Synopsis

“Love for Variety”, Outside Option, and Platforms

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I. Background and Motivation

Platforms refer to a market situation where distinct groups interact with each other through an intermediary. The number of members on the opposite side determines the value of joining the platform. This is called cross-side externality benefits. A platform internalizes this cross-sided externality in its profit-maximizing behavior. As a third party, the platform creates a place or space where two consumer groups, the buyers and the sellers, can get together to carry out the transaction. The platform's structure is pertinent and holds good if and only if the consumers on both the buyers' side and the sellers' side cannot come to an "efficient agreement"[1] outside the platform. In 2024, five of the top ten biggest companies by market cap are structured around platforms.[2] Some examples of sector-specific online or digital platforms include social media platforms like Facebook, e-commerce platforms like Amazon and eBay, credit card platforms like VISA and Master Card, Google web portal as an advertising platform, software platforms like Sony PlayStation video games, entertainment platforms like Netflix and Disney Hotstar, hosted platforms like Airbnb and OYO, ride-hailing platforms like Ola and Uber, food delivery apps like Zomato and Swiggy, and the list goes on. In reality, it is not only about competing platforms but also monopoly platforms. In the actual world, there are several instances of monopoly platforms. As Mukherjee and Mukherjee (2020) point out, the monopoly platform paradigm seems suitable when there is only one magazine or newspaper or a monopoly shopping mall in some area or the Yellow Pages directory of an incumbent telephone company, to name a few. Another example of a monopoly platform is Bharat Matrimony. In the Indian

[1] Rochet & Tirole (2004) define efficiency as the maximum joint utility of the consumers on both sides. The platforms charge some fees, which can be either a fixed membership fee, a per-unit usage fee, or a combination of both, to make such an "efficient agreement" possible.

[2] These five companies are - Apple, Microsoft, Amazon, Alphabet (Google), and Meta Platforms. Check the complete list of "Top 10 biggest companies in the world by market cap in 2024" at https://www.forbesindia.com/article/explainers/top-10-largest-companies-world-market-cap/86341/1

context, when the matchmaking industry began in 1997, it was the sole online website. Online platforms have certain unquestionable benefits that have helped them gain a larger client base over time and achieve faster growth rates. What makes them so popular is the simplicity of conducting business seamlessly with anyone living anywhere in the world by eliminating physical restrictions.

One of the issues that intrigued me is that people usually think of platforms as online or digital and often do not pay more attention to offline ones like shopping malls. The motivation for using shopping malls comes from the rapid rise in the number of malls worldwide[3] and their contribution to determining the quality of urban life. Whether the mall should locate itself in or away from the city has essential implications for forming city structures (Malykhin & Ushchev, 2018), thus making the location choice important. Shopping malls have become attractive because they allow consumers access to different goods and varieties of a particular good in one place without spending much time and money commuting between shops. Moreover, the mall offers a wide range of stimuli: coffee shops, food court establishments, and movie theaters, making it a desirable place to spend time (Farrag et al., 2010). Also, it is common for malls not to charge buyers any membership/entry fee for visiting the malls, thereby adding to their attractiveness. Though COVID-19 changed how people shop, with buyers preferring a more "touch-free"[4] experience, the footfall in malls across the globe did take a hit. India was no exception.[5] However, since 2023, companies including Tata Trent, PVR, Aditya Birla Fashion, and Reliance Retail have greatly expanded the number of their stores.[6] A report in The

[3] The size of the shopping mall market is expected to rise from USD 5.90 trillion in 2022 to USD 9.41 trillion by 2031. See https://www.grandviewresearch.com/industry-analysis/shopping-centers-market-report

[4] Reported at https://www.across-magazine.com/the-mall-as-a-platform/

[5] https://www.trade.gov/country-commercial-guides/india-online-marketplace-and-e-commerce

[6] Reported at https://www.mytotalretail.com/article/how-malls-are-making-a-comeback-in-2024/

