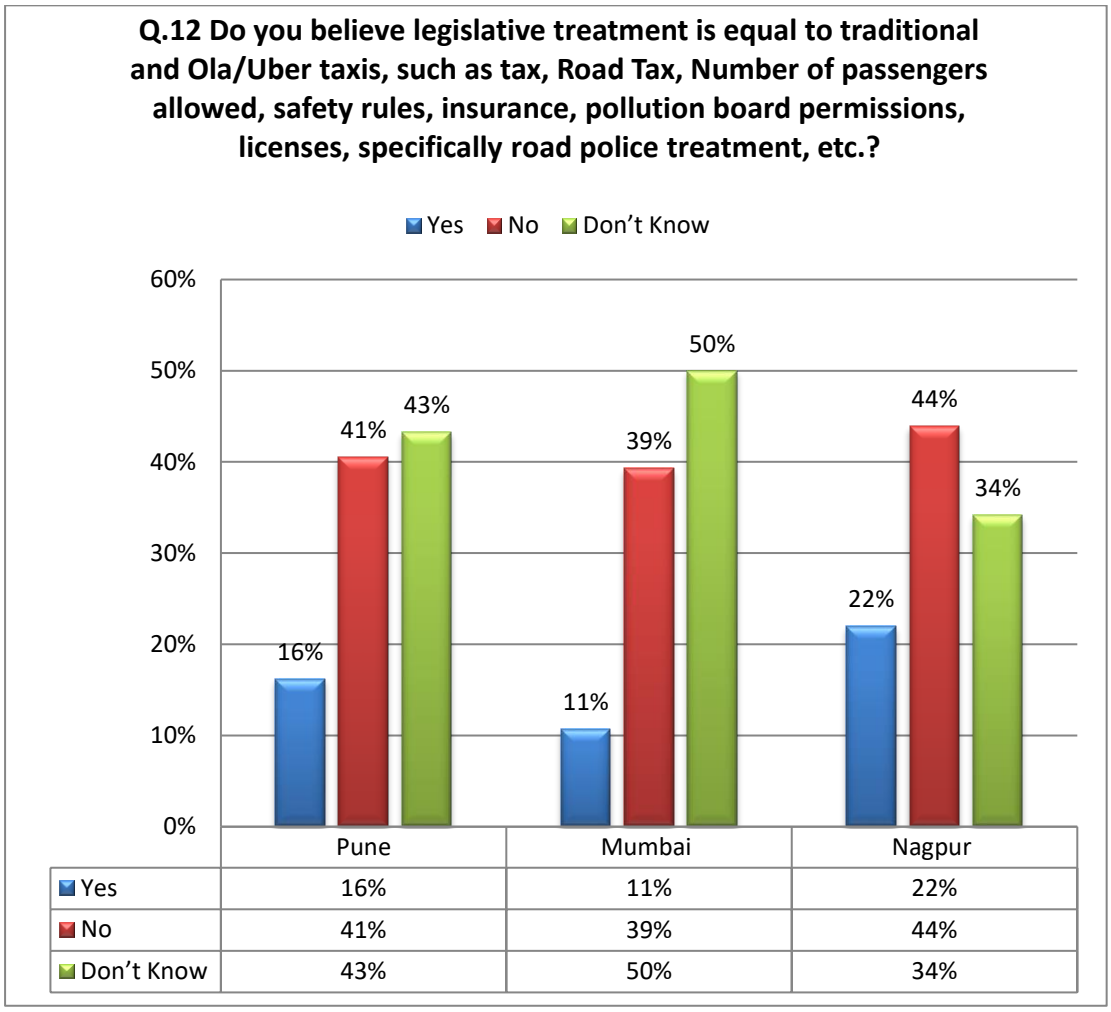
6.8.11. Assessment of Overall Level of Satisfaction



This graph reveals the degree of satisfaction of the Category III respondents more than half of respondents were dissatisfied with their Ola/Uber business model and pricing. The proportion of Category III respondents is higher among those unhappy with Uber's business model or pricing policy than among those satisfied with their model.

The percentage of Category III respondents unhappy in Pune, Mumbai and Nagpur is 76%, 79%, 78% which is greater than those who are satisfied 24%, 21%, 22% respectively. This trend is evident in three cities.

6.8.12. Assessing Perception of Discriminatory Treatment

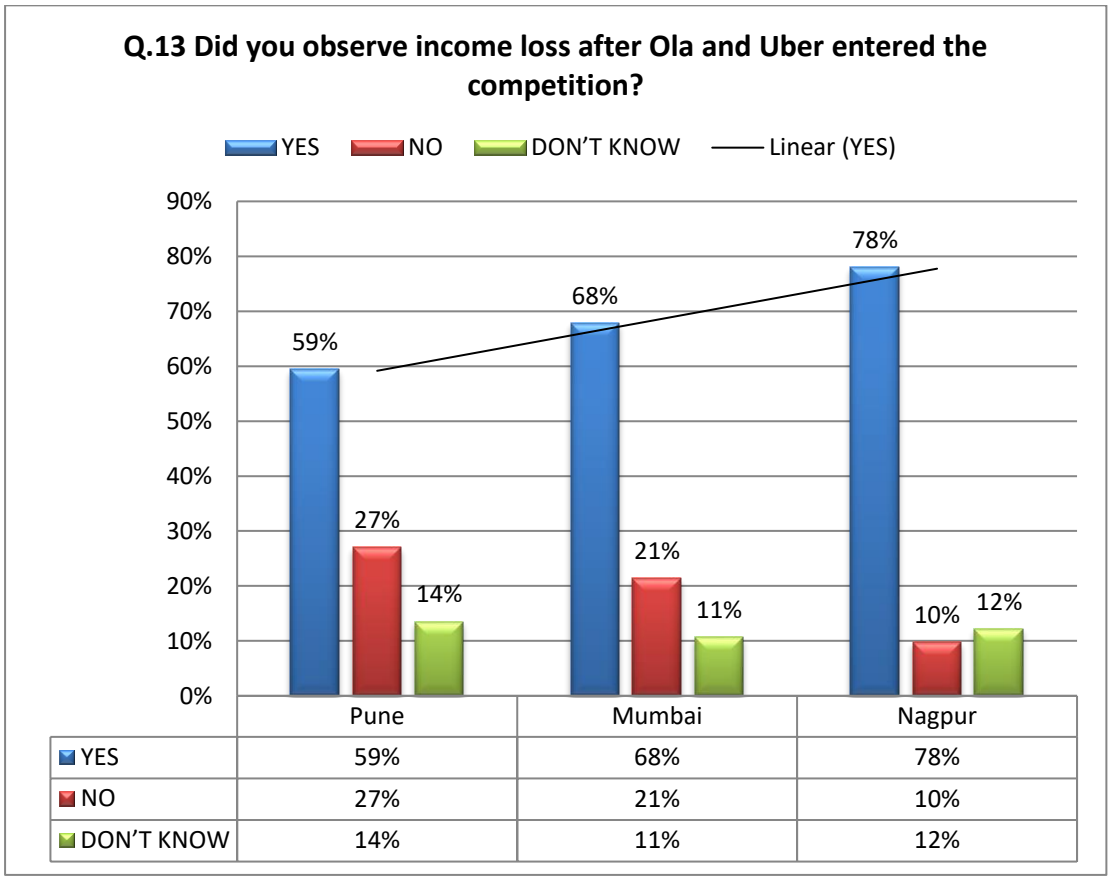


	Pune	Mumbai	Nagpur
Yes	16%	11%	22%
No	41%	39%	44%
Don't Know	43%	50%	34%

This graph reveals the perception of Category III respondents towards the legislative treatments given by various governments for Ola/Uber and traditional taxis. Most of the Category III respondents believe in unequal legislative treatment than equal treatment. In Pune and Mumbai, mostly Category III respondents are clueless about the legislative treatment. The percentage of respondents who believe in equal treatment of legislation is comparatively less in three cities.

The percentage of respondents who are unaware of the legislative treatment is 43%, 50% in Pune and Mumbai, which is higher than those who believe in unequal treatment 41% and 39%, respectively. In Nagpur, the proportion of respondents who believe in unequal treatment of legislation is 44% higher than those who are unaware and believe that equal treatment is 34% and 22%, respectively.