Economic Times (January 4, 2024) states, "In 2023, as many as 11 shopping malls became operational, covering 59,48,395 square feet of space across the top eight cities. In the previous year, nine malls came into eight markets, totaling 34,49,222 square feet area. Hyderabad witnessed the completion of three shopping malls, while Pune and Chennai had two each. One shopping mall each came up in the Mumbai Metropolitan Region, Delhi-NCR, Bengaluru, and Ahmedabad."[7] So, malls as a platform have again started flourishing in large cities in India, despite e-commerce recently becoming the next big thing in the retail sector and business houses concentrating on internet platforms. The thesis will focus on online platforms like e-commerce and offline ones like shopping malls to develop the theoretical models.

Besides these advantages, the platforms, be it online or offline as discussed, are known for offering many varieties of products for sale, produced by different sellers, in one place, attracting buyers. This aspect is one of the key focus areas of the thesis. The buyers get access to a variety of products in one place, reducing their search costs. For instance, large e-commerce platforms in India like Amazon and Flipkart, among others, give buyers the option to choose from a wide range of goods and services provided by vendors featured on their websites. The same is true for the malls. These days, operating system platforms like Google's Android and Windows are the foundation of many consumer electronics devices, including smartphones, smart televisions, and even car navigation systems. These platforms enable users to download and utilize hundreds of applications created by third-party developers[8] compatible with their respective platforms. Also, About 500 million Stock Keeping Units (SKUs) were available on Amazon in 2016; that figure has risen to an incredible 4.5 billion for USA alone in 2023.[9] Thus,

[7] Read at: https://economictimes.indiatimes.com/industry/services/property-/-cstruction/why-bigger-and-more-shopping-malls-are-coming-up-in-top-cities/articleshow/106550628.cms?from=mdr

[8] For instance, we use the food delivery app Swiggy on our Android phones.

[9] Reported at https://amzscout.net/blog/amazon-statistics/

variety has become the "bread and butter" of such marketplaces.[10] The more apps, films, content, etc., a user can choose from online, the better it is. Similarly, there are more shops in a mall to choose from, so buyers will be attracted.

In modern-day economies, one question that has been doing the rounds is the issue of the coexistence of 'brick-and-mortar' shops vis-à-vis shopping malls/e-commerce platforms selling varieties of a differentiated product. Typically, a 'brick-and-mortar' store stocks fewer product varieties than a shopping mall/e-commerce platform. For instance, Amazon lists 57 times as many book titles as a typical physical bookstore, according to Brynjolfsson et al. (2003). In 2020, Walmart's online store had 75 million SKUs[11], whereas an offline Supercenter in the US stocked only 120,000 different items.[12] Then, how does the existence of the 'brick-and-mortar' store affect the shopping malls/e-commerce platforms and *vice versa*? This makes the theme of 'love for variety' and the availability of an outside option very much applicable in the present context regarding two-sided platforms.

There are different ways of modeling 'love for variety', namely, 'ideal variety' (Spence, 1976; Salop, 1979; Perloff & Salop, 1985) and 'love for variety' (Dixit & Stiglitz, 1977). In the models developed in the thesis, the focus is on the Dixit-Stiglitz type of preferences. To match this idea of 'love for variety' preferences where the buyer consumes some amount of every variety of the product available at the market, we started working with a Dixit-Stiglitz type of (Dixit & Stiglitz, 1977) utility function. As we started working on the modeling section, first, we noticed that in the existing literature on Bertrand-type price-competition models in differentiated product oligopoly markets, on their demand side specification, usually assumes

[10] Reported at https://platformpapers.substack.com/p/five-ways-to-boost-platform-growth

[11] https://multichannelmerchant.com/ecommerce/walmart-gives-shopifys-1-million-sellers-access-marketplace/