6.8.13. Assessing Perception of Loss of Income, Livelihood

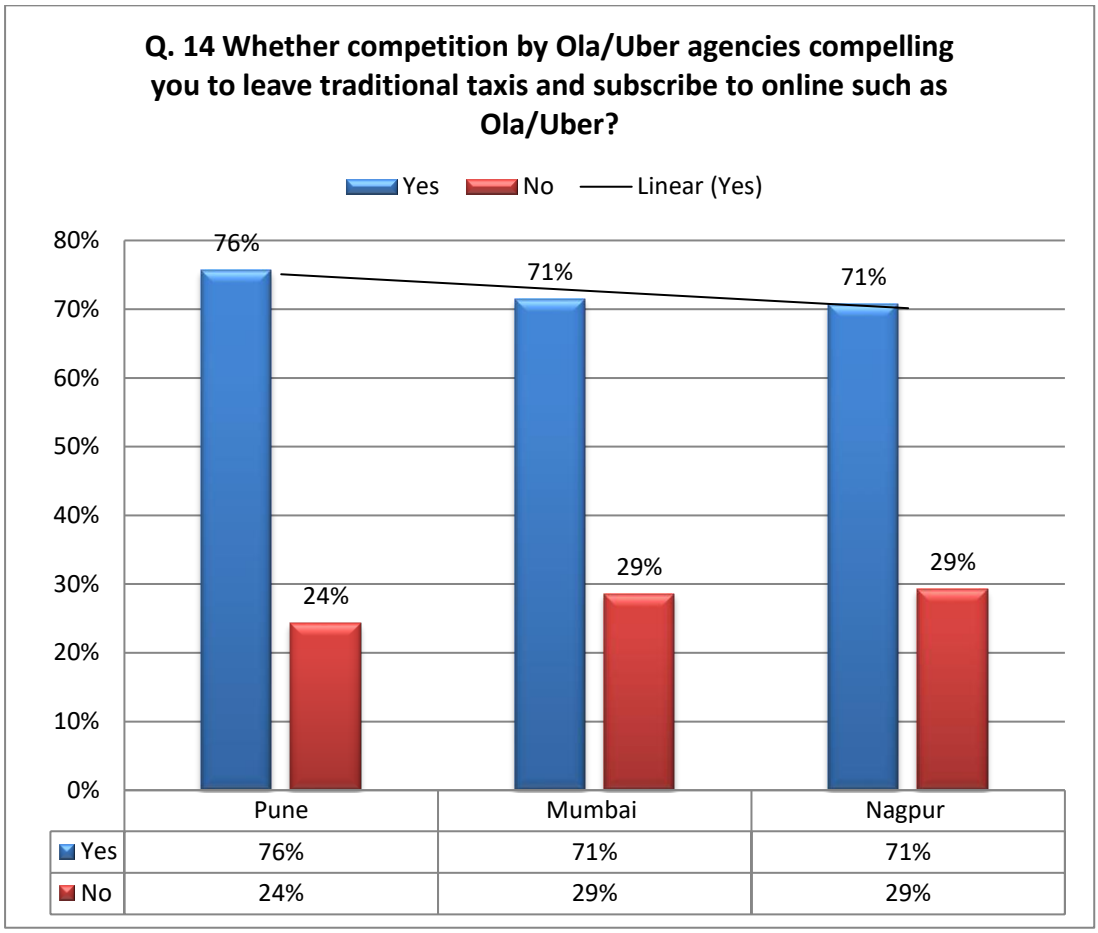


	Pune	Mumbai	Nagpur
YES	59%	68%	78%
NO	27%	21%	10%
DON'T KNOW	14%	11%	12%

This graph examines how respondents perceive a loss of income and livelihood. Most of the Category III respondents were unhappy with their Ola/Uber pricing policy and business model. The percentage of dissatisfied respondents is more significant among those who suffer losses of income and livelihoods due to Uber's pricing model or business policy than those who are unaffected. lower proportion of the Category III respondents in Pune and Mumbai clueless about the impact of Ola/Uber Pricing Policies and impact of such on their income.

The number of respondents experiencing losing incomes in Pune, Mumbai, and Nagpur is 59 %, 68 %, and 78%, which is much higher than the number of traditional taxi respondents who do not suffer the loss of income of 27%, 21%, and 10%, respectively.

6.8.14. Assessment of Competition Environment



The trends clearly show that over half of Category III respondents are believe that they are unable to compete in the competition of Ola as well as Uber. Most of the respondents believe they're not competitive and have to sign up for Ola/Uber to correct their revenue loss, which is higher than those who think they have the tools to be competitive against Ola/Uber.

The percentage of traditional taxi operators believing that they aren't competitive and need to join Ola/Uber to offset their revenue loss of 76%, 71%, 71% which is significantly higher than those who are confident that they need not sign up for an online cab aggregator that includes Ola or Uber is 24%, 29%, 29% Pune, Mumbai and Nagpur respectively. This trend is apparent across three cities.

6.9. FINDINGS BASED ON CATEGORY I RESPONDENTS DATA ANALYSIS

6.9.1. Experience of Supra-Competitive Prices

Majority of Category I respondents experience that, prices of Ola and Uber are usually high or sometimes high indicates that Ola and Uber successfully maintaining supra-competitive prices in the market. Therefore, it can't be denied that the Category I respondents surplus gets reduced by the such supra competitive prices. It is significant to note that, majority of Category I respondents experience the surge, dynamic, and personalised pricing with their affecting parameters.

6.9.2. Strategic Exploitation of Consumer Surplus

In depth analysis of pricing experience as per frequency of use of applications for cab bookings suggests that comparatively the frequent Category I respondents get exploited by supra-competitive prices and non-frequent Category I respondents attracted to network by offering lower prices. It reveals the strategy of predatory pricing actually neither beneficial to Category I respondents nor traditional taxis for long period. It was further tested in depth analysis of level of satisfaction based on frequency, that frequent Category I respondents are poorly satisfied than non-frequent respondents.

6.9.3. Tools to Make Durable Cartel

The popular reasoning behind success is extensive network which further strengthen the stance that predatory pricing strategies are helping hands in maintaining supra-competitive prices.

The extensive network is a result of predatory pricing strategies. In this case, the Ola/Uber would have been able to drive out its (traditional taxis) competitors by offering lower prices, and then use its extensive network to maintain supra-competitive prices.

The extensive network is a separate factor that contributes to the Ola/Uber's success. In this case, the Ola/Uber may have been able to build up its network through other means, such as good customer service or innovative products. However, the predatory pricing strategies may still be helping the Ola/Uber maintain supra-competitive prices.

6.9.4. Violation of Competition Law

From competition law perspective it was observed that, the intention of predatory pricing is not coupled with business economics rather it was rooted in systematic and strategic pricing to led supra-competitive prices for long run period. The phenomenon of price parallelism between Ola and Uber along with perception about their competition is also negative among the majority of Category I respondents. These outcomes state that competition regime has to revisit in terms of predatory pricing and price parallelism. The outcomes of this empirical work also confirm that Uber's business model need of screening by competition regulators in terms of reduction in consumer surplus and injury to traditional market through predatory pricing.

6.10. FINDINGS BASED ON CATEGORY II RESPONDENTS DATA ANALYSIS

6.10.1. Impact of Supra-Competitive Prices on Consumer Surplus

The study examines the perception of these respondents regarding the prices of ride-hailing services offered by Ola and Uber.

Majority of Category II respondents experience high prices for Ola and Uber

The study confirms that most respondents in Category II believe that the prices charged by Ola and Uber are typically high. The statement suggests that Ola and Uber are able to maintain prices that are above the competitive levels. "Supra-competitive" refers to prices that are higher than what would be expected in a competitive market. This indicates that these ride-hailing companies might be able to charge more than what would be considered reasonable in a truly competitive market.

Impact on Category I respondents

The study points out that the high prices experienced by Category II respondents have an effect on Category I respondents. It suggests that the surplus (extra or additional amount) of Category I respondents decreases due to the supra-competitive price-points set by Ola and Uber. In other words, the higher prices charged by these companies lead to exploitation of Category I respondents.

Dynamic, surge, and personalized pricing

The majority of Category II respondents also experience the effects of dynamic, surge, and personalized pricing. Dynamic pricing refers to the practice of adjusting prices based on demand and other factors. Surge pricing is a specific form of dynamic pricing where prices increase during peak times or high-demand periods. Personalized pricing involves offering different prices to different customers based on their individual characteristics or Behavior.

Overall, the passage suggests that Ola and Uber have been successful in maintaining prices above the competitive level, affecting the disposable income of some respondents, and utilizing dynamic pricing strategies such as surge pricing and personalized pricing for different customers.

6.10.2. Exploitation of Stakeholders

The majority of Category II respondents confirms that at initial stage of Ubers business model prices are lower even sometime below the actual cost, but after enlarging the network and influence of traditional taxis the prices become usually high in nature. This predatory intention is without any support of economic rationales. It reveals the strategy of Uber's business model which finally results in exploitation of Category I respondents and Category II respondents also.

6.10.3. Strategy to Drive Out Competitors

In depth analysis of pricing policies based on the driving experience suggests that comparatively the pre-Ola/Uber Category II respondents strongly experienced than post Ola/Uber Category II respondents that, at initially prices of Ola/Uber are lower but after enlarging the network prices become usually high. It reveals the strategy of predatory pricing actually neither beneficial to Category I respondents nor traditional taxis for long period.

The passage indicates that the predatory pricing strategy employed by Ola and Uber might not have been beneficial in the long run. While it may have helped them gain market dominance initially, the eventual price increase might have led to dissatisfaction among customers and potential backlash. Additionally, the disruption caused to traditional taxi services may have resulted in long-term consequences for

the overall transportation industry. The passage mentions “predatory pricing” as the strategy used by Ola and Uber during their initial phase. Predatory pricing is a pricing policy where companies deliberately set prices below the cost of production or below the prices of competitors to drive them out of the market or discourage new competitors from entering. In this case, Ola and Uber may have used lower prices to gain a dominant position in the market.

6.10.4. Long Run Injury to Market and Short-Term Gain

It was further tested in depth analysis of stakeholder’s exploitation reveals that pre-Ola/Uber Category II respondents are strongly observed loss of income and livelihood than post Ola/Uber drivers. The popular reasoning behind success is extensive network and unfair business strategy which further strengthen the stance that predatory pricing strategies are helping hands in maintaining supra-competitive price which results in exploitation of consumer surplus.

6.10.5. Competition Law Concerns

From competition law perspective it was observed that, the intention of predatory pricing is not coupled with business economics rather it was rooted in systematic and strategic pricing to led supra-competitive prices for long run period. The phenomenon of price parallelism between Ola and Uber along with perception about their competition is also negative among the majority of Ola/Uber drivers. These outcomes state that competition regime has to revisit in terms of predatory pricing and price parallelism. The outcomes of this empirical work also confirm that Uber’s business model need of screening by competition regulators in terms of reduction in consumer surplus and injury to traditional market through pricing strategies.

6.11. FINDINGS BASED ON CATEGORY III RESPONDENTS DATA ANALYSIS

6.11.1. High Pricing but Popular Business Model

This also confirms that the majority of Category III respondents experience that price for Ola as well as Uber are typically high. This suggests the fact that Ola and Uber are able to keep supra-competitive prices on the market. So, it is clear That the surplus of Category I respondents decreases due to these price-points that are supra- competitive.

6.11.2. Strategy to Maintain High Pricing

The majority of Category III respondents confirms that at initial stage of Ubers business model prices are lower even sometime below the actual cost, but after enlarging the network and influence of traditional taxis the prices become usually high in nature. This predatory intention is without any support of economic rationales. It reveals the strategy of Uber's business model which finally results in exploitation of Category I, II, III respondents.

6.11.3. Natural Monopoly of UBER

In analysis of level of satisfaction suggests that traditional taxis were put into burden of regulatory compliances but Uber's business model is in advantageous position, which become hurdle to compete and survive them into market.

6.11.4. Injury to Traditional Taxis

In analysis of impact on Income and livelihood demonstrate that due to the loss in income and livelihood compel traditional taxis to subscribe the of Uber's business model. It erases the choice of business of traditional taxis. The popular reasoning behind success is extensive network and computer-based pricing which further strengthen the role of pricing strategies and helping hands in maintaining supra-competitive price which results in injury to traditional taxis.

From competition law perspective it was observed that, the intention of predatory pricing is not coupled with business economics rather it was rooted in systematic and strategic pricing to led supra-competitive prices for long run period. The phenomenon of price parallelism between Ola and Uber along with perception about their competition is also negative among the majority of Ola/Uber drivers. These outcomes state that competition regime has to revisit in terms of predatory pricing and price parallelism.

The outcomes of this empirical work also confirm that Uber's business model need of screening by competition regulators in terms of reduction in consumer surplus and injury to traditional market through pricing strategies.

The empirical study reveals that Uber's business model in the initial days benefitted Category I respondents due to predatory pricing and also their Category II respondents due to the high incentive policy. But after enlarging their network effect and driving out traditional taxis and their market influence, the business model becomes exploitative to Category I respondents, traditional taxis, and drivers. In the long run, Uber's business model successfully reduces consumer surplus by maintaining supra-competitive prices. The declining business and loss of balance between income and expenditure forced traditional taxis into an emergent situation to either drive out from the market or enter into Uber's business model. From the driver's perspective, Uber's business model also seems to cause a loss in income and livelihood, resulting in solid dissatisfaction among the driver group. Apart from that, big data analytics helps Uber's business model to determine the market conditions and adjust their prices accordingly in response to such. It further creates a dominance in the market, which is equipped with an aggressive competition strategy. This technological advancement has pro-competitive outcomes such as price transparency, time and cost consumption, and offers consumers various choices. On the other hand, Uber's business model creates anti-competitive results like a hub and spoke conspiracy, algorithmic collusion, reduced consumer surplus, injury to the traditional taxi market, and exploitation of driver's resources etc. the pure price parallelism is not illegal existing competition rules. Still, this conventional practice needs to reassess in the digital market.

CHAPTER 7

CONCLUSION AND SUGGESTIONS

7. KEY INSIGHTS AND RESEARCH OUTCOMES

The competition between market participants is among the players of economic development and well-being as it boosts productivity and innovation, consequently benefiting consumers. Market players are less likely to innovate and be more productive in the absence of competition. They also have a lower incentive to lose market share. Imagine that there is no balance between the price of the service and the benefits or cost of a product. If that happens, discouragement will prevail, which eventually affects competition and leads to market failure. These consequences are very similar to those in monopolistic markets. This scenario is similar to the one in which monopolistic markets result in discouragement and equilibrium being restored.[1] The regulation's role is open to restoring balance and repairing discouragements in the market. Here, the role of competition regulators needs to appreciate the notion of the comprehensive role of regulations in avoiding market failures. However, deciding to intervene through regulation is subjective and contextual, especially when pricing algorithms come into the picture.

The main hurdles in regulating pricing algorithms are perception bias towards the pro-competitive outcomes from a consumer perspective. Algorithmic pricing has transformative transparency and high convenience, reducing the search cost and time of purchase. The comparative price websites and unlimited window shopping also attract consumers in general. Resultantly, it establishes the popularity and goodness of the digital market. The consumers also start believing it is hassle-free and more worthy than the traditional market due to initial offers and deep discounting. At that moment, it becomes customary to think it is worth it due to the initial lower prices. But the flip side is that algorithms learn to quote prices per consumer behavior and detect consumer ability to pay. Ultimately, it drives traditional taxis out of the market,

[1] Swedish Government, "Regulation and competition—a literature review" (2017) available at :https://www.government.se/government-agencies/swedish-agency-for-economic-and-regional-growth/ (last visited on January 12,2022).

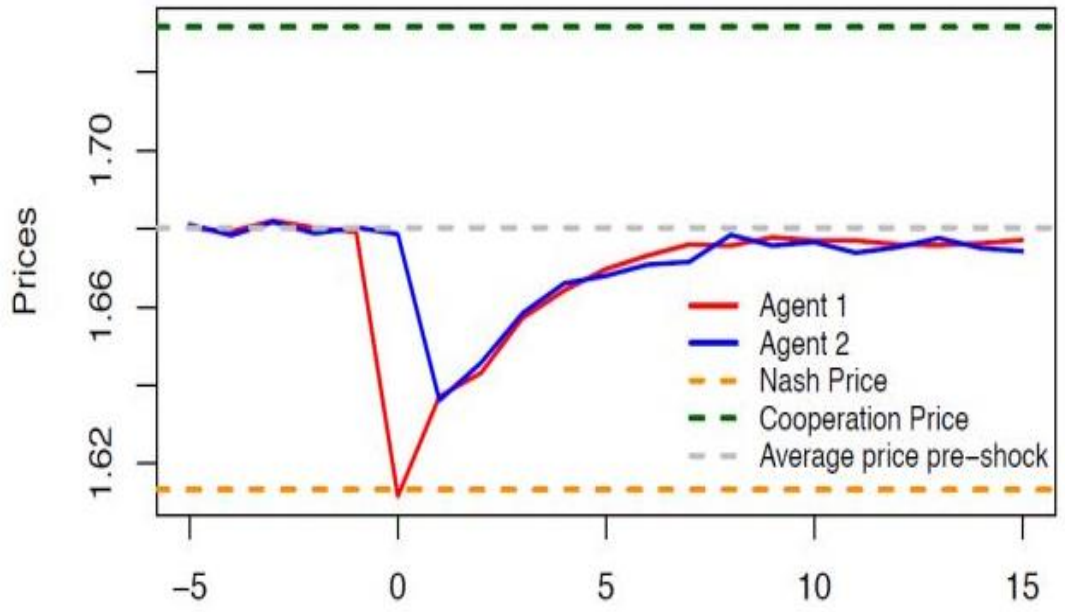
avoids price wars, and sustains in the market with supra-competitive prices. In addition, they also prevent price wars among themselves by using methods of deep discounting and inducing opponents to charge supra-competitive prices.

7.1. GROUNDS FOR HYPOTHESIS JUSTIFICATION

The doctrinal and non-doctrinal research findings substantiate the hypothesis, which suggests that the use of automated pricing algorithms has a significant concern on competition law in the digital market. The research findings provide strong empirical support for the hypothesis that AI-based pricing algorithms have significant implications for competition law in the digital market. The evidence of algorithmic collusion, coupled with adverse effects on consumer surplus, traditional taxi services, and driver satisfaction, highlights the need for a re-evaluation of existing regulations and the development of more effective tools to govern the digital economy. Several grounds in support of hypothesis are as follows:

7.1.1. Existence of Algorithmic Collusion

The third chapter explains the evidence of algorithmic collusions. It further elaborates on various scenarios of algorithmic collusion, which was supported by the literature of authors Ariel Ezrachi and Maurice Stucke in their works. The third chapter also demonstrates the implication of the theoretical framework of Axelrod tournament in devising algorithms to avoid price wars and achieve cooperation. The third chapter further explores the simulation-based evidence for addressing challenges created by AI in the competition law sphere. This concludes with findings that the automated pricing algorithms learn to collude even without any explicit input of collusion. The pricing software frequently used the deep discounting strategy to maintain collusion in the market and punish the deviating sellers. The graph shows the mechanism of deep discounting.