[12] See Brynjolfsson et al. (2022)

the presence of a representative buyer[13] with continuous choice in a commodity space (Singh & Vives, 1984; Häckner, 2000). To capture the presence of multiple varieties in a differentiated oligopoly market, Anderson et al. (1995) introduce consumer heterogeneity, but it comes at the cost of the presence of multiple price equilibria, leading to problems of existence. Second, in many of the initial works in this area of differentiated products, a monopolistically competitive set-up was used, contrary to a differentiated oligopoly market, where an *a priori* assumption of "a large number of firms", each selling a small amount[14] implies firms' actions having a negligible impact on other firms' profits were used. To put it simply, strategic price interactions among firms were absent. Also, the existing literature on platforms does not determine the number of varieties sold in the differentiated product market and assumes it to be exogenously given. In the context of two-sided platforms, it is, thus, evident that the requirement for these dimensions is of paramount importance. Besides, the endogenous location choice configuration is missing from studies in the existing literature for an offline platform like a shopping mall.

In this context, the existing literature fails to provide a unifying framework for studying these dimensions: 'love for variety' with heterogeneous buyer preferences, strategic price interactions among the sellers of the varieties of the differentiated product, an outside option in a differentiated oligopolistic framework and the location choice of a platform (in case it is an offline platform). Hence, the motivation behind choosing such a theme for doctoral research. The thesis attempts to integrate these dimensions into the theoretical modeling frameworks combined with real-life examples to motivate the same.

The survey of literature relevant to the thesis follows in the next section.

[13] Kirman (1992) commented on the debatability of the representative agent set-up and stated that it "deserves a decent burial, as an approach to economic analysis that is not only primitive, but fundamentally erroneous."

[14] See Yang and Heijdra (1993)

II. Survey of Literature

Focusing on 'love for variety' and a non-zero outside option, the thesis aims to extend the existing literature in three specific dimensions: first, in the context of differentiated oligopoly in a delegation common agency framework; next, for a two-sided monopoly platform; and finally, in the context of spatial competition with the location choice of a platform. This section looks into some relevant studies in the existing literature.

Chapter 2 starts the thesis with a differentiated oligopoly market where the sellers compete in prices in delegation common agency games (see Martimort & Stole, 2009). As argued, having an alternative consumption program in our context is important. Their approach, however, does not accommodate buyers' non-zero outside options or 'love for variety', a choice criterion frequently cited in the literature on differentiated product markets. The impact of such a framework on the price-setting game's supermodular structure has also not been explored in the context of a strong extensive margin effect discussed in Chapter 2. Papers like Anderson et al. (1992) and Cosandier et al. (2018) discuss the violation of supermodularity through the network effect due to differences in tastes and incomplete product awareness, respectively. Additionally, the coexistence of the 'love for variety' preference pattern and non-zero outside option makes our framework suitable for discussing the interaction between 'brick-and-mortar' stores and shopping malls/e-commerce platforms. There are two strands of literature. Industry-specific papers like Spanke (2020) and Bhatnagar and Yadav (2022) have argued that 'brick-and-mortar' shops and shopping malls/e-commerce platforms will grow simultaneously, contrary to the dominant view in the literature on country-specific studies, which predicts that it will not, more so after COVID-19 (see Salem & Nor, 2020; Afridi et al., 2021; Li et al., 2022 among others). Chapter 2 adds to this literature.

The framework is then extended to analyze the behavior of a platform, especially its pricing behavior and its location choice in a linear city. Platform pricing in monopoly setting