Source- Emilio Calvano, Giacomo Calzolari, in University of Bologna[2]

Graph No. 1-The image shows how deep discounting used as cartel tool by offering lower prices and induce competitors to learn cooperation and avoid competition.

This deep discounting mechanism to sustain algorithmic collusion in market highlight instances of algorithmic collusion and shortcomings in existing regulations and investigative tools.

7.1.2. Consumer Surplus Impact

The price parallelism between competing players in the market certainly reduces the consumer surplus. The graph shows that price parallelism, even during high prices, highlights the reduction of consumer welfare. The price parallelism during high prices signifies the replacement of competition by cooperation.

The graph shows that the percentage of Category I respondents who experienced the similar prices that Ola and Uber offer is considerably greater than those who did not experience it and were unaware of price parallelism. This trend is common in Pune, Mumbai, and Nagpur cities.

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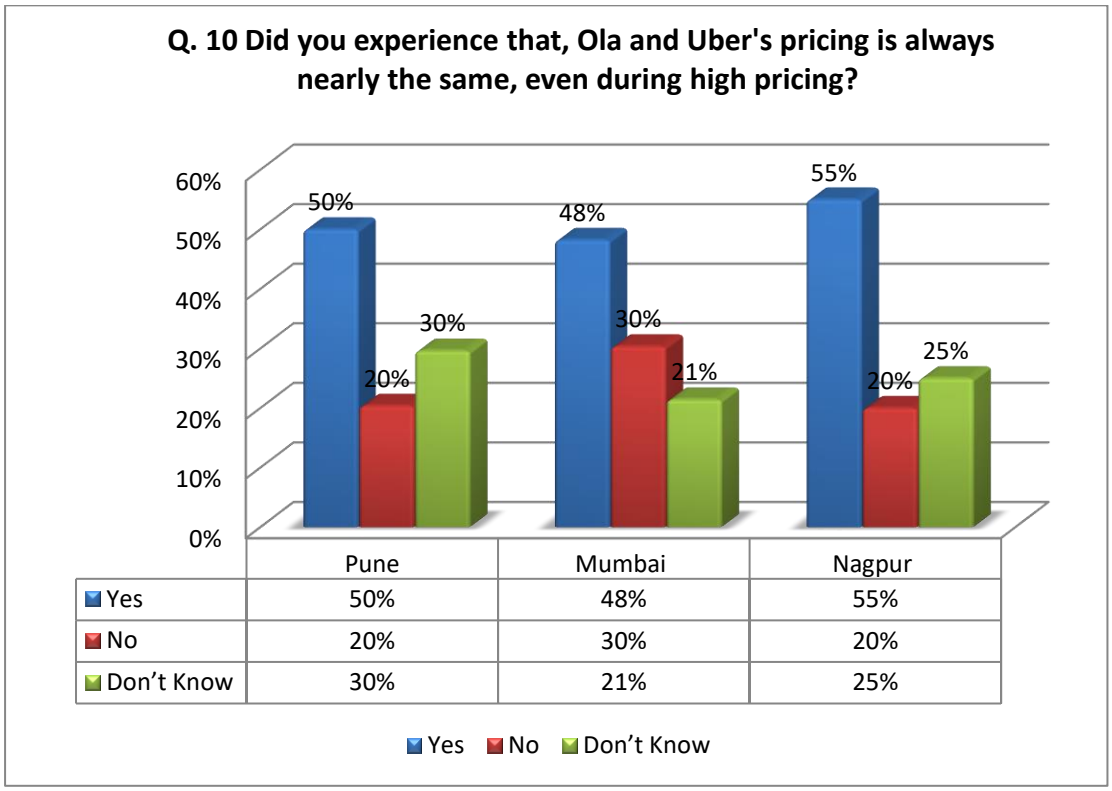
[2] Emilio Calvano, Giacomo Calzolari *et.al.*, "Artificial Intelligence, Algorithmic Pricing and Collusion"*SSRN* available at : https://www.ftc.gov/system/files/documents/public_events/1494697/ calzolaricalvanodenicolopastorello.pdf (last visited on November 6, 2022).

Category I respondent's (Passengers) Experience About Price Parallelism

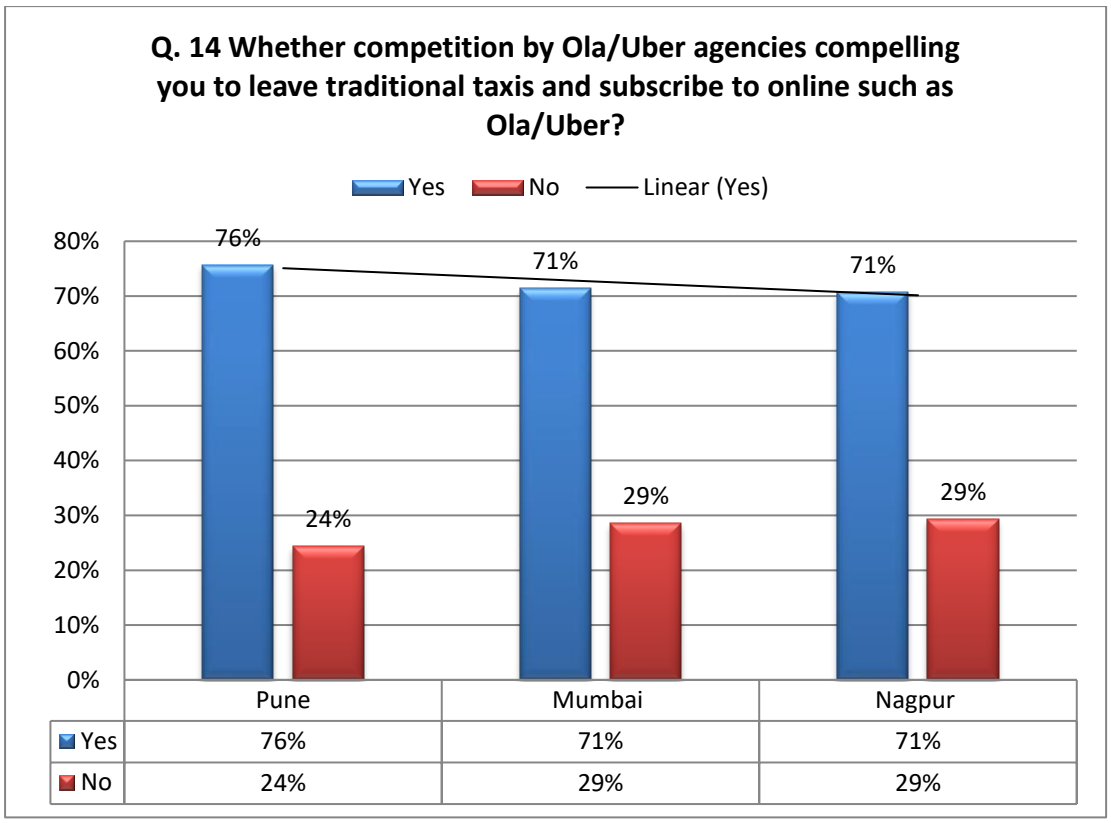


Graph No. 2- The graph shows that the percentage of Category I respondents who experienced the similar prices that Ola and Uber offers is considerably greater than those who did not experience it and were unaware of price parallelism. This trend is common in Pune, Mumbai, and Nagpur cities.

7.1.3. Harm to Traditional Taxi Industry

The empirical data and comparative analysis across three cities reveal that traditional taxis face considerable harm due to the automated pricing algorithms. These algorithms enable ridesharing platforms to undercut traditional taxi services, leading to a decline in their market share and profitability. The loss in income forced traditional taxis to subscribe the norms of the digital cab booking agencies. The perception about such is very apparent in empirical data.

Graph No. 3- The following graph shows the gravity of compelling force on traditional taxi market to subscribe the Ola and Uber business model for repair their loss in income.



The trends clearly show that over half of Category III respondents (Traditional Taxi Drivers) are believe that they are unable to compete in the competition of Ola as well as Uber. Most of the respondents believe they're not competitive and have to sign up for Ola/Uber to correct their revenue loss, which is higher than those who think they have the tools to be competitive against Ola/Uber.

7.1.4. Inadequacy of Existing Regulations

The fourth chapter pointed out gaps in existing provisions to tackle algorithmic collusion with the help of precedents of India, USA and EU jurisdictions. And conclude that the legality of conscious parallelism in the traditional market differs from digital markets. This change highlights the gap in interpreting existing competition rules in the digital market in changed market conditions.

The part of the hypothesis is also confirmed in the conclusion chapter, which points out the limitations of existing regulation of surge multiplier is not enough tool to regulate the digital market, in addition, that current investigation tools are outdated for detecting cartels in the digital market. Therefore, the hypothesis proved with

suggestions that other measures and tools like algorithmic consumers and incubators must develop competition law problems in the digital market.

7.2. SUGGESTIONS BASED ON EMPIRICAL STUDY FINDINGS

7.2.1. Regulation Can Help to Ensure That Markets Are Fair and Competitive

The need for regulation may justify either for an economic or legal basis, for instance, market failures, improving market efficiency and protection of consumer surplus. Therefore, the criteria of crystal-clear violation diminish for a broader perspective of competition law. In addition, the injury to the traditional market and protection of consumer surplus are justified reasons for intervention in the market. The public interest is a requisite stake to justify regulators' intervention; regulation may be necessary to protect the competition environment and smoothen market operations. If the market operations percolated by the restricting market access, injury to the traditional market thereby fall in consumer surplus, producing the need for regulation.[3]

The findings of the empirical work demonstrate that the traditional taxi industry suffered from "Uber's business model". On the other hand, the results of the systematically reduced consumer surplus in the market led to justifying regulation in market. The use of pricing software needs to regulate with specific behavioral and structural remedies. The well-regulated use of pricing algorithms certainly generates some pro-competitive effects in competition. The continuous strikes of traditional drivers and the finding of empirical work towards consumer satisfaction justify the need for regulation in market. As pointy in the study, the gap in legislative provisions also justifies intervention in investigating deep discounting in the market. The changing frequency of tacit collusions in the digital market bears the cause for revisiting cartel prosecutions.

[3] Luis Ortiz Blanco and Ben Van Houtte, "EU regulation and competition law in the transport sector"*Croydon* (2017) available at:https://global.oup.com/academic/product/eu-regulation-and-competition-law-in-the-transport-sector-9780199671076?cc=in&lang=en&(last visited on December 12, 2023).

7.2.2. Injury To Traditional Industry

The empirical study finds that Uber's business model harms traditional taxi drivers and their income; however, the same injury is commonly perceived by Ola/Uber's passengers and Ola/Uber drivers. It further finds that the considerable income loss and decrease in resources after Ola and Uber entered the taxi market, traditional taxis were put into a disadvantageous position in terms of legal discrimination in pricing, which results in the compulsion to subscribe to Uber's business model to avoid the risks of driving out from the competition. In addition, it was also observed that due to extensive networks and surge pricing, traditional taxis are pushed into a difficult position. Traditional taxis are discouraged due to the unregulated and uncontrolled use of pricing algorithms. Traditional taxis, as independently, cannot maintain the pricing software to sustain in the market and practically, it is impossible. Therefore, from a traditional taxi perspective, the intervention of the competition regulator is justified for their protection.

From the consumer surplus perspective, the regulation is justified for regulating supra-competitive prices charged by Uber's business model. At the initial stage of Uber's business in India, the prices were predatory in nature, but in the instance of sufficient market share, they started to charge supra-competitive prices. However, this phenomenon is not illegal as per the general competition rules. And deep discounting for the sustainability of tacit collusion/conscious parallelism must be reinterpreted for a healthy competition environment.

7.2.3. Automatic Market Corrections

The traditional markets get automatically corrected except in a few specific contexts. The Martha's Vineyard gasoline cases rarely occurred and were fructified in identical market conditions. But that, market conditions in the digital market are easily achievable. Therefore, the expectations of auto corrections of the market blurred. Another critical issue is whether the market can handle the problem better than regulatory intervention. Gal and Elkin Koran suggest that AI could be applied on the market to aid consumer decisions. This could be an alternative to market power. It could also be enhanced by algorithmic pricing on supply. In addition, algorithmic consumer programs automatize purchasing decisions, create parameters to disrupt

oligopolistic market structures and identify cartels. However, the authors also pointed out some problems in their proposal.[4] The expectation of using AI applications for auto-correction of the market is not a powerful tool, and it has the probability of making it more complex. The AI-based pricing decisions have already become difficult to explainable human intelligence.

7.2.4. Position Of Existing Regulation of Price Ceiling

The price ceiling measure guided by the Central Transport Authority is not mandatory. Although if it is implemented and all states of India limit the surge multiplier to either 1.2 or 1.5 from base fare, the problem of collusion and declining consumer surplus will only resolve if it becomes more complicated. Surge pricing, personalised pricing, and deep discounting are the strategies to sustain and make collusion durable. A mere price ceiling would undoubtedly change consumers' perception from unfair to fair, but problems still exist in the market. This regulation would promote surge pricing as more legal and sophisticated, resulting in durable algorithmic collusion. For example, if we assume the base fare of one trip of Ola or Uber is Rs.100, without regulation price would be unlimited and may extend to Rs. 300 or Rs. 500. The consumer would start to leave this trip choice and prefer another mode of transportation to make a worthy decision. After such a regulation surge puts a maximum price of Rs.150 or Rs.120, the consumer will perceive and choose it for better convenience and feels worth the choice. Now collusion comes into the picture once the consumer behaviour is enough to infer that this consumer is making the frequent choice of Ola or Uber. The price would always be near Rs. 150, only occasionally near Rs. 100. The consumer also deserves a lower price of up to Rs. 50 becomes nearly impossible for pricing software. The issue of surge pricing can only resolve by considering the big data-based analytics personalised pricing because this big data analytics-based pricing allows one to make inferences of consumer behaviour and detect the ability to pay and put personalised pricing. Notably, the regulators have yet to discover the exact formula of surge parameters. Therefore, regulating the price

[4] Michal S. Gal, and Niva Elkin-Koren, "Algorithmic Consumers" 30 *Harvard Journal of Law & Technology*, (2021) available at:https://jolt.law.harvard.edu/assets/articlePDFs/v30/30HarvJLTech309.pdf last visited on December 12, 2022).

ceiling by limiting the surge multiplier is not an efficient remedy for intervening in the market.

In addition, the regulations still need to address price parallelism, personalised pricing, traditional industry harm, hub and spoke Conspiracy and discriminatory legal treatment, price transparency, and consumer choices. Imposing surge pricing makes Uber's business model more sophisticated and durable with anti-competitive prices. The empirical study confirmed this; there is still a large amount of bitterness about pricing against Uber's business model continued in market stakeholders, which put a burden to rethink upon market regulators.

7.2.5. Surge And Personalized Pricing

The findings of the third chapter conceptualize the problem of the surge and personalized pricing and their role in sustaining the collusion in the market. It further substantiates the potential of algorithms to sustain collusion for an extended period by way of the surge and personalized pricing with the help of describing Axelrod tournaments and further laboratory evidence and simulation conducted by the University of Bologna. In addition, the study further explores the same through empirical work and finds that personalized pricing and surge pricing, along with other strategies, are the means of consumer exploitation. It was again reconfirmed by the market study presented by the CCI and reflected in policy change. According to the Central Transport Authority of India,

"The objective of surge/dynamic pricing is to efficiently manage supply and demand to ensure efficient services for all. However, they have observed that unregulated surge pricing, especially in time of need, can lead to consumer exploitation"[5]

To avoid consumer exploitation, the Central transport authority of India issued the guideline to regulate surge and personalized pricing. However, the regulation of local transport in India is subject to State Regulation; therefore, according to these guidelines, respective states and union territories frame their regulations.

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[5] Competition Commission of India, "Market Study on Competition and Regulatory Issues Related to the Taxi And Cab Aggregator Industry: With Special Reference To Surge Pricing In The Indian Context" *Key Findings and Recommendations of CCI, 2020* available at: https://www.cci.gov.in/images/marketstudie/en/market-study-on-cab-aggregator-industry-with-special-emphasis-on-surge-pricing1662725297.pdf (last visited on October 11, 2022).

"The Aggregator shall be permitted to charge a fare 50% lower than the base fare and a maximum Surge pricing of 1 .5 times the base fare specified under Clause 13(1) hereinabove. This with enable and promote asset utilization which has been the fundamental concept of transport aggregation and also substantiate the dynamic pricing principle, which is pertinent in ensuring asset utilization in accordance with the market forces of demand and supply"[6]

This guideline helps state governments regulate aggregators' prices and promote asset utilization. However, these guidelines are not mandatory to states; therefore, the time of regulation may vary from state to state. Madhya Pradesh government followed the guideline as it is and adopted a surge multiplier of .1.5 times than the base fare. Rajasthangovernment adopted 1.2 as a surge multiplier to protect the consumers from the exploitation of surge pricing. However, the parameters of the surge prices need to be clarified. Even a market study shown by the CCI reveals information asymmetry in riders and drivers about surge pricing.

7.2.6. Reducing Price Transparency

Its settled norm in the competition history about price transparency is a booster of competition, but it won't be applicable at certain times, like in the market of Martha Vineyard. As we discussed in the fourth chapter, the Martha Vineyard gasoline case, the contribution of transparency in sustaining conscious parallelism is inseparable. The higher clarity is devoted to ensuring that other competitors follow the price settled by conscious equilibrium, i.e., the output of tacit collusion. In the same manner, in the phase of algorithmic pricing, transparency weakens the importance of competition law. Instead, it utilizes as a tool to attain and sustain collusion in the market. Therefore, specific measures to reduce market transparency may be justified because of destabilizing algorithmic collusion and consumer protection. The U.S. competition regulator Bill Kovacic pointed out that;

"*A major example is the process for opening bids in a sealed bid procurement. Bids ordinarily are unsealed in a public setting and are displayed for all offerors to*

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6 Government Of India Ministry of Road Transport & Highway, "Motor Vehicle Aggregator Guidelines, 2020" Chapter 13 (3), Issued on 27 November 2020, available at: https://morth.nic.in/sites/default/files/notifications_document/Motor%20Vehicle%20Aggregators27112020150046.pdf(last visited on December 10, 2022).

observe. This procedure enables cartel participants to determine whether their co-conspirators abided by the terms of their agreement to rotate bids or otherwise suppress rivalry. An obvious reform would be to permit inspection of bids by a guardian internal to the purchasing organization, such as an inspector general. This simple measure would complicate the detection of cheating by cartel members and still ensure that the winning offeror has been identified correctly"[7]

There are certain risks with higher price transparency in the market, which builds and secures the coordination among the competitors and effectively fosters collusion in the market. However, the degree of transparency that is risky in the market is difficult to determine, as pointed out by Maurice Stucke in his work.[8] The reducing transparency may resolve through algorithmic incubators, which actively participate in the market and detect the collusions in the market. And inform or sometimes put countermeasures to destabilize the collusion created by the algorithmic collusion. On the other hand, reduced transparency may help to protect the interests of consumers by availing discounts by sellers. It also helps promote and reestablish the discounting culture and reduces the risk of abuse of discounting strategy in the market. In the digital market pricing software, by using deep discounting and personalized pricing, surge pricing stabilizes the tacit collusion for a long. And exploit the benefits from the supra-competitive prices. As a result, it reduces the consumer surplus and destabilizes the traditional markets equally. Therefore, reducing the transparency norm would help the functioning of the market. It may be enforced by regulation of the design of algorithms or may with the help of algorithmic incubators.