has a rich literature pioneered by Rochet and Tirole (2003, 2006). The papers like Caillaud and Jullien (2003), Armstrong (2006), Weyl (2010), Hagiu and Halaburda (2014), Economides and Hermalin (2015), Belleflamme and Peitz (2015), Hovenkamp (2020), Jeon et al. (2022) explored various aspects of it further. Rochet and Tirole (2003) have pointed out that it is common in reality where one side of the market is charged while the other side is subsidized. This phenomenon is common in newspapers, social sites, credit card markets, and shopping malls, to name a few. We use the same concept in Chapter 4, where we assume that the mall, being a two-sided platform, does not charge the buyer side.[15] The differentiated products on the platform are discussed by papers like Hagiu (2009), Galeotti, and Moraga-González (2009) and closer to the scope of the present chapter. We incorporate the non-zero outside option of the buyer, unlike Galeotti and Moraga-González (2009) and Hagiu (2009), which is equally important because it theoretically captures the trade-off between the 'brick-and-mortar' shops and the platform (as discussed in Belleflamme & Peitz, 2021). The key finding in Hagiu (2009) relevant to our context involves the impact of the exogenously defined "intensity" of consumers' preferences for variety, in other words, a fall in the substitutability among varieties, on the platform's pricing structures. His paper finds that the monopoly platform earns more profits on the seller side as the higher the consumer's preference for variety, the lesser will be the extent of rivalry among producers and, consequently, more rent extraction power in the hands of the producers. Thus, increasing the fee on the seller side. It also finds opposite results under competing platforms. However, Hagiu (2009) reaches this conclusion for a monopoly platform by comparing the share of profits on both sides defined based on an exogenously fixed number of varieties. The overall impact on the profit of the platform has not been captured in

[15] Apart from sometimes charging a very negligible parking fee. For instance, the rulings of the Kerala High Court in 2022 and Gujarat High Court in 2019 can be references that do not allow malls to charge parking fees. In Pune, the local bodies have made parking free at the malls.

his paper. Chapter 3 of the thesis addresses this research gap. For a monopoly platform, Galeotti and Moraga-González (2009) find that with an increase in the exogenously given number of varieties, competition among the sellers rises, and the monopoly platform lowers the fee on the seller side relative to the buyer side. However, a fall in the substitutability among the varieties of the differentiated product weakens competition among sellers. It raises the platform's profit; hence, a higher fee is charged from both the buyer and seller sides. We add to this by exploring the possibility where the platform earns a higher profit even by charging a smaller fee on the seller side. Contrary to a monopoly platform setup, Economides and Katsamakas's (2006) model in the context of competing platforms shows that a strong preference for a variety of operating system platforms may lead to higher total profits in a proprietary platform (e.g., Windows) as compared to an open-source platform (e.g., Linux). A similar result was discussed in Manten and Saha (2012). In the context of platforms, the existing literature does not address the platform's role in increasing the number of varieties. This chapter of the thesis, in contrast to its predecessors, not only endogenously determines the number of varieties sold on the platform and outside it but also highlights the importance of different platform-efficiency-related, seller-side, and buyer-side parameters in characterizing the equilibrium.

In the context of platform's (in Chapter 4, I consider the platform to be a shopping malll) location choice, one of the pioneering works is by Smith and Hay (2005), where they study the interactions between three alternative modes of retail organization: the street marketplace, malls, and supermarkets. However, the location choice of such marketplaces is usually fixed exogenously, and each supplies the same goods. It is also assumed that the volumes and prices of the products purchased are independent of firms' strategies, consumers' locations, and the location of each of the marketplaces. However, the cross-sided network effects, common to platforms, have not been discussed. Brando et al. (2014) consider a setting where a shopping mall and a supermarket compete by supplying the same range of goods, and