7.3. GENERAL SUGGESTIONS

7.3.1. Algorithmic Consumer

The present use of pricing software replaces sellers' tasks in market dynamics. The pricing software uses various machine-learning tools for pricing decisions. These

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7 William E. Kovacic, "Antitrust Policy and Horizontal Collusion in the 21st Century" 106 *Loyola Consumer Law Review*, (1997) available at : https://lawecommons.luc.edu/cgi/viewcon tent.cgi?ref erer=&httpsredir=1&article=1484&context=lclr(last visited on October 15, 2022).

8 Maurice Stucke, "Evaluating the Risks of Incraluating the Risks of Increased Price T eased Price Transparency" *UTK Law Faculty Publications, (2005)* available at : https://ir.law.utk.edu/cgi/ viewcontent.cgi? article=1764&context=utklaw_facpubs (last visited on June 12, 2022).

tools collect data from current market conditions and, using big data analytics, determine the market condition for pricing decisions. These tools work upon minimal input of profit maximization and price optimization. Machine learning and deep learning tools help them process large amounts of trade inventory for the pricing decision as per the change in demand and supply in market conditions. This capacity of pricing software replaces the seller's task to update the price. Consumers are away from any digital assistant for pricing decisions in this transaction. Although they benefit from the pro-competitive effects of the competition, like convenient search, unlimited window shopping, and easy price comparison, consumers would still be exploited by the pricing software by analyzing their consumer behaviour. This analysis helps pricing software to quote the maximum price per ability to pay. In this picture, consumers are misplaced in poor and unequal bargaining positions. This misplaced position can be restored by providing digital assistance to consumers for their purchase decisions would undoubtedly make a balance in the transaction this digital assistant named Algorithmic Consumer.

The price comparison websites like Trivago help consumers compare the prices of various websites for homogeneous goods and services. But again, this is part development of the algorithmic consumer because, ultimately, the decision of purchase has to take by the human consumer against the algorithmic seller. These price-comparing websites and web aggregators only help in the collection of data which cannot erase the problem of oligopoly sustained by the algorithmic seller in the market.

Samsung and IBM jointly developed the washing machine Samsung Washer W9000 in their Autonomous Decentralized Peer-to-Peer Telemetry (ADEPT) project in the internet of things study. This washing machine reorders the detergent and spare parts for its maintenance. In addition, it also negotiates power usage in peak time to save electricity bills.[9] It may extend easily to various platforms. Like in a theoretical

[9] Veena Pureswaran and Sanjay Panikkar, Sumabala Nair, "Empowering the edge Use case abstract for the ADEPT proof-of-concept" *IBM Institute for Business Value, (2015)* available at: https://www.ibm.com/downloads/cas/QYYYV9VK (last visited on December 10, 2022).

context, the app may develop to compare Ola and Uber prices and compare with government regulation decides the choice of taxis, including traditional taxis for their ride, or may suggest going another walking distance or waiting for a price drop by analyzing the detailed data. That certainly relocates the passenger at equal bargaining power. Therefore, competition regulators may promote the Algorithmic Consumer Culture for regulating digital markets in the era of artificial intelligence.

7.3.2. Algorithmic Consumer Culture

Promoting algorithmic consumer culture is also a limited solution to the problem. It led to other complex issues; algorithmic sellers may discriminate in quoting prices to human and algorithmic consumers. The limitation may occur in large-value purchases like human consumers won't believe in the suggestion of algorithmic consumers for their jewellery purchase decisions. But to a certain extent, it is worth promoting algorithmic consumer culture.

The competition regulator may promote the algorithmic consumer culture by removing entry barriers and consumer access points by removing relevant data access. The first hurdle to developing algorithmic consumer culture is appropriate data access which the regulator's intervention can erase.[10]

The importance of access to big data is high in the digital market. It fuels the strategy and efficiency of pricing software. The new entrants of algorithmic consumer culture would face the problem of relevant data access collected by big giants like Ola, Uber, and Amazon. Competition regulators cannot eliminate all these problems, but certain initiates would help to reduce the anti-competitive strain. The regulator may impose data portability of norms to grant access to data collected by anti-competitive means, such as privacy for the protection of consumer surplus and public interest. Additional legal tools may develop in data portability.[11] To the extent of this data, interoperability may consider allowing any new entrant in market.

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[10] Michal S. Gal and Niva Elkin-Koren, "Algorithmic Consumers" 2 *Harvard Journal of Law & Technology* available at: https://cyber.harvard.edu/events/luncheons/2017/04/AlgorithmicConsumers (last visited on December 12, 2022).

[11] Maurice Stucke, Allen Grunes, "Big Data and Competition Policy"279 *Oxford University Press*, (2022).

To allow any new competitor to have the ability to utilize data collected by other companies and to capable to discern and understand its patterns. However, rival companies may need more motivation to develop interoperability.[12]Whether the regulators require interoperability, is a difficult question. The main obstacle to creating a platform for data portability is not subject to competition laws. Because these entry barriers are not made artificially, the other regimes may explore this notion and would help to promote algorithmic consumer culture.

7.3.3. Algorithmic Collusion Incubators and Deceleration

It is settled in the literature that algorithms can collude without any detectable communication. The detection of algorithmic collusion is equally difficult to detect by relying on human judgment. The human brain cannot decode pricing algorithms' decisions because pricing algorithms are based on big data analytics by processing large amounts of data using high-velocity processing tools. Algorithmic incubators are a tool for competition regulators. By using computer simulation on market conditions like demand, supply, and market conditions, regulators can understand in what condition tacit collusion occurs in the market and countermeasures to destabilize it. Jin Li and Charles R. Plott proposed the model for algorithmic incubators based on the experimental economics of game theorists;

"*The studies bidder behavior in simultaneous, continuous, ascending price auctions. We design and implement a ''collusion incubator'' environment based on a type of public, symmetrically ''folded'' and ''item-aligned'' preferences. Tacit collusion develops quickly and reliably within the environment. Once tacit collusion developed, it proved remarkably robust to institutional changes that weakened it as an equilibrium of a game-theoretic model. The only successful remedy was a non-public change in the preference of participants that destroyed the symmetrically, ''folded'' and ''item aligned'' patterns of preferences, creating head-to-head competition between two agents reminiscent of the concept of a ''maverick''*[13]

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[12] European Union, "Regulation (Eu) 2016/679 of the European Parliament And Of The Council"*Official Journal of the European Union,* available at: https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32016R0679(last retrieved on December 12, 2022).

[13] Li Jin, Plott, *et.al.*,"Tacit Collusion in Auctions and Conditions for its Facilitation and Prevention: Equilibrium Selection in Laboratory Experimental Markets"*Economic Inquiry, a*vailable

However, the development of algorithmic incubators may need more definitions of collusion because the definition of collusion is different situation-wise. There may be a gap in the judgments of humans and machines to understand collusion. It requires a more straightforward and definite understanding of conscious parallelism in the digital market. An algorithmic incubator may use various options to destabilize conscious parallelism, like the deceleration of certain features of pricing software. It may explore options such as reducing the speed and frequency of price changes.

This measure was already used in the fuel sector, where fuel sellers are restricted to matching their prices once a day in Austria and Western Australia. It is exactly the opposite strategy of punishment for deviations, i.e., deep discounting exercised by the firms to discourage sellers from giving discounts and distort such plans by offering deep discounting, which limits the opportunity to get and enjoy a reputation as a discounter seller in the market. This strategy would stabilize the conscious parallelism in the market. The algorithmic incubators may utilize the deceleration and distort such sustainability of conscious parallelism by limiting price change.[14] Another strategy may be putting a time lag for price change. For instance, the regulator may allow the price to decrease, but for specific periods players may put conditions to be continuously lower for one particular time. That also helps to destabilize the algorithmic cartel. However, the deceleration technique may be used even without algorithmic incubators up to a certain extent. Various countries are putting control limitations on surge pricing and price ceiling through regulations in cab aggregators in transport businesses.