locations are fixed on two extremes of the linear city. Ushchev et al. (2015) extend this model by introducing i) a downtown retail market and a monopoly shopping mall on both ends of the linear city and ii) buyers have a 'love for variety' preference. Some varieties are sold in the retail market, and some are sold in the mall. The downtown retail market is characterized by free entry, while the monopoly shopping mall allows sellers by charging a per-slot fee. Though the location of the marketplaces is fixed, the size of the marketplaces gets endogenously determined. In the literature on social media platforms, a recent paper by Mishra and Sarkar (2023) studied a platform duopoly where the platforms are located on the extremes of a linear city, similar to Uschev et al. (2015). The former assumes a duopoly involving two-sided platforms, while the latter assumes one platform and one marketplace characterized by monopolistic competition. Consumers, depending on their location, can either single-home or multi-home. Thus, one of the major research gaps in the existing literature in this regard is not endogenizing the location choice of a two-sided platform, like a shopping mall. The role of the mall in increasing the number of varieties is something that the literature has not addressed in this context. Furthermore, the other dimension in the literature that needs to be examined is the use of Bertrand-price competition in this type of spatial structure. While the prices derived in Brando et al. (2014) depend on the exogenous number of varieties, Ushchev et al. (2015) derive the Dixit-Stiglitz prices (Dixit & Stiglitz, 1977). However, this result is empirically not supported (see Kaplan et al., 2019). Chapter 4 tries to fill in these research gaps. The impact of an increase in the substitutability of the varieties on the number of varieties sold both on the platform and outside it and also on the platform's profit is a common theme in the literature (Belleflamme & Peitz, 2019). To the best of my knowledge, the existing literature has not adequately discussed other parameters like the platform's efficiency in servicing its clients on both sides, the fixed costs faced by the sellers, improvements in the outside option, and travel costs.

III. Research Objectives and Methodology Used

Building on the research gaps, the thesis addresses the following objectives.

Chapter 2 analyzes how introducing a 'love for variety' preference and a non-zero outside option for the buyers impact the oligopoly prices in a differentiated product oligopoly market. Also, the chapter tries to give insights into how the extensive margin of demand affects the supermodular structure of such a price-setting game. Next up, the model characterizes the equilibrium to endogenously determine the number of varieties sold and the number of buyers in the market. The chapter highlights the role of the extensive margin of demand effect and, in this context, finds out how the prices of the varieties and the number of sellers in the market get affected by the marginal cost incurred by the sellers, substitutability among the varieties of the differentiated product, and an improvement in the outside option.

Chapter 3 discusses how the presence of a platform increases the number of varieties in a market and the factors that determine the number of varieties sold on the platform. The platform internalizes the externalities either side of the market creates for the other side and decides the optimum membership fee for both sides. The comparative static exercises focus on the impact of the platform's costs of servicing its clients on both sides and the fixed costs faced by the sellers in their operation on the number of varieties sold both on the platform and outside it and also on the platform's profit. Moreover, in this chapter, I explore how the presence of an outside option for buyers (like the presence of 'brick-and-mortar' shops) affects a platform and whether greater differentiation of varieties is good for a platform.

Chapter 4 models the platform's location choice using a framework similar to Chapter 3. In this setting, the chapter assesses the impact of such location choice on the price of the

variety of the differentiated product. It analyzes how buyer-side parameters like 'love for variety' preferences and travel costs impact consumer behavior. Like Chapter 3, it emphasizes the role played by the shopping mall in increasing the number of varieties in the differentiated product market. In this light, the chapter finds out how the mall's membership fee on the seller side and its profit are affected by the cost of servicing buyers and sellers, the fixed cost of the sellers, substitutability among the varieties of the differentiated product, and travel costs. In line with the theme of the thesis, we study how the presence of an outside option, like a homogeneous goods market, affects the mall.

A short description of the methodology follows before briefly outlining the main contributions of the thesis. The thesis uses conventional theoretical modeling frameworks used in industrial organization to accomplish the given objectives. The sequential games we develop in each of the three core chapters involve the choices made by the agents in the different stages, and accordingly, the payoffs are realized. The models have been solved using the backward induction method.