7.3.4. Digital Surveillance Tools

Apart from the deceleration and detection featured algorithmic incubators, it may be devised as surveillance tools in market. This surveillance helps to process large scale price inventories and check pricing behavior of the market players. It may further

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at:https://www.researchgate.net/publication/46538570_Tacit_Collusion_in_Auctions_and_Conditions_for_Its_Facilitation_and_Prevention_Equilibrium_Selection_in_Laboratory_Experimental_Markets(last visited on December 20, 2022).

[14] Organisation for Economic Co-operation and Development, "Algorithmic Collusion: Problems and Counter-Measures - Note by A. Ezrachi & M. E. Stucke"*127th meeting of OECD Competition Committee on 21-23 June 2017*, available at: https://www.oecd.org/daf/competition/algorithms-and-collusion.htm> or <Perma | one.oecd.org (last visited on November 11, 2022).

extent to check the rationality of surge pricing based on demand and supply metrics. These features may help to point out artificial demands in market which instigate surge algorithms to led supra-competitive prices. In addition, it may also use as investigation tool for deep discounting probes. The surveillance tools would be also help to other sectors like detecting like cartel. The competition market authority of United Kingdom developed AI based cartel screening tools would necessarily provide inspirations for to develop surveillance tools.

7.4. LEGISLATIVE SUGGESTIONS

7.4.1. Uber's Hub and Spoke

The third- and fourth-chapter study finds that deep discounting helps to sustain collusion in the market and limit the price to attain conscious parallelism. The new approach is necessary to reinterpret term agreement in context of hub and spoke conspiracy in online market by applying theory of rule of reason. In addition, it is necessary to accept larger ambit of interpretation of term agreement in S.3 of Competition Act, it provides understanding and concerted action as well. Further this acceptance may extent to infer that all drivers of Uber's made understanding to follow the price calculated by the agent i.e., Uber's platform. The use of the price data strengthens these arguments. It finally increases the chance to reverse the decision of CCI and prosecute for Uber's business model for hub and spoke conspiracy and found guilty of section 3 of Competition Act, 2002. The CCI may ask to Uber for behavioral changes like complete transparency in price breakups with passengers and drivers. The same issue also pointed by the market study conducted by the CCI on cab aggregators. The Uber's business model should not be considered as mere intermediatory for other regulations. This business model having control over the price and all economic factors, therefore it cannot be escape from the liability.

7.4.2. Utilization of Deep Discounting as a Cartel Strategy

As discussed in third- and fourth-chapters deep discounting may investigate on the basis of cartel rather abuse of dominance. The guilt of abuse of dominance coupled with market dominance which probably difficult to prove in present Uber's business model. The intention of predatory pricing in abuse of dominance is to make platform

for abuse of market power and drive out competitors in market. But intention of predatory pricing through deep discounting is to sustain collusion in market. It makes the conscious parallelism more sustain and durable. Therefore, we propose new interpretation of deep discounting as a cartel tool, this stance was strengthened by the third chapter substantiate that deep discounting help to limit the price and replace the competition by inducing cooperation in digital platform.

7.4.3. Suggestions For Change in Legal Provisions

Existing Version of Section 3 (4)of Competition Act, 2002

"Any agreement amongst enterprises or persons at different stages or levels of the production chain in different markets, in respect of production, supply, distribution, storage, sale or price of, or trade in goods or provision of services, including—

(a) tie-in arrangement;

(b) exclusive supply agreement;

(c) exclusive distribution agreement;

(d) refusal to deal;

(e) resale price maintenance, shall be an agreement in contravention of sub-section (1) if such agreement causes or is likely to cause an appreciable adverse effect on competition in India. Explanation—For the purposes of this sub-section,—

(a) "tie-in arrangements" includes any agreement requiring a purchaser of goods , as a condition of such purchase, to purchase some other goods;

(b) "exclusive supply agreement" includes any agreement restricting in any manner the purchaser in the course of his trade from acquiring or otherwise dealing in any goods other than those of the seller or any other person;

(c) "exclusive distribution agreement" includes any agreement to limit, restrict or withhold the output or supply of any goods or allocate any area or market for the disposal or sale of the goods;

(d) *"refusal to deal" includes any agreement which restricts, or is likely to restrict, by any method the persons or classes of persons to whom goods are sold or from whom goods are bought;*

(e) *"resale price maintenance" includes any agreement to sell goods on condition that the prices to be charged on the resale by the purchaser shall be the prices stipulated by the seller unless it is clearly stated that prices lower than those prices may be charged."*

The Section 3 (4) (f) of Competition Act, 2002suggest to incorporate as

(f) *"Deep Discounting", a practice of pricing software offering personalized discounts to buyers below costs to induce competitors to higher the price, shall be presumed to have an appreciable adverse effect on competition.*

7.5. SUGGESTIONS FOR CHANGE IN JUDICIAL INTERPRETATIONS

In UBER's judgment the requirement of agreement between drivers and UBER for price necessary to relaxed by applying the judgment of Sugar Cartel Case[15] and consider the notion of no requirement of actual working plan for such contacts by object or effect if it influences the competitor's strategy. In UBER case all drivers share their strategy through spoke i.e., UBER's pricing algorithm which equate and share the strategy of competing player in the market. Therefore, it is necessary to consider in the interest of object of competition law and protect the stake of consumer and sustain and promote competition market, the Uber's hub and spoke conspiracy under the violation of section 3 of Competition Act, 2002.

[15] *Suiker Unie v. Commission*, ECR 1663, EU:C:1975:174, (1975) available at:https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX%3A61973CJ0040(last visited on March 13, 2022).

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- Amity Law Review
- Antitrust Bulletin (American Bar Association Section of Antitrust Law)
- Antitrust Law Journal (Oxford University Press)
- Boston College International and Comparative Law Review
- Central India Law Quarterly
- Civil and Military Law Journal
- Cochin University Law Review
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- Competition Law Journal (Butterworths)
- Criminal Law Journal
- Delhi Law Review
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- https://fas.gov.ru/
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- Antitrust Law & Economics Forum
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STUDY CENTERS

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- Centre for Competition Law and Economics (CCLE) - University College London (UCL) - United Kingdom
- Centre for Competition Law and Policy (CCLP) - University of Oxford - United Kingdom
- Centre for Competition Law Studies - King's College London - United Kingdom
- Centre for Competition Policy - University of East Anglia - United Kingdom
- Centre for European Law and Legal Studies (CELLS) - University of Cambridge - United Kingdom
- Centre for Law, Economics and Society (CLES) - UCL Faculty of Laws - United Kingdom
- Competition Law Association (CLA) - United Kingdom
- Competition Law Center - University of Florida Levin College of Law - United States

- Competition Law Forum (CLF) - British Institute of International and Comparative Law (BIICL) - United Kingdom
- Competition Law Research Centre (CLRC) - De Montfort University - United Kingdom
- Competition Policy International (CPI) - Global
- Concurrences - Institute for Competition Law - France
- European University Institute - Florence School of Regulation (FSR) - Competition Law and Economics - Italy
- Global Antitrust Institute (GAI) - Antonin Scalia Law School, George Mason University - United States
- Institute for Consumer Antitrust Studies - Loyola University Chicago School of Law - United States
- Institute of Competition Law (ICL) - Russia
- Institute of European and Comparative Law - University of Oxford - United Kingdom
- Max Planck Institute for Innovation and Competition - Germany
- The Competition Law Initiative (CLI) – India

PARLIAMENTARY DEBATES

India:

1. Parliamentary Standing Committee on Finance, "Report on Digital Competition" (2022).
2. Competition Commission of India, "Annual Report (2021-22)".

United Kingdom:

1. Department for Business, Energy and Industrial Strategy, "Digital Markets, Competition and Consumers Bill" (2022).
2. Competition and Markets Authority, "Digital Markets Task Force" (2022).

European Union:

1. European Commission, "Digital Markets Act" (2020).
2. European Parliament, "Report on the Digital Markets Act" (2021).

LIST OF VIDEOS

OECD Competition Law and Policy,"Competition Law and Digital Markets explained in 7 minutes" YouTube video January 15, 2021. available at: https:/ /www.youtube.com/watch?v=XXXXXXXXXX(last visited on March, 21 2022).

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Institutfrançais des relations internationals,"Digital Middle Powers: What Strategies in the Global Tech Competition?" available at:https://www.ifri.org/en/publi cations/ etudes-de-lifri/digital-middle-powers-what-strategies-global-tech-competition (last visited on 21 March, 2022).

CNBC TV18,"New Draft Law on Digital Competition in The Pipeline" available at: https://www.example.com (last visited on March, 21 2022).

Competition and Consumer Commission of Australia,"Competition in Digital Markets – Part III" available at: https://www.example.com(last visited on March, 21 2022).

ANNEXURE I

QUESTIONNAIRE FOR PASSENGERS

Shrikant Kulkarni, a research Scholar at Lovely Professional University (Punjab), is currently conducting research on the "Interface Between Competition Law and Artificial Intelligence: A Critical Analysis of Pricing Algorithms of Cab Booking Agencies". To this end, responses to questions in a questionnaire form must be received; these responses will then be used exclusively for research purposes.