IV. Results and Contribution to the Literature

As already discussed, Chapter 2 of the thesis introduces 'love for variety' and a non-zero outside option for the buyers in a delegation common agency framework under a differentiated oligopoly market, which is new to the literature. The central theme of the chapter is the presence of a strong extensive margin of demand effect. In the presence of such an effect, the chapter finds that the supermodular structure of a standard Bertrand specification may get changed. The price of a variety of the differentiated product may fall because of a rise in the marginal cost of production contrary to standard textbook results. Even the price and the number of varieties of the differentiated product may rise with an increase in the substitutability among

the varieties of the differentiated product or with the availability of a stronger outside option. To validate this claim, the chapter provides empirical evidence to justify that the revenue of both the e-commerce platform and the 'brick-and-mortar' shops rises simultaneously in the presence of a stronger outside option.

Chapter 3 contributes to the existing literature on the economics of platforms in multiple ways: First, the model incorporates buyers' 'love for variety' preferences; Second, it allows the number of varieties of a differentiated product in the market and on the platform to be determined endogenously, and shows that platform benefits the buyers by increasing the number of varieties available at the market; Third, it characterizes the platform's pricing on both the side of the market for changes in costs to servicing to the clients, changes in fixed costs on the sellers' side, improved outside option of the buyers, and the lower substitutability of the varieties at the market. Besides, the comparative static exercises highlight the role of these factors in influencing the number of varieties sold both on the platform and outside it and the platform's profit. We find that a platform has more incentive to serve its sellers efficiently than its buyers. It dislikes developments that lower the sellers' fixed costs and create alternative options for buyers, such as buying from 'brick-and-mortar' stores, as it leads to a fall in its profit. Additionally, the platform encourages sellers to sell varieties that are not close substitutes for one another. As commonly discussed in the existing literature, a fall in the substitutability among varieties implies stronger preferences for variety but less competition. Sellers are expected to gain more out of it. In equilibrium, thus, the platform charges both the seller side and the buyer side a higher membership fee, and its profit rises. Given the 'love for variety' preferences and the endogenous extensive margin of demand, the result adds to the literature by exploring the possibility of the platform earning a higher profit even by charging a lower fee on the seller side. It is motivated to encourage the expansion of diversity in the variety of products offered in the market.

The contribution Chapter 4 makes can be summed up as follows. First, it combines in a single framework: spatial competition, 'love for variety' preferences on the buyer side, and Bertrand-price competition on the seller side to study the interaction between a shopping mall selling differentiated products and a homogeneous goods market in a linear city; Second, the mall chooses both its location in the linear city and the membership fees it charges from the participating sellers. Interestingly, since the mall's location affects the demand for the differentiated product, the prices of the varieties are influenced by the mall's location, which the thesis proves in this chapter. Third, the representative agent framework used in standard monopolistic competition models, assuming away price interactions, is replaced by introducing heterogeneity on the buyer side with varying preferences for purchasing the differentiated product and on the seller side with their varying transaction costs. Fourth, it enables endogenous determination of the number of the differentiated product produced both inside and outside the mall, demonstrating that the mall helps consumers by expanding the number of varieties available in the market. Fifth, it characterizes the mall's choice of location on the linear city and pricing on the seller side of the market for changes in costs to servicing to the clients, changes in fixed costs incurred by the sellers, improved outside option of the buyers, lower substitutability of the varieties at the market, and the transport costs incurred by the buyers for traveling to the mall. We highlight the impact of the mall's ability to choose its location when analyzing the impact of these parametric changes on the mall's profit. In contrast to Chapter 3, it has been noted in this chapter that under specific conditions on the shopping mall's revenue and cost sides, the shopping mall's profit increases as it becomes more efficient in serving both the buyers and the sellers. The mall might support developments that lower the seller's fixed costs, depending on its location and the impact on its profit. The comparative static exercise pertaining to the sellers' fixed costs in Chapter 3 did not present this case. It is also interesting to note that depending on the mall's revenue and cost considerations, changes in the travel costs

on the buyer side, improvement in the outside option, and substitutability among varieties may increase the mall's profit and the number of varieties sold through it.

V. Outline of the Chapters

The first chapter outlines the background of the thesis. It has three core chapters, Chapters 2,3 and 4, each briefly described in this section. Chapter 5 concludes the thesis.

Chapter 1 establishes the main idea of the thesis and gives a background to what motivated this work. It surveys the existing literature and highlights the research objectives addressed in each core chapter. The theoretical methodology followed has been clearly defined. The significant contributions of the thesis to the existing theory are thoroughly illustrated in this chapter, followed by an outline of how the thesis has been organized.

Chapter 2, entitled "*Love for Variety*", *Outside Option, and Extensive Margin of Demand*, incorporates 'love for variety' and non-zero outside option for the buyers in the delegation common agency framework with uniform pricing. The chapter points out that it is not only the intensive margin of demand (the quantity demanded of a variety the buyer continues to purchase) that matters; the role of an extensive margin (participation of buyers in the market) is also important. It allows for a case where the monopoly price is lower than the oligopoly price even when the different varieties of the differentiated product are substitutes of each other. The chapter contributes to the standard 'love for variety' literature, as it introduces the strategic price competition aspect, which is usually ignored on the basis of *a priori* assumption of a large number of sellers. A buyer holding the Dixit-Stiglitz kind of utility function representing such preference, if decides to buy the differentiated product, owing to her 'love for variety' consumes some amount of every variety of the product available at the market. The chapter has argued that this creates a complementarity on the extensive margin of

the delegation common agency game. So, even in the presence of substitutability among the varieties of the differentiated product, if the price of a particular variety rises, the demand for all other varieties falls in the presence of a strong extensive margin effect. This effect violates the supermodular structure of the price-setting game. The number of sellers and buyers is determined endogenously in the present framework. Then, the comparative static results of the model derive the effect of change in the degree of substitutability among the varieties and the effect of change in the outside option to the buyers both on the extensive and intensive margin of demand and on the equilibrium number of varieties produced in the differentiated product market. The role of a strong extensive margin effect in explaining the results is specifically highlighted. The co-existence of the 'love for variety' preference pattern and non-zero outside option makes the model discussed in the chapter suitable for discussing the interaction between 'brick-and-mortar' stores and shopping malls/e-commerce platforms.

Chapter 3 on "*Love for Variety*" *and Monopoly Platform* studies the role of a monopoly platform in increasing the number of varieties in a differentiated product market where the buyers have a 'love for variety' preference, and Bertrand-price competition exists among the participating sellers. In the model presented in this chapter, a buyer has a Dixit-Stiglitz type of 'love for variety' utility function, which implies that a higher number of varieties consumed increases the buyer's utility. The buyers are identical, except that their preference for the differentiated product differs from each other. Depending on her preference, the buyer also has the option of purchasing a homogeneous product. Each seller sells a specific variety of the differentiated product. Owing to her 'love for variety' utility function, she purchases some amount of every variety of the differentiated product, whether the seller is located at the platform or outside it. The sellers differ from each other in terms of their transaction costs. However, all of them, irrespective of their location inside or outside the platform, involve themselves in Bertrand-price competition with each other. The platform charges a membership

fee for both buyers and sellers. The platform also incurs a cost for servicing both the buyers and the sellers. Only the registered agents can carry out transactions on the platform. We assume that buyers and sellers single-home on the platform if registered with it. The unregistered sellers and buyers do not pay any fee. The number of varieties sold on the platform, outside the platform and the number of buyers in the differentiated product market gets endogenously determined in the model. The platform internalizes the externalities either side of the market creates for the other side and decides the membership fee to charge to both sides. The chapter then discusses the comparative static exercises. It highlights the role of factors like the platform's costs of servicing the buyers and the sellers, the fixed costs faced by the seller side of the market in their operation, outside options of the buyers, and the substitutability of the varieties of the product, on the membership charged by the platform on either side of the market, the number of varieties sold both on the platform, and outside it, and the platform's profit.