Name of Respondents _____

Age ____ **Occupation** _____

1. Are you a passenger of__?

   a) OLA b) UBER

2. How often have you traveled by booking through a mobile application?

   a) Every day b) Weekly

   c) Monthly d) Yearly

3. Do you think that Ola/Uber ride prices are comparatively lower/higher than traditional taxis?

   a) Lower b) Higher c) Don't Know

4. Did you experience that Ola/and Uber pricing are continuously changing for the same ride?

   a) Yes b) No c) Don't Know

5. Did you experience that Ola/Uber pricing depends on the circumstances like office timings or rainfall?

   a) Yes b) No c) Don't Know

6. Do you think that the initial days of Ola/Uber were fair in pricing, and after some time, i.e., after capturing the market, the prices have become high?

   a) Yes b) No c) Don't Know

7. Did you experience that Ola/Uber pricing varies from passenger to passenger, although they book simultaneously for the same ride?

   a) Yes b) No c) Don't Know

8. Do you believe that Ola and Uber actually compete for prices?

   a) Yes b) No

9. What do you think about the reasons behind the success of Ola and Uber?

   a) Fair Business Strategy b) Unfair Business Strategy

   c) Extensive Network d) Computer-Based Pricing

10. Did you experience that, Ola and Uber's pricing is always nearly the same, even during high pricing?

    a) Yes b) No c) Don't Know

11. Do you think that, Ola/Uber business model is troublesome passengers/Drivers/Traditional Taxis?

    a) Passenger b) Drivers

    c) Traditional Taxis d) None of Them

12. Are you satisfied with Ola/Uber business model and pricing strategies?

    a) Satisfied b) Not Satisfied

13. Do you think, Ola and Uber systematically gain more by using computers for pricing and thereby cause loss to traditional taxis?

    a) Yes b) No

QUESTIONNAIRE FOR OLA/UBER DRIVERS

Shrikant Kulkarni, a research Scholar at Lovely Professional University (Punjab), is currently conducting research on the "Interface Between Competition Law and Artificial Intelligence: A Critical Analysis of Pricing Algorithms of Cab Booking Agencies". To this end, responses to questions in a questionnaire form must be received; these responses will then be used exclusively for research purposes.

Name of Respondents _____

Age _____

1. Are you a Driver of__?

   a) OLA b) UBER

2. How much is your driving experience?

   a) 0 to 5 years b) 5 to 10 Years

   c) 10 to 15 Years d) More than 15 Years

3. Do you think that Ola/Uber ride prices are comparatively lower/higher than traditional taxis?

   a) Lower b) Higher c) Don't Know

4. Did you experience that Ola/and Uber pricing are continuously changing for the same ride?

   a) Yes b) No c) Don't Know

5. Did you experience that Ola/Uber pricing depends on the circumstances like office timings or rainfall?

   a) Yes b) No c) Don't Know

6. Do you think that the initial days of Ola/Uber were fair in pricing, and after some time, i.e., after capturing the market, the prices have become high?

   a) Yes b) No c) Don't Know

7. Did you experience that Ola/Uber pricing varies from passenger to passenger, although they book simultaneously for the same ride?

   a) Yes b) No c) Don't Know

8. Do you believe that Ola and Uber actually compete for prices?

a) Yes b) No

9. What do you think about the reasons behind the success of Ola and Uber?

a) Fair Business Strategy b) Unfair Business Strategy

c) Extensive Network d) Computer-Based Pricing

10. Did you experience that, Ola and Uber's pricing is always nearly the same, even during high pricing?

a) Yes b) No c) Don't Know

11. Do you think that, Ola/Uber business model is troublesome passengers /Drivers/Traditional Taxis?

a) Passenger b) Drivers

c) Traditional Taxis d) None of Them

12. Are you satisfied with Ola/Uber business model and pricing strategies?

a) Satisfied b) Not Satisfied

13. Do you think, Ola and Uber systematically gain more by using computers for pricing and thereby cause loss to traditional taxis?

a) Yes b) No

14. Whether online cabs such as Ola/Uber causing you loss of income and livelihood?

a) Yes b) No

QUESTIONNAIRE FOR TRADITIONAL TAXI DRIVERS

Shrikant Kulkarni, a research Scholar at Lovely Professional University (Punjab), is currently conducting research on the "Interface Between Competition Law and Artificial Intelligence: A Critical Analysis of Pricing Algorithms of Cab Booking Agencies" To this end, responses to questions in a questionnaire form must be received; these responses will then be used exclusively for research purposes.

Name of Respondents _____

Age _____

1. Are you a Driver of__?

   a) OLA b) UBER

2. How much is your driving experience?

   a) 0 to 5 years b) 5 to 10 Years

   c) 10 to 15 Years d) More than 15 Years

3. Do you think that Ola/Uber ride prices are comparatively lower/higher than traditional taxis?

   a) Lower b) Higher c) Don't Know

4. Did you experience that Ola/and Uber pricing are continuously changing for the same ride?

   a) Yes b) No c) Don't Know

5. Do you think that the initial days of Ola/Uber were fair in pricing, and after some time, i.e., after capturing the market, the prices have become high?

   a) Yes b) No

6. Do you think that the initial days of Ola/Uber were fair in pricing, and after some time, i.e., after capturing the market, the prices have become high?

   a) Yes b) No

7. Did you experience that Ola/Uber pricing varies from driver to driver, although they get booked simultaneously for the same ride?

   a) Yes b) No

8. Do you believe that Ola and Uber actually compete for prices?

   a) Yes b) No c) Don't Know

9. What do you think about the reasons behind the success of Ola and Uber?

   a) Fair Business Strategy b) Unfair Business Strategy

   c) Extensive Network d) Computer-Based Pricing

10. Do you think that Ola/Uber business model is troublesome passengers /Drivers /Traditional Taxis?

    a) Passenger b) Drivers

    c) Traditional Taxis d) None of Them

11. Are you satisfied with Ola/Uber business model and pricing strategies?

    a) Satisfied b) Not Satisfied

12. Do you believe legislative treatment is equal to traditional and Ola/Uber taxis, such as tax, Road Tax, Number of passengers allowed, safety rules, insurance, pollution board permissions, licenses, specifically road police treatment, etc.?

    a) Yes b) No c) Don't Know

13. Did you observe income loss after Ola and Uber entered the competition?

    a) Yes b) No c) Don't Know

14. Whether competition by Ola/Uber agencies compelling you to leave traditional taxis and subscribe to online such as Ola/Uber?

    a) Yes b) No

ANNEXURE II

RESEARCH PAPER PUBLICATION

Title of the Paper	Exploring risks of investor claims brought forth after the TRIPS waiver for COVID-19
Published Date	31st October, 2022
Volume & Issue Number	
ISSN/ISBN Number	20468954, 20468962
Impact Factor/SJR	Cite Score 2021 3.7 1. SJR 2021 0.331 **2.** SNIP 2021 7.184
Type of paper (Research/Review)	Review
Weather this is thesis work or not (Yes/No)	Yes
Web link of journal indexing	https://doi.org/10.4155/ppa-2022-0034 DOI: 10.4155/ppa-2022-0034 Exploring risks of investor claims brought forth after the TRIPS waiver for COVID-19 | Pharmaceutical Patent Analyst (future-science.com)

ANNEXURE III
CONFERENCE DETAILS

1)

Certificate No. 245174

LOVELY PROFESSIONAL UNIVERSITY
Transforming Education Transforming India

Certificate of Participation

Presented to **Mr. Shrikant Madhav Kulkarni** of **Lovely Professional University** in recognition of his/her participation in **"International Conference on Innovation and Intellectual Property Rights"** held on **18-19th April, 2022** organized by Division of Research and Development, Lovely Professional University, Punjab.

Date of Issue: 13-05-2022
Place: Phagwara (Punjab), India

Prepared by
(Administrative Officer-Records)

Convener
Dr. Runjhun Tondon
(IAIPR 2022)

Dr. Chander Prakash
CD, Division of Research
and Development

2)

Certificate No. 245059

LOVELY PROFESSIONAL UNIVERSITY
Transforming Education Transforming India

Certificate of Participation

Presented to **Mr. Shrikant Madhav Kulkarni** of **Lovely Professional University** in recognition of his/her presentation of paper tilted **AN APPRECIATING LIMITATIONS OF FAIR DEALING IN INDIAN COPYRIGHT LAW FOR EDUCATION: A COMPARATIVE STUDY WITH FAIR USE IN UNITED STATES** in the **"International Conference on Innovation and Intellectual Property Rights"** held on **18-19th April, 2022** organized by Division of Research and Development, Lovely Professional University, Punjab.

Date of Issue: 13-05-2022
Place: Phagwara (Punjab), India

Prepared by
(Administrative Officer-Records)

Convener
Dr. Runjhun Tondon
(IAIPR 2022)

Dr. Chander Prakash
CD, Division of Research
and Development

3)

LOVELY PROFESSIONAL UNIVERSITY

Transforming Education Transforming India

Certificate No. 245034

Certificate of Participation

Presented to **Mr. Shrikant Madhav Kulkarni** of **Lovely Professional University** in recognition of his/her presentation of paper tilted **Analysis of COVID-19 Technology Transfers Through the Lens of TRIPS Interactions to Indian Law and Competition Policy.** in the **"International Conference on Innovation and Intellectual Property Rights"** held on **18-19th April, 2022** organized by Division of Research and Development, Lovely Professional University, Punjab.

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