Following the introduction of a platform in Chapter 3, Chapter 4, titled "*Love for Variety*" *and Location Choice*, incorporates the location choice of the platform in a differentiated product market and studies its interaction with an outside option in the form of a homogeneous goods market. This chapter presents a theoretical model of a monopoly shopping mall, being the platform, selling differentiated products and a homogeneous goods market in a linear city framework over a [0,1] continuum. The location of the homogeneous goods market is fixed on one end of the linear city and has not been explicitly modeled. At the same time, the shopping mall chooses its location at any point in [0,1] and a membership fee to be charged on the seller side. The sellers of the differentiated product observe the membership fee and then decide whether to join the mall or operate outside of it at the same location. Bertrand-price competition among sellers to determine the prices of their products follows. Interestingly, the prices of the varieties are influenced by the choice of the location of the mall. The number of

varieties sold on and off the mall, the location of the marginal buyer, and the number of buyers are endogenously determined. The theoretical model presented in this chapter combines several dimensions − spatial competition, 'love for variety' preferences on the buyer side, intensive and extensive margins of demand, travel costs, and Bertrand-price competition among the sellers participating in the differentiated product market. The choice of location of the mall is of great significance in the context of the results derived in the chapter. The chapter also discusses the comparative static exercises that follow the impact of buyer-side parameters like - the transport costs incurred by the buyers for traveling to the mall, outside options of the buyers, and the substitutability of the varieties of the product, seller-side parameters like - the fixed cost of the sellers and factors related to the platform's cost of servicing the buyers and the sellers on the location choice of the shopping mall, the membership fee charged to the sellers, the number of varieties sold in the mall and the mall's profit.

Chapter 5 concludes the thesis and discusses the policy implications of the results derived in the core chapters. It also outlines the future research agenda.

VI. Policy Implications

Each of the three main chapters in the thesis has its unique policy implications. The model in Chapter 2 relates to real-life market situations, where the 'love for variety' matters and the buyers choose between a 'brick-and-mortar' shop, selling a particular variety vis-à-vis a shopping mall/e-commerce platform selling a number of different varieties of a product. The findings imply that contrary to popular belief, the 'brick-and-mortar' shops, the shopping malls, and the e-commerce platforms may complement each other in the presence of a strong extensive margin of demand effect. Instead of having price competition, the formation of a price-cartel can be a possibility.

In Chapter 3, we have seen factors like the efficiency of the monopoly platform in servicing the buyers and the sellers, fixed operational costs faced by the sellers, the outside option of the buyers, and the substitutability among the varieties of the differentiated product have an impact on the platform's profit. Since online platform giants like Amazon tend to avoid taxes (Mukherjee & Mukherjee, 2020), regulating their profits is an important aspect of the platform literature. The effect of a rise in per-unit tax on both the buyer and seller sides is similar to a rise in the cost of servicing both these sides in our model. In that case, it translates to the fact that raising per-unit taxes on the buyer side can lead to higher profits for the platform, while the platform's profit falls if the regulator imposes the tax on the seller side. This result is similar to the "lucky break" concept introduced by Belleflamme and Toulemonde (2018) in the context of competing platforms. Given the cross-sided network effects, imposing a specific tax on one of the sides of a competing platform may lead to a rise in the platform's profit. Also, as an alternative to imposing taxes on the monopoly platform's profit, the regulator can promote the growth of 'brick-and-mortar' stores, resulting in a fall in the profits of the monopoly platform. These results can have important implications for controlling the profits of a monopoly platform.

Chapter 4 shows the possibility of the coexistence of a homogeneous goods market and a shopping mall. In the context of antitrust regulations, this result can be useful for the policymakers who think that large shopping malls will encroach on the small-scale retail space. This result can also have important implications in the context of regulatory intervention for limiting the size of malls, in support of the 'brick-and-mortar' stores. Even it can have important implications from the political economy perspective. That is, whether building shopping malls to improve the quality of urban life will add to the ruling party's vote share. The contributions of the thesis can be very pertinent in this regard.

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